Male Under-performance in Undergraduate Engineering Mathematical Courses: Causes and Solution Strategy

Luai Al-Labadi, Hishyar Khalil and Nida Siddiqui

ABSTRACT

There has been an increasing trend of females performing better than males academically across the mathematical engineering courses. To confirm this assumption, final marks of two independent samples of students from Calculus courses across all fields within Engineering at a local university of UAE are considered. A two-sample t-test indicates a significant difference in the performance between the two genders. Accordingly, a survey was designed to identify factors that may yield to this scenario. Analysis of the survey found that the time spend studying outside the classroom is a statistically significant factor contributing to the disparity between the gender performances. Based on these results, we propose immediate short-term solutions that can be applied by instructors to address this issue. This study advocates the need of continuous research at micro level to identify gender-based student performance variance. Such researches can assist in immediate intervention thereby leading to the bridging of such a gap.

Keywords: Engineering, Gender, Mathematics, Performance, Undergraduate
1. Introduction

In their research, Ridge, Kippels & Chung (2016) found that UAE along with some other Gulf countries is facing a challenge when it comes to academic achievements of males versus females. In the UAE, females scored higher than males did in mathematics, science, English and Arabic on the 2010 UAE National Assessment Program (Ridge, 2014). See also Yousef (2009, 2011). A similar pattern was observed at the university where this research was conducted. There was almost a unanimous agreement during the mathematics faculty discussions that the male engineering students were almost always underperforming as compared to the females. To confirm this observation, the authors of this paper studied the final marks of two independent samples of students (104 males and 122 females) from Calculus courses across all fields within engineering. When performing a two-sample t-test, the p-value was found to be zero (rounded to 5 decimal places), indicating a significant difference in the performance between the two genders. To deal with this scenario at an instructor and college level, a survey was designed to address the main factors that make female students perform better than the male students in the undergraduate mathematics courses. In this paper, this survey is analyzed and based on the results, immediate short-term solutions are proposed that can be applied by instructors or college to address this issue.

With this introduction, the rest of this paper is organized as follows. The second section presents the research methodology and the process of data collection. The results are then presented and discussed. The paper concludes with the discussion of results, implications, limitations, and recommendations for future research. A copy of the survey is placed in the Appendix.
2. Literature Review

From times immemorial, mathematics and thereby mathematical reliant fields such as engineering have been categorized as a masculine territory. Mathematics and sciences are stereotyped as male domains (Fennema & Sherman, 1977; Hyde, Fennema, Ryan, Frost & Hopp, 1990). The persistence of gendered paths in career choices has been reflected in the current Global Gender Gap Report of the World Economic Forum (WEF), which states that on average men are underrepresented in the fields of education, health and welfare whereas women are underrepresented in the STEM fields (WEF, 2017, p. 31). Since the conventional social structure typically viewed men as the breadwinners of a family, this stereotyping remained unchallenged for quite a while. Research shows that even in today’s modern times, there are more chances of a man to be employed in science and engineering, and when employed, the bias continues in high ranking positions, salary, as well as placement in prestigious institutions (Grant, Sonnert & Holton, 1996; Xie & Shauman, 2009; Xie & Shauman, 1998). The same research also highlighted that the bias is so deeply rooted, that the science and engineering fields are also marked by notable gender disparities in participation as well as performances by the females. In STEM specific workplaces, such as the engineering field, science, math, and the technology field, men still hold more jobs than women. For example, the Society of Women Engineers states that in 2003 approximately 20% (~12,000) of new engineers were women, compared with about 80% of men (~49,000), however, this is an increase from past generations (Crawford, 2012). The social role theory (Eagly & Wood, 2012) suggests that gender roles and their occupants are highly visible in everyday contexts and that gender stereotypes emerge in response to the observation of women and men in different social roles and role-linked activities related to occupational choices (Koenig & Eagly, 2014).
Researchers maintained that females might do as well as, or even better than males on tests of computation, which require relatively simple cognitive processes (Anastasi, 1981). With the new wave of feminism, women started entering all fields in large numbers and educationalists started expecting a more balanced male-female contribution to higher education as well as other professions. However, what was not expected was a reverse gender imbalance in academic performance. Orabi (2007) pointed out the increasing evidence that females are outperforming males in secondary education across a range of subjects. He also summed up about several studies that have been undertaken examining the impact of gender on undergraduate engineering performance, ranging from early year performance to that of later years, with conflicting results.

