A comparative analysis between female and male motivations to study engineering: a case study in Saudi Arabia

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ABSTRACT: The main objective of this case study was to investigate and compare motivations between first-year female and male university students toward studying engineering subjects at Prince Mohammad Bin Fahd University (PMU), Kingdom of Saudi Arabia (KSA). A survey asking about motivational factors to study engineering was distributed to PMU freshmen who specifically registered at an introductory engineering course. The survey questions were designed by incorporating intrinsic and extrinsic factors, and by considering four motivational categories, including professional and personal ambitions, employment opportunities, scientific capabilities and social aspects. Statistical analyses were carried out from the data obtained. Descriptive analysis with mean, standard deviations and variations were also reported. The results obtained for the intrinsic motivation categories showed that the male students were slightly more motivated than the female, while for the extrinsic motivations they were in contrast to each other. The female students demonstrated that they were more independent from external influences and highly self-motivated.

Keywords: Engineering, intrinsic, extrinsic, motivation, education, freshmen

INTRODUCTION

Engineering is an important discipline that any nation must seriously invest in. The quality of human life corresponds heavily to the quality of engineering infrastructures where they live. University as a responsible institution for educating future engineers needs to prepare and adjust engineering curriculum to be up-to-date with rapid changes in societal expectations due to technological advancement [1]. Students entering engineering programmes need to have proper motivation, commitment and understanding about *what and why engineering discipline* to avoid unexpected difficulties in pursuing their education and future professional engineering career [2]. Highly motivated students can arguably lead to high student achievers and qualified future engineers [3][4].

In general, there are two major factors influencing student motivations to choose a major field of study, intrinsic and extrinsic factors [5-10]. Extrinsic motivation relates to external influences, such as opinions of others, while intrinsic is about internal satisfaction raised from observation and learning. According to Gero and Abraham, this type of motivational factors plays a principal role in the learning process in the higher education programme [11].

Javid et al investigated intrinsic and extrinsic motivations between Saudi undergraduate male and female students in learning language and majors in university [12]. They found that the male students showed stronger connections in the extrinsic motivation and less in the intrinsic motivation relative to the female students. Before starting any type of engineering programme, students should be familiar with different learning activities that lead them to skill, knowledge and competency developments. The skill, knowledge and competency required as engineers can definitely motivate students to decide on choosing an engineering discipline. Male or female students in preparatory programme, who are interested in studying engineering, need to learn how to characterise the motivational factors. Instructors at this level can play a major role in guiding and motivating students to select an engineering major by introducing them to; for example, future engineering job places, engineer's role in society and examples of big engineering projects [13-15].

Ocampo et al explored motivations to be engineers of male and female engineering students in Latin America and the United States [16]. They distributed a survey asking about motivation factors (intrinsic, perceived choice and perceived competence) before and after multi-national collaborative design projects conducted by engineering students in those continents. The study concluded that the female students showed high scores in motivations compared to the male students and a significant drop in competencies was observed in the case of male students after they completed the

project. Fernandez et al proposed a framework of motivational instruments and validated it by a case study of 152 engineering students at the Technical University of Madrid in Spain [17]. Their motivational framework incorporated student self-assessment and training to improve the already possessed motivation. They concluded that the engineering students benefited fully from this motivational framework.

Dubreta and Bulian conducted longitudinal research of motivation for mechanical engineering study at the University of Zagreb in three consecutive years (2013-2015) [18]. They found that intrinsic motivation remains the most stable factor; namely, general interest in science and technology, despite job, pay and career concerns. Mallari et al investigated the extrinsic and intrinsic motivational factors related to teaching styles delivered to engineering students [19]. They found that the students were more extrinsically motivated. Although many students were interested and self-motivated in taking engineering and science courses, some students were easily influenced by or dependent upon, the extrinsic factors, such as family, friends, role models or expert opinions.

Ouda et al conducted a study to investigate motivational factors for engineering freshmen (male) to join the College of Engineering (COE) at Prince Mohammad Bin Fahd University (PMU), Kingdom of Saudi Arabia (KSA) [20]. Unlike the present study, no engineering female students were admitted during that period. They distributed a survey at the beginning of semester to students taking the Introduction to Engineering course questioning their motivations based on intrinsic and extrinsic factors. General finding of this study was that the students faced challenges selecting a programme in the engineering discipline. This led to retention issues at the freshman level, i.e. some engineering students changed to a non-engineering major. This was due to the lack of information about engineering as a subject and profession and the lack of proper intrinsic motivation. The study suggested that external factors, such as family influence could improve motivation and eventually upgrade skills required to be engineers. In addition, academic institution involvement could play a significant role in shaping student motivation, by enhancing introductory engineering courses to incorporate more on skills and competencies required to be engineers [20].

Mackensen et al [21] and Alpay et al [22] and Saleh et al [23] studied how to enhance motivation of students who were already admitted to engineering programmes. They proposed to include teaching and learning in engineering study that embraces competency-based training, real problem-solving skills, research-driven activities and interdisciplinary knowledge. Competency-based training includes the development of communication skills, teamwork, leadership, professionalism and ethics. Students are well motivated when engineering course subjects incorporated this type of learning activities. Pulford et al examined correlation between communication skills and motivational factors [24]. They found that intrinsically oriented students performed better in writing skills and developing innovative project ideas relative to extrinsically motivated students.

Studying student motivations to be engineers does not present a complete picture without including female students' participation. Percentage of female students pursuing an engineering degree has increased in recent years, particularly in the Middle Eastern countries, such as Saudi Arabia and the United Arab Emirates (UAE). However, cultural perceptions of female as engineers are still strong in some parts of the world including these regions. The traditional norm for female engineers is to work as a professional without fully releasing family related work responsibilities. This could result in demeaning the engineering profession and decreased motivation for prospective female engineers. Investigating closely female students who are planning to join or pursuing engineering programmes could change the perceptions into a better understanding of future role of professional engineers regardless of their gender.

A study conducted by Orr et al comparing performance of female and male engineers showed results that were contrary to the cultural perceptions [25]. Their study showed that the female engineers had more motivations and sincerity in their professional tasks relative to the male engineers. This finding was reinforced by the study conducted by Sally et al who investigated qualities of engineers in the practical work [26]. They found that the female engineers were more active than the male engineers, especially those who worked in the fields. Snelgar et al studied the extrinsic and intrinsic motivation factors between female and male students in two different countries, South Africa and Germany [27]. They claimed that the intrinsically motivation factors played an important role in engineering education, especially for female students. Saija found different perspective between female and male students' motivation in self-regulated learning environment [28]. She found that the motivation between female and male students is not statistically significant.

