BRCC to LSU Engineering Pathway to Success - Assessment Measures

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The National Science Foundation (NSF) S-STEM funded scholarship program, Engineering Pathway to Success, is a joint effort of the college of Engineering at LSU and Baton Rouge Community College, and it supports the engineering degree progression program with students earning a BRCC Associate of Science degree and completing a Bachelor’s of Science degree in engineering at LSU. Over three years, the program has provided scholarships and academic/professional support to 30 students who demonstrate academic talent and financial need. Another 11 students will be added during year four. The primary goals of the program are to utilize scholarships and a suite of activities to create and sustain a pathway for BRCC transfer students and to develop a successful model for transfer students from other community colleges and 4-year institutions based on the experiences and outcomes of the project. Importantly, this scholarship program aims to increase the number of engineers in the state and nation, reaching out to those students who have an interest in the field but who are unable to pursue the education necessary to acquire a degree.

**Introduction**

In order to understand the unique needs of the transfer student, an intensive questionnaire was developed to assess the Pathway to Success program effectiveness. The questionnaire has several components, including: demographic information, beliefs about self-efficacy in engineering, anticipated and experienced hurdles throughout the program, and scholarship program assessment. Many of the questions posed aimed to better understand the distinctive challenges faced by transfer students so that the scholarship programs could address their specific needs and provide the appropriate resources needed to ensure success at LSU.

Several elements are considered in ensuring the successful graduation of transfer students once they have made the transition from BRCC to LSU. These elements include: financial concerns, academic support, social support, and demographic factors. In making the transition, it is important to understand how these components might change once students are immersed in a four-year university setting. The Laanan Transfer Student Questionnaire (L-TSQ) is one such survey tool utilized to this end. The 304 item survey specifically probes transfer students to provide background information along with details regarding both their community college experiences and university experiences in order to understand this adjustment process. Importantly, this tool is a measure of non-cognitive factors and traits, which can be catered to by providing access to and knowledge about university resources that are available to transfer students to enhance their learning outcomes. By focusing on potential hurdles to be overcome by transfer students, programs can be tailored to meet the needs of those making the transition from community college to university. The information obtained through these items can also be utilized to aid in understanding the needs of any one community college or university, so that they may better serve the needs of all transfer students.

Because the current program is interested specifically in the experiences of STEM transfers into the college of engineering, it is also necessary to understand the self-efficacy attitudes of the transfer students towards the engineering discipline. Henes, Bland, Darby, and McDonald (1995) constructed a series of questions aimed to reveal these attitudes, focusing both on the relationship
students have with faculty members and fellow students as well as their assertiveness and self-sufficiency in classroom situations. Understanding potential differences in the self-efficacy of traditional and transfer students can illuminate possible obstacles to be overcome in various learning environments. Doing so can help educators and transfer counselors identify ways in which to close this gap and encourage all students to feel equally confident in their schooling.

Transfers students also tend to differ demographically from traditional students. For example, transfer students may have begun their education at a community college later in life, be married, or have children. In engineering, there is a great need to enhance the enrollment of women and minorities as well, both demographic groups the Pathway program aims to encourage and support in S-STEM disciplines. Through understanding the ways in which these demographic factors impact learning and retention after enrollment in a four-year university, the program can develop appropriate resources and provide support not otherwise provided by the university at large.

**Methods**

The survey created for this program (refer to Appendix A) aimed to incorporate all factors noted above to extract as complete an understanding as possible of engineering transfer students’ needs. In addition to needs, the survey was designed to determine what external and internal obstacles they face, and what factors contributed to their initial enrollment in community college as opposed to the a four-year university. Along with administering the survey to Pathway Scholar transfer students (Existing Transfer Students), portions of the questionnaire were also given to a comparison group consisting of BRCC students who were interested in transferring to LSU but who had not yet transferred (Anticipating Transfer Students). For the 2014-2015 academic year, students who transferred to LSU and not part of the Pathway Scholarship program have been added to pool of surveyed students. These students will be considered as a comparison group. In the future, this questionnaire will also be administered to traditional four-year university students who will serve as another comparison group.

*Survey Questions for All Students*

There were several subscales of the survey that were answered by all groups of students described above. The subscales can be grouped into: demographic questions (Section 5), beliefs about self-efficacy in engineering (Section 7), and hurdles they expect to face if they transfer into a 4-year university institution (Section 1).

