

“Asians are Good at Math. What an Awful Stereotype”: The Model Minority Stereotype’s Impact on Asian American Engineering Students

DEBORAH A. TRYTTEN, ANNA WONG LOWE^a, SUSAN E. WALDEN
University of Oklahoma, Oklahoma Baptist University^d

BACKGROUND

The Model Minority Stereotype (MMS) describes Asians and Asian Americans (As/AsAm) as the epitome of assimilation into U.S. society using hard work, intelligence, high educational attainment, and economic success to overcome the challenges of discrimination and recent immigration. Certain facets of the MMS intersect with qualities often perceived as desirable in engineering education.

PURPOSE (HYPOTHESIS)

Our research questions are: To what degree do academic data support the assertion that AsAm engineering students conform to the MMS? How do AsAm engineering students express the impact of the facets of the MMS on their lived experiences? What facets of the MMS are more often reported than others among AsAm engineering students? How do AsAm engineering students perceive their fellow racial/ethnic peers fit within the MMS?

DESIGN/METHOD

The research uses a mixed methods approach including analysis of academic transcript data, surveys and semi-structured interviews.

RESULTS

The academic record of AsAm participants was not significantly different from participants in other racial/ethnic groups. Although the AsAm participants were not found to conform to the MMS academically, they discussed their perceptions of many facets of the MMS including: being hardworking, uncomplaining and extremely intelligent, and seeking both economic attainment and educational prestige. Interestingly, many students who denied that the stereotype applied to them projected this stereotype on other AsAms.

CONCLUSIONS

Documentation of the existence of the MMS on our campus shows that, although AsAm students are not underrepresented, they face stereotyping and discrimination. We present specific recommendations for institutions to address equity and parity challenges.

KEYWORDS:

Asian American, diversity, stereotypes

INTRODUCTION

Asians and Asian Americans (As/AsAm) are in a unique position in engineering education. On one hand, they are overrepresented in engineering relative to the U.S. population as a whole. On the other hand, they remain a minority of engineering students at most institutions. Although AsAm students are not underrepresented, they face stereotyping and discrimination issues in common with students from other minority groups. This work serves notice to engineering educators and advocates for underrepresented populations: equity in STEM higher education is not assured simply by proportional participation.

At the institution of our research focus, AsAm representation in the College of Engineering (including graduate students but excluding non-resident aliens) is 6.9% (172 / 2,485) (University of Oklahoma, 2010), while the state is 1.4% Asian (Barnes & Bennett, 2002). This number of students is only slightly larger than those of other underrepresented groups (African American 135, Hispanic 125, and American Indian 135 (University of Oklahoma, 2010)). Assuming a uniform distribution, a class of thirty undergraduate engineering students at our institution might have just two AsAm students, and either one or two from each of the underrepresented minority groups. Students from each of these groups may feel isolated in engineering classrooms.

When institutions and federal agencies use underrepresentation as the qualifier for minority student resources, As/AsAm engineering students are under served by the institutional support structures for minority populations. This marginalization compounds the disadvantage for As/AsAm students because even an overrepresented minority population can have race-discrimination-based experiences (Trytten, 2009) and need specific kinds of support (Do, 2006). Many of these discrimination experiences can be linked to the stereotypes faced by As/AsAm students. We hope that this work will encourage institutions of higher education to consider how As/AsAm students fit into diversity initiatives and inspire other engineering education researchers to consider this population for study.

One of the most widely acknowledged and studied stereotypes of As/AsAms is the Model Minority Stereotype (MMS) (Choi & Lahey, 2006; Lee, 1996). The MMS describes As/AsAms as the epitome of assimilation into U.S. society, using hard work, intelligence, high educational attainment, and economic success to overcome the challenges of discrimination and recent immigration. Engineering prizes some of these traits that As/AsAms are stereotyped to possess (Godfrey & Parker, 2010). The superficially complimentary stereotypes of As/AsAms may seem helpful or at least benign. However, racial and ethnic stereotypes, including the MMS, have been identified as sources of stress on individuals within organizations (Cocchiara & Quick, 2004). In the educational setting, stereotypes can alter interactions with professors, staff, peers, and even other As/AsAms. The harm of complimentary stereotypes is potentially as detrimental as negative stereotypes. Frank Wu summarizes the consequences of the MMS (Wu, 2002):

Above all, the model minority myth is a case study in the risks of racial stereotypes of any kind. It is the stereotyping itself, not the positive or negative valence it assumes temporarily, that is dangerous. A stereotype confines its subjects. The myth was neither created by nor is it controlled by Asian Americans. It is applied to but not by Asian Americans [a claim we will address in the discussion]. The model minority myth tells us that the only good Asian American is a genius workaholic, not an average or normal man or woman. The expectation of being a supergeek can be debilitating. (p. 76).

While we will focus on the MMS, other stereotypes of As/AsAms exist that are obviously detrimental. These stereotypes include *forever foreigners*—an assumption that all As/AsAms lack fluency in English and U.S. culture (Tuan, 1998), *yellow peril*—implying huge populations of Asians will flood the U.S. and take over (Takaki, 1998), *racial castration*—a view that Asian men are not masculine (Eng, 2001), *exotification*—the perception of Asian women as mysterious, submissive, and hypersexual (Chou & Feagin, 2008; Prasso, 2005), and the *bamboo ceiling*—asserting that As/AsAms are unsuited for leadership roles (Hyun, 2005).

We explore the expression of the MMS by AsAm engineering students at our institution by answering the questions below:

1. To what degree does academic data support the assertion that AsAm engineering students conform to the MMS?
2. How do AsAm engineering students express the impact of the facets of the MMS on their lived experiences?
3. What, if any, facets of the MMS are more often reported than others among AsAm engineering students?
4. How do AsAm engineering students perceive their fellow racial/ethnic peers fit within the MMS?

LITERATURE REVIEW

The term “model minority” was first used to describe As/AsAms by William Peterson in a *New York Times* article (Chang, 2000), published in 1966 during the civil rights era in the U.S. This article came from a time when the struggle for voting rights and freedom from overt racism like segregation was transforming the U.S. through the rise of the Black Power Movement. Many oppressed populations protested systematic, substandard political and economic opportunities, and demanded equality (Omatsu, 2007; Woo, 2000). The MMS was used to explain disparity between success of As/AsAms and struggles of other racial and ethnic minority groups (Woo, 2000). Early articles described several facets of the current model minority stereotype: streets are safe in Chinatown, children of Asian immigrants seem to be top students, and Asians never complain publicly about discrimination (Wu & Song, 2000). The first two sentences of a foundational 1966 *U.S. News and World Report* article titled, “Success Story of One Minority Group in U.S.” (reprinted in (Wu & Song, 2000)) labeling Chinese-Americans as the model minority reveals the sinister beginnings of this stereotype:

Visit Chinatown U.S.A. and you find an important racial minority pulling itself up from hardship and discrimination to become a model of self respect and achievement in today's America. At a time when it is being proposed that hundreds of billions be spent to uplift [African Americans] and other minorities, the nation's 300,000 Chinese-Americans are getting ahead on their own, with no help from anyone else.

Instead of examining cultural barriers to attainment that existed for members of minority groups, dominant society chose to use the MMS as a hegemonic device (Lee, 1996). Hegemony refers to oppression by a dominant group with the unknowing consent of non-dominant groups, and comes from Gramsci's analysis of the interactions between peasants and the bourgeoisie in the early twentieth century (Allan & O'Leary, 1993).

Assimilation rhetoric is an example of a hegemonic device. If everyone agrees that members of underrepresented groups should give up their distinctiveness and behave like members of the dominant group, the dominant group does not need to value or adapt to differences. It was, and is, easy for As/AsAms to accept the superficially complimentary MMS, particularly compared to some of the other stereotypes of As/AsAm and other racial/ethnic groups (Zhou, 2004).

