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People Like Me

Increasing likelihood of success for underrepresented minorities in STEM by providing realistic and relatable role models

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Abstract—Seeing themselves represented in the role models they aspire to, has been shown to be important to students' sense of belonging and success. Underrepresented college students in STEM fields are exposed to only a small set of role models. This set often consist of famous individuals with extraordinary stories (we call these outliers), and represent unfeasible paths to success for a large majority of these students. We aim to remedy this by identifying a set of role models who represent more feasible paths to success (we call these non-outliers) for many underrepresented students. We contend that, despite the less extraordinary success and stories of non-outliers, they share important qualities with outliers. We envision a “People Like Me” website based on profiles of this broader set of role models that can be used as a tool for recruitment and retention. Our current work is to (1) identify role model qualities from the perspective of students, (2) identify and create profiles of non-outlier role models based on these qualities, and (3) test if students are accepting of these non-outliers as potential role models. We have completed steps (1) and (2), and have found that non-outliers do exhibit the qualities our student sample pool seeks in role models.

I. INTRODUCTION

Literature from career and learning theorists shows the importance of role models for an individual's personal growth and development [1], [2], [3]. Minority students in college often suffer from a lack of role models [4], and they continue to face “solo status,” where they are only one or few of a minority group in a class setting or in a specific major [5]. Students who have race and gender matched role models are shown to have higher academic achievement than students with no role models or unmatched ones [6]. **Thus, the absence of role models for minority students in college, both in general and more specifically role models like them, is believed to limit their future success.** In STEM disciplines in particular, minority participation rates lag significantly behind White and Asian Americans [7]. This means that for underrepresented students in STEM, the pool of plausible professional role models is even more limited.

One widely visible pool of role models are extraordinarily successful professionals, who happen to be minorities. We

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call these people outlier role models. Many enjoy “celebrity” status, and celebrity idols have been found to influence youths' lives in nontrivial ways. This includes youths taking substantial steps to transform oneself to “match” their idols identity [8]. Celebrity idols in STEM disciplines, or with STEM backgrounds, tend to be less prominent, and have especially unique stories (e.g., Neil DeGrasse Tyson). Thus, we argue that it is not only this absence of race and profession matched role models that is disadvantaging many STEM minority students, but it is also the notion that **many existing/obvious/visible role models do not represent a feasible and realistic path to success for the majority of these students.**

These factors can be quite discouraging, and suggest that a lack of viable role models may be one barrier to success for minority students in STEM. We believe that increasing the pool of realistic role models for minority students in STEM fields will help students develop a greater sense of belonging and see more accessible paths to success.

Our approach to generating this larger pool of realistic role models is to: (1) identify the valued qualities that students' existing role models possess, (2) identify other relatable role models that exhibit those qualities (specifically, alumni of the institution of interest for relatability), and (3) test the success of steps (1) and (2) by confirming if role models we select, using qualities that students report they value, are perceived as apt role models in the eyes of the same students.

Should we find that students are accepting of these role models, we believe an online repository of profiles of non-outlier role models can not only be a tool for recruitment and retention, but more importantly can increase the likelihood of success for underrepresented students by providing an online resource where students can see the success stories and paths of people who were once in their shoes as minority STEM students at the institution of interest. Our ultimate goal is to create such an online resource, a “People Like Me” website, that will provide a larger pool of realistic role models benefiting not only our student participants, but also the greater STEM minority community at our institution. We believe that the website has positive implications for practice, and we intend to share this tool with other academic

institutions so they can develop their own “People Like Me” website.

