Science and the American Public

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Abstract

Many Americans reject science as a way of knowing and evolution as an explanation for life (Culotta and Holden 2006; Rutledge and Sadler 2007; Rutledge and Warden 1999). Possible causes for this rejection of science include ignorance of the geological time scale (Cotner, Brooks, and Moore 2009), a lack of understanding of how science is a method of inquiry (Rutledge and Sadler 2007), a lack of exposure to evolution in high school (Cavillo and McCall 2008), a perceived conflict with religious beliefs (Moore and Cotner 2009), or a misunderstanding of the significance of chance in life (Nadelson and Sinatra 2010). In an effort to shine light on the acceptance of evolution in the classroom, this study synthesizes research that used the Measure of Acceptance of the Theory of Evolution, as well as various demographics pertaining to regions where the studies were conducted. Despite having a small sample size, we can determine that politically more liberal regions may have a higher education level, teachers may have higher evolutionary acceptance scores, and a region’s dominant religion may have no effect on evolutionary acceptance.

It is important that the public understands that one can in fact believe in both religion and science. Gould (1997) argues that science covers the physical world, including what it is made up of and how it works, while religion covers the spiritual world, which raises questions of morality and value. Gould (1997, 16) offers a novel resolution to the evolution/religion controversy through his concept of “non-overlapping magisteria.” Gould was inspired by the Catholic Church’s acceptance of evolution and borrowed its term “magisterium,” which refers to the teaching authority of the Catholic Church. Gould explains that the scientific and religious magisteria do not overlap, but instead meet at a fine line separating the two. Science cannot disprove there being a creator, for no one can observe the unobservable, just as religion cannot disprove science. They both can, in fact, coexist in the belief system (or understanding) of an individual.

There has been a controversy about the coexistence of religious beliefs and the scientific theory of evolution since 1859, when Darwin first published his findings on natural selection (Bybee 2001). The theory of evolution by natural selection challenges some of the oldest Judeo-Christian beliefs about how humans came to be through naturalization (Zimmer 1998). For example, those who interpret the Christian Bible literally (e.g., Creationists), believe that their God created humans in their modern form and that humans have always looked otherwise (Zimmer 1998). Zimmer (1998) mentions that this disconnect never sat well with many religious ideologues. The main concerns leading to the controversy between religion and science are the questions regarding the origin of the universe and humanity (Zimmer 1998). Zimmer (1998) states that just as the 1543 Copernican theory of heliocentrism upset religious ideologues, because it took humans and the Earth out of the center of the universe (known as geocentrism), so does the theory of evolution threaten many because their self-identifying ideas are based on the writings in the Judeo-Christian Bible.

To those who believe in the validity of evolution, the scientific theory that the earth is around 4.6 billion years old and that all living organisms evolved from predecessors is without question (Riess 2009). This is in opposition to the Christian creationist beliefs that the earth is only 10,000 years old and evolution has not occurred (Riess 2009). American society still persists with creationist beliefs, along with the increasing acceptance of Intelligent Design (ID) (Riess 2009). The basic argument for ID is that all living organisms are structurally complex and mechanisms, such as natural selection, cannot solely be capable of producing such complexity (Cleaves and Toplis 2007). Intelligent Design is a popular teleological theory that threatens science education in the United States (Branch and Scott 2009). Many people even think that ID should be taught in schools as an alternative to the theory of evolution (Cleaves and Toplis 2007). Dawkins (1986) states that Intelligent Design can be explained through William Paley’s “Watch-maker Analogy,” where the design of the watch implies a designer. This designer ultimately is the creator of the universe (Dawkins 1986).

This researcher had a pivotal experience when she was first enrolled in a lower division general education course in general biology that eventually led to this study. On the first day of class, the professor asked for the students who did not accept the validity of evolution to raise their hands. Nearly half the class raised their hands in unison. That experience made clear to this researcher that science and religion as perceived by this group of students cannot overlap. Those in the scientific community are concerned about what will become of science education (Matsumura 2008). Personal experience has revealed that modern students continue to reject the fact of evolution entirely, despite overwhelming evidence to support its existence. This conflict between religious beliefs and evolutionary theory in the classroom led to this study.