We asked the students to provide demographic information such as: gender, age, family status, etc. (refer to Section 5 in Appendix A for the complete list of questions). Questions were designed for two main purposes: to determine any preexisting differences between the groups and to determine the unique needs of transfer students. Presumably, most of these answers were not expected to be different among community college attendees, however we do expect there to be significant differences between those who attended community college and those who did not (traditional 4-year university students). For the current paper, we were only able to compare the demographic responses of existing Pathway Scholars and anticipating transfer students. Other than indicating the continuous variable of age in years, most of the demographic questions were indicated with a “yes” or “no” response.
We also asked the participants to indicate their self confidence in their ability to be an engineering students and an engineer in the future (these questions were developed from Henes, et al., 1995). Refer to Section 7 in Appendix A for the complete list of questions). This section was included in the current analyses because we hypothesized that it would be insightful to determine difference in self efficacy between students who are currently in a community college engineering program and those who have transferred to a 4-year university. This subsection will also be information when we compare the responses from transfer students to traditional university students in the future. Self-efficacy was assessed by asking the students to indicate their level of agreement to six statements on a 5-point Likert scale.

We also asked all students to indicate what hurdles they expect to face if and when they enter a 4-year university institution (refer to Section 1 of Appendix A, however note that the specific wording was designed for the existing transfer students. The wording was changed for the anticipating students to reflect their future concerns). This subsection was designed to assess the issues and concerns transfer and potential transfer students had in order to address and alleviate said concerns. We hypothesized that if we were aware of what hurdles community college students were concerned about, then we could address the issues and relieve any concerns they have about transferring to a 4-year university.

Survey Questions for Pathway Scholars

When the existing Pathway Scholars were asked about their experienced hurdles (Section 1), they were also asked to indicate how they handled the obstacles and overcame the hurdles. This information was obtained in order to prepare potential transfer students for their transition by way of discussing them ahead of time.

In addition to the subsections described above, the Pathway Scholars also answered questions regarding their experience and assessment of the scholarship program (refer to Section 3 of Appendix A). The results from the program assessment subscale were designed to be a direct introspective measure of the students’ opinions of how the scholarship program affected their lives. This section consisted of open-ended questions regarding the most and least helpful part of the Pathway Scholarship program, and ratings of the level of support the program offered the students in six areas (academic, financial, social, career, professional development, and personal), rated on a 5-point Likert scale. The purpose of this section was two-fold: to assess the effectiveness of the program and to determine weaknesses in the program that can be bettered in the future.

Survey Questions for Future Analyses

There were some additional subsections of the scale that have not been analyzed in this paper due to the fact that they were not designed for testing among the current groups of participants. In the future we hope to compare community college transfer students with traditional 4-year university students in the following areas and subscales along with those described above: their home and family life (Section 4) and why they chose engineering (Section 6).

We expect that traditional 4-year university students would differ from all community college students (transfer and non-transfer) with respect to the nature of their home life because we hypothesize that part of why bright and interested students do not enter a 4-year university is because of extraneous life circumstances such as those explored in Section 4. For the same
reason we do not expect there to be much, if any, differences among the groups regarding why they chose to become engineering students; we hypothesize that the reason students choose different education paths towards engineering has to do with life issues, not engineering interests or abilities.

**Results and Discussion**

**Demographic Information**

Currently descriptive information has been obtained regarding the personal and demographic information of the BRCC transfer and BRCC students who are interested in transferring but have not yet. Potential differences between the groups based on demographic information were tested by using Chi-square analyses due to the categorical nature of the data, with the exception of age which is a continuous variable and therefore was analyzed using an independent samples t-test.

<table>
<thead>
<tr>
<th>Table 1. Demographic Information based on the two groups of students.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing Students</strong> n=27</td>
</tr>
<tr>
<td>Gender: % male</td>
</tr>
<tr>
<td>Age: Mean years</td>
</tr>
<tr>
<td>Race / Ethnicity: % ethnic minority</td>
</tr>
<tr>
<td>Marital Status: % married</td>
</tr>
<tr>
<td>% who have children</td>
</tr>
<tr>
<td>% who have a job</td>
</tr>
<tr>
<td>% who have served in the military</td>
</tr>
<tr>
<td>% belonging to a Student/Professional Org.*</td>
</tr>
</tbody>
</table>

* denotes a significant difference between the two groups, \( \chi^2 (1) = 5.353, p = .021 \).

The results of these analyses show that there are no preexisting demographic differences between the two groups of respondents, except membership to a student or professional organization. The students who have transferred to LSU have had opportunity to belong to organizations whereas those who have not transferred have not. These findings were consistent with our expectations as we did not expect there to be any demographic differences between these two groups. The fact that the groups differed with respect to organization membership was also expected as organization membership has been a goal of the Pathway Scholarship program. The significant difference obtained indicates that the program has been successful in this area.