While there are many facets to the MMS (Chou & Feagin, 2008; Lee, 1996; Lee, 1999; Wu, 2002), we will highlight the facets discussed by the AsAm participants in our research. The statements below are summaries of these facets of the MMS:

- Extremely intelligent: As/AsAms are perceived as inherently smarter than other racial groups, especially in mathematics and science.
- Hard working (good work ethic): As/AsAms willingly work long hours and are exemplary employees and students.
- High economic attainment and goals: As/AsAms desire monetary stability and upward mobility.
- Seeking educational prestige: As/AsAms see education as the path to success, preferring to study high status professions at elite institutions and attaining high GPAs.
- Uncomplaining about racial issues and problems: As/AsAms passively accept racism and discrimination, choosing to be model citizens that do not complain about inequities.

All facets of the MMS are false. The MMS characterization as being highly intelligent, especially in mathematics and science, is false because all members of any group cannot exhibit any trait (Cheryan & Bodenhausen, 2000; Tuan, 1998). The stereotype that As/AsAm pursue education at high status universities and in high status professions ignores the reality that many Asian immigrants struggle for subsistence (Wu, 2002). In spite of the MMS characterization of As/AsAms avoiding criminal activity, Choi and Lahey (2006) report that Asian and Pacific Islander youth participate in aggressive offenses more than White youth. The stereotype that As/AsAms are uncomplaining about racial issues and problems is also false. Although the participation of As/AsAms is routinely omitted from historical discussions of the civil rights movement (Omatsu, 2007), As/AsAms were prominent civil rights activists. For example, Yuri Kochiyama, a Japanese American civil rights activist, worked alongside Malcolm X and was by his side when he was assassinated.

Other facets of the MMS have been borrowed from characterizations of other racial/ethnic groups, particularly from the earlier wave of Jewish immigrants into the U.S. (Wu, 2002). Rags to riches stories of starting in the U.S. with few resources yet obtaining success through hard work and good values have been shown to be significant aspects of the U.S. experience in general and are not specific to As/AsAms (Takaki, 1998; Woo, 2000). Having a strong family network to teach their children good values and push them to excel in school despite sometimes living and working in poverty has also been assigned to many minority groups over time (Wu, 2002).

The MMS has been used to separate As/AsAms from solidarity with other racial and ethnic minority groups. The looting of Asian owned businesses during the 1992 race riots over the not guilty verdict in the trial of four police officers accused of beating Rodney King in Los Angeles is an example of violence inspired, in part, by the MMS (Zia, 2000). The perception among other minority populations that As/AsAms are disinterested in

racial politics has also made it more difficult for As/AsAms to join with those groups to demand social justice (Aguirre & Lio, 2008).

In addition to separating As/AsAms from other racial and ethnic groups, the MMS causes As/AsAms to become an educational and professional threat for members of the dominant group in society (Kawai, 2005; Takaki, 1998; Woo, 2000). The recent public outcry about the parenting practices described by an AsAm mother in *Battle Hymn of the Tiger Mom* (Chua, 2011) can be interpreted as responses to the perceived threat of AsAm children excelling over children from the dominant culture. The intersection of the MMS with the forever foreigners stereotype creates the bamboo ceiling (Hyun, 2005). Although As/AsAms are viewed through the lens of the MMS as ideal employees, their foreignness makes them unacceptable for leadership roles, leaving those prestigious and well paid opportunities open for members of the dominant society.

The MMS can contribute to feelings of stereotype threat among As/AsAms who have been socialized to its various facets. Stereotype threat was originally identified among high-achieving African American and Latino/Latina students when their performances on academic tasks was diminished by reminding them of negative academic stereotypes associated with their race or ethnicity (Steele, 1997; Steele & Aronson, 1995). Under stereotype threat, the anxiety of potentially confirming negative stereotypes prevents the sufferer from fully demonstrating his or her ability. Later research demonstrated that the effect could be induced among highly competent, dominant culture students who have not been subjected to negative stereotypes when they were told they were being compared to Asians in mathematics (Aronson et al., 1999). Additional research by Cheryan and Bodenhausen (2000) revealed that a similar effect occurred with Asian students when they were reminded of the MMS before an academic test. In this instance, the fear of not living up to the standard set by the MMS greatly diminished the students' performance.

Our examination of the MMS as experienced by AsAm undergraduate engineering students will employ a critical race theoretical framework. Critical race theory is a part of critical cultural theory. Critical cultural theory looks at the culture of a society as something that is engineered by the powerful to benefit themselves at the expense of others. Consider, for example, the U.S. policy before 1971 of excluding any student making progress in a college degree program (including graduate programs) from the military draft during the Vietnam War. It could be argued that this was a practical method of keeping the most intellectually talented individuals in the U.S. from dying in war. However, a critical cultural theorist would view this as a way for those with the power of money (who could afford endless years of college) to protect their sons from being drafted. At the heart of critical race theory (CRT) is the understanding that race is an artificial device used by those in power to differentiate and subordinate less powerful groups. A CRT interpretation could see Vietnam War era draft policies as providing a way to assure that a disproportionate number of soldiers were racial and ethnic minorities.

Critical cultural theory sees culture not only as being engineered by the powerful in a society but as being purposefully transmitted to younger generations to preserve the status quo. The family and educational systems are actors in this transmission process. Critical race theory in education therefore seeks to identify, analyze, and transform those structural and cultural aspects of education that serve to maintain subordinate and dominant positions in society based on race (Solorzano & Yosso, 2002). CRT challenges claims that education is a meritocracy with a level playing field and focuses on education's role in the construction of social and racial power (Fernandez, 2002). For example, the legacy system used at some colleges (where children of graduates are given preference in admissions),

when viewed through CRT is seen as a way for powerful families from the dominant culture to ensure that their children have preferential access to the most prestigious venues in higher education over racial and ethnic minorities. Legacy admissions allow the racial discrimination of the past to be transferred to the next generation using a policy that superficially appears color blind, but is not in practice.

Hegemonic devices, like the MMS, are examples of the power structures for which CRT is applicable. Experiential knowledge of non-dominant students is central and valued in this type of analysis. CRT provides a means for the voices of those on the margins to be heard (Fernandez, 2002; Parker & Lynn, 2002; Villenas & Deyhle, 1999). After an explanation of the research methodology, we will discuss how CRT informed our research decisions.

RESEARCH METHODOLOGY

This work is part of a larger research study examining the success of four groups of racial/ethnic minority students (African American, Hispanic American, Asian American, and Native American) at our institution (National Science Foundation's Directorate of Undergraduate Education's STEM Talent Expansion Program Grant No. DUE-0431642). Students were sophomores, juniors, or seniors when they were first interviewed. Participants that continued to major in engineering disciplines and had not graduated were contacted in subsequent years to be interviewed once a year. Participants were interviewed as many as three times. The overall study contained 227 interviews of 159 participants.

We recruited participants for our research from a list provided by the College of Engineering. We contacted students by email, mail and telephone, and by visiting classrooms and student organization meetings according to an Institutional Review Board approved protocol. Initial ethnic/racial identifications were derived from the University's information system where students self-identify upon admission. Participants were informed of the purpose of the research. Participants then gave consent to allow the use of their interview and survey data and for the research team to view their academic transcript.

Our research blends quantitative and qualitative methodologies. Participants filled out a survey that included questions about their racial and ethnic background and questions similar to the Pittsburgh Engineering Attitudes Survey (Besterfield-Sacre, Atman, & Shuman, 1997) with modifications to include computer science students who were not in the original survey population. Participants were then interviewed using a semi-structured protocol that probed their background and college experiences, similar to those used by both Seymour and Hewitt (1997) and Margolis and Fisher (2003). The participants' comments on the MMS came while the students were discussing general engineering-related activities and college experiences or addressing questions asking about their lives as As/AsAm students. As/AsAm participants were interviewed by As/AsAm research assistants specially trained for the task. Students were not systematically asked about the MMS in the interview protocol.