Culotta and Holden (2006), writers for Science magazine, discuss the many polls taken in the U.S.A. to determine where individuals stand on evolutionary theory. Culotta and Holden (2006) report that the polls demonstrate that the more educated someone is, the more likely they are to endorse evolutionary theory. However, having a college degree is no guarantee that the graduate has abandoned the way they do today (National Center for Science Education 2011). However, the theory of evolution threatens this belief because the fossil record suggests otherwise (Zimmer 1998). Zimmer (1998) mentions that this disconnect never sat well with many religious ideologues.
their religious beliefs and will agree with Darwin. Indeed, many intellectuals in fields other than biology reject evolutionary theory (Culotta and Holden 2006).

Research based on the acceptance of evolution in secondary schools has been slowly accumulating since the Scopes Trial in the mid-1920s (Bybee 2001). The aim of this article is to review research on students’ and teachers’ acceptance of evolution as determined by a variety of instruments. Data will also be presented on the closely related topics of understanding evolutionary theory and understanding the nature of science.

**Literature Review**

Rutledge (1996) describes the central role of evolutionary theory as the unifying premise in biological disciplines. Only it allows connections to be made between incredibly disparate organisms, characteristics, and behaviors. Rutledge (1996, 3) describes the educational enterprise as “the vital nexus between accepted knowledge generated within a discipline and the general public.” Further, Rutledge (1996) describes the educator as the most important determining factor pertaining to the quality of science instruction. Rutledge (1996) believes it is the educator’s responsibility to translate the various curricular goals into learning. Rutledge (1996) claims that it is the science educator who is held responsible for determining whether or not future generations of students will be literate in science. Yet, Rutledge reports that high school biology teachers have either not taught evolutionary theory or taught it poorly.

Rutledge (1996) summarizes research conducted from the late 1930s through the late 1980s on high school teacher understanding and teaching of evolution. He states that prior to the 1960s, evolution was taught in less than 50% of high school classrooms. After the 1960s, due to the launching of Sputnik and the widespread adoption of a curriculum that emphasized evolutionary theory, Rutledge (1996) reports that fewer teachers completely avoided teaching evolution. Rutledge (1996) reports that over the past few decades, teaching evolution was widespread, but that it still did not receive the amount of attention it deserves as the unifying theory in biology. Rutledge (1996) concluded that the instruments used by previous researchers did not directly address teacher understanding of evolutionary theory. Rutledge (1996) also examined the literature on teacher understanding of the nature of science. Overwhelmingly it was found that teachers’ understanding of the nature of science was poor compared to that of working scientists.

Rutledge (1996) lists a number of factors, such as religious beliefs or poor coverage in textbooks, which have been investigated as explanations for the situation in high school biology classes. At the time of his writing, one factor not investigated was that of the teachers’ attitudes about evolutionary theory.

Therefore, Rutledge decided to explore these attitudes among high school teachers using an instrument that he developed. The instrument, Measure of Acceptance of the Theory of Evolution (MATE), assesses teachers’ perception of: (1) the scientific validity of evolutionary theory, (2) its ability to explain observable facts, and (3) its acceptance by scientists. The instrument has been described as “a valid and reliable, homogenous, multi-item instrument to assess teacher acceptance of evolutionary theory” (Rutledge and Warden 1999, 13). Based on his field research with the MATE instrument, Rutledge (1996) determined five categories of acceptance (Table 1).

<table>
<thead>
<tr>
<th>Category</th>
<th>MATE Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High Acceptance</td>
<td>89-100</td>
</tr>
<tr>
<td>High Acceptance</td>
<td>77-88</td>
</tr>
<tr>
<td>Moderate Acceptance</td>
<td>65-76</td>
</tr>
<tr>
<td>Low Acceptance</td>
<td>53-64</td>
</tr>
<tr>
<td>Very Low Acceptance</td>
<td>20-52</td>
</tr>
</tbody>
</table>

Source: Rutledge, 1996.