The main objective of this case study was to investigate and compare motivations between first-year female and male university students toward studying engineering during the Introduction to Engineering course delivery offered at the College of Engineering at PMU, KSA. This academic work is a continuation from the previous study conducted by Ouda who focused mainly on male engineering students [20]. This study specifically examined the intrinsic and extrinsic factors that influenced students to achieve their ultimate goals to become successful professional engineers. The authors extended the analysis by comparing female and male student motivations and related them with their performance in the Introduction to Engineering course. Furthermore, the study was intended to characterise the motivational factors in studying general science, engineering, mathematics and professional ethics courses for freshmen.

METHODOLOGY

The main method used in this study was data collection and analysis through a survey distributed to the female and male students of the three engineering programmes (civil, electrical and mechanical) housed under COE at PMU.

While conducting the survey in 2018-19, COE at PMU just opened edits programmes to female students after nearly twelve years since the university inception in 2006. A set of questions was used to incorporate the intrinsic and extrinsic motivation factors, and they were divided into four different categories (Appendix A). There were three intrinsic motivational factors asked about in the survey: job expectation; professional and personal ambitions; and scientific capabilities. While the only extrinsic motivational factor used involved influence from family and friends. The survey was pilot tested on a subset of survey participants of engineering freshmen. The survey was conducted at the early week of the semester before students were exposed further to the content of the GEEN 1211 Introduction to Engineering course. This course is the earliest engineering introductory course offered in the first semester of freshman level. As in other mixed-gender universities in KSA, female and male sections were offered separately. The instructors gave students one week to complete and submit the survey anonymously. One hundred twenty-one students responded to the survey (80% response rate), 45 responders identified as female and 76 as male.

The questions used in the survey were adopted from the work undertaken by Ouda et al [20]. In total there were 18 question-statements asked. The statements such as *I want to be an engineer, because engineers are well-paid professionals compared to most of other professionals*; *I want to be an engineer, because it will be easy for me to find a job after graduation*; and *I want to be an engineer, because engineers contribute to society by solving community/world problems* represented the intrinsic motivations. While the statements: *I want to be an engineer, because my family (parents) told me to do so*; and *I want to be an engineer, because my friends/peers told me to do so* represented the extrinsic motivations.

The scaling response was divided into five levels, with A = strongly agree (score 5); B = agree (score 4), C = neutral (score 3), D = disagree (score 2) and E = strongly disagree (score 1). Simple statistical calculations including obtaining the average, standard deviation and coefficient of variation were performed for each category, both for female and male responders (Appendix A). The data was also presented in a graphical display as bar charts to capture the highest and lowest scoring questions.

RESULTS

Out of 121 student responders in the survey, the following percentage was observed: 68.4% were males and 42.2% females from the mechanical engineering (ME) programme; 22.4% were males and 35.6% females from the electrical engineering (EE) programme; and 9.2% were males and 22.2% females from the civil engineering (CE) programme. The numbers of ME students participating in the survey were the highest relative to the other two programmes (EE and CE), since they represented the highest number of total students in COE (around 60%). ME was the preferred engineering programme due to the proximity of the PMU location to big manufacturing and petrochemical industries, such as Saudi Aramco, Saudi Basic Industrial Companies (SABIC) and Sadara Chemical Company. During the survey, female students were just admitted to the engineering programmes and represented less than 10% of the total freshman students. Figure 1 and Figure 2 show the distribution percentage of students participating in the survey and taking GEEN 1211 Introduction to Engineering according to the semester they were enrolled in. It can be observed that female students took this course earlier than the male students.

Appendix A, at the end of the article, shows the complete result of the intrinsic and extrinsic motivation factors for each category. Raw data in terms of the number of responses to the satisfaction scale (strongly agree - SA, agree - A, neutral - N, disagree - DA and strongly disagree - SDA) for both female and male students are presented along with their percentage values. Also, the mean, standard deviation and coefficient of variation (COV) for each category are included to observe their consistency and trend. The COV was defined as the standard deviation value divided by the mean to indicate the variability of the data collection, which proved useful to describe the consistency (and to some extent confidence) of the responders. The data are also presented in form of bar charts to observe graphically how the data has been distributed.

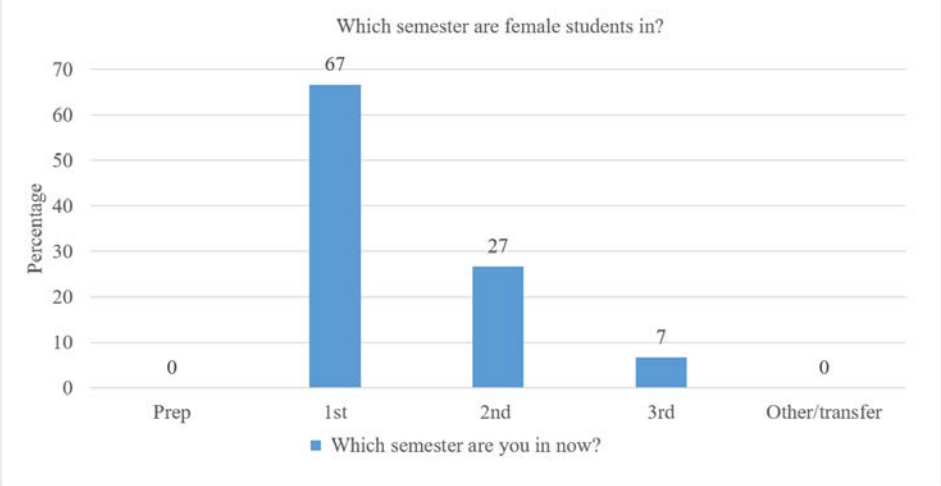

Figure 1: Study semester of female students.