CRT shaped many decisions in the research methodology. For example, the choice to use interviews of racial/ethnic minority students rather than surveys alone was based on CRT. Interviews allow the lived experiences of racial and ethnic minority students as expressed in their own words to be the primary research data. Data collection relying on predetermined questions with preselected response options could limit the voice of

participants in describing their interactions with the power structures of the institution. The decision to use semi-structured interviews was also based on CRT. While it can be easier to analyze fully structured interviews, semi-structured interviews allow the participants more opportunity to clarify their viewpoints. The decision to select interviewers who were As/AsAm was based on the need for racially sensitive data for CRT analysis, as it is easier for participants to have frank discussions about race with co-racial interviewers (Fielding & Thomas, 2001). In the demographic surveys that we collected as secondary data, the decision to collect information such as the languages spoken in the home, and generations of the family in the U.S. was based on CRT. For majority students, these questions are often unimportant, but they are critical to understanding the lived experiences of As/AsAm students since they influence the imposition of racial assumptions on them by the dominant culture. The decision to analyze the data from each racial/ethnic group separately in the larger research study, rather than aggregating across racial and ethnic groups, was based on CRT. This decision allowed for a critical examination of the issues and concerns for each racial/ethnic group, even if the issues were not of importance to other racial and ethnic minority groups. For example, the MMS would have been less likely to come up as a topic for analysis if the four racial and ethnic groups in the original study were aggregated.

Participant interviews were recorded, transcribed, and reviewed for accuracy. Identifiers (such as faculty and student names) were replaced with non-personal identifiers. Interview transcripts were uploaded into NVivo qualitative data analysis software (Q.S.R. International, 2002) and coded using an iterative-inductive methodology (O'Reilly, 2005), where categories are developed and refined repeatedly during the coding process based on the narratives. Each racial/ethnic group was coded separately to ensure that issues specific to each group were accessible for analysis. Coding validity and reliability were assured through coding team structure (co-racial and outside members), team review, and consensus building (Borrego, Douglas, & Amelink, 2009; Case & Light, 2011).

Data for this work were selected from an NVivo search of the As/AsAm interview transcripts for coding and text related to the MMS, including those excerpts that indicated either a self-perception or a perception of other As/AsAms. Individual quotes that addressed multiple subtopics were counted in more than one category and subcategory. This means that counts of quotes will sometimes be different from categorical totals. Our search strategy was to select all coding, even tangentially related to MMS, and to assess manually the appropriateness of each interview segment. This strategy has been shown to be reliable (Murphy et al., 2007).

Table 1 describes our definition of generation. The integral generations follow the usual definitions, which assume an unrealistic homogeneity (e.g., either all of your grandparents were born in the U.S. or none were). The half generations describe individuals of less homogeneous heritage. Using this definition, the participants whose data we will analyze include those from generations 1.5 to 3.5. We have only one participant from generation 3.5. All but one of our participants had at least one parent who was born in Asia.

Tables 2-4 describe the demographics of participants. We show the distribution of participants by gender (Table 2) and major (Table 3) versus generation, and by self-identified race/ethnicity (Table 4). We have organized the demographic data by generation to help conceal the identities of the participants, some of whom are highly identifiable within their disciplines because of low representation, particularly for female participants. We aggregated generations 2.5 and 3.5 in Table 3 for the same reason. Multi-racial/ethnic

TABLE 1
The Definition of Generation for As/AsAm

Generation	Student Born in U.S.	Student Raised in U.S.*	Number of Parents Born in U.S.	Number of Parents Born in Asia	Number of Grandparents Born in U.S.	Number of Grandparents Born in Asia
1.0	No	No	0	2	0	4
1.5	No	Yes	0	2	0	4
2.0	Yes	Yes	0	2	0	4
2.5	Yes	Yes	1	1	0-2	2-4
3.0	Yes	Yes	2	0	0	4
3.5	Yes	Yes	2	0	1-3	1-3
4.0	Yes	Yes	2	0	4	0

Note. * We consider a student to have been raised in the U.S. if they immigrated prior to age 13.

TABLE 2
The Distribution of Participants by Gender and Generation

Gender	1.5 Gen*	2.0 Gen*	2.5 Gen*	3.0 Gen*	3.5 Gen*	4.0 Gen*	Total
Female	2	9	1	0	0	0	12
Male	6	11	6	0	1	0	24

Note. * Generation designations defined in Table 1.

TABLE 3
The Distribution of Participants by Major and Generation

Major	1.5 Gen*	2.0 Gen*	2.5-3.5 Gen*
Aerospace Engineering	1	0	1
Chemical Engineering	2	3	1
Civil Engineering	1	3	0
Computer Engineering	0	2	0
Computer Science	0	2	1
Electrical Engineering	0	4	3
Environmental Science	0	1	0
Industrial Engineering	2	0	0
Mechanical Engineering	2	5	1
Petroleum Engineering	0	0	1
Totals	8	20	8

Note. * Generations defined in Table 1.

TABLE 4
Distribution of Participants by Self-Identified Race/Ethnicity

Race/Ethnicity	Frequency
Asia (non-specific)	2
Black, U.S.	1
China *	8
India	1
Indonesia	1
Korea	1
Pacific Island +	3
Philippines	6
Taiwan	1
Thailand	1
Vietnam	14
White	7

Note. Multi-racial individuals have at least one Asian identification and are counted in all racial/ethnicity categories where they self-identified.

*Students in this category self-identified in a variety of ways, including Chinese, Asia-Chinese, Hong Kong, Chinese from another country.

+ The ethnicity of these individuals was withheld to maintain confidentiality, since our institution has a very small number of Pacific Islanders.

students are counted in all applicable categories in Table 4. The demographic descriptions in Tables 1-4 should help readers determine whether or not our research results are transferrable to their institutions.

We focus this analysis on self-identified As/AsAm students who were either born in the U.S. or attended middle school and high school in the U.S., in other words generations 1.5 to 3.5. While it is not our intent to marginalize more recent immigrants by exclusion, the issues faced by recent immigrants (particularly the acquisition of English language proficiency) are distinctly different from those who have been in the U.S. longer. This study's population of generation 1.0 participants was too small to be able to treat them as a separate sub-sample.

U.S. government census data collects everyone with ancestry in Asia into the category of Asian Americans (Barnes & Bennett, 2002). Although Pacific Islanders are now

separated from Asians in government census categories (Lai & Arguelles, 2003), they were not separated in our University's information system at the time this research was conducted. The generalized Asian label is not universally embraced by the categorized individuals. Individuals who might be characterized as Asian American actually may identify themselves according to their country of origin, ethnicity, or a subgroup defined by language, region, or along another dimension (Wu, 2002). We choose to use the language students provided to describe themselves and to recognize their race and ethnicity as it was presented to us.

From Table 4, it may appear that students of Vietnamese ethnicity are over represented in our sample population. Table 5 gives the distribution of As/AsAm's ethnicities for the U.S. and the state in which the institution resides. About one-third of the As/AsAm population in the state is Vietnamese, and that proportion is reflected in our population sample. This state has about twice as many people of Vietnamese ethnicity as Chinese ethnicity, as does our sample. The main difference is that our sample has a smaller number of people of Asian Indian ethnicity than the state demographics would predict. Instead, we have a broader range of ethnicities represented in our sample.

TABLE 5
Distribution of Asian Ethnicities for the U.S. and Oklahoma from the 2000 Census (Reeves & Bennett, 2004)

Ethnicity/Nationality	U.S. (%)	Oklahoma (%)
Asian Total alone or in combination	4.21	1.4
Chinese	1.02	0.2
Filipino	0.85	0.1
Asian Indian	0.66	0.2
Vietnamese	0.43	0.4
Korean	0.44	0.1
Japanese	0.41	0.1
Cambodian	0.08	included in other Asian
Hmong	0.07	included in other Asian
Laotian	0.07	included in other Asian
Pakistani	0.07	included in other Asian
Thai	0.05	included in other Asian
Other Asian	0.2	0.2
Pacific Islander Total alone or in combination	0.31	0.1

The state our institution resides in has a relatively small population of As/AsAms, compared to the U.S. in general, as shown in Table 5, and western states (particularly California with 13% of the population being As/AsAm in the 2010 U.S. Census (2012)). Although they may apply in other contexts also, our research results should transfer to large public institutions in states with a similar percentage of As/AsAm residents or citizens.