Rutledge (1996) and Rutledge and Warden (1999) identified six foundational concepts to assess with the MATE instrument: (1) the process of evolution, (2) the scientific validity of evolutionary theory, (3) the evolution of humans, (4) the evidence of evolution, (5) the scientific community’s view of evolution, and (6) the age of the earth. He used 20 Likert-scaled statements to explore the six concepts. Respondents to Likert-scale statements indicate the degree of their agreement or non-agreement on a five-point scale method from strongly agreeing to strongly disagreeing with a statement.

Half of the statements in the MATE instrument are positively phrased and half are negatively phrased. Using the five point Likert-scale, if participants strongly agree (5 points) with the positive statements (N=10) the score is 50; if they strongly disagree (5 points) with negative statements (N=10) the score is 50. Thus, the highest possible score is 100 and the lowest is 20.

The MATE statements were judged by five university professors with scholarly expertise in evolutionary and education theory and the philosophy of science. Based on the feedback of this group, some statements were modified for clarity and precision. Rutledge (1996) used factor analysis to assess the validity of the MATE instrument. The factor analysis demonstrated that the instrument was a valid construct.
Rutledge and Warden (1999) assessed the reliability of the MATE instrument by mailing the instrument to 989 high school biology teachers in Indiana during the 1994-1995 academic year. They analyzed the responses using an internal consistency test, which showed that the MATE instrument was 98% reliable. Rutledge and Warden (1999) determined that the MATE instrument is homogeneous, i.e., that it is assessing only one construct: teacher acceptance of evolutionary theory.

There are at least three inventories being used to assess students'/teachers' understanding of evolutionary theory. The first, by Rutledge and Warden (2000), used a modified form of a scale, developed by Johnson (1985), to assess teacher understanding of evolutionary theory. Their modified scale contained 21 items. Cumulative scores were determined based on the number of correct responses. A score of 21 indicated a high understanding of evolutionary theory while a score of 0 indicated no understanding.

The second, by Anderson, Fisher, and Norman (2002), involved developing and testing the reliability and validity of a 20-item multiple-choice Concept Inventory of Natural Selection (CINS) that uses authentic scientific studies of natural selection. Anderson, Fisher, and Norman (2002) used ten concepts related to natural selection with two questions per concept. The authors believe the inventory is best for pre- and post-instruction testing situations (Anderson, Fisher, and Norman 2002). They state, based on work of predecessors, that undergraduates are expected to answer about 50% of the questions correctly. Indeed, Anderson, Fisher, and Norman (2002) reported that their sample of undergraduate students scored 46.4% correctly.

The third inventory, by Cavallo and McCall (2008), involved taking questions from Understanding Biological Change (UBC), designed by Settlage and Jensen (1996). Cavallo and McCall (2008) took four additional questions from another questionnaire and modified them to match the UBC questions. Possible scores ranged from 0-20, with high scores indicating a high level of understanding of evolutionary theory.

There are at least three inventories being used to assess students'/teachers' understanding of the nature of science. Rutledge and Warden (2000) used a modified form of the first such inventory by Johnson (1985). Rutledge and Warden's (2000) scale, included 17 items. The items were Likert-scaled with the most correct response receiving a score of 5 and the least correct a score of 1. For this customized scale, a score of 85 indicated a very high level of understanding while a score of 17 indicated a very low level of understanding.

The Scientific Attitude Inventory II (SAI II) is the second scale referenced in this article. The SAI II is an instrument developed by Moore and Foy (1997). The instrument is a revision of one developed 25 years earlier and used extensively around the world. It has 40 items and uses a five point Likert-scale to measure perspectives of the nature of science. The instrument uses a combination of positive and negative statement items. The range of scores for the entire SAI is 40–200 (1–5 points * 40 items). Moore and Foy found a mean score of 141.2 for their sample of 557 middle- and high-school respondents.

