Measuring the Factors Associated with Student Persistence in the Washington State STARS Program

Ms. Katherine C Tetrick, Washington State University

Katherine directs the STARS program at Washington State University. She obtained her bachelors in mathematical sciences from Montana Tech of the University of Montana in 2013 and her masters in mathematics with a teaching emphasis from Washington State University in 2015.

Dr. John B. Schneider, Washington State University

John Schneider is an associate professor in the School of Electrical Engineering and Computer Science (EECS) and the Associate Dean for Undergraduate Programs in the Voiland College of Engineering and Architecture. He has been with WSU since 1991. He conducts research in the areas of acoustics, optics and electromagnetics; wave propagation and scattering; computer solutions to electromagnetic and acoustic problems; and remote sensing. He has received the Reid Miller Teaching Excellence award from the College and has been the EECS researcher of the year. He was the recipient of a prestigious U.S. Office of Naval Research Young Investigator Award. In 2012, he was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE), where he was recognized for contributions to the field of computational electromagnetics.

Prof. Charles Pezeshki, Washington State University

Charles (Chuck) Pezeshki is the Director of the Industrial Design Clinic in the School of MME at Washington State University. The Industrial Design Clinic is the primary capstone vehicle for the School and focuses on industrially sponsored projects with hard deliverables that students must complete for graduation. His research area is in knowledge construction as a function of social/relational organization.

Measuring the Factors Associated with Student Persistence in the Washington State STARS Program

Abstract

As the state of Washington continues to face a shortage of qualified workers needed to fill jobs in STEM-related fields, Washington State University (WSU) and the University of Washington (UW) continue to partner to increase the number of engineering and computer science graduates through the Washington STate Academic RedShirt (STARS) Program. Adopting the "redshirt" term from athletics, where student athletes will defer their playing eligibility for one year to improve their skills in the sport, STARS gives students from academically and economically disadvantaged backgrounds an additional year of support as they begin their pursuit of a degree in engineering or computer science. (Despite use of the term "redshirt," the program is independent of athletics.) Modeled after the University of Colorado's GoldShirt Program, the STARS program provides engineering and computer science students with scholarship support, specialized curriculum, intrusive advising, and a supportive community.

While student performance in math and science courses can be correlated with retention in the college of engineering, this correlation does little to inform about practices and mindsets that help retain those students. Students may receive passing grades in their math and science courses but do not utilize the tutoring offered by STARS. Some students appear to be enticed to the STARS program for scholarship support, but may not be enthusiastic about the social aspect of the program and yet they perform acceptably well academically. Others hit a wall, usually a failed exam or tough professor, and want to give up. However, the students who take advantage of the resources offered by STARS, take part in activities within the college of engineering, and display a "growth" mindset persist to a higher degree than students who do not. In the past, this was observed in largely an anecdotal manner. In this work, we discuss the development of a rubric for measuring the awareness and utilization of resources, level of activity in the college of engineering, and change in a "growth" vs. "fixed" mindset. This rubric will provide insight as to what behaviors and activities are most impactful in terms of student persistence.

Introduction and Background Information

Stemming from a State need for diverse, qualified laborers in STEM fields, the STARS program plans to graduate engineering students from low-income backgrounds by providing support in the first two years. The goals of this five-year program are to:

- Increase the total number of engineering and computer science degrees by 225.
- Retain 75% of STARS students to the upper division of an engineering or computer science program.
- Increase by 50% the retention of Pell Grant-eligible students who enter directly as freshman to the upper division of an engineering program.

- Increase by 20% the number of underrepresented minorities pursuing engineering degrees.

Students are identified for STARS through their economic and academic disadvantages. A student is considered economically disadvantaged if the student is Pell Grant eligible. A student is considered academically disadvantaged if the student graduates from a Washington State high school where 30% or more of its students are receiving free or reduced-price lunch. Upon admission to the WSU STARS program, students have access to individual mentoring, intrusive advising, a community of engineering students, specialized courses, and mathematics, physics, and chemistry tutoring. Each aspect of the program layers the foundation of success in academic performance and career preparation.

