Literature Overview: Diversity, Inclusion, and Cultural Awareness for Classroom and Outreach Education

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I. Concise Overview

Students in the U.S. educational system are increasingly diverse, and this diversity is reflected in science, technology, engineering, and mathematics (STEM) fields. Diversity in education encompasses students from many races, genders, and socioeconomic backgrounds; students who speak a variety of languages; and students from many cultures. For instance, ethnic diversity increased by 5% across primary and secondary public schools from 2000 to 2007 (Aud, Fox, & KewalRamani, 2010). Diversity is also evident in the socioeconomic make-up of students, with almost half of 4th graders in public schools meeting the eligibility for free or reduced-price lunch programs (Aud et al., 2010). Diversity is also increasing in higher education, with a higher percentage of women than men enrolling in and graduating from college (Kleinfeld, 2009; Snyder & Dillow, 2010). The past three decades have seen increases in racial and ethnic minority students across the educational system (Snyder & Dillow, 2010), and racial and ethnic minorities attending college will continue to increase as the demographic makeup of the U.S. population continues to change (Murdock & Hoque, 1999; Murdock & Swanson, 2008).

Although the education system is becoming more diverse, students who come from stigmatized groups (e.g., groups that are the target of negative stereotypes, prejudice, and discrimination) still perceive barriers to education. These perceptions may be the result of both actual differences in the treatment of students in the classroom and the inability of educators to understand students and be sensitive to and inclusive in teaching styles and content. Thus, this overview examines how to achieve greater diversity, inclusion, and cultural awareness in the classroom. Although this topic is relevant to numerous groups of students, the focus will be on diversity and inclusion as they relate to gender and race.

First, the overview examines why the presence of diverse students does not necessarily equal diversity in education. In other words, integration is a necessary but insufficient condition for achieving fairness and equality for all students. Although a classroom may include diverse students, if some students perceive barriers and do not feel included, an actual atmosphere of diversity may not exist. Furthermore, minority students (particularly Black and Hispanic) are more likely than nonminority students to run into other barriers in primary and secondary education due to lack of access to higher-quality teachers in math and science classes, higher-level advanced classes (e.g., physics), and resources (National Science Board, 2010). Such barriers cause minority students to be less prepared to enter STEM fields in college and the workforce.

Second, the overview presents some well-documented negative effects that differential treatment can have on students. For instance, elementary and middle school girls often start off well in STEM classes, but many lose interest, try less, and perform worse as they get older, due, in part, to micro-inequities, or small injustices that they experience (Brotman & Moore, 2008).

Last, the overview offers research-tested strategies to accomplish the goal of greater diversity, including recruiting and retaining diverse educators (Bradley & Holcomb-McCoy, 2002; Glass & Minnotte, 2010), incorporating active inclusive learning activities into curriculums (Davis-Lowe, 2006; Hebl & King, 2004), incorporating content that represents diverse social and cultural perspectives into curriculums (Adams, 1992), creating safe environments for all students (i.e., nondiscriminatory classrooms in which all students feel comfortable asking questions and taking risks [Davis-Lowe, 2006]), and promoting outreach programs to minority students and their families (Amelink, 2009). Creating more diverse and inclusive classrooms has several benefits, ranging from increasing learning to improving social interactions (Gurin, Dey, Hurtado, & Gurin, 2002).