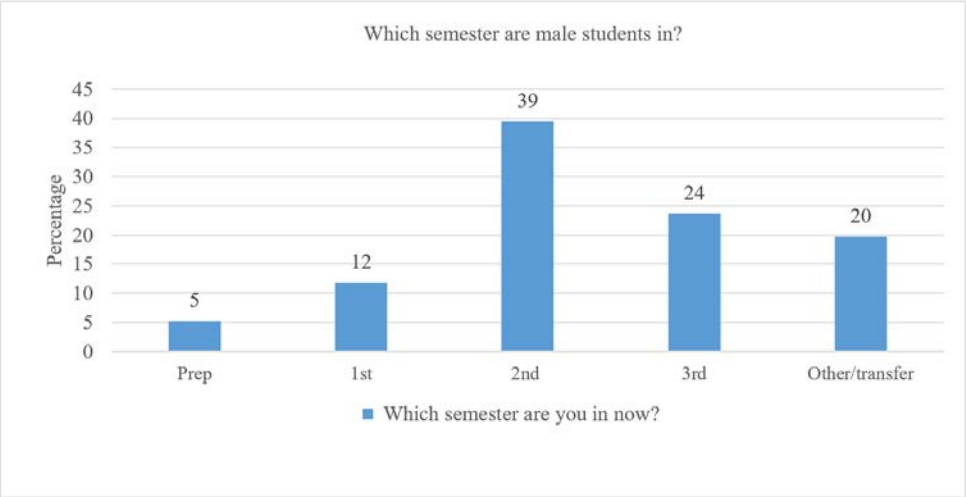

Figure 2: Study semester of male students.

Category 1: Intrinsic motivation related to job expectation

The data in the graphs is presented in terms of response percentage for each response scale. To obtain the mean value of response(s), Appendix A is used as the reference. Figure 3 and Figure 4 show the number of students agreeing and disagreeing with the two intrinsic factors related to job expectation. In this category, the male students scored the overall mean value of 4.3/5 with the associated COV of 0.18; while the female students scored 3.68/5 and 0.28 for the mean and COV, respectively. This indicated that the male students were more confident relative to the female students in the job expectation category. As a developing nation with abundant natural resources (oil, minerals), KSA needs to boost engineering sectors by preparing highly qualified engineers. The high market demand for engineers will not be decreasing in the foreseeable future. Despite this fact, KSA has produced limited local engineers and at the moment is depending heavily on foreign engineers (expatriates).

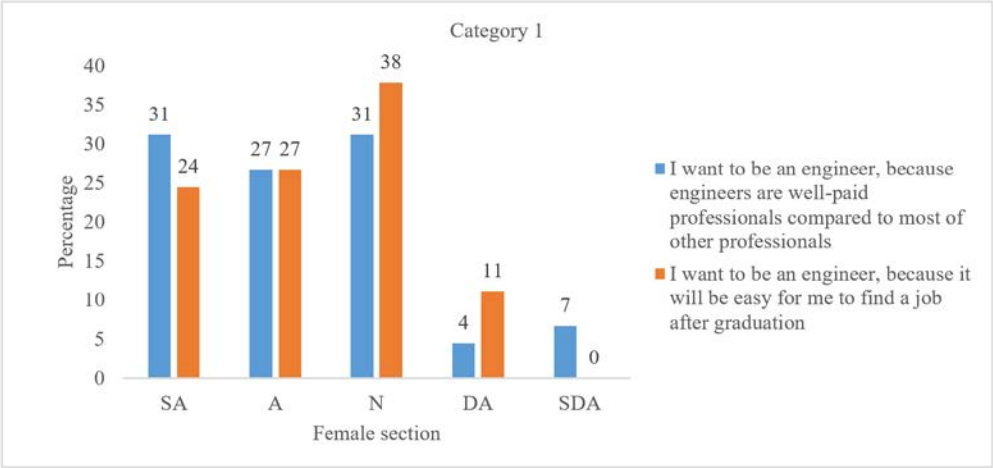

Figure 3: Intrinsic motivation related to job expectation of female students.

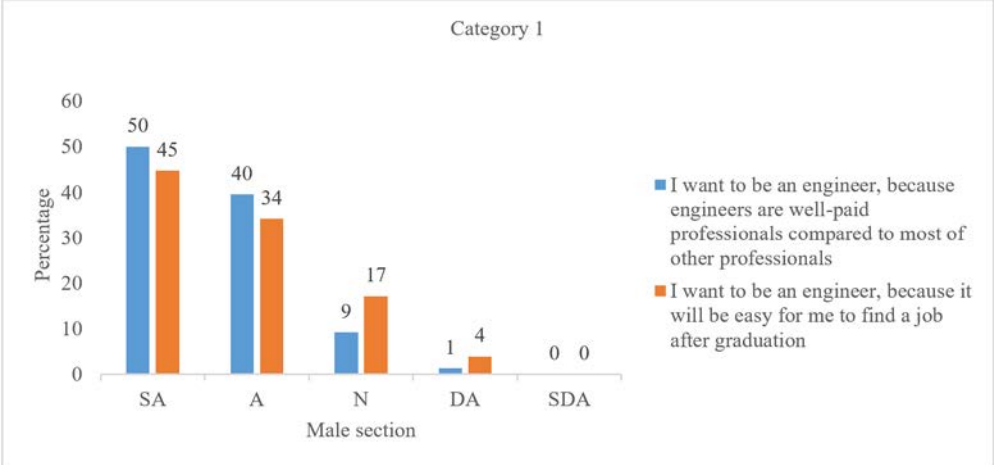

Figure 4: Intrinsic motivation related to job expectation of male students.

The engineering profession in KSA has enjoyed a respected position accompanied with a very competitive salary package relative to other professions. In general, getting an engineering job is expected to be easier for Saudi citizens, considering also the current government incentive to increase competitiveness of its workforce, i.e. Saudisation. However, due to social and cultural barriers, female students have faced challenges pursuing career as professional engineers. Female students prefer more working in the office environment rather than in field work [29], and this will create less opportunities for them since field work is often a crucial part of engineering activities [30]. In addition to this, many companies in KSA still offer different wages for male and female employees, thus continuing the salary disparity based on gender. All of these factors could be some of the reasons that the female students were less motivated to study engineering programmes.