WSU STARS accepts a maximum of 32 students each academic year. During the first three years of the program, recruitment began in May after Pell Grant eligibility information was released and largely took place in the summer months when students visited WSU for orientation. Eligible students in engineering and computer science were identified based on their Pell Grant eligibility and the Washington high school they attended. Students were intercepted at WSU's orientation, informed about the STARS program, and encouraged to apply before the start of the semester. The fourth year of the program took a more active approach to recruiting students where estimated financial need, together with high school attended, were used to identify students who were likely to be eligible. These students were recruited with mailed solicitation, phone calls, and, again, contacted during orientation visits. Applicants filled out an interest form, wrote three essays, and were interviewed by the program administrator.

The number of applicants to STARS roughly matched the number of accepted students during the first three years. Given that a student filled out an application, acceptance into the program was nearly guaranteed provided their math placement score put them in a pre-calculus or Calculus I course. The fourth year saw an increase in the number of applicants due to the earlier and more active recruitment effort. Some demographics for the first four cohorts of the program are provided in Table 1. We note that the increased recruitment efforts actually resulted in a decrease in the percentage of first generation and underrepresented minorities (putting them roughly in alignment with overall WSU demographics) but an increase in the percentage of females (somewhat ahead of the overall percentage of females in the College).

Table 1: WSU STARS demographics for first four cohorts (year in parentheses is the year of the Fall semester in which the students started).

	Cohort I (2013)	Cohort II (2014)	Cohort III (2015)	Cohort IV (2016)
First Generation	58%	79%	70%	42%
Underrepresented minority	45%	48%	48%	34%
Females	18%	14%	19%	27%

The STARS program gives support to first year-students. To retain students and inspire degree completion in the engineering programs, STARS implements five strategies:

- Give students essential study skills, teaching students "how to learn."
- Lighten the students' financial burden.
- Develop an intricate understanding of the fields of engineering.
- Engender group community and learning.
- Advise students with mentorship and counsel specific to their needs.

The STARS program at WSU and UW is adapted from the University of Colorado's GoldShirt Program, which has gained high retention rates of students in engineering, in particular of underrepresented minorities (URM) paying special attention to the needs of economically and academically disadvantaged students. Although details concerning the implementation at each of these universities differ, the programs share seven core components:

- First Year Curriculum: The STARS curriculum is designed particularly to instill helpful learning methods, build community, and give students strong preparations for their mathematics and chemistry courses. To ensure students have the necessary algebra and pre-calculus skills for success in calculus, students participate in a course called Introductory Mathematics for Engineering Applications. Here they solve math problems set in different engineering contexts. WSU offers chemistry help included in weekly math review sessions. Because study skills are so vital to success in engineering, STARS students are enrolled in a seminar course to emphasize these important study skills. This course focuses on topics like note-taking, connecting with faculty and building relationships with professors, group study skills, taking full advantage of resources (teachers, tutoring, etc.), effectively reading and understanding textbooks, and time-management skills.
- Academic Advising: The STARS staff individually mentors and advises the STARS students. Students meet with their academic advisor a minimum of six times per year to discuss personal goals, study habits, and academic issues.
- Residential Living-Learning Community: First-year students are required to live on campus. STARS students are placed into the Engineering Living-Learning Community.
- Community-Building: Group activities are essential components of building camaraderie and a sense of belonging among STARS students. (A particular favorite among WSU's students is cosmic bowling.) Students also participate in movie nights, holiday parties, field trips, and informative workshops.
- Career Awareness and Vision: In their first-year STARS seminar, students hear from engineers, research and instructional faculty, and upperclassmen. Course assignments are designed to ignite curiosity about the field of engineering and computer science and provide a structure for pursuing that curiosity. In cooperation with WSU's career center and the College's office of Professional Practice and Experiential Learning, STARS

facilitates access to career advice, engineering exploration workshops, and opportunities to develop professional skills.