There has been a lot of research on the reasons leading to such disparity. Some attributed this disparity to biological factors (Hyde, 1981; Tartre & Fennema, 1995; Geary & Flinn, 2002). However, nature cannot be solely held responsible for such an imbalance. Other factors that have been proposed include mathematics learning strategies (Carr & Jessup, 1997) and differential course-taking patterns (Davenport et al., 1998). Since the phenomenon of gender disparity across the mathematics fields have been around for so long, researchers till today keep on exploring as to what other possible circumstances could have led to the breeding of such a shortcoming. As more and more educationalists pondered over the issue, Weiler (1988) proposed socialization as another factor. The contribution of effect and attitude was also proposed by (Frost, Hyde & Fennema 1994).

The closing of the education gender gap has been a key priority not just for OECD and non-OECD countries alike, but also for international development organizations and governments which have devoted substantial resources to ensure that females have equal access to educational and labor market opportunities (Unterhalter & North, 2011). However, this progress made in
closing the gender gap has led to the emergence of a reverse trend where not only the enrollment of female students’ is at par with their male counterparts, on the contrary the females seem to outstrip the male students in their academic performance. In terms of achievement, males score significantly lower than females across a range of national and international assessments (Martin, Mullis & Hooper, 2016).

Ridge (2014) has observed that in the Middle East and the Caribbean, females have been outperforming males for many years, but this phenomenon has received little attention at the global level. She also observed this to be true for UAE. This phenomenon was further confirmed by Ridge, Kippels & Chung (2016) who found that in UAE, gender-based student performance analysis shows a skewness towards the female. In either case, most of the above-mentioned research attributes such an imbalance to factors such as biology, culture, attitudes, socialization and so on. However, true as these factors may be, their solutions require reforms at social, economic and governmental levels, which many at times are beyond the peripheral of a college or its instructor. We thereby define these factors as macroscopic factors, because of them being present within the multiple layers of the structure of a society.

3. Research Methodology

We used quantitative methodology to understand the trends across various parameters involved in a student’s performance such as effort, goals, perceptions, and satisfaction. The quantitative methodology reflects the philosophical underpinning of positivism, which asserts that knowledge (e.g., satisfaction with chosen major) can be examined through observation and numerical data collection from a large number of people, which can help explain why individuals (e.g., undergraduate engineering students) behave the way they do (Sears & Cairns,
For instance, a survey design can provide quantitative descriptions regarding a large number of individuals’ perceptions (Creswell, 2012).

3.1 Population

Population data for this study is from an Emirati private national university located in UAE. It offers the largest number of accredited programs in the UAE with approximately 15000 students. Of all students, 36% are Emirati nationals, 43% are other Arabs, 11% are GCC members, and 10% are international students. Every semester, the Department of Mathematics teaches approximately 3500 undergraduate students from different disciplines.

3.2 Sample

The data in this study is collected in the mid-semester of Fall 2018-2019. There are total of 490 students enrolled in 14 sections for Calculus for Engineering. First, we selected 4 sections. Then all students enrolled in the 4 selected sections were asked to complete the questionnaire. That is, we have used a one-stage cluster sampling of about 30% of the clusters. This sample size is considered large enough to detect any variation in the population and hence it is considered a representative sample. At last, a total of 127 Engineering students (36 males and 91 females) carried out the questionnaire.

3.3 Survey Instrument

A quantitative survey questionnaire was designed to investigate the main objective of this study that aimed at understanding the amount of effort student’s put for learning mathematics (average number of study hours devoted to mathematics per week outside class time), their plan
to achieve professional goal, their need to maintain high university GPA, their perception of the degree importance, and their satisfaction with the major they chose. The survey questionnaire included additional questions of interest that are concerned with students’ gender, their high school GPA, their current living accommodation, their perception of impact of morning classes (8:00 am - 9:15 am) on their learning, their preference of instructor’s gender, and their preference for the use of technological tools in their mathematics courses.