II. OVERALL STUDY DESIGN

Our study is conducted at a small liberal arts institution where the student (and employee) population is predominantly White. To recruit student participants, we reached out to students that fit our participation criteria: (1) majoring in a STEM discipline, and (2) are part of an ethnical minority federal group. STEM disciplines at the institution of interest include: Animal Behavior, Applied Mathematical Sciences, Biology, Biomedical Engineering, Cell Biology/Biochemistry, Chemical Engineering, Chemistry, Civil Engineering, Computer Engineering, Computer Sci. & Engineering, Computer Science, Electrical Engineering, Geology, Mathematics, Mechanical Engineering, Neuroscience and Physics. The ethnical minority federal groups in STEM disciplines include: Black, Hispanic/Latino, Mixed Race, Native American and excludes, White, Asian and International students. Through email solicitation, we initially recruited eighteen student participants. Two participants withdrew from the study at different time periods, due to a lack of time availability in their schedule. Participants were given a compensation of a \$25 gift card upon agreement to participate, not conditional on their future participation in the study. Our study began with focus groups intended to gather information on students’ perception of current role models. Through analysis we identified five predominant quality categories (which we will refer to just as qualities) and continued our study with a survey that was designed to confirm our findings, as well as give us insight on who and how to approach potential role models. We then recruited potential role models and surveyed them with questions in order to create profiles of them. Currently we are in the process of presenting the profiles to our student participants via a survey that will seek their stance on the aptness of the new role models.

III. STUDY PART I: STUDENT FOCUS GROUPS

A. Student Focus Groups

Method: To get an understanding of our student participants’ perceptions of role models and their attributes, we conducted three focus groups of five or six randomly assigned participants. Each focus group started with a stimulating ice breaker, in which participants were asked to individually brainstorm different uses for a brick and then share their ideas with the group. The idea behind this activity was to show how the participation of each individual contributes to providing a broader perspective on the topics we will discuss. Following the ice breaker, participants were asked to come up with three definitions of a role model. Participants then shared their definitions with their group, and each group united around a consensus of three definitions. Next, each participant was asked to assign a personal role model of theirs to each one of the three definitions. The focus groups concluded with a discussion of and reflection on the activities we went through and the definitions of role models we reached together.

Results: The results of the personal role model exercise were unique, as a wide variety of role models were selected by the participants. When asked to provide specific examples of role models, participants rarely mentioned outliers, whereas non-outlier figures were often cited. For example, many close mentors and family members were mentioned. One of the sentiments that often came up was that role models should be people who demonstrate resilience—those that have had some failures, but have been able to overcome them. Out of the nine definitions of role model and discussions on specific role models participants look up to, we distinguished five prominent qualities that our student participants seek and appreciate in their role models. We defined these five qualities as: (1) Achieved Success, (2) Constant Improvement & Resilience, (3) Moral Character, (4) Relatable, and (5) Empathetic & Helpful.

B. Qualities Confirmation Survey

After the focus groups, we were set to: (1) confirm the aptness of the five qualities we identified, (2) gain insight on which questions to ask and who we should approach as potential role models, and (3) obtain information from the student participants to create profiles of themselves as role models. The latter goal was driven by our discovery in the focus groups that participants also see themselves as potential role models. We administered a survey based on the insights from the focus groups to address these goals.

1) *Confirming the Representation of the Five Qualities:*
Method: In the first part of the survey, we wanted to confirm that the qualities we identified through the focus groups are a good representation of the qualities our participants seek in their role models. We presented them with twenty-five phrases, with five phrases for each quality, ordered randomly. The phrases were gender-neutral equivalents of statements made in the focus groups. The following phrase is an example of one phrase that represents the quality *Constant Improvement & Resilience*: “*One who takes full advantage of what they are capable of, and always keeps learning.*”

Participants were asked to indicate how well, in their perspective, each phrase fits a characteristic of a role model. The scale given was: Not accurately at all, Slightly accurately, Moderately accurately, Very accurately and Extremely accurately. Using the Likert scale, we converted our accuracy scale to a numerical scale, where a score of 1 corresponded to *Not accurately at all* and a score of 5 corresponded to *Extremely accurately*.

Results: The results from the survey support our idea that non-outliers exhibit the qualities sought in role models. All qualities, except *Relatable*, yielded a relatively high agreement, in the range between Moderately accurately and Very accurately, that the statements accurately reflect a characteristic of a role model. We believe *Relatable* resulted in a relative low score as the nature of the quality is personal to each participant and thus highly variable across the participant sample pool. In other words, each of the five phrases of *Relatable* captured only the opinion of only some subset of individuals.