- Financial Aid: STARS students receive up to $2000 in scholarship support to lessen the burden of paying for school. An amount of $500 is awarded to students for joining STARS, and students can earn $500 for each math class passed up to three math courses. The university is equally committed to students from low-income backgrounds through "Cougar Commitment" which guarantees tuition and fee scholarships for Pell Grant eligible Washington residents.
- Engagement in the Second Year: A second phase of funding has allowed for STARS to create a second-year engagement plan for students. This plan consists of physics tutoring, professional development, additional scholarship money, and enhanced engagement with the college of engineering.

Creating a Rubric to Assess the STARS Program

Students face an array of academic, career, and personal issues (Heppner and Neal, 1983). Both WSU and UW offer a number of support services to students ranging from financial guidance to time management workshops. At their first-year orientation session, students are informed about the majority of these services that are available to them. However, whether or not students remember specifics from the densely packed short-term information stream is another story. The hope is that students will remember something and be able to find help when the need arises. But, more often than not, the students who identify that they need help are either unaware that it is there or unable to figure out where to start looking for it (Neal and Heppner, 1986). At WSU, we have seen this with several students. In the Fall semester of 2015, a student took a chemistry exam and performed poorly. This student studied for hours and felt like he knew the material, but when it came to taking the test, he ran out of time. In a conversation with the STARS program administrator, he revealed that he had an Individualized Education Program (IEP) in high school because of a documented learning disability. This student did not realize that he could get an accommodation from WSU's Access Center. He was quickly informed about the services that the Access Center provides and encouraged to fill out an application. Once he did, he was approved for extra time on exams. He received a B in both of his required chemistry courses.

The STARS program offers a direct connection to help. The program staff has been trained to refer students to the appropriate resources they should seek to address various academic and personal issues. In addition, the STARS seminar course includes guest speakers from multiple campus resources. Our hope is that STARS students are more aware of campus resources and will therefore be able to utilize resources as they need them, thus improving the likelihood of the student's academic success. If the student mentioned above had not been in STARS, it is uncertain if he would have received the timely help he needed to be successful in his chemistry courses. From our experience at WSU, an informed, resourceful student is a successful student.

At UW, STARS students are significantly more aware of campus resources than non-STARS students (Margherio and Branstad, 2017). At WSU, we have come to the understanding that a STARS student's level of awareness and utilization of resources may be a strong predictor of future success. We thus feel this must be a component of the STARS rubric.

STARS students are repeatedly encouraged to be involved in student clubs or organizations as a part of their career preparation owing to the fact that participation in student organizations has a positive impact on career preparation (Sagen *et al.*, 2000). In addition, students in the STARS program are encouraged to participate in the Voiland College of Engineering and Architecture's (VCEA's) Internship and Cooperative Education program (otherwise known as the Professional Practice and Experiential Learning program). Internships lead to better academic performance in college and better job preparation (Knouse *et al.*, 1999). For these reasons, involvement in student organizations and internship programs is taken to be another component of the STARS rubric.

The mindset theories developed by Carol Dweck offer another opportunity for assessment of the STARS program. Dweck started her work on mindsets with theories of intelligence and looking at how children deal with failure (2008). She observed that children view their ability to solve problems differently. When faced with a difficult problem, some children give up or display patterns of avoidance believing that they cannot solve the problem. Other children view the problem as a challenge believing that they can solve it with enough time and effort (Dweck and Reppucci, 1973; Dweck, 1986). Later, she studied the effect a child's beliefs about themselves had on a child's goals using the model that a child who viewed their intelligence as a fixed quantity would choose goals that reflected that belief and a child who viewed their intelligence as a changeable quantity would choose goals in accordance with that belief (Dweck and Leggett, 1988). Dweck went on to label these mindsets "fixed" and "growth," respectively (2008). In advocating for mindset interventions, Rattan *et al*. (2015) say:

> Growth mindsets foster greater learning and achievement in students from elementary school through college, especially during challenging transitions or in difficult courses. This is because students with growth mindsets seek to learn and develop their abilities, and thus pursue challenges, value effort, and are resilient to setbacks; in contrast, students with fixed mindsets avoid challenges (which could reveal "permanent" deficiencies), dislike effort (which they think signals low ability), and give up more easily when facing setbacks (which they view as evidence of low ability).

