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Comprehensive Project: Stow Munroe-Falls High School

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April 11, 2011

Introduction

I am getting my Masters of Science with Licensure for Adolescent to Young Adult: Earth Science and Chemistry. I have my Bachelors of Science from Kent State University in Geology and I have a particular interest in deep mantle geochemistry. I have decided to pursue a Masters in Education so that I can share my passion for Earth Science and Chemistry with young students and spark a curiosity and self-motivation that is so crucial in the sciences and in student development. The following is a general profile of Stow-Munroe Falls High School, an example of a school that I would be honored to experience as an instructor.

<u>District Profile</u>

Stow-Munroe Falls is a suburban district of Northeast Ohio, located en route to Cleveland, Ohio from Akron, Ohio. Figure 1 in Appendix A shows the racial/ethnic diversity of this school district, which is 3% African-American, 2.4% Asian/Pacific Islander, 1% Hispanic, 2.4% Multi-racial, and 91.3% Caucasian (ODE District Report Card, 2010). According to the Individuals with Disabilities Education Improvement Act (IDEA) of 2004, students with slowed physical, cognitive, adaptive, or social development that inhibit the student's ability to learn in a normal educational setting qualify for special education or other related services. Students of this category account for 11.5% of the district.

The school district is comprised of mostly middle-working class, with 20% of students considered economically disadvantaged (ODE District Report Card, 2010). According to the United States Federal Government, a family is considered economically disadvantaged if it meets the low-income eligibility requirements to receive federal aid in life necessities (Americorps, 2011). Life necessities are considered food, housing, and health and are provided by the Federal Government in the form of SNAP benefits, Section 8 housing, and Medicaid, respectively. Formally known as the Food Stamp Program, the Supplemental Nutrition Assistance Program (SNAP) gives the family in need a considerable discount on food that will be prepared at home and is considered necessary for a healthy diet according to the Food Pyramid prepared by the United States Department of Agriculture in 1992 (Figure 2). Section 8 Housing is federally funded housing for low-income families granted by the United States Housing Act of 1932. Finally, Medicaid is federally funded health insurance for low-income families, granted by Title XIX of the Social Security Act of 1965.

The District of Stow-Munroe Falls has been assigned a rating of Excellent and has fulfilled 25 of 26 Performance Indicators (ODE District Report Card, 2010). Performance indicators are standards set by the Ohio Department of Education (ODE) to more easily identify a district and school's progress in different areas over time. Fifth grade mathematics scored a 74.6%, just a fraction short of the 75% goal, making it the sole unmet performance indicator for the district for the 2009-2010 school year. Academic Yearly Progress (AYP) is a qualitative measure designated by ratings set by the United States Department of Education per the No Child Left Behind Act. The ratings in this system are, in descending order, Excellent, Effective, Continuous Improvement, Academic Watch, and Academic Emergency. The Performance Index is a numerical value assigned to quantify these progressive measures. Stow-Munroe Falls District Schools have met their academic yearly progress, and have had a consistent performance index of 102.8 for the past two consecutive school years (ODE District Report Card, 2010).

<u>School Profile</u>

Stow-Munroe Falls High School (SMFHS) is a suburban school within the Stow-Munroe Falls School District located on Graham Road between the intersections at Fishcreek and Kent Roads. The high school is mainly middle-working class, similar to the district, and is comprised of approximately 15.9% economically disadvantaged (ODE School Report Card, 2010). Figure 3 in Appendix A shows the racial/ethnic diversity of the high school, which is 2.7% African-American, 2.4% Asian/Pacific Islander, 0.8% Hispanic, 1.5% Multi-racial, and 92.7% Caucasian (ODE School Report Card, 2010).

SMFHS has been assigned a rating of Excellent and has fulfilled all 12 of 12 performance indicators (ODE School Report Card, 2010). The high school has not met its academic yearly progress due to its decline in performance indices from 106.7 from the 2008-2009 school year to the current 105.5 from the 2009-2010 school year. The school improvement status is "At Risk" due to its unmet goals from the 11.4% of students with disabilities (ODE School Report Card, 2010).

Classroom Profile

I teach a Conceptual Chemistry class of 11^{th} and 12^{th} graders, ages sixteen to eighteen. My class consists of ten female and twelve male adolescents, totaling a classroom of 22 students. This arrangement is typical for this school, satisfying the district's 22.24:1 student-teacher ratio (Stow-Munroe Falls, District Info, 2011). In my class, I have about three students that are economically disadvantaged (14%), but their classmates do not know this. My class is composed of one African American boy, one Asian/Pacific Islander girl, and the rest of the students are Caucasian/Non-Hispanic (Figure 4).