When we quote students in this work, we will give only their race/ethnicity and generation. Student major and gender are not given. This limitation is necessary to protect the confidentiality of the participants who may be identifiable within their majors. Students that are multi-racial are more easily identifiable and will be described only as biracial. Since one third of the research participants are female, we will arbitrarily assign genders in this ratio during the discussion section. In the cases where gender is relevant, we provide the information.

We removed conversational fillers, such as “ummm,” “like,” and “you know.” Words not said by the participant that were inserted or substituted by the authors to clarify context are given in square brackets ([]), a practice also used in a literature quote above to remove a racially insensitive word. When words or sentences are deleted, ellipses (...) are used. Words that are not clear upon transcription and verification are put in parentheses. Words in angle bars (< >) are categorizations substituted to avoid identifying participants. A (p) indicates that the participant paused at that point. Statements preceded with a “P:” were said by the participant. Statements preceded with an “I:” were said by the interviewer. Statements without a prefix were said by the participant.

RESULTS AND DISCUSSION

Do AsAm Students Conform to the MMS Academically?

The first research question we will address is: To what degree do the academic data support the assertion that AsAm engineering students conform to the MMS in terms of academic achievement? To examine academic achievement of AsAms, we compare GPAs across all four minority group participants in our research study. Although a comparison to the majority students might appear to be necessary, the GPA comparison should be made to other minority populations. AsAms are perceived to be the model minority, not the model race. Furthermore, the MMS is a hegemonic device used by the majority to set minority populations in competition with each other (Aguirre & Lio, 2008).

Table 6 summarizes the academic data from the participants from four racial/ethnic minority groups. Grade point averages contain all coursework including transfer courses and are adjusted based on academic forgiveness policies. The retention data are for all students interviewed (excluding first generation AsAm who are not included in this analysis), whereas the GPA and credit data are only from the subset allowing academic transcript access.

Based on the data from the participants who allowed us to access their academic transcripts, a shallow review shows that AsAm students have higher mean and median GPA and more hours of advanced standing credit than the other three groups. Hispanic Americans (HisAms) had a larger fraction of students retained in engineering than AsAms. In spite of higher mean advanced credit hours, a similar proportion of AsAm, Native American, and HisAm students have failed a required course. Using analysis of variance (ANOVA) calculations, no statistical difference in mean GPA by race/ethnicity was found ($p = 0.11$).

TABLE 6
Academic Data for Participants from Four Racial/Ethnic Groups

Academic Characterization	AsAm	NatAm	AfAm	HisAm
<i>Detailed: For students who allowed access to academic transcripts</i>				
% of students who allowed access to transcript	83	100	86	95
Mean GPA	3.274	3.178	2.983	3.123
Median GPA	3.435	3.135	2.956	3.118
Mean hours of advanced standing credit	13.62	4.40	3.53	6.05
Median advanced standing credit (mostly AP)	6	0	0	1.5
% of students who failed a course (F U I)	28	26	37	29
<i>General: For all student participants</i>				
# of participants	36	35	44	40
# of students retained in engineering major	32	29	37	37
# of students who left engineering major or college	4	6	7	3

Note. *As with other data for AsAm, these data exclude 1st generation immigrant students. NatAm stands for Native American participants. AfAm represents African American participants. HisAm are Hispanic American participants. AP stands for Advanced Placement credit attained by high school students taking nationally certified exams (<http://professionals.collegeboard.com/educator/higher-ed>). U = unsatisfactory and I = incomplete.

While we recognize that the label “Model Minority” implies many characteristics not measurable in academic GPA and advanced standing data, grades are the currency of higher education and are used as a proxy for hard work and intelligence, which are facets of the MMS. As a result of this analysis, the academic achievement data do not support the identification of the AsAm participants as model minorities.

What are the Impacts of the MMS?

We now examine the research question: How do AsAm engineering students express the impact of the facets of the MMS on their lived experiences? Notwithstanding the answer to the previous research question, many participants’ college and life experiences intersected with the MMS. First, we describe the participants’ remarks about acceptance or rejection of the five facets of the MMS found most in the data. In the final subsection, Summary of the Impact of the MMS, we will discuss the impact of these facets on the participants’ lived experiences. When reviewing the data, it became apparent that some participants were separating how they viewed themselves from how they viewed other AsAms. We have included the description of the participants’ view of other AsAms in the description of each facet. The analysis of the participants’ views of other AsAms is done in the section entitled What is the Perception of MMS for Co-racial Co-ethnic peers, where the fourth research question is answered.

Hardworking. Eleven participants commented on this facet. Participants generally expressed full acceptance of this stereotype both for themselves and for other As/AsAms. While these students recognize that their culture and family socialized them toward this behavior, being hard working is now part of their identity. Eight participants fully embraced the stereotype with comments like “don’t slack off, work hard.” The participants were more likely to identify with hard work and link it with their race than some other facets of the MMS, perhaps because it is a better cultural fit with the work ethic that is part of U.S. culture (Gillin, 1955). One student reported an Asian faculty member announcing in class that he expected Asian students to work harder. One participant reported not being hardworking, although he recognized this as a stereotype of AsAm.

The two students below express full acceptance of the stereotype both for the participant and other As/AsAms. The first participant not only foregrounds her perception of Asian family expectations regarding hard work, she projects this on to all Asian parents.

I: Are you always a good student? Are you always self-motivated?

P: Yeah, I try.

I: Where do you think you get that from?

P: I’m not sure. I think I just want to be a hard worker. Maybe it’s because it’s from my culture to work hard. ... When I was younger, my parents, like when you are in elementary school I come home with not a really good grade, not a super good grade... You know like Asian parents sometimes say, “Why don’t you get a 100?”...so I feel like I need to get a 100.

Vietnamese, 2nd generation

A distinction between the perceived work ethic of Asian and White students was addressed by the participant below.

I guess I’m more dedicated. Because in my [class project] group... Besides me and this other guy, we’re just Asian and two other White <people>. It’s always me and the Asian guy. ... And then my friend, my only White <other gender> friend says “I don’t know how you <Asians> do it. You <Asians> are crazy...” And I was like: “Well if you have to, you have to. That’s just how it is.” ... And for us two [AsAm students], we’re like “Well we have to. We have to do it because it’s due tomorrow.” And they’re like “No, it’s ten o’clock. I have to go.” And we’re like “It doesn’t matter what time it is. We’re not done.”... Me and my Asian friend are like “Come on, we can help you. You still have a few more hours.” <White group member says>: “No, forget it.” ... We’re still trying for an A and they’re trying to pass.

Vietnamese, 1.5 generation

The participant’s perception is that White people are willing to accept mediocrity, while As/AsAms are driven to excel. The participant perceives that As/AsAms are willing to sacrifice sleep or social activities to excel. This perception may contribute to interracial conflicts with other engineering classmates. The participant thinks that both As/AsAm and White group members share this perception.

The MMS, and particularly the hard-working and intelligent facets, may cause faculty and advisors, as well as peers to hold As/AsAm students to higher standards. A participant described an experience with oppression by a co-racial faculty member.

P: One of my electives was [a general education course] and my teacher was [of Asian ethnicity] and he blatantly said he was going to be more strict on the Asian students because "I know you guys came from Asian families and I know you guys study more" and he said that in class ...

I: Yeah, how did that make you feel?

P: I don't know. I laughed at first and then I just blew it off.

I: In the end was he really serious about that?

P: I don't know. I don't know. He might have been; every time at the conclusion he made comments if I got something wrong. I don't know if he did that to everybody else.

(Ethnic identification removed to maintain participant confidentiality)

The following student represents a group of students with unrecognized inconsistencies between their beliefs that the U.S. is a colorblind meritocracy and that Asian societies have a good work ethic.

P: There is that stereotype that Asian people are smarter and I think the only reason people think that is because a lot of times they have a really good work ethic. And I don't think it matters who you are or what race you are; if you are willing to work in most cases you will be able to succeed and be smart and be successful. ...I know there is... a pretty hard work ethic in Asian countries so because they work hard at things and try to excel, they excel and that's true of anybody I think. If anyone tries hard, they can do well.