Claro and Paunesku's work with Dweck (2016) concluded that students from low-income backgrounds were more likely to hold a fixed mindset than their peers from high-income backgrounds. They determined that a fixed mindset among students from low-income backgrounds is more incapacitating to a student's academic performance than a fixed mindset among students from high-income backgrounds. On the other hand, a growth mindset among students from low-income backgrounds is more empowering to a student's academic

performance than a growth mindset among students from high-income backgrounds (Claro *et al*., 2016). This finding is highly relevant to the STARS program since students from low-income backgrounds are targeted. Potentially, persistence in engineering could be linked to a student's mindset. Students displaying growth mindset motivated goal orientation in the STARS program could lead to higher academic performance. Clearly, mindset should be part of the STARS rubric.

Previously, the success of students in the STARS program has been measured using math and science course grades, GPA, and retention in engineering (note that the program at WSU has not yet produced any graduates as it is just entering its fourth year). While the STARS program continues to measure success of the program in a quantitative fashion, this paper seeks to provide an assessment alternative to these metrics. In addition, long-term assessment of student progress can be made throughout the different phases of STARS program (Petkova and Petkov, 2008). We indicated in the previous text, we propose the use of a rubric for measuring awareness and utilization of resources, activeness in the college of engineering, and change in mindset of STARS students. A rubric can be thought of as "a set of criteria specifying the characteristics of a learning outcome and the levels of achievement in each characteristic" or "a document that articulates the expectations for an assignment by listing the criteria or what counts, and describing levels of quality from excellent to poor" (Andrade, 2000; Arter and Chappuis, 2007; Stiggins, 2001). According to Petkov and Petkova (2006), rubrics can be used to assess programs across semesters. Of course, a common concern with rubrics is the description of categories of performance (Reddy and Andrade, 2010). Some rubrics leave room for interpretation (and hence are unclear). We seek to avoid this by precisely describing what we are looking for and trying to allow for a broad range of likely possibilities.

To determine a student's awareness of campus resources, a student needs to report their knowledge of a resource and what they know about the resource. Thus, this category can be split into subdivisions: (1) the number of resources the student knows exist, and (2) the amount of knowledge the student has about the resources. Then, evaluators can tally the number of resources the student knows exist and how much the student knows about the resource. These tallies can be assigned to a level of awareness in the rubric. There are several resources at WSU that STARS students must interact with at some point in the semester in order to maintain their academic standing at WSU (Office of the Registrar, WSU Housing and Residence Life, Student Financial Services) and their eligibility in STARS (Study Sessions). Thus, the minimum number of resources that the student is expected to know exist is four (and, of course, the ability to recognize a resource as a recourse is something that is captured with the rubric). However, there are over 20 different services available to WSU STARS students that are not tied to specific courses (or are only loosely affiliated with courses), such as:

- Campus Resources: Access Center, Health and Wellness, WSU Housing and Residence Life, WSU Ombudsman Office, Counseling and Psychological Services, Student Financial Services, The Office of Multicultural Student Services, Gender

Identity/Expression and Sexual Orientation Resource Center, Women's Resource Center, TRiO Student Support Services, Academic Success and Career Center
- Academic Tutoring: Academic Success and Career Center, Multicultural Student Services, Chemistry Department, Math Learning Center, Writing Center
- VCEA Resources: VCEA Tutoring Center, Office of Professional Practice and Experiential Learning
- STARS Resources: Mathematics Tutoring, Chemistry Tutoring, Community

Whether or not the students know the kind of help offered by each resource is a different case. For example, a student might know that STARS Study Sessions happen twice a week, but forget that Chemistry help is offered during those sessions. How much a student knows about a resource can be determined by an open-ended question. The answer to the question can be coded with a "yes" or a "no" to signify the student has or does not appear to have adequate knowledge about the type of help the resource offers. Once the "yes" responses are tallied, the number can be assigned to a level of awareness in the rubric.