The survey questionnaire was administered in English. Therefore, a pilot study was conducted to ensure that the sampled students can understand the items used in the questionnaire. Although all the students had met the university admission requirement with respect to English proficiency, there was a concern among faculty whether the student-respondents can comprehend the survey-questions. Thus, 16 students from one of the mathematics sections taught by one of the authors of this paper volunteered to participate in the pilot study. Based on the student-volunteers’ input, we clarified the wordings of some of the survey questions. Thus, we adopted this version as the final version to administer to the 127 sampled students.

3.3 Data Collection

The responses to survey questions were collected anonymously from the 127 sampled students. The survey questionnaire was administered at the beginning of mathematics classes and provided students with 15 minutes to complete the questionnaire.

4. Data Analysis

Collected data were analyzed using IBM SPSS software. In what follows, we describe the characteristics of participants by providing the summary statistics of their responses to each...
of the survey questions (Table 1 in the appendix). We then present the results and pattern of association among the variables of interest related to the present study’s objective (Table 2 in the appendix). To investigate whether there is a relationship between gender and the variables of interested, we employed chi-square test of independence (Agresti, 2018). We conclude this section by describing the statistical significance of the results obtained from the analysis of the association among the variables of interest related to the present study’s objective.

4.1 Characteristics of Participants

Majority of student-participants were females ($n = 91, 71.3\%$). Overall, most students ($n = 88, 69.3\%$) obtained high school GPA standing of more than 90%. They mostly ($n = 65, 51.2\%$) indicated between 1 and 3 hours of studying for a single mathematics course per week outside of class time. Most students ($n = 80, 63\%$) lived off campus with their family. They mostly ($n = 102, 80.3\%$) did not think that the gender of their instructor matters. Overall, most students ($n = 79, 62.2\%$) indicated having a clear and definite plan to achieve their professional goals. They mostly ($n = 85, 66.9\%$) strongly agreed that it is important to maintain a high university GPA. Moreover, most students ($n = 91, 71.7\%$) perceived the importance of attaining their degree as becoming successful. They mostly ($n = 114, 89.8\%$) were satisfied with their chosen major. Table 1 in the appendix provides this information.

4.2 Association between Gender and Variables of Interest

We investigated how gender of students vary with variables of interest related to present study’s objective. The contingency tables (crosstabs) between Gender and other factors can be found in Appendix Table 2.
To investigate which of the factors in the questionnaire vary by gender, a chi-squared test is considered. The p-value of all tests are summarized in Table 3 below. It is found that the only significant test (p-value<0.05) is for testing whether there is a relationship between gender and the average number of hours given to a single math course in a week outside the class. That is, we have enough evidence to conclude that the average number of hours given to a single math course in a week outside the class varies by gender. Consequently, one main aspect of the difference in performance in mathematics courses between male and female students is due to the difference in the average number of hours given to a single math course in a week outside the class.

Table 3: p-values of chi-square test of independence between gender and the variable of interest.

| Factors                                        | p-value | Test     |
|-----------------------------------------------|---------|----------|
| High school G.P.A                             | 0.783   | Insignificant |
| Average number of hours given to a single math course in a week outside the class | 0.029*  | Significant |
| Current accommodation                         | 0.984   | Insignificant |
| Morning classes                               | 0.104   | Insignificant |
| Gender of the instructor                      | 0.905   | Insignificant |
| Plan to achieve professional goal             | 0.564   | Insignificant |
| Technological educational tools               | 0.143   | Insignificant |
| Maintain high G.P.A.                          | 0.215   | Insignificant |
| Importance of educational degree              | 0.871   | Insignificant |
| Satisfaction of the chosen major              | 0.838   | Insignificant |

5. Result Analysis, Discussion and Proposed Solution Strategies

The statistical analysis of the data collected suggested that the only statistically significant factor, which seems to be causing an imbalance in the gender-based performance, is the number of study hours devoted to mathematical courses outside the classroom. The data pointed out that the females were intrinsically motivated to achieve better results and thereby were putting in more time studying the mathematical courses outside the classroom. The males on the other hand appear
to be allotting considerably less time doing the same. Another factor whose statistical significance was not categorically established by the p-value but still appeared to be impacting the male student’s performance to quite some extent was the early morning class timings. Male student’s data suggested a preference for mid-morning and afternoon classes as compared to early morning classes whereas the female students had no such preferences for any particular class timings.