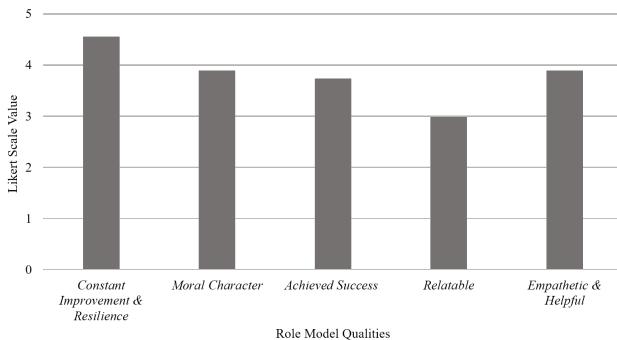


Fig. 1. Likert scale results for how well phrases related qualities shown fit students' perception of role models. 5 = *Extremely accurately*, 1 = *Not accurately at all*.

2) Gaining Insight to Approach Potential Role Models:

Method: In the second part of the survey, we wanted to understand how we should approach potential role models, and who these role models should be. We created four short stories, each corresponding to one of the four qualities: *Achieved Success*, *Constant Improvement & Resilience*, *Moral Character*, and *Empathetic & Helpful*. To capture the fifth quality, *Relatable*, we wrote the four stories in a realistic and gender-neutral manner, that participants could more likely relate to. After each story, participants were asked a question that intended to capture their reaction to the character of the story. As an example, the following story and question were presented for the quality of *Achieved Success*:

Charlie grew up in a poor family in the suburbs of Chicago and had a love for biology even at a very early age. Graduating from high school with honors, Charlie was accepted to Lehigh University as a Biology major. This meant the world for Charlie. At the age of 42, while being a part of a research project in a large pharmaceutical company, Charlie developed a daily treatment for people who suffer from Narcolepsy (a neurological disorder that causes sudden and irresistible bouts of sleep that can strike anytime). Today, 4 years later, this treatment improves millions of lives and the discovery received significant recognition from the American Institution of Biological Sciences.

What challenges of Charlie would you like to hear about?

Results: The responses to the stories' follow up questions were broad and diverse; each participant naturally perceived the stories differently. However, we did manage to distinguish recurring patterns in the responses to most stories. For example, Charlie's story above, drew a lot of attention regarding Charlie's personal life while being successful. Specifically, questions about relationships with family and friends arose. This provided us great insight on what questions to ask our potential role models when focusing on this specific quality, *Achieved Success*. The following example is

a question that we asked our potential role models:

Think of a time that you felt successful in your professional career. Please share your challenges/ the way you handled your personal life at the time. In terms of relationships with family and friends.

The question focuses on the quality of *Achieved Success*, while also touching upon the interest of our student participants in the role model's personal life. The other questions we asked our potential role models, regarding the other qualities, were similarly informed by the students responses to the stories.

3) Seeing Myself as A Role Model: Method: As mentioned in the focus group section, we discovered that the participants also see themselves as role models. This was surprising and interesting, as it supports the idea behind the methodology in our study. Qualities of role models exist in people that are not necessarily famous and experienced, but are still apt to serve as a role model. Therefore, we decided to gather information for the purpose of creating short profiles of our participants. After each short story, we asked a question related to the participant's experience in relation to the story. For example, after Charles story written above, we asked the following personal question:

Can you think of an achievement of yours? Please write a couple of sentences about your experience and describe what you felt.

Results: Thirteen of sixteen student participants responded to the personal question following each story. Each elaborated on their personal experience and a clear process of self reflection was evident. The data they provided is substantial in quantity for us to be able to generate profiles of them, and thoroughly demonstrates that they also have the same qualities that they admire in their role models.

IV. STUDY PART II: FINDING NEW ROLE MODELS AND CONFIRMING THEIR APTNESS

A. Recruiting Alumni as Potential Role Models

Method: From the responses to the stories, we learned the student participants specific interests within each quality. Based on this data, we constructed a survey with questions to ask our potential role models. We decided to approach alumni of the same University as we believe they will be the optimal representation of the quality *Relatable*: they will represent a feasible and approachable path to success for our student participants, as they were once in a very similar position. By emailing alumni that fit the same criteria as our student participants, STEM majors and are part of an ethnical minority federal group, we managed to recruit ten potential alumni.

The alumni were given an online survey constructed of personal questions that implicitly emphasized one of the the five qualities we identified in Part I of our study. The questions linked to the quality of *Relatable* were broken down to three time periods: (1) before entering the University,

(2) while being at the University, and (3) after leaving the University. It is important to note that the survey did not reveal the qualities explicitly to the alumni participants.