Again, a STARS student is expected to use a minimum of four resources. Anything less than this would constitute an unacceptably poor use or awareness of campus resources and would indicate the need for timely intervention to ensure the student is not adrift. Improvement from this minimally acceptable position could be realized either through developing a deeper understand of the resources about which a student is already aware and/or gaining awareness of and understanding of previously unfamiliar resources. Each position of improvement can be assigned to a level of utilization in the rubric.

There are multiple ways a STARS student can be active in the Voiland College. The college offers over 42 student organizations, an internship and co-op program, and numerous seminars, workshops, and social events. If a student has not participated in any of these opportunities, the student is poorly involved in the college. However, if the student has attended at least one VCEA sponsored event, is involved in at least one student organization, or is involved in an internship or co-op organized by VCEA, and a student would be considered fairly active in the college. If the student is involved in more than one student organization, attends many VCEA events, and is involved in an internship, the student is highly engaged in the College. (There also needs to be a recognition that excessive engagement in extracurricular activities can have a negative impact on classroom success.)

Mindset is largely (although certainly not exclusively) a bimodal measurement: in many ways a student either has a fixed mindset or has a growth mindset. In order to see if the student's mindset is changing, a student must demonstrate change from fixed to growth or at least from fixed to "unclear." A student's mindset can be determined using Dweck's Implicit Theories of Intelligence Questionnaire (2000). Student demonstrating an entity theory of intelligence (i.e. they believe their intelligence is a fixed quantity and spend their time trying to prove their intelligence) can be categorized as having a fixed mindset. Conversely, students demonstrating

an incremental theory of intelligence (i.e. they believe their intelligence is a malleable quantity and spend their time trying to add to their intelligence) can be categorized as having a growth mindset. Students demonstrating neither an entity nor an incremental theory can be categorized as having an unclear theory of intelligence.

Combining all of these categories, we propose the rubric in Table 2.

Table 2: Proposed Rubric

Category/Score	Poor	Fair	Good	Very Good	Excellent
Knowledge of the existence of resources	The student knows that 4 resources exist.	The student knows that 5-7 resources exist	The student knows that 8-10 exist	The student knows that 11-13 resources exist	The student knows that 14 or more resources exist
Knowledge of the type of help campus resources offer	The student knows what type of help is offered by 4 resources	The student knows what type of help is offered by 5-7 resources	The student knows what type of help is offered by 8-10 resources	The student knows what type of help is offered by 11-13 resources	The student knows what type of help is offered by 14 or more resources
Utilization of resources	The student has visited 3-4 resources at least once	The student has visited 5-6 resources at least once AND/OR the student has visited 3-4 resources more than once	The student has visited 7-8 resources at least once AND/OR the student has visited 5-6 resources more than once	The student has visited 9-10 resources at least once AND/OR the student has visited 7-8 resources more than once	The student has visited 11 or more resources at least once AND/OR the student has visited 9-10 resources more than once
Engagement in VCEA (VCEA Sponsored Events)	The student has not attended any VCEA sponsored events	The student has attended 1-2 VCEA sponsored events	The student has attended 3-4 VCEA sponsored events	The student has attended 5-6 VCEA sponsored events	The student has attended 7 or more VCEA sponsored events
Engagement in VCEA (Student Organizations)	The student is not involved in a student organization	The student has attended a few student organization meetings	The student is involved in 1 student organization	The student is involved in 2 student organizations	The student is involved in 3 or more student organizations
Engagement in VCEA (co-op or internship organized by VCEA)	The student is not involved in a co-op or internship	The student has applied to a co-op or internship	The student is involved in a part-time co-op or internship	The student is involved in a full-time co-op or internship not in their major	The student is involved in a full-time co-op or internship in their major
Mindset	The student demonstrates a strong fixed mindset	The student demonstrates a fixed mindset	The student does not demonstrate a clear mindset	The student demonstrates a growth mindset	The student demonstrates a strong growth mindset

Case Study Examples

STARS Student A started attending WSU in Fall 2015. Using the rubric from Table 2, Student A scores the following in Table 3.