The proposals to address these issues are categorized into two categories. The first one is for exclusive Male/female sections, which are completely gender-wise segregated sections, and the second one is for mixed sections, which are co-ed sections. To address the issues mentioned above, the mathematics department can ensure that they offer all their courses in segregated sections. Once this is achieved, the department can further co-ordinate with the University scheduling committee to offer classes to male students during mid-morning and afternoon sessions. The next step would be to address the issue of the number of study hours outside the classroom. In order to deal with this issue, we propose a shift in the assessment format for the male student sections. Heavy reliance on formative assessment could be the key here. We propose to increase the number of assignments, quizzes and projects for the male sections and assign them much more weightage as compared to term-end exams. Pop quizzes and online assessments can also be introduced. Since formative assessment, by definition, monitors student learning, they can help ensure that the male students are aware of their strengths and weaknesses from the very beginning of the course. By assigning more weightage to formative assessment, we believe that the male students will not only recognize their target areas but also work on them all along the course, thereby increasing their study hours outside the classroom and positively impacting their overall course performance. However, this approach may not resolve our issue of gender performance imbalance in the case of co-ed classes. Therefore, for co-ed classes, we propose a modified
approach. For co-ed classes, the instructor can begin with diagnostic tests/preliminaries test at the beginning of the course. Based on the results of these tests, the instructor can assign compulsory practice sessions outside the classroom to students appearing at the lower end of these test results. Another approach could be that of providing counseling sessions that can be arranged for the male students, highlighting the importance of time given to mathematics outside the classrooms and its consequent impact on their performance and henceforth. Efforts to enhance students’ motivation to succeed in mathematics courses can also play a vital role here. For more details about this approach, consult Hammoudi (2019).

6. Limitations and Conclusion

The current study was conducted for engineering students. It remains to be investigated whether similar patterns can be revealed for different mathematical courses in other majors and other universities within the same region as well as beyond. Moreover, this study is an observation study and thus we cannot infer that gender causes mathematics motivation. However, we can generalize the findings of this study to similar characteristics of engineering students.

We recommend that future studies include innovative teaching practices in mathematics courses. For instance, a future study could design an experimental study by including technological course-based activities or projects into teaching and learning an undergraduate engineering Calculus course and compare gender-based mathematics motivation and student achievement with that of a control group where no innovative teaching practice is utilized.

Mathematical performance has always been an issue of research. Any skewness in it thereby is an issue of concern. Although it is commendable that the female population today is outperforming its male counterpart, it is not a desirable scenario. A desirable scenario would be
achieved only when mathematical performance remains unaffected by extrinsic societal factors and gender is one of them.
REFERENCES

Agresti, A. (2018) *Statistical Methods for the Social Sciences*, 5th edition. Boston: Pearson Education, Inc.

Anastasi, A. (1981). Sex differences: Historical perspectives and methodological implications. *Developmental Review*, 1(3), 187-206. https://doi.org/10.1016/0273-2297(81)90017-4

Carr, M., & Jessup, D. (1997). Gender differences in first-grade mathematics strategy use: Social and metacognitive influences. *Journal of Educational Psychology*, 89(2), 318-328. https://doi.org/10.1037//0022-0663.89.2.318

Crawford, M. (2012). Engineering still needs more women. *American Society of Mechanical Engineers*. Recuperado de http://www.asme.org/career-education/articles/undergraduate-students/engineering-still-needs-more-women

Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. Boston, MA: Pearson Education, Inc.

Davenport, E., Davison, M., Kuang, H., Ding, S., Kim, S., & Kwak, N. (1998). High school mathematics course-taking by gender and ethnicity. *American Educational Research Journal*, 35(3), 497. https://doi.org/10.2307/1163446

Eagly, A. H., and Wood, W. (2012). “Social role theory,” in *Handbook of Theories of Social Psychology*, eds P. van Lange, A. Kruglanski, and E. T. Higgins (Thousand Oaks, CA: Sage), 458–476. doi: 10.4135/9781446249222.n49

Fennema, E., & Sherman, J. (1977). Sex-related differences in mathematics achievement, spatial visualization and affective factors. *American Educational Research Journal*, 14(1), 51. https://doi.org/10.2307/1162519

Frost, L., Hyde, J., & Fennema, E. (1994). Gender, mathematics performance, and mathematics-related attitudes and affect: A meta-analytic synthesis. *International Journal of Educational Research*, 21(4), 373-385. https://doi.org/10.1016/s0883-0355(06)80026-1