This class in particular is composed of a higher concentration of students with special needs, in which twelve of my students require mild to moderate intervention, totaling 55% of the class. They have either been diagnosed or suspected to have a cognitive or social learning disability, including Attention Deficit Hyperactivity Disorder (ADHD – characterized by a lack of focus and attention and the inability to control inappropriate behavior), Asberger's Syndrome (a very mild form of Autism - an inability to connect to the outside world and respond to stimuli), among other learning and reading disabilities (Ormrod, 2009). I have a special education aide that observes the class so he can help the students with special needs on homework and exams. The remaining students have been placed in this class because they have shown a lack of motivation in the sciences and have lower test scores in science and math than the majority of the students in the school.

Characteristics of Learners

Cognitive Development

Since my students are ages sixteen to eighteen, they fall under Piaget's formal operational stage of cognitive development. This stage is often displayed in children over twelve and is characterized by abstract, three-dimensional thinking and the formation of hypotheses and understanding of cause/effect relationships (Ormrod, 2009). Children and adolescents in this stage are thus able to question origins of information and grasp their deeper meanings. For example, when discussing the periodic table, a child in the previous stage of development (concrete operational) would most likely try to memorize what the periodic table looks like. They may use study tools like mnemonics, or word games, to help them remember where the elements are on the table and each element's unique characteristics. They may understand basic classification schemes for the periodic table, but not to the extent of formal operational children.

Students in the formal operational stage have the ability to understand how the periodic table was constructed. This involves an added dimension of classification that the concrete operational child could not grasp. The periodic table of elements is organized in such a complex matrix of elemental characteristics, including the number of protons to each element, the number of "comfortable" electrons to an element, the size of the element, the behavior of the element when in contact with other elements, and much more. The formal operational child can understand how and why the periodic table was constructed this way, and he/she can even question why it was not constructed another way.

Although a number of my students have disabilities or a lack of motivation, they are mostly still able to operate in this formal operation stage of development. Many of them feel comfortable in the concrete stage, and thus choose not to operate in the formal stage. The students with special needs require more time and attention than the other students to grasp the information, but they seem to try harder than the other students also. All of my students have somehow proven to me that they have the ability to operate formally, but most of them excel in the concrete stage. The concrete stage of development as described by Piaget is most often found in children seven to eleven years of age and is characterized by the formation of logical thought and the absence of abstract thinking (Ormrod, 2009). In the example with the periodic table, most of my students prefer to try to memorize the basic classification schemes of the construction of the periodic table. If they were willing to move their thought process into the formal operational stage, they may find the periodic table much easier to understand and much more interesting.

The Zone of Proximal Development, or ZPD is a term Vygotsky defines as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving with adult guidance or in collaboration with more capable peers" (1978, p. 86). In other words, the ZPD is the range of a student's abilities from the best s/he can do by his/herself compared to the best s/he can do with assistance. This principle is very useful in my classroom because according to test score data, my students do not appear to achieve much by themselves. However with the right assignments and when asked the right questions, it becomes apparent that they have the ability to understand the material at a higher level.

For example, a few weeks ago we were learning about balancing equations. My students understand that a balanced equation is in equilibrium, but many of them struggle with assigning coefficients to the molecules in the chemical equation in order to balance it. In order to balance an equation, every element present in the equation needs to have the same number of atoms represented on both sides. The basic example we worked on is shown in Equation 1, the formation of water from hydrogen and oxygen:

$$\text{(Unbalanced) } \_O_2 + \_H_2 \rightarrow \_H_2O \qquad \text{(Balanced) } \underline{\mathbf{1}}O_2 + \underline{\mathbf{2}}H_2 \rightarrow \underline{\mathbf{2}}H_2O$$

Equation 1.

My students showed nonverbal signs of frustration, irritation, and even apathy. The lower limit of their ZPD in this example is usually being able to place the "2" in front of the H_2O to balance the oxygens. They then get frustrated when they realize that by balancing the oxygens, they have disrupted the hydrogens. With persistence, we reach the upper level of the ZPD when I show them that they simply need to look at the equation again without getting frustrated. We see that it is a simple fix when we add another "2" in front of the H_2 to make the left side of the equation agree with the right side, giving two oxygens and four hydrogens on either side.