Category 2: Intrinsic motivation related to professional and personal desires

Figure 5 and Figure 6 present graphically the results for the first three factors under Category 2, which are related to professional desires, such as engineering contribution to society, engineering perception and engineering ability. The average score of these three factors for the female students (4.3/5) was slightly higher than that of the male students (4.2/5). This result confirmed the study conducted by Male et al pointing out that female students are more interested to do engineering projects as they feel comfortable and are more motivated compared to male students [26]. Figure 7 and Figure 8 present the results with respect to two important engineering attributes, such as teamwork and presentation (communication) skills. The average result of these two factors indicated that the male students scored significantly higher (4.3/5) than the female students (3.5/5). The female students were found not as comfortable as the male students in working as a team and giving presentations. A sales engineer is one of the examples of common engineering occupations for fresh engineering graduates and it requires good oral communication skills. In KSA, male engineers normally face fewer challenges relative to female engineers when it comes to sales and marketing.

This result was expected because of social and cultural perceptions in KSA that female employees are expected to work only with other female employees. This constraint would make teamwork in mixed male and female working places a challenging task for future female engineers. Recent changes and development in KSA, such as encouraging women participation in society and more importantly allocating more women to engineering work places would diminish this cultural barrier. Relative to Category 1 (job expectation), the overall mean result in this category for both female and male students was higher indicating they were well motivated with respect to expected professional and personal desires as engineers.

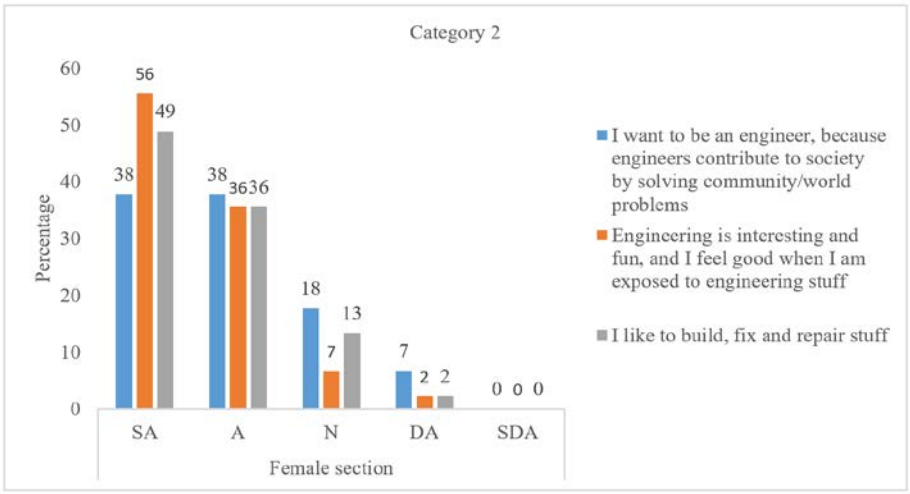

Figure 5: Intrinsic motivation related to professional and personal desires of female students.

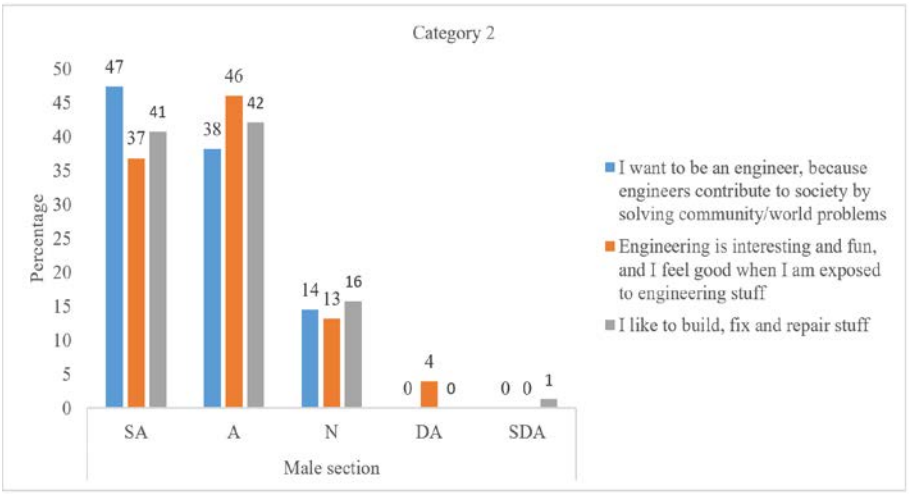

Figure 6: Intrinsic motivation related to professional and personal desires of male students.

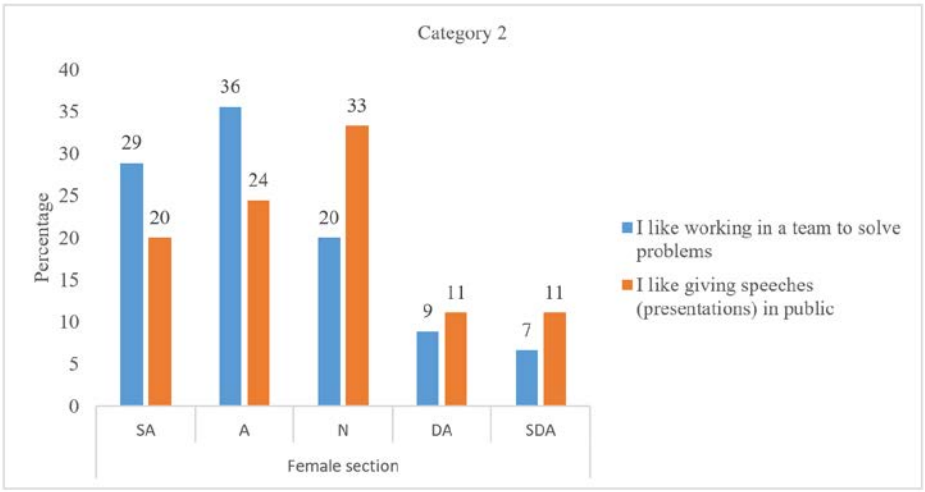

Figure 7: Intrinsic motivation related to professional and personal desires of female students.