The third inventory is the Science Knowledge Questionnaire (SKQ). An earlier version used by Cavallo et al. (2003) was modified by Cavallo and McCall (2008) to measure students' beliefs about the nature of science. The SKQ has 16 items with a four point Likert-scale. A low score indicates that students have a more “fixed” view of science and a high score indicates that students understand the more tentative nature of science. The scores can range from 16 to 64 and are converted into percentages by dividing the score attained by the maximum value (64) and multiplying by 100.

Methodology

Data were collected from peer-reviewed articles, most of which were published in the journal, The American Biology Teacher. The results of each article are organized and presented first by the educational level of the sample (post-baccalaureate high school teachers, lower division university students, lower division high school students), then by their MATE scores. Information is also provided about the authors and purpose of each article, the sample size of respondents, and if provided, scores assessing the teachers'/students' understanding of evolution and of the nature of science.

The MATE acceptance data were then organized by geographical region and the predominant political affiliation of the geographical region, based on the majority-vote from the last four presidential elections (Smith 2011). They were given a red (conservative), blue (liberal) or purple (uncertain) assignation. Then, the dominant religious affiliation of each region was categorized based on the state’s religious demographics according to The Pew Forum on Religion and Public Life displaying the U.S. Religious Landscape Survey. All religions viewed that lie under Christianity were classified as being Christian. The average educational level of each region was scored on a three-point scale from high to low, based on the six-year graduation rates of adults holding bachelor degrees as determined by the National Center for Higher Education Management Systems (NCHEMS) from 2009. Last, these demographic indicators were paired with the MATE scores obtained from each article.

Results

Trani (2004) used the MATE instrument to assess Oregon’s high school biology teachers’ acceptance of evolutionary theory and its relation to religious conviction
(Table 2). The biology department chairs of eighty Oregon high schools were asked to have their teachers participate in the research; 79 agreed. Trani (2004) found that the Oregon teachers had a mean MATE score of 85.9, which is a high evolutionary acceptance rate. Based on tests developed by Rutledge and Warden (2000), Trani (2004) further concluded that the teachers in Oregon have an overall good understanding of evolution and a good understanding of the nature of science, and are able to present that well to their students. However, some of the Oregon biology teachers also had strong religious beliefs. Nevertheless, in these cases, their religious convictions did not seem to stop them from presenting the theory of evolution (Trani 2004).

Table 2

<table>
<thead>
<tr>
<th>Sample</th>
<th>Authors</th>
<th>Purpose</th>
<th>N</th>
<th>Mean MATE Scores</th>
<th>Understanding Evolution Theory</th>
<th>Understanding Nature of Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon HS teachers</td>
<td>Trani, 2004</td>
<td>Affect of religion</td>
<td>82</td>
<td>85.9 High</td>
<td>Mean score of 17.5 (= 83% correct on 21 item scale) - High (Rutledge and Warden, 2000)</td>
<td>Mean score of 66.1 (= 71% correct on 17 item scale) - Moderate to High (Rutledge and Warden, 2000)</td>
</tr>
<tr>
<td>Indiana HS teachers</td>
<td>Rutledge and Warden, 2000</td>
<td>Establish teacher's understanding</td>
<td>552</td>
<td>77.6 High</td>
<td>Mean score of 14.9 (= 71% correct on 21 item scale) - Moderate (Rutledge and Warden, 2000)</td>
<td>Mean score of 59.5 (= 70% correct on 17 item scale) - Moderate (Rutledge and Warden, 2000)</td>
</tr>
<tr>
<td>Nevada and Idaho HS sophomores</td>
<td>Nadelson and Sinatra, 2010</td>
<td>Pre/post test after web-based instructional interventions in experiments</td>
<td>89</td>
<td>Pre-test scores 72.3 (Moderate)</td>
<td>Analysis of variance using group as factor showed no significant difference between the groups</td>
<td>Pre-test scores 71.1 pre-test vs. 73.4 post-test</td>
</tr>
<tr>
<td>Michigan HS freshmen</td>
<td>Cavallold and McCall, 2008</td>
<td>Pre/post test</td>
<td>77</td>
<td>66.7 pre-test/instruction: 68.5 post-test</td>
<td>60% (= 30% correct on 20 item scale) - Pre-test (Anderson, Fisher, and Norman, 2002)</td>
<td>428% Pre-test/instruction/ (SBI) (Cavallo et al., 2003)</td>
</tr>
<tr>
<td>Middle Tennessee State Univ: Lower Division</td>
<td>Rutledge and Skaller, 2007</td>
<td>Reliability with students</td>
<td>62</td>
<td>55.9 Low</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