The modal memory model describes how information is stored in the brain. The three components of memory that this model suggests are the sensory memory, the working memory, and the long-term memory (Figure 5). The sensory memory is where information retrieved from stimuli by one or more of the five senses is stored. The information stored there will either last a very short amount of time before it is forgotten, or it can be transferred, or encoded to the short-term or working memory. The working memory is the temporary location for "information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning"

(Baddeley, 1992, p. 556). Information stored here will not last a very long time, although longer than the sensory memory, and thus it may either be forgotten or encoded into the long-term memory. Once information has reached the long-term memory, it can once again be forgotten or stored until it is called for and retrieved by the working memory.

This means that the students' attention spans are fairly short, meaning they can really only stay completely focused on something for a few minutes. C. Boch, a professional colleague of mine, once told me "I've noticed that [the students'] attention spans are about their age plus two in minutes." He suggests that when I am teaching a class of 16-year-olds, only expect them to pay attention for about 18 minutes, so break up the class into 18-minute intervals. When transitioning into a new interval, take a break by passing something out or write something on the board. The idea is to give the students a few minutes to refocus when they begin to drift (personal communication, April 4, 2011).

I feel that it is extremely important to relate the material with something the students are already familiar. This is Piaget's principle of assimilation, or responding and interpreting a new event according to an existing scheme (Ormrod, 2009). For example, the other day we were talking about acids and bases in chemistry. We were giving examples of acids and bases that we encounter every day. Most of my students knew that lemon was an acid and Drain-O was a base, but that did not necessarily tell them anything about how acids and bases behave with each other. We talked about when an acid and base are mixed, they neutralize to a pH closer to 7 (neutral). The students had made a large list of acids and bases that they often encounter in the household. To many of the students, we had made a list of random household items that have nothing to do with each other. Then, we began pairing the items into likely combinations, like coffee (acid) and milk (base), demonstrating how we use chemistry every day without even knowing it.

I use a number of different learning strategies in my classroom with the intention of targeting many different types of learners. The different types of learners I have in my classroom are visual, aural, and kinesthetic (Ormrod, 2009). Visual learners prefer to process information by sight, so I like to use visual aids like Power Point presentations with bright colors and funny pictures. Aural learners prefer to process information through hearing information; for the aural learners I ask them to repeat back important concepts so the students can hear themselves say the information out loud. Kinesthetic learners prefer to learn through touch. This is why we often conduct experiments and create things with our hands to bring conceptual chemistry to life.

One of the learning strategies I use that appeal to these students is organization. Organization is the cognitive process in which learners make connections among various pieces of new information (Ormrod, 2009). I often write things on the board in a systematic way that makes the material easier to remember later. I have the students create concept maps so they can organize the information they way they prefer to remember it. The concept maps, or a visual diagram of concepts that illustrates interrelationships, are an example of visual imagery. Visual imagery is the process of forming mental pictures of objects or ideas (Ormrod, 2009). I also tend to color code drawings or handouts according to the lesson with which they pertain so the information will be easier to remember. Organization and visual imagery are two strategies I use that help the visual learners in my classroom.

To aid the aural students, I like to tell stories that relate to the lesson. These stories often have a metaphorical message that relates to the lesson. I will clearly point out which variables in the story relate to which specific chemistry concept and it is much easier for the students to relate the material to their personal lives and experiences. Then we will have a class discussion and elaborate on what we have learned by thinking about deeper meanings. Thus, elaboration is supplementing additional ideas to new information based on what one already knows (Ormrod, 2009). Sometimes I will create a podcast, or voice recording of a lesson and post it to the class website for the students to refer back to what they might have missed in class. Podcasts are a good use of technology that aid in retrieval, or the act of recalling information from another location from the brain, such as the working or long-term memory storage (Atkinson and Shiffrin, 1968).

For the kinesthetic learners, we perform experiments and create tangible models of chemistry concepts. For instance, we have created the structure of an atom with foam balls and we will observe the effects of acid rain on steel over time. It is crucial in the sciences to see demonstrations of how these concepts actually work, because science is an ongoing process that is happening every day.