Geary, D., & Flinn, M. (2002). Sex differences in behavioral and hormonal response to social threat: Commentary on Taylor et al. (2000). *Psychological Review*, 109(4), 745-750. https://doi.org/10.1037//0033-295x.109.4.745

Grant, L., Sonnert, G., & Holton, G. (1996). Gender differences in science careers: the project access study. *Contemporary Sociology*, 25(5), 678. https://doi.org/10.2307/2077593

Hammoudi, M. M. (2019). Predictive factors of students’ motivation to succeed in introductory mathematics courses: evidence from higher education in the UAE. *International Journal of Mathematical Education in Science and Technology*, 50(5), 647-664
Hyde, J. (1981). How large are cognitive gender differences? A meta-analysis using w2 and d. *American Psychologist, 36*(8), 892-901. [https://doi.org/10.1037/0003-066x.36.8.892](https://doi.org/10.1037/0003-066x.36.8.892)

Hyde, J., Fennema, E., Ryan, M., Frost, L., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and affect: a meta-analysis. *Psychology of Women Quarterly, 14*(3), 299-324. [https://doi.org/10.1111/j.1471-6402.1990.tb00022.x](https://doi.org/10.1111/j.1471-6402.1990.tb00022.x)

Krejcie, R. & Morgan, D. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*, 607-10.

Koenig, A. M., & Eagly, A. H. (2014). Evidence for the social role theory of stereotype content: observations of groups' roles shape stereotypes. *J. Personal. Soc. Psychol. 107*:371. doi: 10.1037/a0037215

Martin, M. O., Mullis, I. V. S., & Hooper, M. (Eds.). (2016). Methods and Procedures in TIMSS 2015. Retrieved from Boston College, TIMSS & PIRLS International Study Center Retrieved from [http://timssandpirls.bc.edu/publications/timss/2015-methods.html](http://timssandpirls.bc.edu/publications/timss/2015-methods.html)

Orabi, I. (2007). Gender differences in student academic performance and attitudes paper. *Annual Conference & Exposition*, Honolulu, Hawaii. Retrieved from [https://peer.assee.org/1860](https://peer.assee.org/1860)

Ridge, N. (2014). *Education and the reverse gender divide in the Gulf States, Embracing the Global, Ignoring the Local*. Teachers College Press, Colombia University, New York.

Ridge, N., Kippels, S., & Chung, B. J. (2016). *The challenges and implications of a global decline in the educational attainment and retention of boys*. Qatar Foundation, Doha.

Scheaffer, R., Mendenhall, W., Ott, L. & Gerow, K. G. (2012). *Elementary Survey Sampling*, 7th edition. Cengage, Boston.

Sears, A., & Cairns, J. (2010). A *Good Book, in Theory: Making Sense through Inquiry*, 2nd edition. Toronto: University of Toronto Press.

Tartre, L., & Fennema, E. (1995). Mathematics achievement and gender: A longitudinal study of selected cognitive and affective variables [grades 6 to 12]. *Educational Studies in Mathematics, 28*(3), 199-217. [https://doi.org/10.1007/bf01274173](https://doi.org/10.1007/bf01274173)

Unterhalter, E., & North, A. (2011). Girls’ schooling, gender equity, and the global education and development agenda: conceptual disconnections, political struggles, and the difficulties of practice. *Feminist Formations, 23*(3), 1-22. [https://doi.org/10.1353/ff.2011.0045](https://doi.org/10.1353/ff.2011.0045)

Weiler, K. (1988). *Women teaching for change: Gender, class and power*. South Hadley, MA: Bergin and Garvey.
WEF (2017). *The Global Gender Gap Report*. WEF. Available online at: https://www3.weforum.org/docs/WEF_GGGR_2017.pdf (accessed November 11, 2018).

Xie, Y., & Shauman, K. (1998). Sex Differences in Research Productivity: New Evidence about an Old Puzzle. *American Sociological Review, 63*(6), 847-870.

Xie, Y., & Shauman, K. (2009). *Women in science*. Harvard University Press, Cambridge, Massachusetts.

Yousef, D. A. (2011). Academic performance of business students in quantitative courses: A study in the faculty of business and economics at the UAE University. *Decision Sciences Journal of Innovative Education, 9*(2), 255-267.