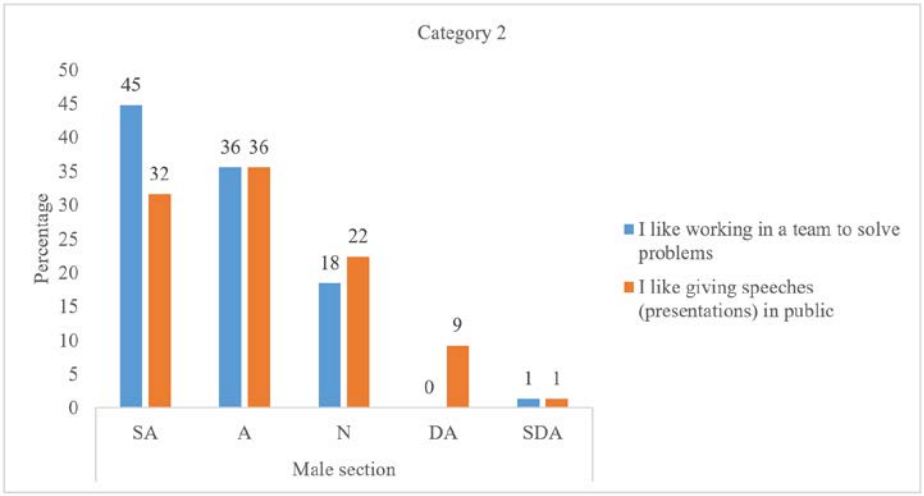

Figure 8: Intrinsic motivation related to professional and personal desires of male students.

Category 3: Intrinsic motivation related to scientific capabilities

Figure 9 and Figure 10 present the results of three motivational factors under the scientific capabilities category asking about how comfortable and confident the students were with mathematics and science courses. Calculus and physics represent the majority of mathematics and science courses required for engineering students to complete before they could advance to study main engineering subjects. The Accreditation Body of Engineering and Technology (ABET) requires every engineering programme to have at least 22% or 30 credit hours of mathematics and science courses in its curriculum [31]. Therefore, it is crucial for engineering students to be strong and confident about these courses. The average result of these three factors showed that both the female and male students scored nearly the same (4.0/5 and 4.1/5), indicating they were comfortable and confident with mathematics and science courses.

Figure 11 and Figure 12 present the result of the other three motivational factors under this category revealing students' confidence in experiment, design and knowledge in specific engineering subjects (CE, EE and ME). The average results of these three factors for both the female and male students were the same (4.3/5) indicating they were confident and had adequate expectations and knowledge in engineering design, experiment and subjects. The overall result under this category was very optimistic, the students were highly motivated due to the comfort and confidence in their background knowledge to become engineers.

Among other high score responses under this category were confidence and excitement of the female and male students to conduct laboratory experimentation and to design innovative projects, both factors scored 4.4/5. Student abilities in problem solving, design and experimentation are some of major learning outcomes mandated in all accredited engineering programmes [31]. When asked about the knowledge of, and differences between, CE, EE and ME programmes and their decision whether to stay in the current programme, the female students scored slightly lower (4.0/5) than the males (4.1/5). It should be noted that the majority of students surveyed had a little knowledge about the difference between various engineering majors, since the survey was conducted at the beginning of the course term. Students would be taught to recognise various engineering disciplines under the Introduction to Engineering course a few weeks later.

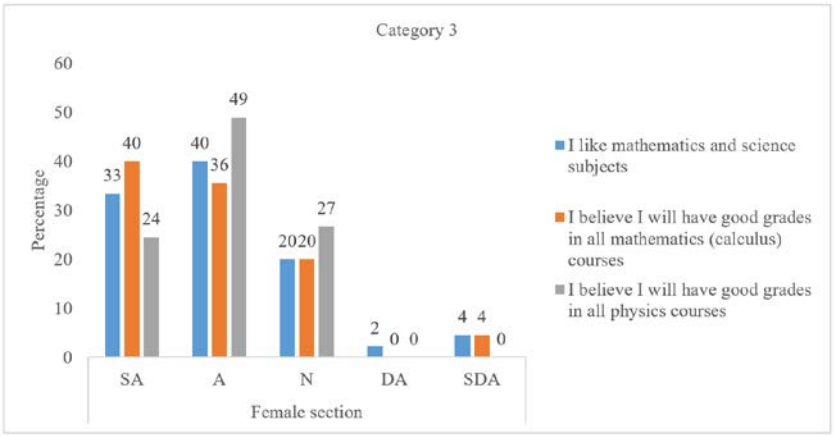

Figure 9: Intrinsic motivation related to scientific capabilities of female students.

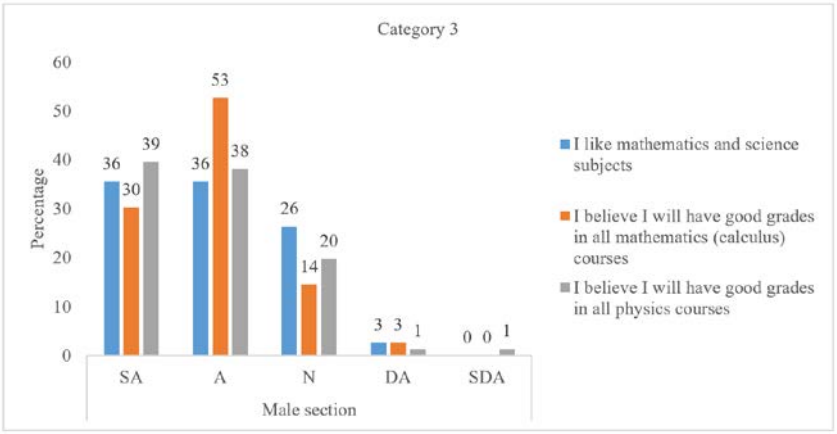

Figure 10: Intrinsic motivation related to scientific capabilities of male students.

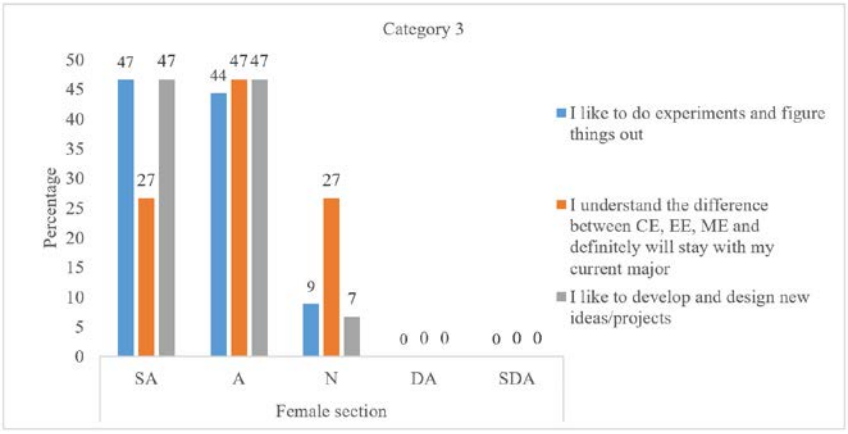

Figure 11: Intrinsic motivation related to scientific capabilities of female students.