I: OK, it doesn't matter which race?

P: No.

Biracial, 2.5 generation

The participant quoted above is biracial, acknowledges that she has a White phenotype (as confirmed by our AsAm interviewer) and has a typically western last name. It is possible for her to participate as White in the U.S. culture, also known as "passing" (Ginsberg, 1996). Since she is not a recognizable As/AsAm, she is unlikely to experience racial discrimination that may challenge her belief that the U.S. is a meritocracy.

Another biracial participant who has a non-Asian phenotype reports being freed from the pressure to be a hard working AsAm only to be caught by another stereotype.

P: I know some Asians who are taking classes and I know they're pressured into doing things you know being smarter than anybody else, working harder than anybody else. Some of the Chinese and Japanese people I know are like that but I don't get that pressure.

I: Why?

P: Just because nobody knows I'm Japanese. And then if I do tell people I'm Japanese after they've known me a few months and they're like, "Oh, that's why you're good at computers."

Biracial, 2.5 generation

Extremely intelligent. Thirteen participants commented on the stereotype that As/AsAms are intelligent, particularly in mathematics and science. Unlike with the other facets, the participants were quite varied in their acceptance or rejection of this facet, both for themselves and what they projected onto other As/AsAms.

Many of the participants saw this facet of the stereotype as beneficial. One participant was proud of the stereotype. One second generation participant reported that in grade school she was presumed to be unable to speak English and thus academically weak, but in junior high suddenly was recognized as smart and asked to tutor others. She saw this as an advantage since she was a loner and it allowed her to make friends. Four participants rationalized that this facet of the stereotype was true because immigration to the U.S. was possible only for the most intelligent in Asia, resulting in unusually intelligent AsAms. These participants appear to be unaware of the history of Asian refugee immigration.

Other participants talked about how others projected this facet of the MMS on them. Four participants reported that others expected them to be smart, although they did not always link this to race (e.g., one thinks the reason that strangers assume he is smart is because he was the valedictorian of his high school class and “word gets around”). A friend of one participant jokes with him, saying that the participant should be smarter in engineering. Two others rejected this facet of the MMS stereotype as untrue. However, one of these students later said that he had decided not to apply for scholarships that were restricted to As/AsAms because he did not feel he could compete with other As/AsAms. He later disclaimed this by saying that he also did not need the money and wanted to leave it for others.

The participant below assumes that the dominant society uses the intelligent facet of the MMS and she seems willing to take advantage of that benefit, while denying that race is an element in her success. The participant links her desire for good grades to her desire for economic attainment, instead of innate intelligence. She sees grades as being incredibly important to career success, more important than they probably are.

I: Do you think you have ever been treated negatively or badly or have been discriminated against because of your race?

P: Actually, I think I have benefited from being Asian....They assume that you are smarter and stuff. ...They know that you are dedicated to education, I think, especially in engineering.

I: Do you think that you can get that same respect outside of engineering?

P: In the workplace? Yeah...I try to make A's so that I can be able to back it up and represent.

I: ...Does it make you want to do well because of that stereotype?

P: No, no. I just want to do well because companies want to look at your GPA and stuff, so that is why I do well. I don't do well because of my race or anything.

Thai, 1.5 generation

Only one participant saw this facet as solely harmful. He describes the experiences of a peer who did not live up to the expectations of the MMS.

Asians are good at math. What an awful stereotype. I met a guy [whose] family had moved from <large city on west coast> to <small town in Oklahoma> and he

was Asian and absolutely awful in math—could not do it, and it was [in] good humor. That’s the stereotype: Asians are good at math. And his friends started poking fun at him, and it was something to laugh at.

Biracial, 2.5 generation

Seeking economic attainment. Eight participants discussed the stereotype that AsAms seek economic wealth. The general trend among the participants is to express acceptance of this facet of the stereotype. The participants apply this stereotype both to themselves and to other As/AsAms. Three participants were open about their desire for economic attainment. When asked about professional goals, one participant responded: “Just like every other Asian man: make as much money as you can.” Another participant observed that his AsAm friends gravitated towards pharmacy out of the desire to make money. One participant detailed how his desire for economic attainment had impacted his choice of major, including staying in a major he hated because of family pressure. His family perceived the major as a good backup if he did not pursue medical school. He chose the major because it was reported to be the most lucrative in his Introduction to Engineering class: “I just need a job that pays a lot. I don’t really care what it is now.” This student eventually left engineering, one of four AsAm participants to do so. Two participants commented on their desire to achieve beyond what their uneducated immigrant parents had done. Three participants commented that AsAms are stereotyped as being greedy and cheap, with one of these wishing that the stereotype of being cheap was true since he would “have more money in the bank.” One participant gave an unsolicited and detailed account of his extended family’s wealth.

The participant quoted next represents the students who enthusiastically embrace this stereotype, both for himself and for other As/AsAms.

I: How do you feel about your Asian background?

P: I’m very proud of it just because there’s a lot of Asians that are... in the more upper part of society ... a lot of them have good jobs and good morals and good ethics and ... they’re financially stable. ... A lot of Asians, like my Asian friends ... almost everyone has a pretty decent car. ... I feel pretty proud and ... there’s a lot of [Asian] Indians that are doctors and engineers, a big percentage.

Asian Indian, 2nd generation

The participant below does not talk about his own focus on economic attainment, but does project this stereotype onto other As/AsAms.

I: You said earlier that a lot of your friends are pharmacy majors? Do you mean Asian friends?

P: Well, the only pharmacy friends that I know are Asians. So many of them go into pharmacy. A whole bunch of the incoming freshman that I talk to, like some of them from home, they always mention pharmacy as a possibility. I tend to kind of discourage that, because most of them just want to do it for the prestige or the money. ... I don’t think that they really understand what being a pharmacist really means besides just counting drugs behind a counter all day.

Vietnamese, 2nd generation

A substantial number of AsAm participants discussed pharmacy as a career option, often receiving family pressure that pharmacy was preferable to engineering. As/AsAm families saw pharmacy as a highly desirable and lucrative field, less desirable than being a medical doctor yet still within the prestigious medical fields but with less educational time commitment.

Seeking educational prestige. Eleven participants discussed seeking educational prestige. Nine of these participants had a clear set of professions that they considered to be sufficiently prestigious to be worthy of pursuit. The list generally included medical fields (with pharmacy mentioned repeatedly), engineering, and law. While engineering was considered by most to be sufficiently prestigious to be worth pursuing, it is clear that many of these participants' families generally would prefer that they had pursued a medically-related profession. Family influence was reported almost universally, with parents described as subtly (mentioning medicine as a possibility) and not so subtly (refusing to pay for college if the student transferred out of engineering into anything but medicine) encouraging medical careers. Two participants rejected the stereotype, and then applied it.

Given that future economic achievement correlates with college major, it is not surprising that many of the quotes of seeking educational prestige also relate to professional economic attainment. Furthermore, the general trend in this category was similar to economic attainment in that most participants expressed acceptance for others; however, they were less likely to accept this facet for themselves. The last participant quoted in the previous section is an example of a student who expresses that others seek educational prestige, while he remains silent on whether this applies to him.

The following quote is an example of a participant who describes the stereotypical As/AsAm familial emphasis on seeking educational prestige. She defines the hierarchy of careers in her family: medical doctor, then pharmacist, then engineer. This differs from the Asian Indian participant in the previous section who equated the prestige of engineers and medical doctors. This student's parents only accepted engineering when the participant obtained recognition within the engineering discipline.

I: Was it assumed that you and your sister would go to college?