Yousef, D. A. (2009). Success in an introductory operations research course. *International Journal of Educational Management.*
# APPENDICES

**Table 1:** Frequency Distribution Table for Participating Students’ Survey Responses

| Survey Question                                                                 | Frequency | Percentage |
|---------------------------------------------------------------------------------|-----------|------------|
| **1 Gender**                                                                     |           |            |
| Male                                                                            | 36        | 28.3       |
| Female                                                                          | 91        | 71.3       |
| **2 High school G.P.A**                                                          |           |            |
| More than 90%                                                                   | 88        | 69.3       |
| Between 80%-90%                                                                  | 34        | 26.8       |
| Less than 80%                                                                   | 5         | 3.9        |
| **3 Average number of hours given to a single math course in a week outside the class** |           |            |
| 1 hour                                                                          | 33        | 26.0       |
| 1-3 hours                                                                       | 65        | 51.2       |
| More than 3 hours                                                               | 29        | 22.8       |
| **4 Current accommodation**                                                      |           |            |
| University Campus                                                               | 43        | 33.9       |
| Off campus alone                                                                 | 4         | 3.1        |
| Off campus with family                                                          | 80        | 63.0       |
| **5 Morning classes**                                                            |           |            |
| Positive Impact                                                                  | 21        | 16.5       |
| Negative Impact                                                                 | 60        | 47.2       |
| Doesn’t matter                                                                   | 46        | 36.2       |
| **6 Instructor’s gender**                                                        |           |            |
| Female instructor                                                               | 9         | 7.1        |
| Male instructor                                                                  | 16        | 12.6       |
| Doesn’t matter                                                                   | 102       | 80.3       |
| **7 Goals**                                                                      |           |            |
| Yes                                                                              | 79        | 62.2       |
| No                                                                               | 17        | 13.4       |
| Sure                                                                            | 31        | 24.4       |
| **8 Technology Education Tools**                                                 |           |            |
| Yes                                                                              | 56        | 44.1       |
| No                                                                               | 33        | 26.0       |
| Doesn’t matter                                                                   | 38        | 29.9       |
| **9 Maintaining High G.P.A.**                                                    |           |            |
| Strongly agree                                                                   | 85        | 66.9       |
| Strongly disagree                                                                | 17        | 13.4       |
| Not sure                                                                        | 25        | 19.7       |
| **10 Importance of the degree**                                                 |           |            |
| Social status                                                                    | 20        | 15.7       |
| Success                                                                          | 91        | 71.7       |
| Others                                                                           | 16        | 12.6       |
| **11 Satisfaction of the chosen major**                                         |           |            |
| Yes                                                                              | 114       | 89.8       |
| No                                                                               | 13        | 10.2       |
Table 2: Cross Tabulation of Students’ Survey Responses

**Gender * GPA**

| Gender * GPA | GPA     | Total |
|--------------|---------|-------|
|              | more than 90% | between 80-90 | less than 80 |
| Male         | 24 (66.67%) | 11 (30.56%) | 1 (2.78%) |
| Female       | 64 (70.33%) | 23 (25.28%) | 4 (4.40%) |
| Total        | 88       | 34     | 5     |

**Gender * Average Study Hours**

| Gender * Average Study Hours | Average Study Hours | Total |
|------------------------------|---------------------|-------|
|                              | 1 hour | 1-3 hours | more than 3 hours |
| Male                         | 12 (33.33%) | 21 (58.33%) | 3 (8.33%) |
| Female                       | 21 (23.08%) | 44 (48.35%) | 26 (28.57%) |
| Total                        | 33      | 65       | 29     |

**Gender*Accommodation**

| Gender * Accommodation | Accommodation   | Total |
|------------------------|-----------------|-------|
|                        | University campus | Off campus alone | Off campus with family |
| Male                   | 12 (33.33%) | 1 (2.78%) | 23 (63.89%) |
| Female                 | 31 (34.07%) | 3 (3.3%) | 57 (62.64%) |
| Total                  | 43      | 4       | 80     |