Results: From the survey responses, we constructed personal profiles of each alumna/alumnus. The profiles feature basic information about the alumni, such as graduation year, major, extracurricular activities, and short stories that emphasize how the five qualities emerge in each individual's life. The pool of the ten alumni we recruited is very diverse in terms of majors (four different types of engineers, three types of sciences, one math), graduation years (between 1962 and 2016), ethnicities (Hispanic/Latino, Black/African American and Multiple Races) and gender (six males and four females). This background diversity is very important, as *Relatable* is one of the five qualities our participants look for in their role models.

B. Role Model Confirmation Survey

We are currently in the process of distributing a role model confirmation survey to our student participants. Students will be presented with eleven profiles, ten profiles of alumni and their own personal one (See Study Part I B.3). For each of the eleven profiles, the student participants will identify and elaborate on how well the individual fits their idea of a role model. The students will also be asked to specifically share which qualities they recognize within the individuals that they perceive as apt role models.

This survey seeks to serve as a confirmation to our overall research process. In the focus group we gathered data about what qualities the participants admire in their current role models. Then, we confirmed those qualities in the students' survey and gained insight on what information to seek from our potential role models. Lastly, we recruited potential role models and highlighted the qualities within them. This survey seeks to see if they are apt to serve as role models in the eyes of our student participants.

V. IMPLICATIONS FOR PRACTICE

Implications of Completed Work: In Part I of the study, we discovered that student participants look up to individuals that are not necessarily famous and have extraordinary stories, but rather any individuals that have qualities that they admire. We also discovered that students see themselves as potential role models. These two discoveries provide valuable insight for individuals who mentor and guide minority students. The discoveries emphasize the need to be careful when making assumptions about who can be a good role model. Furthermore, the realization that students see qualities of role model within themselves can be used to design professional development programs that further empower minority students.

Implications of Future Work: We will conclude the last part of the study, Part II, with analysis on students' Role Model Confirmation Surveys. Students' acceptance of the alumni as role models would support our belief that we can use student input to provide a wider pool of role models representing more feasible paths to success. Our ultimate

goal is to create a "People Like Me" website that will present the profiles of role models from this expanded pool. This will benefit not only our student participants but also the broader STEM, and potentially non-STEM, minority communities in our institution. To evaluate the benefits, we will work with the Admission Office of the institution and track the impacts on minority recruitment. We will also work with the Office of Student Affairs to evaluate the website's impact on minority student retention. Should this website prove to be effective on either front, we will share this tool with other academic institutions so they can replicate the study and create their own "People Like Me" website.

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REFERENCES

- [1] J. R. Bowers, D. M. Rosch, and D. A. Collier, "Examining the relationship between role models and leadership growth during the transition to adulthood," *Journal of Adolescent Research*, vol. 31, no. 1, pp. 96–118, 2016.
- [2] A. J. Murrell, F. J. Crosby, and R. J. Ely, *Mentoring Dilemmas: Developmental Relationships within Multicultural Organizations*. Mahwah, NJ: Erlbaum Associates, 1999.
- [3] E. M. Almquist and S. S. Angrist, "Role model influences on college women's career aspirations," *Merrill-Palmer Quarterly of Behavior and Development*, vol. 17, no. 3, pp. 263–279, 1971.
- [4] D. L. Tan, "Perceived importance of role models and its relationship with minority student satisfaction and academic performance," *NACADA Journal*, vol. 15, no. 1, pp. 48–51, 1995.
- [5] S. Hurtado, C. B. Newman, M. C. Tran, and M. J. Chang, "Improving the rate of success for underrepresented racial minorities in stem fields: Insights from a national project," *New Directions for Institutional Research*, vol. 2010, no. 148, pp. 5–15, 2010.
- [6] S. Zirkel, "Is there a place for me? role models and academic identity among white students and students of color," *Teachers College Record*, vol. 104, no. 2, pp. 357–376, 2002.
- [7] National Science Foundation, National Center for Science and Engineering Statistics, "Women, minorities, and persons with disabilities in science and engineering: 2017," Special Report, 2017.
- [8] S. D. Boon and C. D. Lomore, "Admirer-celebrity relationships among young adults," *Human Communication Research*, vol. 27, no. 3, pp. 432–465, 2001.