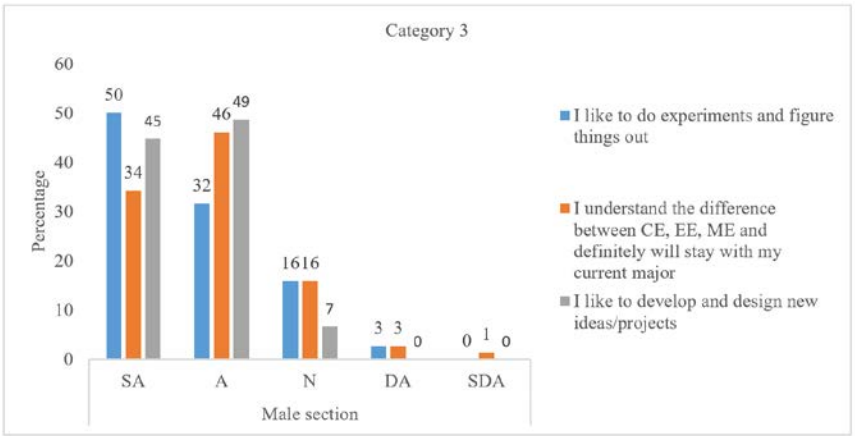

Figure 12: Intrinsic motivation related to scientific capabilities of male students.

Category 4: Extrinsic motivation related to social desire

Two factors were considered in this category asking for the reason why students want to be engineers by specifically mentioning family or friends' influence. Both the family and friend factors are external and related to social interaction. Figure 13 and Figure 14 show the response results. From the average value of these two factors, the female and male students scored 1.8/5 and 2.8/5, respectively. This indicated that the female students tended to strongly disagree (SDA) relative to their male counterparts that external factors shape their decision to study an engineering discipline. It can be deduced from this finding that independence and sincerity levels of the female students are better than that of the male students. This result confirmed the study conducted by Male et al that female students thoroughly investigated by themselves the knowledge required to be competent engineers [26].

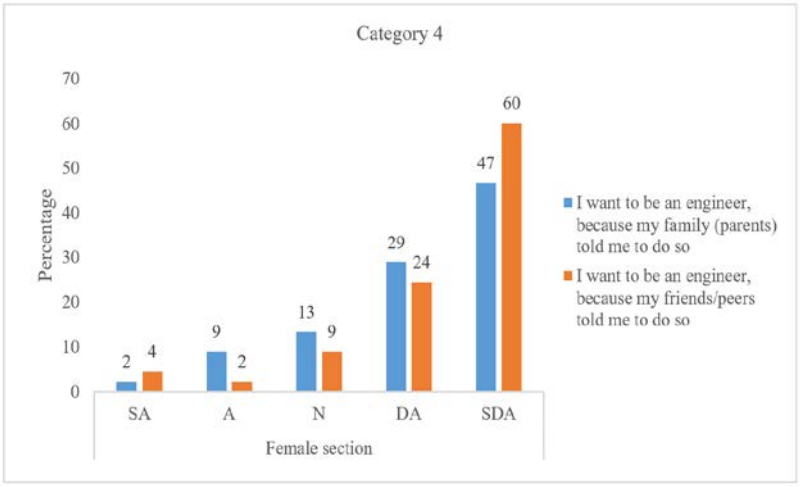

Figure 13: Extrinsic motivation related to social desire of female students.

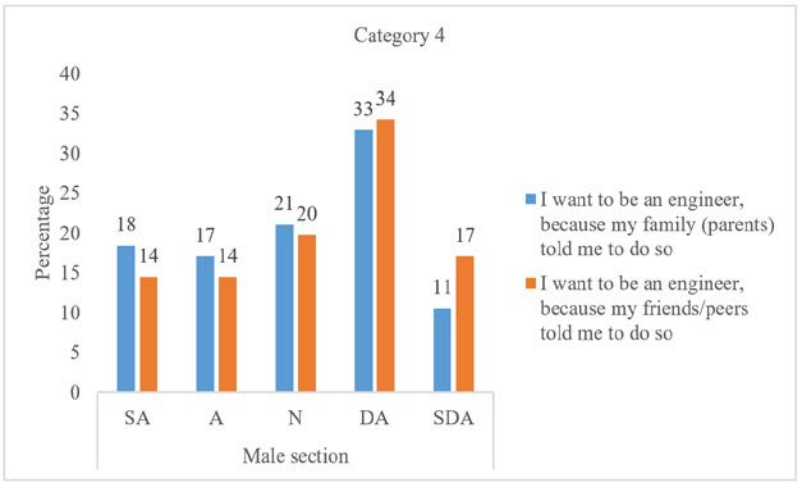

Figure 14: Extrinsic motivation related to social desire of male students.

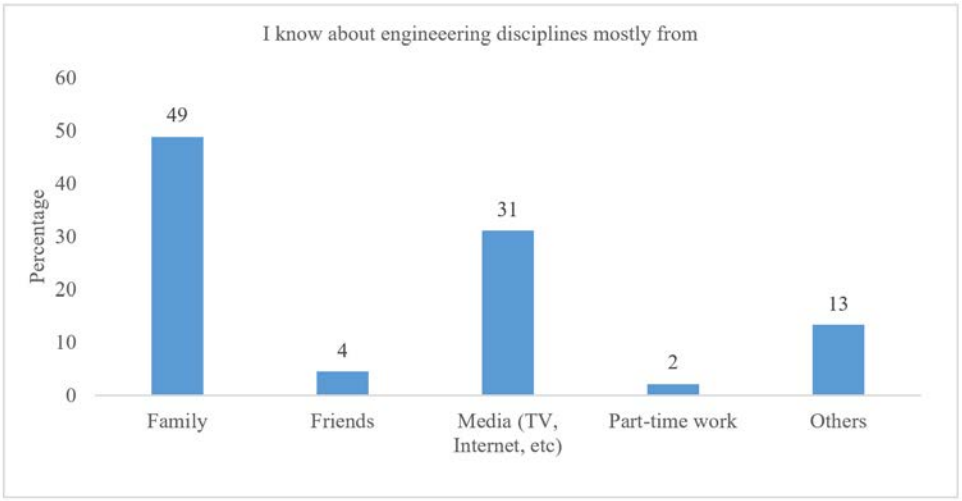

Figure 15: Sources of knowledge about engineering disciplines of female students.