Personal Development

Erik Erikson's theory of psychosocial development is one that describes how life experiences may shape an individual's personality and ego identity. He defines "ego identity" as the conscious state of self that one develops through social interaction (Erikson, 1950). Throughout life, we are faced with obstacles or tests that we can either master or fail. By mastering each obstacle, we feed our ego identity and by failing these life challenges, we starve it. A satisfied ego identity gives one confidence and security and a weakened ego identity results in insecurity and self-doubt throughout life. Each stage is crucial in the process and is equally significant in self-growth.

My students fall into the adolescent stage of individuals from twelve to eighteen years of age. They are faced with the life obstacle of identity versus role confusion. In this stage, social events play a significant role in the individual's psychosocial development (Erikson, 1950). In my students' struggles with recognizing their self-identities, I see leaders emerge. Often among these leaders are the ones who have established a secure self-identity. They have friends that have established similar self-identities, usually according to a common interest, such as music. However, many of the students that follow these leaders among their groups have not necessarily mastered this stage in psychosocial development. Sometimes they have failed the test of identity and thus fall into the common trap of role confusion. Role confusion is when the individual identifies his/herself with something that does not reflect who that person really is (Erikson, 1950). It is very difficult to mend this failure later in life and thus these individuals will have a weak sense of self until they are finally comfortable in their own skin.

The next stage in Erikson's theory of psychosocial development is intimacy versus isolation that occurs in individuals from ages 19 to 40. As with all "stages" of growth, there is some overlap. I mention this stage because it is almost inevitable that an 18-year-old will experience some of the life struggles that are attributed to the intimacy stage. In this stage, intimate and loving relationships are desired and crucial for a sense of security for the future. Success in this stage leads to strong and healthy relationships and failure results in loneliness and isolation (Erikson, 1950). I see students in high school relationships all the time. The students in healthy relationships seem to have a sense of confidence that the students in unhealthy relationships lack. These intimate relationships may or may not last, but experiencing them and their psychosocial implications are what helps personal growth.

At this age, the students are fairly independent emotionally to their parents/guardians. I feel that to encourage self-growth in my students is to grant them this independence they yearn in the classroom. It is important that the students learn the material, but it is more important that students learn the procedure of learning. Each student learns differently. By giving projects that will give the students the flexibility to develop their understanding uniquely gives them the opportunity to understand and explore their self-identities in the process. Familiarizing oneself with a unique self-identity is invaluable for the success of one's wellbeing for life.

Social/Moral Development

Forming relationships at the adolescent stage of development is very important for social growth. As mentioned before, the students are at the stage of psychosocial development in which they are constantly struggling to discover themselves. This leads to very diverse friend groups, full of individuals of very different identities. As they grow up, their identities will usually water down a little bit, but for now, identity characteristics are very prominent. These friend groups form "cliques," or a group consisting of three to ten individuals that share a common interest (Ormrod, 2009). Peers also tend to hold cliques to a specified social status; thus, individuals are judged according to their associated clique or crowd. In this context, a crowd is a larger group of people that share common interests and attitudes (Ormrod, 2009). It is helpful for an adolescent to identify with an existing group as a blueprint, and it is crucial for that individual to find acceptance among the associated group. My students with social development disorders, like Asberger's Syndrome are less likely to hold high social status, but they still have friends. Although holding high social status feels important to the students at their age, what is really important is that they have at least one close friend.

When students do not find acceptance, they often stand out from the crowd and can be picked on, or bullied. Bullies are students often with high social status who threaten, harass, or physically harm certain individuals (Ormrod, 2009). Males tend to bully in a more physically aggressive sense, whereas females bully through "trash talking" or verbally putting someone down. Since the 21st century, cyber-bullying has taken bullying to a whole new level. Cyber-bullying is attacking somebody through technology. It is especially harmful because a bully in a previous decade might have an audience of maybe five to ten individuals. With cyber-bullying, the bully now suddenly has the opportunity to have an audience of millions (Campbell, 2005). It is difficult for teachers to detect cyber-bullying because it happens via the Internet and not necessarily right under our noses. My students do not seem to have bully issues and they know that I do not tolerate any form of bullying in my classroom. All I ask of my students is to stand up for their peers when they see bullying in the hallways and even on the Internet, because the students are the ones that see it happen, not me. All I can do is report what I see, and form a relationship with the students so they feel comfortable enough to approach me when they are having problems. Regretfully, there is not much more I can do.