P: Yeah, definitely. Like I said earlier, they [my parents] put a lot of pressure on us to do well in school and they'd always pushed us to go get a medical degree like many Asian parents. So yeah, there was definitely an expectation of having to go to college. They always wanted us to do better than they did.... When I tell them that I wanted to be an engineer, they weren't too happy about it. They ... originally pushed me to be a doctor. I said that I didn't want to do that, so then they said "Okay, well what about pharmacist?" I said no, that's just not for me. They definitely weren't too happy about that. But now that I'm in engineering and I'm actually doing real well and I will have a job for when I graduate ...they're actually pretty happy for me...[They started supporting me] when I actually started taking my real engineering courses and started winning scholarships and when I had started interviewing for jobs that were kind of related to engineering.

Vietnamese, 2nd generation

Sometimes the expectation for seeking educational prestige is subtle, and may not come from the parents alone. The source of the following participant's perception that the medical and engineering fields were the only ones open to him is unknown.

I: So growing up, your parents didn't put anything into your head that you have to do this or that?

P: No, but all Asians you have to do either medical or engineering.

Vietnamese, 1.5 generation

The family influence seen in the preference for medical careers can be understood through critical cultural theory. Families are a social institution transferring culture from one generation to the next (Wong Lowe et. al, 2011). In this case, some families may be engaged in stereotyping (only certain professions are worthy of pursuit) and oppression (by forcing their children into professions where the children are neither interested nor suited).

Uncomplaining. The stereotype that As/AsAms are uncomplaining was commented on by four participants. Three male participants expressed that others see As/AsAms as uncomplaining, although they reject this characterization for themselves at different levels. A Korean, 1.5 generation, male stated this facet of the stereotype applies to Japanese people, not Asians in general, reminding us that the generalized category of AsAm is not the primary identity for many participants. The fact that this participant was born abroad and immigrated to the U.S. (instead of being born in the U.S. like most of our participants) may mean that some of his ethnic sensitivities come from Korean culture instead of U.S. culture. The response of the female participant will be discussed after we explore the statements by the male participants. Since gender is relevant to this facet, the gender identities of the participants have not been randomly altered as they were for other facets.

Two of the three male participants who commented at length about this facet were among the most racially aware of the study population, and had long, rich, and detailed interviews. Both of these participants were interviewed twice, which allowed ample time to understand and probe their perspectives. One of these participants had educational experiences outside of engineering leading him to greater racial awareness and hence had an intellectual framework to express and understand his experiences. The other participant had recently experienced and confronted a racial discrimination incident. The power of their interviews is palpable.

Many of the discrimination experiences reported by these students and others in the study are examples of microaggressions, a term first used by Chester Pierce in the 1970s in the context of African American studies. Derald Wing Sue defines microaggressions as "Commonplace verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to people of color" (Sue, 2010). Microaggressions described by As/AsAm students in this participant sample have been summarized (Trytten, 2009).

Microaggressions are troublesome for all minority groups. Through multiple encounters every day, group members must undertake the emotionally draining process of interpreting and deciding how to respond to each microaggression. If they do not confront others, they fail to help others understand race and risk having the microaggression repeated. If they confront others, they could be dismissed or called racist (Dei, Karumanchery, & Karumanchery-Luik, 2007). This bind is pronounced for As/AsAms because the uncomplaining facet of the MMS leads others to assume that AsAms will ignore microaggressions.

The participant below is proud of being Vietnamese American, but is struggling with daily microaggressions resulting from the dominant culture's perception of Asian males as

passive. The assignment of passivity to AsAm males deprives them of claims to masculinity, termed racial castration by Eng (2001). As a result of feeling labeled as unmasculine, this participant deeply resented White society at the time of this interview. The quote also shows another stereotype that affects As/AsAms: the forever foreigners stereotype (Tuan, 1998).

I am very proud of who I am. ... I'm damn proud of my Vietnamese heritage. When I go outside that's not what I can see. I can see that they look at you and they automatically judge you: "Oh, you're that typical Vietnamese... You can't speak English correctly." ... I feel that in society if you grow up in a predominantly White community, I hate to say it but it's kind of a disadvantage. I mean, you're expected in society as well as your family to grow up into this mild-mannered, small, quiet student ... that's horrible. I don't want to go through [that]. ... Being Vietnamese, you can tell the difference between when they [Whites] look at you and when they look down on you. When you walk into a bar or a restaurant, White people, they'll turn around and look at you. It's just foolish ... That really pisses me off. I hate feeling weak. I hate feeling looked down upon.

Vietnamese, 2nd generation

The participant quoted next accepts the stereotype of being uncomplaining for others, but is ambivalent in his expression for himself. He is hurt by stereotypes and microaggressions, but he also is reluctant to complain. His repeated excusing of microaggressions indicates some acceptance of the stereotype for himself.

P: Asians typically are more passive you know? So whenever something like this goes on nobody ever says anything. Everybody knows not to call White people a certain name. They know not to say certain things in front of Black people or Mexicans but I don't think people know that some of the stuff they say to Asian people is racist or degrading, like <racial expletive for Chinese> or something like that or <description of physical facial feature>. I kind of take offense sometimes but then I realize that to me it seems like it's kind of socially acceptable by their nationalities to make fun of Asians because they don't know any better. ... You know how sometimes you're put into groups, and you have to introduce yourself? And something as small as somebody saying, and I don't think they mean anything by it, but they say something like, "So do you eat dogs?" What the <expletive>? Do you eat dogs? ... I think they don't know. Asians being so passive they just don't say anything. They just be quiet and exclude themselves. Sometimes it irritates me but.

I: How do you react to that kind of stuff? You say most Asians are passive.

P: I don't know, a lot of times I get angry. I've never been in a fight or anything but pretty close. But most of the time I just snap back with something smart, some remark or something.

Filipino, 2nd generation

The female participant responds to all racial encounters by "brushing them off," a term she uses in two different passages related to separate microaggressions (one related to gender, and the other to race). In other words, she is uncomplaining about both racism and

sexism. Being uncomplaining does not endanger her gender identification as female, hence the angst that the male participants experienced does not exist for her.

Race and gender intersect not only in this facet, but also in other places. Recall that sexual stereotypes for Asian men and women, for example, are wildly divergent (castration versus exotification). Although we were aware that race and gender intersect in interesting ways, our research design matched the race or ethnicity of the interviewer to the participant, but did not match the gender. This strategy was appropriate since the original research question was primarily about race/ethnicity. However, this design has left the question of how gender interacts with many facets of AsAm identity in engineering for future work.

Summary of impact of the MMS. The quotes above show the intersection of the MMS with the lived experiences of the participants. Nineteen of 33 participants discussed one or more facets of the MMS, although few of these students have the vocabulary and racial awareness to discuss the stereotype directly by name. Most participants reported experiences that the researchers recognized were influenced by facets of the MMS, even though the students claimed MMS was untrue either for themselves or for other As/AsAms. Many participants expressed both their general belief in racial equality and meritocracy and their hegemonic socialization towards the positive aspects of the stereotype. This effect has been also documented by Barreto and Ellemers (2009). Some participants described how they experienced negative impacts of the MMS. The participant providing the title quote for the paper witnessed the dark side of the MMS facet of extreme intelligence, when his AsAm friend was mocked for not understanding mathematics. Because of the MMS facets of extreme intelligence and prestigious careers, As/AsAm students may be pressed by both their families and society into careers where they are not comfortable or engaged, instead of being encouraged to pursue their interests in less prestigious and lucrative areas such as liberal arts and humanities that might be more personally fulfilling. The experience with perceived lateral oppression reported in the hard-working facet, where the faculty member reported that he would treat Asian students more harshly, offers a warning to faculty members. That faculty member may have commented on everyone's paper errors equally. However, since the instructor said that he would be stricter on Asian students, the participant notices the potential for discrimination. The participant's sensitivity to that facet of the MMS is heightened by the faculty member's behavior. This experience is another example of a microaggression.

That quote also shows an example of racial spotlighting, where members of underrepresented groups are unwillingly given hypervisibility based on their minority status (Carter, 2008). While spotlighting may seem preferable to ignoring, where members of underrepresented groups are excluded based on their minority status, both experiences objectify members of underrepresented groups and deny them control over their classroom participation (Fuligni, 2007).