II. Synthesis of Findings

Despite the increase in diversity, minority students do not always feel included. Stigmatized students often perceive barriers to education and certain career paths due to their minority status (Luzzo & McWhirter, 2001; McWhirter, 1997; Mooney & Rivas-Drake, 2008). For instance, a high percentage of racial minority college students perceive racial discrimination and isolation from nonminority peers (Mooney & Rivas-Drake, 2008). Similarly, teachers, advisers, counselors, and other role models often have negative perceptions or make negative comments about female students' abilities (versus male students' abilities) (Gatta & Trigg, 2001; Leaper & Brown, 2008). Negative perceptions from others may translate to negative perceptions of oneself. For example, middle and high school girls have reported that participating in mathematics extracurricular activities (which could help lead girls to pursue math in college and as a career), such as school math clubs, is unpopular for girls (Andreescu, Gallian, Kane, & Mertz, 2008). Additionally, female students are less likely than male students to see themselves taking future science and engineering courses and pursuing careers in science and engineering fields, and many girls (and boys) believe that science and engineering are less suitable for women than for men (Jones, Howe, & Rua, 2000; Malcom, 2008). These types of negative perceptions persist into high school and beyond and also translate into high school girls believing that they have lower abilities in science than do comparable boys (DeBacker & Nelson, 2000). Furthermore, these perceptions may play a role in the increased anxiety toward some science fields that high school girls report more often than boys do (Britner, 2008). Finally, female and racial minority students may perceive barriers to engineering because of the image of engineers, which still remains one that, according to stereotypes, is still predominately White and male (Malcom, 2008).

Negative perceptions by stigmatized students may be due in part to differential treatment in the classroom. For instance, teachers interact and engage more often with male students than they do with female students in the classroom (Babaria, Bernheim, & Nunez-Smith, 2011; Jones & Dindia, 2004; Trautman & Stewart, 2007) and use more positive interaction techniques (e.g., praise, affirmation) when engaging White as opposed to Black or Hispanic students (Tenenbaum & Ruck, 2007). When girls are called on, they are more likely to be asked easy questions as opposed to difficult ones (Babaria et al, 2011; Brickhouse, Lowery, & Schultz, 2000). Thus, boys may be challenged to use critical thinking skills in the classroom to a greater extent than are girls.

Additionally, differences emerge in how students are tracked or placed into particular classes. Teachers are more likely to refer White students to high-track classes (e.g., gifted and talented programs) and Black and Hispanic students to low-track classes (e.g., special education [Tenebaum & Ruck, 2007]), and some evidence shows that Black students are indeed less likely than White students to enroll into college preparatory courses (Southworth & Mickelson, 2007). Communication barriers may also present a culture-related challenge between teachers and bilingual or bicultural students; thus, many school districts focus on tracking these students into "basic" skills courses (e.g., reading, writing, and mathematics) for English learners and choose to sacrifice high-level learning in other areas, such as science (Amaral, Garrison, & Klentchsy, 2002). In addition to treatment from teachers, classroom materials may create barriers. For example, many textbooks depict fewer images of women and people of color in STEM fields (Brotman & Moore, 2008; King & Domin, 2007).

Family involvement also plays a role in the perception of barriers to education. Research shows that parental support can be particularly valuable in positively influencing minority students' future aspirations, expectations concerning education and academic achievement, and self-efficacy concerning career decisions (Gushue & Whitson, 2006; Hill & Tyson, 2009; Jeynes, 2007; Kerpelman, Eryigit, & Stephens, 2008). Parents of minority students have high aspirations for their children's academic attainment and success (Spera, Wentzel, & Matto, 2009), and other family members also can influence the pursuit of education. Research has shown that Latino students who have high-quality relationships with and receive academic support from their siblings report higher levels of academic motivation than do those who do not (Alfaro & Umaña-Taylor, 2010). While family support has been shown to benefit minority students, parents may not be able to adequately support their children, which may contribute to putting them at a disadvantage. This may be particularly true for students whose families have a low socioeconomic status or who are first-generation college students. A higher percentage of Hispanic and Black students come from families with fewer resources (i.e., lower incomes and lower parental education) than do White and Asian students, which can contribute to lower rates of college enrollment for minority students (Perna & Titus, 2005).