**Beliefs about Self-Efficacy in Engineering**

A group of questions taken from Henes, et al. (1995)\(^2\) were included in order to determine how the students feel about their abilities in an engineering program. Six independent samples t-tests were conducted in order to determine any group differences in how the students felt about their own self-efficacy in an engineering program.
Table 2. Level of agreement with statements regarding self-efficacy in an engineering department based on the two groups of students. The range of responses were 1 – 5 where higher numbers indicate greater agreement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Existing, n=27</th>
<th>Anticipating, n=31</th>
</tr>
</thead>
<tbody>
<tr>
<td>All faculty members treat me with fairness and respect*</td>
<td>4.1</td>
<td>4.6</td>
</tr>
<tr>
<td>I feel that I am an equal participant in group work</td>
<td>4.0</td>
<td>4.3</td>
</tr>
<tr>
<td>I am comfortable approaching instructors for help outside of class</td>
<td>4.4</td>
<td>4.5</td>
</tr>
<tr>
<td>I have not felt discouraged about pursuing an engineering degree</td>
<td>3.7</td>
<td>4.0</td>
</tr>
<tr>
<td>I am comfortable asking questions in the classroom**</td>
<td>3.7</td>
<td>4.3</td>
</tr>
<tr>
<td>I will be an excellent engineer</td>
<td>4.3</td>
<td>4.7</td>
</tr>
</tbody>
</table>

* denotes a significant differences between the two groups, \( t (40.171) = 2.201, p = .034 \).
** denotes a significant differences between the two groups, \( t (45.361) = 2.504, p = .016 \).

Students who experienced time in the 4-year university submit lower self-efficacy ratings than those who had no or little time at the 4-year university level, specifically with statements related to the classroom experience. This finding suggests that there is a difference in the difficulty of the program requirements between BRCC and LSU and that difference affects the students’ self-confidence (perhaps due to the size of the classes, or the speed of the pace of the course, or the type of assessment measures). It might also be the case that transfer students, having completed the majority of their pre-requisite classes within the community college setting, enter the four-year university at a point when they are to begin taking upper level courses specific to the engineering major. These major-specific courses are by nature more difficult and challenging; however, students may interpret this difficulty to reflect a lack of ability and preparation on their part rather than acknowledging the material itself as challenging. The findings from this component highlight the importance of increasing the academic support for the transfer students.

**Anticipated and Experienced Hurdles**

The purpose of these questions was to improve the scholarship program activities to meet the needs of the students. The majority of the students indicated that they were expecting substantial financial hurdles, however the scholarship program met those needs. Many were also concerned about how to distribute time between their employment and their academics, however the funding from the scholarship allowed them to work less and focus more on school. Other hurdles that were addressed through the program were related to a change in the size of the campus. Another important hurdle in the process of being addressed is more support academically.

**Scholarship Program Assessment**

A group of questions were designed to assess the Pathway Scholarship program. Pathway Scholars who had experience in the program (more than one semester) rated how supportive they found the program to be in six areas. A dependent-samples \( t \)-test was conducted to determine if the students found any source support to be more or less beneficial than others.

Table 3. Scholars’ ratings on the supportiveness of the program.
The range of responses were 1 – 5 where higher numbers indicate greater agreement.
<table>
<thead>
<tr>
<th></th>
<th>Average Rating, n=21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic support</td>
<td>3.9</td>
</tr>
<tr>
<td>Financial support</td>
<td>4.7</td>
</tr>
<tr>
<td>Social support</td>
<td>3.9</td>
</tr>
<tr>
<td>Career support</td>
<td>3.8</td>
</tr>
<tr>
<td>Professional Development support</td>
<td>4.1</td>
</tr>
<tr>
<td>Personal support</td>
<td>3.7</td>
</tr>
</tbody>
</table>

All means were significantly greater than the midpoint of the scale (3), t’s (21) > 3.020, p’s < .01.

Overall, all the Pathway Scholars found the program to be very beneficial to them. The largest source of support was financial, which in turn allowed the students to work outside of school less and focus more on their studies. The students also found other aspects of the program helpful such as the caring and helpful staff and job and interview training. Largely, the students who have completed the program credit much of their success to the support provided by the Pathway Scholarship program. The success of the Pathway Scholarship program is also supported by the 92% retention rate of the first three cohorts in the scholarship program.

**Conclusion and Future Plans**

The results of this survey have shown that the Pathway to Success scholarship has been a supportive and beneficial experience for the students involved. The questionnaire that was developed for this project serves not only as an assessment tool, but also as a means of assessing clear potential directions for future scholarship and supportive programs designed to assist talented students in need of support. Specifically, the findings from this survey indicate that the Pathway Scholars need more academic support in the future. This questionnaire was also designed as a measure of comparison between traditional and non-traditional engineering students, which would also provide insight in the types of struggles students face and the support they need. As we collect more data from the other comparison groups (mainly the traditional 4-year university engineering students), we expect to expand the use of this survey and develop more effective supportive programs for transfer students, with the ultimate goal of increasing the amount of diverse, bright, driven, and successful engineers in the future.
References

APPENDIX A

SECTION 1

In this section, you will be asked to think back to when you were about to transfer to LSU. Specifically, what were your concerns regarding the potential hurdles you were going to face?