Table 3: Student A

Category/Score	Poor	Fair	Good	Very Good	Excellent
Knowledge of the existence of resources	The student knows that 4 resources exist.	The student knows that 5-7 resources exist	**The student knows that 8-10 exist**	The student knows that 11-13 resources exist	The student knows that 14 or more resources exist
Knowledge of the type of help campus resources offer	The student knows what type of help is offered by 4 resources	The student knows what type of help is offered by 5-7 resources	**The student knows what type of help is offered by 8-10 resources**	The student knows what type of help is offered by 11-13 resources	The student knows what type of help is offered by 14 or more resources
Utilization of resources	The student has visited 3-4 resources at least once	The student has visited 5-6 resources at least once AND/OR the student has visited 3-4 resources more than once	The student has visited 7-8 resources at least once AND/OR the student has visited 5-6 resources more than once	The student has visited 9-10 resources at least once AND/OR the student has visited 7-8 resources more than once	**The student has visited 11 or more resources at least once AND/OR the student has visited 9-10 resources more than once**
Engagement in VCEA (VCEA Sponsored Events)	The student has not attended any VCEA sponsored events	The student has attended 1-2 VCEA sponsored events	The student has attended 3-4 VCEA sponsored events	**The student has attended 5-6 VCEA sponsored events**	The student has attended 7 or more VCEA sponsored events
Engagement in VCEA (Student Organizations)	**The student is not involved in a student organization**	The student has attended a few student organization meetings	The student is involved in 1 student organization	The student is involved in 2 student organizations	The student is involved in 3 or more student organizations
Engagement in VCEA (co-op or internship organized by VCEA)	**The student is not involved in a co-op or internship**	The student has applied to a co-op or internship	The student is involved in a part-time co-op or internship	The student is involved in a full-time co-op or internship not in their major	The student is involved in a full-time co-op or internship in their major
Mindset	**The student demonstrates a strong fixed mindset**	The student demonstrates a fixed mindset	The student does not demonstrate a clear mindset	The student demonstrates a growth mindset	The student demonstrates a strong growth mindset

Student A is aware of and knows the services offered by 10 resources (Health and Wellness, WSU Housing and Residence Life, Office of the Registrar, Counseling and Psychological Services, Student Financial Services, the Academic Success and Career Center, the Writing Center, the Math Learning Center, and the tutoring offered by STARS) and is categorized as having good knowledge of the resources available to STARS students. Student A has visited 5 of these resources at least once (Health and Wellness, WSU Housing and Residence Life, Office

of the Registrar, Student Financial Services, the Academic Success and Career Center, the Math Learning Center), and visited the Math Learning Center over 30 times in one semester and is categorized as having excellent utilization of resources. Student A has attended 4 workshops offered by Voiland's Professional Practice and Experiential Learning office, in addition to the VCEA Technical Career Expo and is categorized as having very good engagement. In conversations with Student A, the student has demonstrated that he holds a "fixed" mindset. The student constantly blamed his circumstances in situations of low academic performance instead of taking ownership of his actions. Holistically, this student demonstrates good awareness and utilization of resources and engagement in the College. Despite the fixed mindset, Student A is progressing towards a degree in construction engineering.

STARS Student B started attending WSU in Fall 2015. Using the rubric from Table 2, Student B scores the following in Table 4.

Table 4: Student B

Category/Score	Poor	Fair	Good	Very Good	Excellent
Knowledge of the existence of resources	The student knows that 4 resources exist.	The student knows that 5-7 resources exist	**The student knows that 8-10 exist**	The student knows that 11-13 resources exist	The student knows that 14 or more resources exist
Knowledge of the type of help campus resources offer	The student knows what type of help is offered by 4 resources	The student knows what type of help is offered by 5-7 resources	**The student knows what type of help is offered by 8-10 resources**	The student knows what type of help is offered by 11-13 resources	The student knows what type of help is offered by 14 or more resources
Utilization of resources	**The student has visited 3-4 resources at least once**	The student has visited 5-6 resources at least once AND/OR the student has visited 3-4 resources more than once	The student has visited 7-8 resources at least once AND/OR the student has visited 5-6 resources more than once	The student has visited 9-10 resources at least once AND/OR the student has visited 7-8 resources more than once	The student has visited 11 or more resources at least once AND/OR the student has visited 9-10 resources more than once
Engagement in VCEA (VCEA Sponsored Events)	The student has not attended any VCEA sponsored events	**The student has attended 1-2 VCEA sponsored events**	The student has attended 3-4 VCEA sponsored events	The student has attended 5-6 VCEA sponsored events	The student has attended 7 or more VCEA sponsored events
Engagement in VCEA (Student Organizations)	**The student is not involved in a student organization**	The student has attended a few student organization meetings	The student is involved in 1 student organization	The student is involved in 2 student organizations	The student is involved in 3 or more student organizations
Engagement in VCEA (co-op or internship organized by VCEA)	**The student is not involved in a co-op or internship**	The student has applied to a co-op or internship	The student is involved in a part-time co-op or internship	The student is involved in a full-time co-op or internship not in their major	The student is involved in a full-time co-op or internship in their major