Fewer family resources can also lead to educational situations that produce further barriers to education. For instance, students who come from low socioeconomic families often attend schools in lower-achieving school districts that provide fewer resources for students. Black and Hispanic students are more likely to be in this situation than are their White counterparts, so they are more often excluded from access to better resources such as higher-quality educators, particularly in science and math (National Science Board, 2010). Fewer Black and Hispanic (compared to White) students enroll in higher-level math and science courses in high school or in advanced placement (AP) courses, which are designed to prepare students for and give them an edge in college (College Board, 2011; Moore & Slate, 2008; Riegle-Crumb & King, 2011). A higher percentage of girls than boys of all races enroll in more AP courses; however, a higher percentage of boys tend to enroll in STEM-related AP courses, namely calculus, chemistry, physics, and computer science, while girls are more likely to enroll in AP courses in languages and history (College Board, 2011). When girls enroll in STEM-related AP courses at higher rates, they tend to enroll in psychology, biology, and environmental science. As STEM-related AP courses are designed to prepare students for college courses, Black and Hispanic as well as female students may be at a disadvantage in STEM majors due to lower enrollment in these courses prior to college.

Impact and effects of diversity, inclusion, and cultural awareness on individual performance
Both negative perceptions and differential treatment can lead to negative outcomes for minority and female students in STEM fields. One widely researched negative psychological outcome that affects students in

STEM fields is stereotype threat. Stereotype threat occurs when persons feel threatened in a particular domain for which a negative stereotype is held about a group they belong to, resulting in impaired performance (Aronson, Cohen, McColskey, Montrosse, Lewis, & Mooney, 2009; Singletary, Ruggs, Hebl, & Davies, 2008; Steele & Aronson, 1995). Specifically, performance is impaired because one feels scared that s/he will inadvertently confirm the negative stereotype about her or his group. Much of the research in this area has focused on the impact of this phenomenon on African American students in educational settings and women in math settings (Blascovich, Spencer, Quinn, & Steele, 2001; Marx & Roman, 2002; Steele & Aronson, 1995; Steele, 1997).

One of the major premises of this theory is that stereotypes exist about a division in performance between one group (e.g., women or a particular racial group) and another (e.g., White men) and that one group generally performs worse than the other. These stereotypes can be particularly damaging because they heighten anxiety that can lead to stereotype threat and for members of stigmatized groups, stereotypes also lead to feelings of exclusion from specific domains. These feelings of exclusion may be confirmed by lack of support, encouragement, and ultimately engagement in the classroom.

Feelings of stereotype threat in certain domains can lead to lower feelings of self-efficacy or belief that one has the ability to actually perform well in a particular domain. Ethnic minority students who have reported higher perceived barriers to education (e.g., lack of inclusion) also reported lower coping efficacy or confidence that they can manage these difficult situations (Luzzo & McWhirter, 2001; Uwah, McMahon, & Furlow, 2008). Lower self-efficacy within a domain about which one is already unsure contributes to the gap between stigmatized and nonstigmatized students going into that particular domain. Similarly, students who feel threatened in a particular domain and have low efficacy may experience disidentification from that domain (Steele & Aronson, 1995). Those who disidentify with a domain tend to give up or fail to put forth complete effort in this domain. Another consequence of having classrooms that do not feel inclusive to all students is the lack of retention of students from a diverse group into a particular field. This attrition has been seen for female and minority students in STEM fields and is commonly referred to as the "leaky pipeline" (Bond & Fotiyeva, 2010; Chesler, Barabino, Bhatia, & Richards-Kortum, 2010).

Implications for practitioners
It is important for educators and practitioners to be aware of the negative effects of exclusion and the positive benefits of diversity, inclusion, and cultural awareness for several reasons. Incorporating diversity, inclusion, and cultural awareness can have several positive outcomes. First, diversity and inclusiveness in classrooms can help boost students' self-confidence and self-efficacy about their performance. In addition, diversity helps create what Gurin (2002) has referred to as two types of positive outcomes: learning outcomes and democracy outcomes.

Learning outcomes are related directly to the processing of knowledge and information by students. In a higher education setting, racial and cultural diversity in the classroom and informal settings (e.g., interacting with diverse others on campus) have a positive effect on active thinking, motivation, and intellectual engagement (Gurin, et al., 2002). Other studies have found that greater frequency in cross-racial interactions in college is positively related to higher levels of growth in general knowledge, critical thinking, problem-solving skills, and group skills (Chang, Denson, Saenz, & Misa, 2006; Terenzini, Cabrera, Colbeck, Bjorklund, & Parente, 2001). Thus, increasing diversity may increase knowledge and other learning outcomes for all students.