1. Did you expect to face any ACADEMIC hurdles?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?

2. Did you expect to face any PERSONAL hurdles?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?

3. Did you expect to face any FINANCIAL hurdles?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?

4. Did you expect to face any hurdles with FACULTY MEMBERS?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?

5. Did you expect to face any hurdles with OTHER STUDENTS?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?

6. Did you expect to face any hurdles with your FAMILY AND FRIENDS?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?
7. Were there any other hurdles you anticipated?
   a. If so, please describe them:
   b. How did you plan to overcome the hurdles?
   c. Did you actually experience these hurdles in your first year?
   d. If so, how did you overcome them?
SECTION 2

In this section, you will be asked to think about your concerns about your **upcoming year at LSU**. Specifically, what are your concerns regarding the potential hurdles you are going to face?

1. Do you expect to face any ACADEMIC hurdles?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?

2. Do you expect to face any PERSONAL hurdles?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?

3. Do you expect to face any FINANCIAL hurdles?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?

4. Do you expect to face any hurdles with FACULTY MEMBERS?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?

5. Do you expect to face any hurdles with OTHER STUDENTS?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?

6. Do you expect to face any hurdles with your FAMILY AND FRIENDS?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?

7. Are there any other hurdles you anticipate?
   a. If so, please describe them:
   b. How do you plan to overcome the hurdles?
SECTION 3

In this section, you will be asked to rate the effectiveness of the program.

1. Which part(s) of the Pathway Scholars program have you found to be the MOST helpful in supporting you in your transition to LSU?
2. Which part(s) of the Pathway Scholars program have you found to be the LEAST helpful in supporting you in your transition to LSU?

Please rate to what extent the Pathway Scholars program has supported your transition to LSU based on the specified aspects.

Please use the following scale:

1-----------------2-----------------3-----------------4-----------------5

No Support at all                      A lot of support

1. Academic support:
2. Financial support:
3. Social support:
4. Career support:
5. Professional Development support
6. Personal support:

Why did you decide to apply to the Pathway Scholars program at LSU?
How effective was the recruitment efforts of the Pathway Scholars program?
How did you learn about the Pathway Scholars Program?
How easy was the application process for the Pathway Scholars program?
SECTION 4

In this section, please describe different aspects of your support system (friends and family).

1. What financially supportive role do you play in your family?
2. What emotionally supportive role do you play in your family?
3. Is your family financially supportive of your education plans?
4. Is your family emotionally supportive of your education plans?
5. Are your friends emotionally supportive of your education plans?
6. Do you know anyone in your personal life who is an engineer?
   a. If yes, who is this person in your life?
   b. Is he or she a mentor for you?
7. Do you belong to a student or professional organization?
   a. If yes, which one(s)
SECTION 5

In this section, please provide some demographic information.

1. What is your gender?
   a. Male or Female
2. How old are you?
3. Please indicate your race/ethnicity (select all that describe you):
   a. American Indian/Alaskan
   b. Asian
   c. Black/African American
   d. Hispanic
   e. Native Hawaiian/Pacific Islander
   f. White
   g. Other (please describe)
4. Were you born in the USA?
   a. If not, please describe your immigration status
5. Are you married?
   a. If yes, for how long?
   b. What does your spouse do for a living?
6. Do you have children?
   a. If yes, how many? Ages?
   b. Are you the primary caregiver?
   c. Do you co-parent or are you a single parent?
7. Do you have a job?
   a. If yes, how often do you work per week?
   b. Is it related to the engineering field?
8. Have you ever served in the military?
   a. If yes, please describe the branch, highest rank and for how long
9. Did either parent graduate from college?
SECTION 6

In this section, you will be asked questions regarding your decision to go to school for engineering.

1. Why did you choose engineering? Check all that apply:
   a. Interest in mathematics and science
   b. Ability in mathematics and science
   c. Good financial rewards
   d. Information from a parent or friend
   e. Recommended by co-worker/supervisor
   f. Interest in electronics, electricity
   g. “I like it”
   h. Interest in mechanical things, building
   i. Seemed interesting, I thought I would like it
   j. Other; describe

2. How old were you when you chose engineering?

3. What are your ideal career goals in engineering?

4. Was there another field that you sincerely considered entering?
   a. If yes, why did you not pursue that field?
SECTION 7

In this section, you will be asked to answer questions regarding your experience in an engineering program.

Please use the following scale:

1----------------2----------------3----------------4----------------5
Strongly Disagree Strongly Agree

1. All faculty members treat me with fairness and respect
2. I feel that I am an equal participant in group work
3. I am comfortable approaching instructors for help outside of class
4. I have not felt discouraged about pursuing an engineering degree
5. I am comfortable asking questions in the classroom
6. I will be an excellent engineer