Kohlberg's theory of moral development explains the stages of understanding of right and wrong throughout life. The adolescents in my class fall into Level II: Conventional Morality. This level is characterized by the uncritical acceptance of society's conventions regarding right/wrong (Ormrod, 2009). It consists of Stages 3 and 4 of the six stages defined by Kohlberg. Stage 3 is the "good boy/nice girl" stage in which children will try to please others, especially authority figures, by doing what they believe will appease them. The children in this stage often consider others' perspectives when making decisions to try to identify with how they might view that decision. Stage 4 is the "law and order" stage in which people view rules as rigid and absolute. They follow these rules because they view them as the backbone for a civil society (Ormrod, 2009).

Nearly all of my students view the world in these two stages. I appreciate it, because it makes discipline much easier for me. Their peers often call the Stage 3 students "teacher's pet," but as long as they do well in school, it does not bother me. The only thing that concerns me is that to really do well in science long-term, one needs to develop respectful skepticism. It is difficult to reach students that accept everything for how it appears. I often challenge what they once knew as fact, but oftentimes they respond by blindly accepting whatever new fact I tell them. When discussing scientific issues, I want them to challenge me back. The only way to really understand science and how it works is to challenge what has been previously done and support your process. Accepting whatever a textbook says as fact is the trap that too much of the American population does and it is harmful to the progression of science and therefore our economy. I want to encourage students to think independently but still respectfully follow society's norms.

Assessment

Formative

Formative assessments are those given out before or during the lesson has been taught (Ormrod, 2009). These are helpful in determining a baseline for the class and knowing what to initially expect from the students. It is also useful in identification of the best learning strategies to be utilized. It also allows the students to become more familiar with the subject before diving into new concepts and vocabulary. In my Conceptual Chemistry class, we use formative assessment by introducing a new topic with some time reserved for exploration. Since it is a science class, I like to treat each lesson like a scientific experiment and by using the scientific method. The first thing we do with a new topic is make observations. If we are talking about reduction-oxidation reactions, or redox reactions, I might pass around some Iron-rich rocks and have the students make observations about how the rocks look, feel, weigh, smell, etc. In fact, I would really like to pass around my collection of Banded Iron Formations (BIFs), rocks that preserve the redox history over time. By conducting this formative assessment, the students may come to realize that they know more about a subject than they think.

Summative

Summative assessments are those that help determine what has been learned after instruction (Ormrod, 2009). Following this scientific method approach, we can make either class-wide or individual conclusions about the topic we have just discussed. A written exam only favors the students with high achievement in reading and writing, and most students find presentations intimidating. A project that would allow the students some flexibility in execution might be the solution of choice. Also, an oral exam in which the students meet with me one at a time would certainly give the students another option to show what they had learned in a less intimidating way.

Authentic

Authentic assessments are those that assess the knowledge learned in a practical, real-life context (Ormrod, 2009). I always try to use authentic assessments because the students always ask me, “Why do I need to know this?” I always need to be prepared to answer that question because I will get it everyday if I do not answer it first. The Conceptual Chemistry class was designed for students that do not necessarily want a career in the sciences or even have plans for college. It was meant to be a science class that will teach the students practical skills that they will need in everyday lives, regardless of the career path that they choose.

When I assign a project, it will require that the students utilize the skills they should have learned in class, and I make my expectations of the students clear. I usually do not grade based on how the project looks, but how much effort the students put into it. I like to see that they took their own initiative while doing the project and that they actually learned something about the topic, too. A lot of times the students give nonverbal cues how hard they worked on the project and I try to pick up on those. A higher level of confidence usually means that the student put a lot of time and effort into the project; conversely, a reserved, unclear, and sloppy presentation usually indicates less effort. I've noticed that when the students are asked up front how they think they did on the project, they will almost always be honest and say that they either worked really hard on it, or they didn't spend much time on it. Either way, self-reflection and self-discipline is paramount for self-assessment.

Conclusion

As I teach these 11th and 12th grade students at Stow-Munroe Falls High School, I am reminded daily of the unique cocktail of fine students I have in my classroom. Although they may not look very diverse from the outside, I know that each one of them is special and different. They all come from different backgrounds that shape who they are. They all have different goals in life and they were all called for different purposes. I can now empathize with their situations and their struggles after completing this project. I can understand why they may not understand something or why they may make certain decisions. I need to remember not to judge what they do based on how I would handle a situation because I am at different cognitive, personal, social and moral stages in my own life. Each individual experiences the world differently, and here I have the opportunity to be a part of my students' life experiences; and that is the greatest honor I could ask for as an educator.