Second, practitioners also see benefits of diversity, inclusion, and cultural awareness through democracy outcomes related to interpersonal relationships. Democracy outcomes include perspective taking, citizenship engagement, and greater racial and cultural understanding (Gurin et al., 2002). Diversity and inclusiveness help increase students' ability to work and get along with individuals from different racial and ethnic backgrounds (Orfield & Whitla, 2001). Another study examining students involved in a curriculum centered on diversity initiatives versus a control curriculum found that over the course of four years, students in the diversity program were more democratic than those in the control sample (Gurin, Nagda, & Lopez, 2004). Specifically, those in the diversity program were more motivated to view the perspective of individuals who had different characteristics (e.g., race, gender) from themselves. This quality is important in the education system and beyond because perspective taking, or viewing a situation, topic, or idea from another person's point of view, can reduce stereotyping and prejudice (Galinsky & Moskowitz, 2000). Perspective taking in the classroom between students of differing racial, cultural, and gender backgrounds can help provide students with feelings of equality with their peers, which in turn may boost self-confidence, particularly in domains in which students may be stereotyped. Student interactions are also important in educational settings because students often look to peers for acceptance and approval. Thus, having the support of a diverse group of peers can help classrooms run more effectively and students become more productive.

Research-tested remedies or interventions

Researchers have examined a number of different strategies across a variety of studies and have found some methods to be effective. First, we present three strategies focused on improving the representation of diverse educators and improving educator awareness and preparation. Then we shift our attention to five strategies focused on how educators can increase diversity in STEM fields, reduce bias in the classroom, and improve the quality of education for all students.

To foster diversity, inclusion, and cultural awareness in the classroom, educators and practitioners should consider incorporating the following strategies.

Strategies implemented for educators

1. *Provide role models and diverse examples*. Providing role models and diverse examples can be done in the classroom and outreach-education programs in which students have the opportunity to gain knowledge and experience in a specific domain. Seeing successful role models who are similar to themselves helps students build confidence that they too can be successful in that domain. For instance, female students who are exposed to women who have performed successfully in mathematics and science-related fields perform better than female students who are not exposed to such examples (Blanton, Crocker, & Miller, 2000; Marx & Roman, 2002; Marx, Stapel, & Muller, 2005). Similarly, female students who interacted with "expert" women (e.g., advanced peers, professionals, or professors) in STEM fields have also shown enhanced self-concepts and attitudes to and motivation to pursue STEM careers (Stout, Dasgupta, Hunsinger, & McManus, 2011).

   One way to provide role models is to recruit and retain diverse educators and mentors (Bradley & Holcomb-McCoy, 2002; Davis-Lowe, 2006). Diverse educators are attracted to environments in which diversity is embraced, so one way to recruit diverse role models is to highlight diversity in job advertisements. For instance, women have reported being more likely to apply to academic STEM jobs when such jobs are advertised in venues that directly target women (Glass & Minnotte, 2010). Racial

minorities have reported being more attracted to organizations when racial diversity is depicted in recruitment advertisements (Avery, Hernandez, & Hebl, 2004; Purdie-Vaughns, Steele, Davies, Ditlmann, & Crosby, 2008). Implementing recruitment strategies that target diverse and underrepresented minorities are likely to lead to increased rates of applications from highly qualified diverse individuals. Furthermore, having diverse educators is beneficial for students because having a same-race and same-sex teacher has been shown to be related to better academic achievement for Black and female students (Dee, 2004, 2007).

Another way to provide role models is to invite speakers from different backgrounds who are successful in a particular field to come and speak to the class. This technique can be implemented at all levels of the education system by all educators, regardless of background, and will help students identify with someone who is pursuing a career of interest in which they are interested. Potential role models can include not only diverse individuals already working in the field but also diverse undergraduate or graduate students from a local college or university. When bringing in diverse role models is not feasible, educators can implement this technique by creating bulletin boards that depict recent accomplishments by diverse individuals in a field and providing literature that highlights diverse practitioners in the field (Montgomery, 2001). Providing role models and examples of diverse individuals who have succeeded or are succeeding in a particular field can help reduce negative impacts of stereotypes for female and minority students (Marx & Roman, 2002; McIntyre et al., 2005).