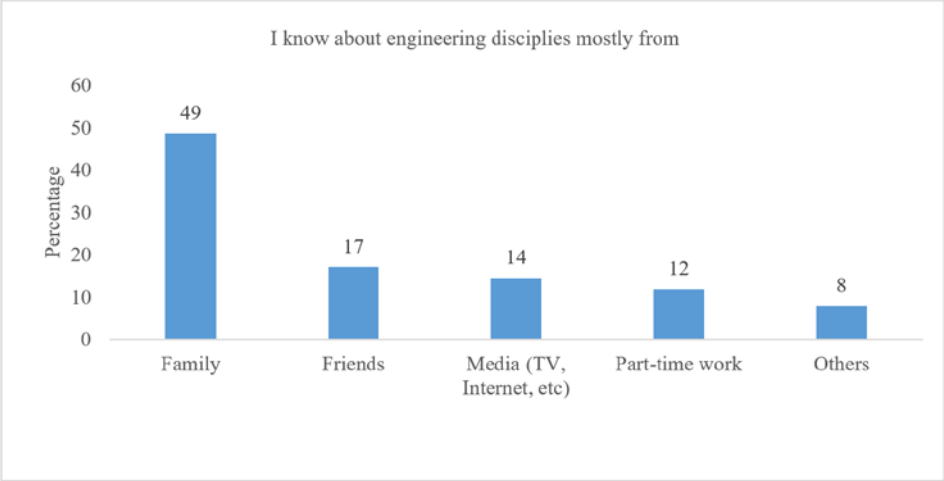

Figure 16: Sources of knowledge about engineering disciplines of male students.

Figure 15 and Figure 16 depict the results about where from the students get the information about engineering disciplines. It was obtained that the family represented the major source of reference information (49%) gathered by both the female and male students. Other sources included information from friends, media (Web, Internet searches, podcasts), as part-time workers and from others (e.g. company exhibitions and advertisements). Media sources were the second most important source of information (31%) for the female students, while friends were second for the males (17%). Part-time work was also used as an information source of engineering disciplines as many PMU students even during their study have professional working experience mostly as interns in various engineering companies. It was found that 12% of the male students taking this survey obtained information about engineering from their work experience while only 2% of the female student responders did so.

DISCUSSION

By taking the average response of all factors in Category 1 to Category 3 (intrinsic motivations), it was obtained that the female and male students scored 4.2/5 and 4.0/5, respectively. The male students seemed slightly higher intrinsically motivated compared to the female students. While for the extrinsic motivation, the female students were highly self-motivated and tended strongly disagree with family or friends' influences on their decision to be an engineer. It should be noted that the survey was conducted during the early years of extending the offer of engineering programmes to female students (2018-2019).

Confidence to be an engineer in female students was not expected to be as strong as that of male students. In KSA, social and cultural restrictions have played a major role in shaping female student perceptions about engineering work. Teamwork that normally involves mixed genders in professional engineering practice is yet another cultural challenge that needs to be overcome to become a successful engineer. As engineering programmes in KSA are opening their doors more to female students, it is anticipated that engineering companies will follow this trend by accepting more female engineers, while at the same time adjusting their working environment to be more mixed.

The above survey results were validated by examining student performances in the GEEN 1211 Introduction to Engineering course. The authors hypothesised that highly motivated students would normally perform well in their course. The same students who participated in the survey were assessed in the course and their final grades compared.

Table 1 presents the grade results for both the female and male students, and Figure 17 depicts the grade distribution percentage. By comparing the average grade results, the female students scored 3.4/4 and heavily outperformed the male students who achieved only 2.4/4. It can also be seen that none of the female students failed in the course (F - grade), while 11 male students (14%) did so. The average calculation was done by weighting the overall grade assuming A+ - A = 4.0, B+ - B = 3, C+ - C = 2, D+ - D = 1 and F = 0. The Introduction to Engineering course was delivered mostly with motivational styles introducing students to topics, such as knowledge of engineering disciplines, professionalism, ethics, basic engineering problem solving, communication skills and teamwork development. Traditional examinations and term (group) projects were used as the main assessment tools.

Table 1: Grade results for the Introduction to Engineering course.

Grades	Males	Females
A^{+} - A	22	27
B^{+} - B	18	11
C^{+} - C	13	5
D^{+} - D	12	2
F	11	0

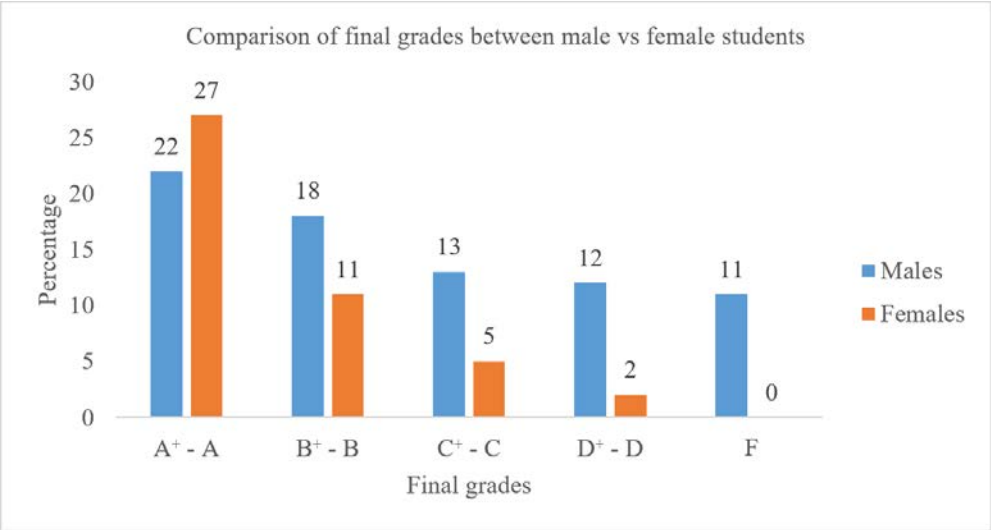

Figure 17: Grade distribution for male and female students.