Mindset	**The student demonstrates a strong fixed mindset**	The student demonstrates a fixed mindset	The student does not demonstrate a clear mindset	The student demonstrates a growth mindset	The student demonstrates a strong growth mindset

Student B is aware of and knows the services offered by 9 resources (Health and Wellness, WSU Housing and Residence Life, Office of the Registrar, Counseling and Psychological Services, Student Financial Services, the Academic Success and Career Center, and the tutoring offered by STARS) and is categorized as having fair knowledge of the resources available to STARS students. Student B has visited 4 of these resources at least once (WSU Housing and Residence Life, Office of the Registrar, Student Financial Services, STARS tutoring sessions) and is categorized having poor utilization of resources. In conversation, Student B told the program administrator that he had a documented learning disability. The program administrator informed the student about the Access Center and gave directions to the location, but Student B did not utilize the center. Student B was often absent while taking the required STARS courses. Student B has attended the VCEA Technical Career Expo and is categorized as having fair engagement in the College. In conversations with Student B, the student has demonstrated that he holds a "fixed" mindset. The student constantly blamed his circumstances in situations of low academic performance instead of taking ownership of his actions. Holistically, this student demonstrates only fair awareness and utilization of resources and engagement in the College. Student B left the university after one year in the engineering program.

Conclusions and Suggestions for Future Research

The STARS program continues to give support to first-year students from low-income backgrounds. In the past, the results of the program were evaluated using student surveys, student GPA, and performance in mathematics and science courses. We plan to add the use of the proposed rubric to the evaluation of the WSU STARS program to provide a multi-dimensional view of the effects of the program. The rubric described in this paper can serve as a template for evaluating first-year programs. Future work will validate the rubric and determine its efficiency and consistency at measuring the aspects described.

Acknowledgements

The UW and WSU STARS faculty and staff want to thank the University of Colorado Boulder's Associate Dean of Inclusive Excellence Jacquelyn Sullivan and GoldShirt Program Director Tanya Ennis for their guidance and encouragement throughout the development of the Washington STARS in Engineering Program.

This material is based upon work supported by the National Science Foundation Graduate 10K+ STEP Grant under Grant No. 1317246 and 1317349.

Any opinion, finding, and conclusion or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

Andrade, H. G. (2000). Using Rubrics to Promote Thinking and Learning. *Educational Leadership*, *57*(5), 13-18.

Arter, J. A. (2007). *Creating and recognizing quality rubrics*. Upper Saddle River, New Jersey, Boston, MA: Pearson Education.

Claro, S., Paunesku, D., and Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(31), 8664–8. https://doi.org/10.1073/pnas.1608207113

Dweck, C. S., and Reppucci, N. D. (1973). Learned helplessness and reinforcement responsibility in children. *Journal of Personality and Social Psychology*, *25*(1), 109–116. https://doi.org/http://dx.doi.org/10.1037/h0034248

Dweck, C. (1986). Motivational Processes Affecting Learning. *American Psychologist*, *41*, 1040.

Dweck, C., and Leggett, E. (1988). A Social-Cognitive Approach to Motivation and Personality. *Psychological Review*, *95*(2), 256.