2. *Explain the benefits of diversity to educators.* Research shows that people have more positive attitudes about diversity when they feel it benefits all groups and not just the minority group (Knight & Hebl, 2005). Furthermore, medical students from all backgrounds have reported that although they did not experience much cultural diversity in their formative education years, they were exposed to it during higher levels of education, and this cultural diversity among peers greatly enhanced their educational experience (Whitla et al., 2003). This suggests that exposing students to cultural diversity at earlier stages in education may be beneficial for all students. Thus, explaining to educators that more diverse and inclusive classrooms likely lead to greater learning and citizenship in the classroom may be an incentive for them to create this type of atmosphere.

3. *Provide professional development in diversity and cultural awareness.* Educators must be prepared to create and nurture diversity in classrooms. This includes not tolerating discrimination against any students in any form (e.g., teasing, impatience with peers, derogatory jokes [Davis-Lowe, 2006]). Educators also should understand and embrace cultural and other differences students have, incorporate information into the curriculum that is relevant to all students, and use a variety of methods that support different learning styles (Davis-Lowe, 2006). To achieve this goal, teachers should first educate themselves on different cultures and the prominent minority individuals within subfields of learning.

One way to help educators prepare to be more inclusive is to have them attend professional development seminars on diversity, cultural awareness, and sensitivity. Results from the National Assessment of Educational Progress in mathematics for an 8th grade sample revealed that teachers who received professional development on working with diversity showed significantly heightened student performance (by more than one grade level [Wenglinsky, 2000]). In addition, teachers should be trained on how to interact with diverse students and their parents and families. This training should focus on teachers developing high-quality relationships with students' families, including those from various backgrounds. Teachers should learn skills to engage parents and families as partners in

supporting their child's education (Baum & Swick, 2008). Fostering a high-quality relationship with parents also enables teachers to seek parental advice when personalized instruction or attention is needed. Teachers who are better equipped to handle classrooms with diverse students can help all students feel included and important.

Strategies implemented by educators

1. *Recruit diverse students.* Teachers, advisers, and counselors should encourage all students to pursue fields that they find interesting and help students develop interests in STEM-related fields by showing them how their interests are relevant in these fields. School counselors can play an influential role in guiding diverse students, particularly minority girls, to pursue math and science fields (West-Olatunji et al., 2010). Counselors have the opportunity to talk with minority girls about their concerns about the stereotypes of being female and a minority in STEM-related fields and provide these girls with encouragement and knowledge about female minorities in STEM.

2. *Involve students in active learning.* Active learning is a process by which students interact with the instructor and engage in the learning process instead of simply sitting and robotically listening to lectures. Actively engaging students in learning increases knowledge of the subject above and beyond that of simple instruction (Hebl & King, 2004; Knight, Hebl, & Mendoza, 2004) and can be implemented by incorporating into class time activities such as demonstrations, role-playing, debates, hands-on experiments, and student-led discussions. Active learning gives students the opportunity to apply theory and knowledge to practical examples and helps them to critically analyze information they are given. Active learning also can foster creativity and experimentation (Davis-Lowe, 2006) that can be beneficial for all students, particularly those who may not otherwise be encouraged to explore a particular field.