We examined each factor category for patterns of response by student generation, shown in Table 2, and found no discernable patterns. Our data have shown that familial longevity in the U.S. does not change participant experience with the MMS. However, the relatively small numbers of students falling into each generational category means that this question cannot be settled with our dataset alone. The absence of participants from generation 4.0 and beyond also limits the possibility of some generational comparisons.

The MMS clearly has a strong impact on the experiences of the participants. While the examples given for the individual facets derive from inter-personal experiences, the

participant below feels the impact of the MMS through the governmental and institutional emphasis on underrepresentation as a priority over minority status.

I: How do you feel about scholarships and things? Do you feel like there is enough?

P: I feel that a lot of the scholarships are biased...If I was African American I could have gone to college even with my low GPA for significantly less than I have right now. Or if I was (p) American Indian or Spanish [sic]. I was filling out a scholarship form for some minority scholarship in engineering, and it had those three races, not Asian or anyone else. I thought that was kind of biased. As an Asian on this campus, when it comes to a lot of scholarships and a lot of minority stuff, you are almost just like a White person. You are not heard as much.

I: How does that make you feel?

P: I just find that funny, the fact that you have like race scholarships, and the fact that we are a minority. The fact that it is a minority scholarship is to help people that are underrepresented. But we are sort of underrepresented. I don't see a whole load of Asian people going through this campus, so I think I should qualify for that sort of thing. The whole racial dividing there doesn't make sense to me at all.

Biracial, 2.5 generation

The selection of underrepresentation instead of minority status as an issue which is deserving of attention, particularly funding, by governmental agencies could be viewed as an attempt to exclude As/AsAms from the stream of resources that are made available to other racial/ethnic minorities (Zhou, 2004). This view is based on the hegemonic use of MMS to pit minority groups against one another. An even more cynical interpretation would be that the government endorses the MMS for As/AsAm and therefore believes As/AsAms do not need assistance or support.

What is the Relative Prevalence of MMS Facets?

Next, we examine the third research question: what, if any, facets of the MMS are more often reported than others among AsAm engineering students? Facets of the model minority stereotype were prevalent in our data in the following order (from most to least commonly discussed): (1) Extremely intelligent; (2) and (3) Hardworking & Seeking educational prestige; (4) Economic goals; (5) Uncomplaining.

The participants were more likely to discuss the aspects of the model minority stereotype that align with traditional engineering values. The facets listed above are approximately in order of desirability for and importance to engineers. For example, we hypothesize that engineering students discuss intelligence, hard work, and seeking educational prestige more often because these traits are central parts to the elitism of engineering identity (Godfrey & Parker, 2010).

The secondary position of economic goals in engineering can be seen in salary data. While engineering students certainly value the economic benefits of their majors, engineering is not the most lucrative profession for a student with STEM related interests. The U.S. Department of Labor shows that mechanical engineers make \$80,580 and petroleum engineers \$119,960; whereas, family and general practitioners make \$168,550 and surgeons \$219,770 (Bureau of Labor Statistics 2010). In addition, medical doctors are employed by practices that they wholly or partially own, offering them superior

employability and job security. If engineering students viewed economic attainment as their most important goal, they might make other educational choices.

Economic goals and seeking educational prestige are often intertwined in the participants' stories and explanations. The distinction between these facets was sometimes blurred in the participants' minds. This blurring may be a consequence of the perception in the As/AsAm community that educational attainment is the means to the end of economic attainment (Keshishian, Brocavich, Boone, & Pal, 2010; Xie & Goyette, 2003). In many Asian cultures, filial piety is expected (Traylor, 1988): children are expected to respect and support aging relatives, particularly parents and grandparents. This may account for the focus of some As/AsAm parents on the economic attainment of their children. The expectation of filial piety shows another example of cultural information being transmitted via the family (and possibly co-racial peers) to a new generation. In the context of the dominant U.S. culture, filial piety might be viewed as oppressive, however, in the context of many Asian societies filial piety is considered to be a natural and reasonable expectation.

The least discussed facet of the MMS is uncomplaining. The uncomplaining stereotype was discussed by the smallest number of participants and only discussed by four participants, two of whom exhibited the greatest racial awareness of all participants. The uncomplaining stereotype is an insidious facet of the MMS. It is counter to the U.S. cultural values of individuality, competitiveness, courage, and power "achieved and maintained by 'moral' suasion and influence" (Gillin, 1955).

What is the Perception of MMS for Co-racial/Co-ethnic Peers?

We offer more in-depth discussion for question 4: How do AsAm engineering students perceive their fellow racial/ethnic peers fit within the MMS? When reviewing transcripts, we observed that many of the participants denied that stereotypes of As/AsAms (including the MMS) applied to them and immediately projected the stereotype onto other As/AsAms. The last quote in the section on seeking educational prestige is an example of this deflection. The participant denies pressure from his parents to study any particular field and then immediately states that all Asians must study either medicine or engineering.

This pattern appeared in each facet of the MMS studied in this work. Even our most racially aware participants stereotyped other As/AsAms while distancing themselves from the stereotype. This analysis is inconsistent with Wu's earlier claim that the MMS "is applied to but not by Asian Americans." Although we concur that As/AsAms do not control the MMS, we found that AsAm engineering students are applying the MMS to other As/AsAms. This practice is typical with hegemony, where both the majority and minority groups consent to a claim or stereotype (Lee, 1996). Since the MMS is an oppressive device, those within the group that project the MMS on their co-racial peers are engaged in lateral oppression, where members of the same minority group oppress each other. An example of both lateral oppression and hegemony observed by a participant is given below. In this case the hegemony is in the context of another culture and is therefore easier for the student to identify.

P: One of my professors treated me and the rest of our pre-capstone group pretty well, but he always treated my friend kind of crappy. He would always talk down to him. That was because they are both [Asian] Indian, and the professor was from a higher caste than my friend was....

I: Wow, how did you feel about that?

P: I thought that was kind of crappy to let that sort of thing come all the way over here to the Free World. Some of that stuff dies hard, especially if you grow up in India. You grow up always looking down at a certain person with a certain last name.

Biracial, 2.5 generation

Neither the oppressed Asian Indian student nor the other students in the class, including this participant, discussed objections to this discriminatory treatment. We cannot rely solely on As/AsAm students to bring microaggressions to the attention of those in power because of hegemonic consent to stereotypes and the MMS uncomplaining facet. Based on our data, we can see that AsAm engineering students are applying the MMS to co-racial peers.

CONCLUSIONS AND FUTURE WORK

The interview protocol was designed to identify the factors that lead members of racial/ethnic groups to succeed in engineering at the baccalaureate level. It was not designed to provide a comprehensive catalog of MMS facets, frequencies, and impacts. The fact that MMS was integrated into so many interviews without systematic prompting shows that this stereotype is very much a part of the lived experiences of the AsAm engineering students at this institution, although the academic performance data shows that the AsAm participants do not conform to an academic characterization of the MMS.

We examined how MMS impacted our students' educational experiences from their perspectives. Stacey Lee expresses a more generalized impact of the MMS.

The model minority stereotype is dangerous because it tells Asian Americans and other minorities how to behave. The stereotype is dangerous because it is used against other minority groups to silence claims of inequality. It is dangerous because it silences the experiences of Asian Americans who can/do not achieve model minority success. And finally, the stereotype is dangerous because some Asian Americans may use the stereotype to judge their self-worth (Lee, 1996, p. 125).

The MMS has many consequences for As/AsAms beyond what the participants described in their interviews. In order for one group to be a model minority, it means others are not. The MMS positions racial groups in competition with each other (Lee, 1996). This sense of competition has been a driving force behind the MMS since its inception (Wu, 2002). A more subtle difficulty is that a stereotype denies an individual control of her ability to choose how others see her, an essential element of identity (Fulgini, 2007). This limitation is particularly salient in U.S. society where individuality is highly prized (Gillin, 1955) and among college students where the process of identity development is ongoing (Tatum, 1997).