**Gender * Early Morning**

| Gender * Early Morning | Early Morning | Total |
|------------------------|---------------|-------|
|                        | Positive Impact | Negative impact | Doesn't matter |
| Male                   | 3 (8.33%) | 22 (61.11%) | 11 (30.56%) |
| Female                 | 18 (19.78%) | 38 (41.76%) | 35 (38.46%) |
| Total                  | 21      | 60      | 46     |
### Gender*Gender of Instructor

| Gender | Female Instructor | Male Instructor | Doesn’t Matter | Total |
|--------|-------------------|----------------|---------------|-------|
| Male   | 3 (33.33%)        | 4 (25%)        | 29 (28.43%)   | 36    |
| Female | 6 (6.59%)         | 12 (13.19%)    | 73 (80.22%)   | 91    |
| Total  | 9                 | 16             | 102           | 127   |

### Gender * Goals

| Gender | Yes | No | Not sure | Total |
|--------|-----|----|----------|-------|
| Male   | 20 (55.56%) | 5 (13.89%) | 11 (30.56%) | 36    |
| Female | 59 (64.84%) | 12 (13.19%) | 20 (21.98%) | 91    |
| Total  | 79   | 17 | 31       | 127   |

### Gender * Technology Education Tools

| Gender | Yes | No | Doesn’t Matter | Total |
|--------|-----|----|---------------|-------|
| Male   | 19 (52.78%) | 5 (13.89%) | 12 (33.33%) | 36    |
| Female | 37 (40.66%) | 28 (30.77%) | 26 (28.57%) | 91    |
| Total  | 56   | 33 | 38           | 127   |

### Gender*Maintain GPA

| Gender | Strongly agree | Strongly disagree | Not sure | Total |
|--------|----------------|-------------------|----------|-------|
| Male   | 20 (55.56%)    | 7 (19.44%)        | 9 (25%)  | 36    |
| Female | 65 (71.43%)    | 10 (10.99%)       | 16 (17.58%) | 91    |
| Total  | 85             | 17                | 25       | 127   |

Gender*Degree Importance ($\chi^2 = 0.28, df = 2, p\text{-value} = 0.87$; Fisher’s Exact Test $p\text{-value} = 0.95$)
### Importance of Degree

| Gender   | Social status | Success | Others | Total |
|----------|---------------|---------|--------|-------|
| Male     | 5 (13.89%)    | 27 (75%)| 4 (11.11%)| 36    |
| Female   | 15 (16.48%)   | 64 (70.33%)| 12 (13.19%)| 91    |
| Total    | 20            | 91      | 16     | 127   |

### Gender * Major Choice Satisfaction

| Gender   | Major Choice Satisfaction | Total |
|----------|---------------------------|-------|
|          | Yes                       | No    |
| Male     | 32 (88.89%)               | 4 (11.11%)| 36    |
| Female   | 82 (90.11%)               | 9 (9.89%)| 91    |
| Total    | 114                       | 13    | 127   |
Questionnaire

The objective of this questionnaire is to study factors impacting students’ GPA (Grade point average) and try to come up with strategies to overcome those issues. Taking few minutes to answer the questions carefully is greatly appreciated.

Gender…………………… Course…………………… Class Time…………………… Sec….

Q1. What was your high-school G.P.A?
   a. more than 90%                          b. between 80-90                       c. less than 80

Q2. How many hours on an average do you give to a SINGLE Math/statistics course in a week outside the class?
   a. 1 hour                                  b. 1-3 Hours                    c. More than 3 hours

Q3. Where is your current accommodation?
   a. University campus                 b. Off campus alone           c. Off campus with family

Q4. How does an early morning (8:00-9:15) class impact your performance?
   a. Positive impact           b. Negative impact            c. Doesn’t Matter

Q5. My performance in a course is better if I have a
   a. Female Instructor                 b. Male Instructor              c. Doesn’t Matter
Q6. Do you have a clear and definite plan for achieving your professional goal?
   a. Yes                      b. No                     c. Not sure

Q7. Do you believe more use of technological educational tools can help you improve your G.P.A.?
   a. Yes                      b. No                    c. Doesn’t Matter

Q8. Maintaining a high G.P.A. will help you to be successful in your professional career.
   a. Strongly Agree           b. Strongly Disagree      c. Not sure

Q9. Your educational degree is important because
   a. It gives you a higher social status           b. It helps you to be successful in your career.
   c. Other…………….

Q10. Are you satisfied with the choice of your major?
   a. Yes                     b. No, because………………………………………………………………………………