3. *Reframe educational topics and tasks.* The way in which subjects, majors, and careers are framed can make a significant difference in students' interest levels. For example, Jones et al. (2000) found that when asked, middle-school boys reported that science was "dangerous" and "destructive," and consonant with science, they reported being interested in atomic bombs, atoms, cars, computers, X-rays, and technology. Middle school boys felt that science was more appropriate as a field of study and career choice than did middle school girls, who instead said they wanted to pursue careers in which they could help people, something that is not so readily linked with science. Girls were particularly likely to indicate being interested in animal communication, healthy eating, weather, and AIDS. If educators are aware of these common perceptions (and often times misperceptions) and the particular interests that girls have, educators can work to educate, nurture, and tailor their portrayals of fields to be accurate and inclusive to all, regardless of gender, ethnicity, or other diverse background. Thus, teachers could frame science to girls in such a way that it is particularly interesting to them. Rather that describe science as beakers and building things, educators can frame it as helping others (e.g., curing disease, helping people live longer, making people's lives more meaningful, or helping save children and animals).

4. *Engage students in interdependent group activities.* Educators should engage students in group activities that require the involvement of all students in the group. For instance, teachers can employ the "jigsaw classroom," a group activity that fosters group participation and interdependence by providing each group member with a critical piece of information that is necessary for the group to succeed in its goals (Aronson, 2002). This method has been shown to increase students' self-esteem

and morale and help minority students improve academic performance without showing decreases in majority students' performance (Aronson & Bridgeman, 1979). Furthermore, this strategy can also help prevent students' feelings of isolation (Davis-Lowe, 2006). With respect to STEM-related class environments, cooperative group learning has been shown to be an effective strategy (Assessing Women in Engineering [AWE] Project, 2005).

One of the mechanisms by which this activity works is simply getting people to have contact with each other, and decades of research show how valuable this is in reducing discrimination and enhancing diversity (Allport, 1954; Pettrigrew & Tropp, 2006). Educators must be aware of the necessary conditions (i.e., equal status, common goals, intergroup cooperation, teacher support) for making the jigsaw classroom and other forms of intergroup contact successful; otherwise, contact can lead to more problems (Pettigrew & Tropp, 2006).

5. *Create safe spaces.* Safe spaces for students are psychological and physical places in which stereotype threats are not present. Safe spaces allow students to feel free to discuss experiences and perceptions of exclusion and isolation and develop coping strategies. One type of safe space is outreach-education programs. Outreach-education programs introduce and attract students to a particular field to pursue in higher education and beyond. Outreach education can take many forms, from summer camps emphasizing a particular field, to the inclusion of field-specific materials in nine-month curricula, to web-based resources that target certain age groups. Outreach-education programs can be vital for minority students in filling knowledge gaps resulting from a lack of advanced-level classes.

Outreach education is particularly important in engineering and other STEM-related fields. Many universities work with public school systems to attract K–12 students to the field of engineering using a variety of outreach methods (Jeffers, Safferman, & Safferman, 2004). One program that has been implemented in elementary schools was evaluated to examine students' interest level in the program and future interest in civil engineering. Results showed that after completing the program, students, particularly women and Black students, were interested in the subject area (Elton, Hanson, & Shannon, 2006), suggesting that outreach education is beneficial in helping diverse young students begin to think about career paths that they may not have otherwise considered.

III. Assessment Methodologies

One of the biggest challenges in implementing diversity and inclusion methods is ensuring the effectiveness of these methods. The assessment of diversity measures often relies on a gauge of temporary affective feelings toward the diversity initiative as opposed to solid empirical evidence concerning lasting diversity and inclusion over time. It is essential to instill accountability for educators concerning this area, and to do this, diversity initiatives must be properly assessed. A critical part of this is to make clear what the goals are for a particular program (Brody, 2006). Establishing goals, both short- and long-term, help determine the effectiveness of the initiative. Diversity initiatives also should be assessed beyond initial completion of the intervention, and one of the best ways to do this is to track students across time. Thus, students' levels on variables of interest such as academic performance, increase in knowledge, interest in domain, pursuit of a field, and feelings of self-efficacy and self-confidence in a domain should be first tested at a baseline level and then tracked longitudinally across time. Some outreach-education programs use longitudinal methods to examine effectiveness for students involved in the program. This data should also be analyzed against students not involved in outreach education to fully examine the

effectiveness of the program above and beyond helping students improve from their individual baseline levels. If diversity initiatives in education are truly successful, educators should be able to identify when students from stigmatized groups are losing interests in fields (particularly STEM) and reduce the level of attrition by women and minorities in these fields.