CONCLUSIONS

Based on the survey results, it can be concluded that the male students showed a slightly higher intrinsic motivational factors compared to the female students. This could be due to some existing social perception, which portrays engineering work as a male dominated profession. The finding seems to confirm the overall world composition about female engineers relative to male engineers. However, there is additional challenge for KSA future female engineers. The female students did not feel comfortable about working in the field due to some cultural restrictions, such as clothing attire limitations, prohibition on work in gender mixed environments, etc. Some engineering companies are also still in the process of accommodating or adjusting infrastructure needs for female engineers and waiting for updated government regulations related to supporting female participation in workplaces.

These barriers also limit the female students' comfort to work as a team and conduct public presentations, which are some of the key factors to be a successful engineer. As far as the extrinsic motivation related to social aspects is concerned, the female students are more self-motivated towards engineering study than the male students as indicated by their strong disagreement with the external influence coming from family or friends.

When looking at the assessment result of the Introduction to Engineering course, the female students performed better compared to the males, and this indicates consistency and seriousness in their motivation to choose engineering study. To enhance student motivation particularly for female students, cultural restrictions should be relaxed and society needs to be more tolerant and accept the female involvement in industry as engineers. Industry supported by government regulations will play a critical role in shaping the acceptance of this cultural norm in the longer term.

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BIOGRAPHIES

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Appendix A: Detailed student questionnaire results.

Serial no	Survey questions	Female students						Male students						Female students					Male students					Female students			Male students		
		Student respondents scale					No of students	Student respondents scale					No of students	Percentage					Percentage										
		SA	A	N	DA	SDA		SA	A	N	DA	SDA		SA	A	N	DA	SDA	SA	A	N	DA	SDA	Mean out of 5	Std	Variance	Mean out of 5	Std	Variance
Category 1: Intrinsic motivation related to job expectation																													
1	I want to be an engineer, because engineers are well-paid professionals compared to most of other professionals	14	12	14	2	3	45	38	30	7	1	0	76	31	27	31	4	7	50	39	9	1	0	3.71	1.15	1.32	4.38	0.71	0.50
2	I want to be an engineer, because it will be easy for me to find a job after graduation	11	12	17	5	0	45	34	26	13	3	0	76	24	27	38	11	0	45	34	17	4	0	3.64	0.97	0.94	4.20	0.86	0.74
Category 2: Intrinsic motivation related to professional and personal desires																													
1	I want to be an engineer, because engineers contribute to society by solving community/world problems	17	17	8	3	0	45	36	29	11	0	0	76	38	38	18	7	0	47	38	14	0	0	4.07	0.90	0.82	4.33	0.71	0.51
2	Engineering is interesting and fun, and I feel good when I am exposed to engineering stuff	25	16	3	1	0	45	28	35	10	3	0	76	56	36	7	2	0	37	46	13	4	0	4.44	0.72	0.51	4.16	0.80	0.63
3	I like to build, fix and repair stuff	22	16	6	1	0	45	31	32	12	0	1	76	49	36	13	2	0	41	42	16	0	1	4.31	0.78	0.61	4.21	0.80	0.64
4	I like working in a team to solve problems	13	16	9	4	3	45	34	27	14		1	76	29	36	20	9	7	45	36	18	0	1	3.71	1.17	1.36	4.22	0.84	0.70
5	I like giving speeches (presentations) in public	9	11	15	5	5	45	24	27	17	7	1	76	20	24	33	11	11	32	36	22	9	1	3.31	1.23	1.50	3.87	1.00	1.01
Category 3: Intrinsic motivation related to scientific capabilities																													
1	I like mathematics and science subjects	15	18	9	1	2	45	27	27	20	2	0	76	33	40	20	2	4	36	36	26	3	0	3.96	1.01	1.02	4.04	0.85	0.72
2	I believe I will have good grades in all mathematics (calculus) courses	18	16	9	0	2	45	23	40	11	2	0	76	40	36	20	0	4	30	53	14	3	0	4.07	1.00	1.00	4.11	0.74	0.54
3	I believe I will have good grades in all physics courses	11	22	12	0	0	45	30	29	15	1	1	76	24	49	27	0	0	39	38	20	1	1	3.98	0.71	0.51	4.13	0.86	0.75
4	I like to do experiments and figure things out	21	20	4	0	0	45	38	24	12	2	0	76	47	44	9	0	0	50	32	16	3	0	4.38	0.64	0.41	4.29	0.82	0.68
5	I like to develop and design new ideas/projects	21	21	3	0	0	45	34	37	5	0	0	76	47	47	7	0	0	45	49	7	0	0	4.40	0.61	0.37	4.38	0.61	0.37
6	I understand the difference between CE, EE, ME and definitely will stay with my current major	12	21	12	0	0	45	26	35	12	2	1	76	27	47	27	0	0	34	46	16	3	1	4.00	0.73	0.53	4.09	0.85	0.72
7	I know about engineering disciplines mostly from	22	2	14	1	6	45	37	13	11	9	6	76	49	4	31	2	13	49	17	14	12	8	3.73	1.42	2.02	3.87	1.34	1.80
8	Which semester are you in now?	0	30	12	3	0	45	4	9	30	18	15	76	0	67	27	7	0	5	12	39	24	20	3.60	0.61	0.37	2.59	1.09	1.19
9	My current major is?	10	16	19	0	0	45	7	17	52	0	0	76	22	36	42	0	0	9	22	68	0	0	3.80	0.78	0.60	3.41	0.65	0.43
Category 4: Extrinsic motivation related to social desire																													
1	I want to be an engineer, because my family (parents) told me to do so	1	4	6	13	21	45	14	13	16	25	8	76	2	9	13	29	47	18	17	21	33	11	1.91	1.07	1.15	3.00	1.29	1.66
2	I want to be an engineer, because my friends/peers told me to do so	2	1	4	11	27	45	11	11	15	26	13	76	4	2	9	24	60	14	14	20	34	17	1.67	1.03	1.07	2.75	1.30	1.69