*Nadelson and Sinatra (2010, 22) report that “our participants fell in the middle of the range of values, which indicated that our participating pre-service teachers had about average perceptions of nature of science.” Based on the range of scores reported by Moore and Foy (1997), this researcher had to extrapolate the median value (120) to represent their “middle” value.

In 2000, Rutledge and Warden measured high school teacher acceptance of evolutionary theory. Using the results Rutledge (1996) had collected in 1994-1995, they found that the Indiana teachers had a mean MATE score of 77.6 (Table 2), which they report as indicating only a moderate acceptance of evolutionary theory, though according to the categorization given by Rutledge (1996; see Table 1), the score should be categorized as high acceptance (which is how it is presented in Table 2). Rutledge and Warden (2000) reported that it is worrisome that educators, who are responsible for the next generation’s understanding of science, responded correctly to only 71% of the Understanding Evolution Theory scale. Not only was the average MATE score eight points lower among Indiana teachers than for those in Oregon, but their scores on the same tests used by Trani (2004), Understanding Evolution Theory and Understanding the Nature of Science, were also substantially lower for the Indiana than Oregon teachers.

Rutledge and Warden (2000) identified two concepts that were the least accepted by the teachers. Over one-third of the respondents doubted the testability of evolutionary theory and 30% of them did not accept the evolution of humans. The most well-received concept by teachers was the acceptance by the scientific community of evolutionary theory; nevertheless, one-fifth of the respondents even doubted that. Rutledge and Warden (2000) revealed that Indiana public high school biology teachers had scores like those reported for the general public in their relatively low acceptance of evolutionary theory, which had been reported amongst the general public.

Nadelson and Sinatra (2010) were interested in the affect of the Understanding Evolution web-based instruction on pre-service teachers’ (1) acceptance of evolutionary theory, (2) understanding of biological evolution, and (3) understanding of the nature of science. Eighty-nine pre-service teachers from two universities, one in Nevada and the other in Idaho, were recruited for the study. They were divided into a control group (45) and an experimental group (44). The experimental group was exposed to parts of the Understanding Evolution (University of California’s Museum of Paleontology website) that addressed misconceptions about evolution and the nature of science. The control group was exposed to similarly designed filler material. Pre- and post-tests were given to both groups before and after viewing their respective websites. Pre-service teachers’ acceptance of evolutionary theory was assessed using the MATE instrument.

Pre-service teachers’ understanding of biological evolution was assessed using the Concept Inventory of Natural Selection (CINS) developed by Anderson, Fisher, and Norman (2002). Pre-service teachers’ understanding of the nature of science was assessed using the Scientific Attitude Inventory II (SAI II) developed by Moore and Foy (1997).

Nadelson and Sinatra (2010) found that the pre- and post-test MATE scores for the pre-service experimental teachers exposed to the Understanding Evolution website did not differ significantly from those of the control group (Table 2). Similar results were obtained for both the CINS and SAI II evaluations. Nadelson
Cavallo and McCall (2008) conducted a study at a ninth grade campus in a mid-western region of the U.S. Cavallo and McCall (2008) adapted the MATE instrument to assess student acceptance of evolutionary theory. Cavallo and McCall (2008) used questions taken from Understanding Biological Change (UBC) version B (Settlage and Jensen 1996) to determine students’ understanding of evolution. They used the Science and Knowledge Questionnaire (SKQ), developed by Cavallo et al. (2003), to measure students’ beliefs about the nature of science. Cavallo and McCall (2008) administered a pre-test prior to four weeks of instruction about evolution and then a post-instruction test. They used paired t-tests in order to identify shifts in the students’ acceptance of evolutionary theory and their understanding of evolution and beliefs regarding the nature of science. Cavallo and McCall (2008) found no significant shift in students’ acceptance of evolutionary theory and beliefs regarding the nature of science, but they found that their understanding of evolution shifted significantly and positively from pre- to post-instruction (Table 2).