Appendix A: Figures

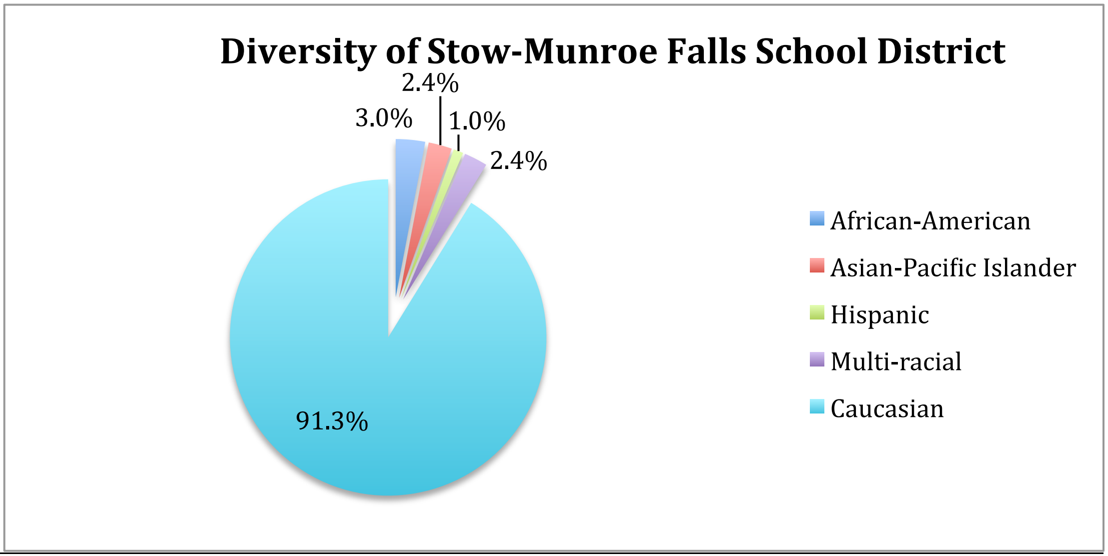

Figure 1. Data taken from Ohio Department of Education Report Card for Stow-Munroe Falls District Schools for 2009-2010[1].

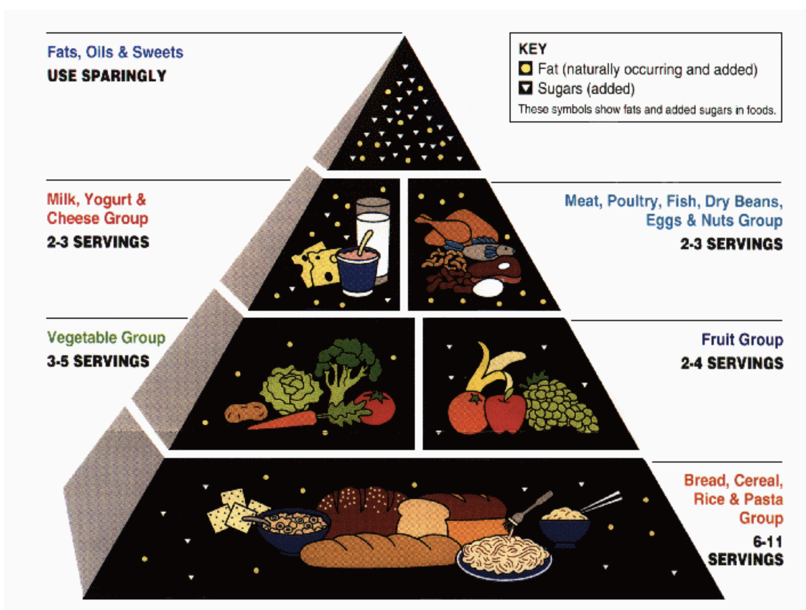

Figure 2. United Stated Department of Agriculture Food Guide Pyramid, 1992.