Dweck, C. (2000). *Self-theories: Their Role in Motivation, Personality, and Development* (1st ed.). Psychology Press.

Dweck, C. S. (2008). *Mindset: the new psychology of success* (Ballantine Books Trade Paperback Edition). New York: Ballantine Books.

Ennis, T. D., Milford, J. B., Sullivan, J. F., Myers, B. A., & Knight, D. (2011). *GoldShirt Transitional Program: First-Year Results and Lessons Learned on Creating Engineering Capacity and Expanding Diversity* (p. 22.754.1-22.754.15). Presented at the 2011 ASEE Annual Conference & Exposition. Retrieved from https://peer.asee.org/18035

Heppner, P. P., and Neal, G. W. (1983). Holding Up the Mirror: Research on the Roles and Functions of Counseling Centers in Higher Education. *The Counseling Psychologist*, *11*(1), 81–98. https://doi.org/10.1177/0011000083111014

Kingma, J., Riskin, E. A., Schneider, J. B., Olsen, R. G., Cunningham, S., Wiggin, D., and Winter, S. (2014). The Washington State Academic RedShirt (STARS) in Engineering Program (p. 24.1256.1-24.1256.7). Presented at the 2014 ASEE Annual Conference and Exposition. Retrieved from https://peer.asee.org/the-washington-state-academic-redshirt-stars-in-engineering-program

Knouse, S. B., Tanner, J. R., and Harris, E. W. (1999). The Relation of College Internships, College Performance, and Subsequent Job Opportunity. *Journal of Employment Counseling*, *36*(1), 35–43. https://doi.org/10.1002/j.2161-1920.1999.tb01007.x

Margherio, C., and Branstad, J. (2017). *Evaluation of WA STARS* (No. 3). Center for Evaluation and Research for STEM Equity: University of Washington.

Neal, G. W., and Heppner, P. P. (1986). Problem-Solving Self-Appraisal, Awareness, and Utilization of Campus Helping Resources. Journal of Counseling Psychology, 33(1), 39–44. https://doi.org/10.1037/0022-0167.33.1.39

Petkov, D., and Petkova, O. (2006). Development of Scoring Rubrics for IS Projects as an Assessment Tool. *Issues in Informing Science and Information Technology*, *3*, 499–510.

Petkova, O., and Petkov, D. (2008). *Interweaving Rubrics in Information Systems Program Assessments- Experiences from Action Research at Two Universities* (Vol. 5). Issues in Informing Science and Information Technology.

Rattan, A., Savani, K., Chugh, D., and Dweck, C. S. (2015). Leveraging Mindsets to Promote Academic Achievement. *Perspectives on Psychological Science*, *10*(6), 721–726. https://doi.org/10.1177/1745691615599383

Riskin, E. A., Wiggin, D., Kingma, J., Schneider, J. B., Cunningham, S., and Winter, S. (2015). The Washington STate Academic RedShirt (STARS) in Engineering Program (p. 26.1579.1-26.1579.9). Presented at the 2015 ASEE Annual Conference and Exposition. Retrieved from https://peer.asee.org/the-washington-state-academic-redshirt-stars-in-engineering-program-2015

Reddy, Y. M., and Andrade, H. (2010). A review of rubric use in higher education. *Assessment and Evaluation in Higher Education*, *35*(4), 435–448. https://doi.org/10.1080/02602930902862859

Sagen, H. B., Dallam, J. W., and Laverty, J. R. (2000). Effects of Career Preparation Experiences on the Initial Employment Success of College Graduates. *Research in Higher Education*, *41*(6), 753–767. https://doi.org/10.1023/A:1007072705601

Stiggins, R. J. (2001). *Student-involved classroom assessment* (3rd ed.). Upper Saddle River, N.J.: Merrill Prentice Hall.

Tetrick, K. C., Riskin, E. A., Schneider, J. B., and Cunningham, S. (2016). Implementation and Assessment of the Washington STate Academic RedShirt (STARS) Program. Presented at the 2016 ASEE Annual Conference and Exposition. Retrieved from https://peer.asee.org/implementation-and-assessment-of-the-washington-state-academic-redshirt-stars-program