Interestingly, no participant used the term "MMS" or any variation of it specifically. The participants generally lacked the vocabulary to discuss this common stereotype of their own racial group. This omission is not surprising since the interview transcripts show that the majority of the AsAm participants appear to lack knowledge and understanding of how race interacts with U.S. culture. Living in a racially mediated world does not

provide anyone with expertise on racism, not even a member of a minority group who experiences racism. In other words, AsAms do not automatically see how the MMS is a hegemonic device that reproduces social inequities. Instead, AsAms may continue to believe that the U.S. is a color-blind meritocracy, just as the dominant society wishes them to believe. We see this in the research data when participants unknowingly contradict themselves about the MMS, often within the space of just a few sentences.

The lack of exposure to ideas like the MMS, critical race theory, and hegemony among the AsAm participants may also be an unintended consequence of engineering curricula filled with technical classes and general education requirements of the University, leaving few spaces for non-technical electives. The University's general education policies do not require courses on gender or race and ethnicity in the sociopolitical context of the U.S. The rationale for the policies in place at the time of the research was documented in a general education task force report:

Ethical, international, minority and gender issues should be addressed in general education courses when appropriate. These topics deserve attention, but the task force believes that they are best treated by integrating them into general education courses at appropriate times rather than by requiring courses, which have them as the major subject. (Provost's Advisory Committee regarding General Education Requirements, 2009)

This policy left a hole in the knowledge of college graduates of all races and ethnicities from our institution. Although the policy document has been rewritten to conceal the hole, the hole itself remains. A review of the list of courses applicable for this requirement reveals that the vast majority (427 out of 429 in the Spring of 2011) of western civilization general education courses have no obvious link to a multi-cultural perspective on race issues in the U.S.

Another venue for students to learn about diversity issues is a race-based technical society. During our data collection period, the College of Engineering created a Pan-Asian technical society, called the Society for Asian-Pacific Engineers; however, no national student organization for As/AsAm students exists. The other racial/ethnic groups we have studied have national technical organizations, including the National Society of Black Engineers (NSBE), Society of Hispanic Professional Engineers (SHPE), and the American Indian Science and Engineering Society (AISES). The benefits of the national organizations include conferences, professional socialization, and nation-wide networking. On the local level, these technical societies provide an opportunity for students to build a support network of peers to moderate the impacts of being a minority student at a majority White institution (Foor & Shehab, 2009; Walden & Shehab, 2009).

Although our data arise from student interviews at a single institution, our findings should transfer to STEM fields at other large, majority White, public institutions of higher education, particularly those where the AsAm population is small. In its relatively short lifetime, MMS has become accepted by members of all racial/ethnic groups and could be an obstacle for As/AsAm students at any university. However, schools without a majority racial/ethnic group or where the As/AsAm population is substantially higher than at ours may also have an additional set of issues. For example, racial discrimination against As/AsAms at highly selective universities was one of the factors leading to the backlash against affirmative action in higher education (Takagi, 1992).

Although we have not analyzed faculty academic transcripts, it is a reasonable conjecture that just like engineering students, very few faculty in engineering have taken courses

on gender or race and ethnicity in the sociopolitical context of the U.S. The preponderance of technical requirements in engineering curricula, particularly for their generation when ABET accreditation was more focused on meeting the checklist of technical course requirements, left these important topics out of the engineering curriculum. The result is that very few engineering educators are prepared for the challenges of working with a diverse set of students. If we are to remedy this gap, research such as this study using a lens of critical race theory focused on engineering education must be incorporated into engineering education practice.

Beyond understanding how race is used to elevate some people at the expense of others, educators need to begin the process of altering the culture of engineering education to be more equitable in many dimensions. Hegemony silently benefits powerful people—the people whose support is necessary to enable cultural change. Even those who are disadvantaged by the system may resist cultural change. Achieving cultural change tends to be slow and unpredictable. For example, there is not a common accepted understanding of the current cultures in engineering education (Godfrey & Parker, 2010), which complicates creating a concrete plan for change. In the paragraph below, we recommend some specific actions that could start us down a path toward confronting the hegemonic culture of engineering.

We recommend that engineering educators invest effort in understanding the racially-based issues that As/AsAm students and other minority students encounter in higher education. While these recommendations can be applied beyond engineering, they are particularly relevant for engineering and other STEM disciplines where many AsAm students cluster and little time is spent on race and ethnicity awareness. We make the following specific recommendations for faculty, administrators, and institutions who want to establish a more equitable educational environment:

- Recognize that, although As/AsAm students may not be underrepresented at your institution, they have challenges and burdens that are racially-based.
- Consider carefully whether the various benefits and programs related to minority status should be reserved only for underrepresented groups.
- Examine general education requirements at your institution to determine whether they are giving students an opportunity to develop an appropriate knowledge of diversity issues in the socio-political context of the U.S.
- Provide As/AsAm students with parallel opportunities for support from a co-racial technical society that organizations such as NSBE, AISES, and SHPE provide for other racial/ethnic minority groups. This might include office space, social space, mentorship, financial support and leadership.
- Train all institutional employees who interact with students to recognize racial/ethnic stereotypes, including the MMS and other stereotypes common to As/AsAm. Do not project stereotypes, even complimentary ones, on students.
- Train faculty and staff to respond to microaggressions, removing that burden from racial/ethnic minority students.
- Recognize that co-racial/co-ethnic lateral oppression occurs. Do not expect co-racial/co-ethnic faculty alone to advocate for minority students.
- Recognize that the absence of complaints of racism from As/AsAm or other minority students does not mean that your institution is equitable.

The students' experiences recounted here offer insight into why overall proportional representation in engineering of traditionally underrepresented groups has changed little

over the past 20 years despite huge investments in recruiting and retention programs (National Science Foundation Division of Science Resources Statistics, 2000, 2011). This work demonstrates that even an overrepresented population in engineering education can face hostility within an engineering culture. This report is a warning for engineering educators that the focus on representational parity is misplaced. Engineering educators need to focus on making cultural changes to attain an equitable culture. If we attain a culture that is equitable, then proportional representation (parity) may follow.

There remains much research work to be done examining equity issues for As/AsAm students in engineering education. The focus of federal funding for diversity-based initiatives has been limited to underrepresented groups for many years, undercutting research on the As/AsAm population in engineering education. Even the most basic research questions that have been investigated for other underrepresented racial/ethnic groups have not been addressed for As/AsAms.

Analyses based on the separation of the As/AsAm population by generation could be used to answer research questions about how As/AsAm integration into U.S. culture impacts engineering education. For example, our data suggests, but does not demonstrate convincingly, that AsAm students from later generations may leave engineering more frequently than As/AsAm students from earlier generations. Just as separating As/AsAm from other minority groups in engineering made it possible for us to consider issues that are distinct to As/AsAm (like the MMS), analyses which separate As/AsAm students by ethnicity, language, region, or other demographic variables (such as whether immigration occurred with or without refugee status) could identify issues that are salient to sub-groups of As/AsAm. Answers to these questions could inform the building of structures to better support students coming from a variety of backgrounds.

Interpretive qualitative work is strengthened by replication at institutions with a range of similarities and differences. The research questions we addressed in this work need to be analyzed at institutions similar to ours, with new immigrant populations, at institutions with different racial and generational balances, and at institutions that have different missions and selectivity (e.g., highly selective and open enrollment). The prevalence and impact of other racially-based stereotypes of As/AsAms on engineering students also needs examination. More generally, the attitudes, behaviors, and structures (i.e., the cultures) of engineering education that continue to create and support differential power structures between the dominant majority in engineering and each of the many minority groups need to be analyzed and challenged. Only when we have a clear picture of where we are, can we figure out where we need to be.

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AUTHORS

Deborah A. Trytten is an associate professor in the School of Computer Science, University of Oklahoma, 110 W. Boyd; Room 234, Norman, OK 73019; dtrytten@ou.edu.

Anna Wong Lowe is adjunct faculty at Oklahoma Baptist University, 1500 Oriole Drive, Norman OK 73071; awonglowe@gmail.com.

Susan E. Walden is a research associate professor in the College of Engineering, University of Oklahoma, 202 W. Boyd, Room 107, Norman, OK 73019; susan.walden@ou.edu.