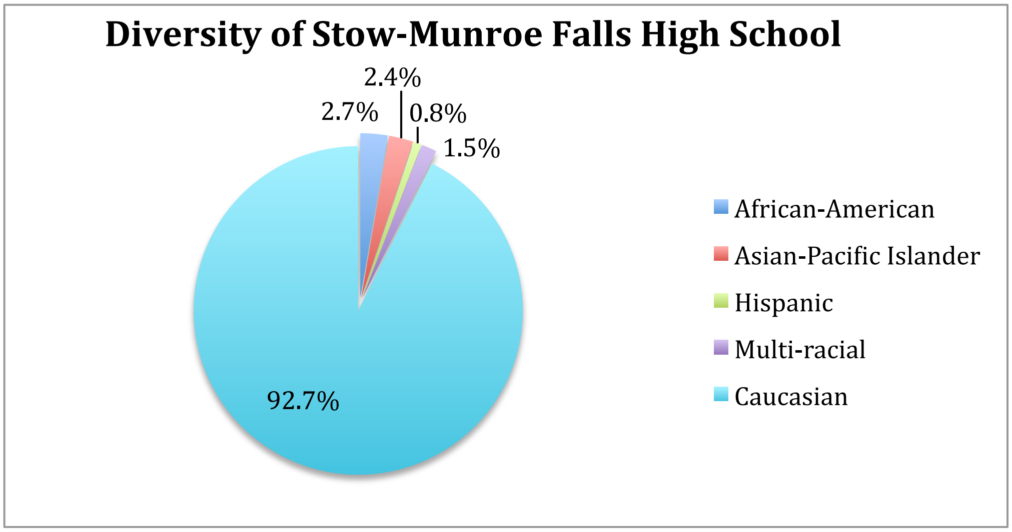

Figure 3. Data taken from the Ohio Department of Education Report Card for Stow-Munroe Falls High School for the 2009-2010 school year[2].

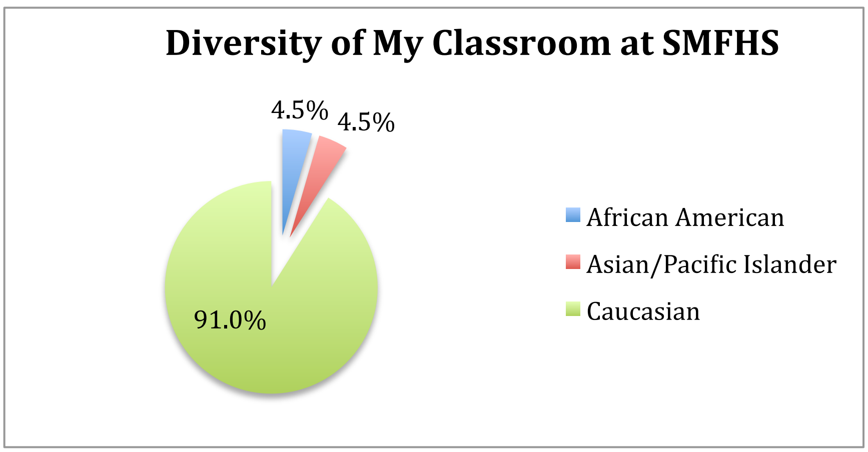

Figure 4. Diversity of My Chemistry Class at SMFHS (hypothetical).

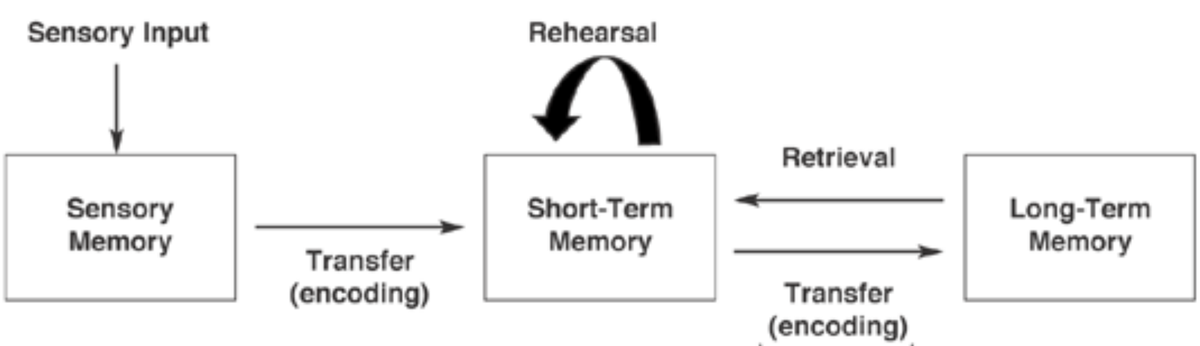

Figure 5. Modal Memory Model. (Atkinson and Shiffrin, 1968)

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