Rutledge and Sadler (2007) assessed the reliability of the MATE instrument (designed for high school teachers) with university students in a non-majors biology course at Middle Tennessee State University. The MATE instrument was administered in a test-retest format, with no discussions of evolutionary theory occurring between the two tests so as to lessen the effect of learning. Rutledge and Sadler (2007) used the Pearson Product Moment correlation coefficient to assess the test-retest reliability of the MATE instrument with university students. They found a strong correlation between students’ acceptance of the theory of evolution between the two tests; that is there was no difference. Rutledge and Sadler (2007) also found that the instrument was internally consistent at the university level. Finally, the MATE scores for the Tennessee students tested were the lowest of all those reported in this article. Rutledge and Sadler (2007) conclude that their findings indicate a critical need for science education courses in order to provide knowledge, skills, and experiences, which offer the structure that enables students to think scientifically.

Table 3 presents the samples given above organized by state, and with the MATE category given exclusive of the score. Additionally, three other variables are included: political affiliation, dominant religion, and average educational level, as discussed in the Methods section. The samples are presented in the same order as in Table 2.

Table 3
Demographic variables associated with acceptance levels of MATE

<table>
<thead>
<tr>
<th>State</th>
<th>Political</th>
<th>Religion</th>
<th>Education</th>
<th>Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>Blue</td>
<td>Christian</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Indiana</td>
<td>Red</td>
<td>Christian</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Nevada</td>
<td>Purple</td>
<td>Christian</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Idaho</td>
<td>Red</td>
<td>Mormon</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Michigan</td>
<td>Blue</td>
<td>Christian</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Red</td>
<td>Christian</td>
<td>Moderate</td>
<td>Low</td>
</tr>
</tbody>
</table>

Note: Nevada and Idaho were included in the same study by Nadelson and Sinatra (2010).

First, the majority of states were categorized as Red politically. Only Oregon and Michigan were categorized as Blue and Nevada was the sole Purple representative. Second, all but one state were classified as Christian; only Idaho was classified as Mormon (and some would consider them Christian). Third, the educational level of the states listed ranged from high to low. Nevada was the only state classified as having a low educational level.

When looking at relationships among these variables, none of the blue states had a low educational level. Michigan, a blue state, had a moderate education level, while Oregon, a blue state, had a high educational level. The states categorized as red politically had their education levels ranging from moderate to high. Second, there is no visible pattern relating religious affiliation to acceptance of the theory of evolution.

Further, both teacher samples had high MATE scores. Of the student samples, all MATE scores were of moderate acceptance with one exception. This exception is from the red state of Tennessee, which was categorized as having low acceptance.

Discussion

Despite not having the desired results of any identifiable patterns linking various demographics to evolutionary acceptance, this study is still of educational significance and belongs amongst the evolutionary acceptance literature. This study is one of the first to implement various demographics in relation to MATE scores. We can determine from the results that politically more liberal regions may have a higher educational level and that teachers may have a higher evolutionary acceptance score. However, the comparison of MATE scores along with comparing the Understanding Evolution and the Nature of Science variables between the teachers from Oregon and Indiana indicates that a regionally
different political view could be a potential factor. There is still much to be determined about evolutionary acceptance in the United States in the near future.

In terms of science education, a lack of understanding in the nature of science is often viewed as harmful to students (McComas, Clough, and Almazzroa 2002). With the uncertainty of what the future of science education holds, it cannot be determined whether or not the American public will agree on a force of action in the science curricula. The National Center for Science Education (NCSE) is the biggest forum for the American public to visit and become educated on the importance of evolution in the science classroom. They continue to back evolution in the classroom as well as offer news articles, polls, and information on the controversy. The NCSE aims to improve K-12 and college science curricula and pedagogy.