IV. Recommendations for Practitioners

As seen in the previous sections, numerous methods can be used to increase diversity, inclusion, and cultural awareness in classroom settings. Some strategies can be used in combination with others, while still others are less practical for a variety of reasons. One strategy that appears to be beneficial and practical is simply raising awareness of the importance of understanding and embracing all types of diversity in the classroom. School systems can create and implement professional-development courses that focus on cultural diversity and sensitivity, help educators engage families of diverse students in the learning process, and develop diversity-friendly strategies that can be implemented into curricula. School systems can also help provide role models by recruiting diverse educators and ensuring that diverse individuals are represented at school-hosted functions (e.g., judges at science fairs).

A second strategy is culturally responsive teaching that infuses cultural characteristics, perspectives, and experiences of ethnically and racially diverse students into one's teaching style to help a broader range of students understand the content presented (Gay, 2002). This can be done by adapting curriculums and providing diverse role models and mentors. Culturally responsive teaching helps students from various backgrounds feel included in the lesson and comfortable with the material being taught. In addition to culture, attention should be paid to gender, especially in fields where women are generally underrepresented. As with culture, gender inclusivity can be achieved by incorporating appropriate content and adapting teaching styles when necessary to give proper attention to students of both sexes (Mills, Ayre, & Gill, 2008).

A third strategy is to become aware of, incorporate, and promote outreach-education programs to prepare students, particularly those from disadvantaged backgrounds, as research shows that these types of programs (e.g., Upward Bound) are effective in helping students succeed at the next level of academia (Fields, 2001). Through outreach-education programs, educators and practitioners should seek to mend the pipeline for women and students from various racial and cultural backgrounds by introducing them to information in nontraditional fields and providing them with active learning projects within those fields so that they have the opportunity to explore for themselves. This is particularly important for outreach-education programs geared toward engineering and science fields in which students can incorporate knowledge with laboratory experiences. Engaging families in outreach programs is important because it helps them feel and become involved in supporting the academic success of their child. Outreach programs can also educate parents on the costs of education as well as the available sources of financial support, which is beneficial for parents who see finances as a barrier to their child's education.

V. State of Current Research and Further Avenues of Study

Diversity, inclusion, and cultural awareness have many positive benefits in the education system, while the lack of diversity can have many negative impacts on students from stigmatized groups. Research offers insight into how to achieve diversity and inclusion, the impacts of diversity and inclusion, and the progress that has been made throughout the years in helping women, minorities, and other diverse students enter fields in which they have traditionally been underrepresented. Researchers have long recognized that the inclusion of diverse students in education is needed and beneficial and that educators need the proper

tools to implement programs effectively. Yet much work still needs to be done, particularly to examine the effectiveness of current methodologies. For example, although girls appear to be encouraged by outreach-education programs and initially express interest in STEM fields after involvement in these types of programs (Elton et al., 2006; Fields, 2001), many female students in STEM still get lost (e.g., lose interest or drop out for other reasons) during college or prior to actually entering a field. In addition, while minority students show as much desire to achieve in STEM fields as nonminority students do, a lack of rigorous preparation and lower academic achievement for many minority students pose potential barriers to realizing a career in these fields (Riegle-Crumb & King, 2011). Thus, researchers should continue to further examine what is meant by "effectiveness" of current methods used to make fields more diverse.

Research also should explore why women and minorities are leaving STEM fields and, more importantly, how to mend the leaky pipeline at stages such as undergraduate and graduate school education. Finally, while data is available to examine gender differences and racial differences separately, little research cuts across the two to inform educators about specific ways that race and gender might interact. Thus, research should examine the intersection of race and gender on STEM-related outcomes on classroom and outreach-education programs.

In sum, the population continues to change and more diversity is anticipated (Murdoch & Hoque, 1999; Murdoch & Swanson 2008). Thus, it is critical to research, identify, and know how to successfully and optimally manage the differences in students from a wide variety of backgrounds.

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