**Limitations**

There were several limitations regarding this study. Due to a lack of studies using the MATE tool to assess evolutionary acceptance among science education in the literature, it became difficult to acquire an abundance of these articles. This would have been a great asset to the data. More data are needed in order to provide significant demographic patterns amongst the findings. The MATE instrument is a relatively new evolutionary acceptance tool that was derived in the Midwest. This caused a lack of demographically diverse regions.

The majority of the studies included in this research were primarily of Midwestern, southern, and western regions of the United States. Also researchers familiar with the MATE instrument had used it several times resulting in a repeat of the geographical region being studied. The data were comparable given that all studies used the MATE tool and that grade levels were not too distant with one exception being Cavallo and McCall (2008). Educators and students were not compared regarding MATE scores due to a significant difference in their education levels. However, for those studies that implemented the two other variables: Understanding Evolution Theory and Understanding the Nature of Science, they were not comparable due to having been measured with different instruments and were only included in Table 2 to offer broader insight to potential factors that can be related to MATE scores. As the MATE tool becomes more familiar to educators and researchers concerned with evolutionary acceptance around the United States, it will continue to be implemented in various regions that have yet to be studied, leading to a broader understanding of evolutionary acceptance amongst educators and the American public.

**Future Research**

This study holds significance to the science education community and for that reason alone it is in the hopes of this author to take this study further in the near future. First, due to the lack of studies done on the west coast, it is in the hopes of the researcher to construct her own MATE survey and administer it to both biology and anthropology students. Both studies hold evolution at its core, yet evolutionary acceptance studies done on anthropology students and teachers alike are almost nonexistent. It is also in the hopes of the researcher to implement two other factors that often accompany the MATE tool in the literature. These two factors are the Understanding of Evolution Theory and the Understanding of the Nature of Science. Both are often seen in the evolutionary acceptance literature as an aid to identifying why such low evolutionary acceptance exists in the United States.

The evolutionary acceptance of students and teachers is something that will continue to grow amongst the literature, as it is becoming more and more an issue to both the scientific community as well as the American public. With various court cases amongst school districts and parents, as well as the growing concern for student education, acceptance of the theory of evolution amongst the American public is a topic of concern that will continue to be researched until there is perhaps a resolution to the evolution versus religion controversy.
References


Black Students’ Experiences in College: Exploring California State University, Sacramento Barriers through Their Standpoints

Cassie Garrett-Lewis
Dr. Manuel Barajas, Faculty Mentor

Abstract

The purpose of this study is to understand more about retention and graduation rates among Black American university students through their own standpoints and experiences. The results of two focus groups suggest numerous reasons as to why these students believe there are such low retention rates at CSUS, including a lack of diverse curriculum, lack of Black faculty, financial aid obstacles, lack of mentorship and guidance, intelligence stereotypes, and more. The findings may be useful in providing institutions with the information needed to implement a better system that will improve the retention and graduation rates of Black college students.

This article examines college experiences of African American students at a California State University and the effects of underrepresentation of this group through their experiences within the academic setting. There has been a lot of attention in theoretical discussions about the achievement gap between Black and White students (Kao and Thompson 2003). Historically, African American students have been underrepresented in academic institutions in the United States and this is still the case today (Herndon and Hirt 2004). Most staff and faculty that work in a university setting believe in equal opportunity, but have conformed to social views and values of unequal access and opportunity to higher education, claiming meritocracy and individual effort as factors responsible for the educational inequities (Sue 2004). One possible indicator of inequity within an institution would be the lack of representation of African American undergraduate students enrolled at California State University, Sacramento. In Fall 2011 there were 24,701 total undergraduate students enrolled at the university. However, the percentage of African American students enrolled in 2011 was 6.5 percent compared to the population of African Americans in the United States, 12.6 percent (United States Census 2010a).