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Career Self –Efficacy of Undergraduate Students in Science Technology Engineering Mathematics (STEM)

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Abstract: *Career self-efficacy is an individual's ability to identify the potential for systematic career planning. This study aimed to identify the level of career self-efficacy, differences self -efficacy in the field of study and differences in self-efficacy between genders among STEM students. This study was conducted using a combination of descriptive and inferential type study design to 1632 undergraduate students in a Public University. The findings of the study show that the level of career self-efficacy among STEM students is high. There are significant differences between fields of study for career self-efficacy ($F (1632) = 14.515$, $p <0.05$), while there was no significant difference between genders for career self-efficacy, $t (1632) = 0.060$, $p <0.05$. The results of this study clearly show that STEM fields of study influence students career self -efficacy. The implications of the study make it clear that STEM students need to be focused in decision making to improve career self-efficacy. The suggestion for further study is to expand the study location and make comparisons in several educational institutions.*

KEYWORDS *- Career Self -Efficacy, STEM Field of Study, Academic Level, Gender*

I. Introduction

Self-efficacy is the basic preparation for self-motivation, well-being, and personal achievement. This is because individuals have a high incentive to face challenges and can generate the desired results when the individual is given trust. Career self-efficacy is an individual's ability to identify the potential for systematic career planning. Self-efficacy is defined as the ability of an individual to make judgments, organize and implement desired actions to achieve desired goals based on the skills possessed [1].

In addition, self-efficacy is one of the positive personalities of that can be formed through learning [2]. Based on the Socio-Cognitive theory developed by Albert Bandura (1986) emphasizes on the cognition of self regulation especially with the expectations of self-efficacy which is in line with the main traits that want to be highlighted by Bandura. Career self-efficacy is conceptualized to the dynamic nature as well as ever changing self perceptions where individuals will stick to their ability in performing certain tasks. Individual career choice in perspective of Social Cognitive Career Theory (SCCT) asserts that individuals learn through observation of others who are more expert and knowledgeable [3].

Careers in science, technology, engineering and mathematics (STEM) are seen to help prepare generations for this industry by integrating and applying all four fields in the real world. STEM is important in the development of generations and the future of the country in increasing competitiveness as well as the development of current technology and high career opportunities in these fields compared to other fields [4]. This approach is also seen to be able to realize Malaysia's aspiration to become a high income developed

country through quality human resources and a nation of creators [5]. STEM education is an approach that explores teaching and learning between any one to two components of STEM or more with other disciplines [6].

In line with the provisions of the 2020 Economic Budget that has been tabled, the government will allocate RM11 million through the Ministry of Energy Science, Technology, Environment and Climate Change (MESTECC) to encourage more students into STEM. According to the National STEM Movement, Prof Datuk Dr Naraini Idris, learning methods in STEM should be more attractive as the statistics of students who follow STEM are only 19 percent of the approximately 447,000 candidates who sit for the Form Three Assessment (PT3) choose to enter the science stream when set foot into form four [7].

II. Literature Review

Literature review have found that there are significant gender differences on individual career self-efficacy [8]. However, there are also past studies that show that there is no difference between gender and career self-efficacy. Usually this can be seen through some STEM job career fields such as engineering. This is due to the learning experience that determines a person's willingness, interests, and socio cultural aspects such as society's view of women who are already married are not compatible to venture into the field of engineering,

It is also closely related to the selection of current streams in Secondary Schools which play the role of career selection in this field. There are four factors that contribute to this situation, namely STEM related careers, quality in teaching and learning, curriculum and awareness and importance of science and technology [9].

Most of the impacts related to STEM integration are carried out at higher levels or at universities. This has led to a lack of exposure to STEM activities at an earlier stage [10]. Thus, indirectly this matter contributesto lack of knowledge, awareness or interest in STEM learning. This is also supported by the findings obtained in the study of Shahali [10] that one of the characteristics of an effective science curriculum is exposure at an early stage as well as the intervention process.

Furthermore, the self-efficacy of individual careers, especially in the field of teaching showed no significant differences based on gender, age and professional qualifications [11]. However, high self-efficacy cannot anticipate consistent behavior if the individual believes that the outcome of the behavior has undesirable effects and this also indicates that low levels of individual career self-efficacy are likely from outcomes influenced by his external or internal environment [12].

III. Research Objective

- Identify the level of career self-efficacy among STEM students
- Determining differences in self-efficacy between genders among STEM students
- Determining differences in self-efficacy between STEM fields

This study is important to see the level of self-efficacy of students who follow the field of STEM based on the three objectives of the study so that the university can help students through programs or interventions to identify their potential and ability in making systematic career planning.

IV. Methodology

This study uses a survey study design that aims to identify the level of career self-efficacy and comparisons between fields of study and gender. The sample of this study consisted of 1632 students in a public university. Study participants are students from seven faculties in the field of STEM namely the Faculty of Health Sciences (FSK), Faculty of Dentistry (FGG), Faculty of Technology and Information Science (FTSM), Faculty of

Engineering and Built Environment (FKAB), Faculty of Science and Technology (FST), Faculty of Medicine (FPER) and Faculty of Pharmacy (FFAR). The study was conducted using a combination of descriptive, and inferential type study design. There were two sections of the questionnaire that were distributed to the study participants.

The CDSME test tool is a test tool that has been developed by Betz, Klein and Taylor (1996). However the CDMSE was converted to the Career Decision Self-Efficacy Scale Short Form (CDSE-SF) by Betz and Taylor in 2006. The questionnaire contained 25 items that were modified from the original 50 items and measured self-sub constructivity including self-knowledge, information career, selection goals, planning and problem solving. This test tool has several subscales to measure self-efficacy including self knowledge, job information, choice goals, planning and problem solving. The marking of the CDSE -SF measurement tool uses a five point likert scale in which each question posed has five scale dimensions, namely (1) - (Very Unsure) to (5) - (Very Confident). The mean score of interpretation is 1.00 to 2 [13].

The confidence values obtained for the entire Cronbach alpha scots were .96 and the Cronbach alpha values for the five subscales ranged from 0.086 to 0.89. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. There are two types of statistical analysis used in this study, which is descriptive analysis and inferential statistical analysis. Descriptive analysis is mean, percentage standard deviation and frequency. While, the inferential statistics are t-test and regression.

V. Findings

Table 1 below shows the descriptive analysis consisting of frequency and percentage for gender profile, faculty and program of study according to the study conducted. Table 1 shows the demographics of the study respondents which is a total of 1632 respondents. The total number of male respondents was 517 (31.7%) and 1115 (68.3%) female respondents. Based on the faculty category, there are seven faculties involved, there is a total of 618 students (37.2%) in FST, 328 students (20.1%) in FKAB, 190 students (11.6%) in FTSM, 53 students (3.2%) in FFAR, 156 students (9.6%) in FPER, 250 students (15.3%) in FSK and 37 students (2.3%) in FGG. Meanwhile, the total number of STEM study programs was 496 students (30.4%) representing S, 190 students (11.6%) representing T, 328 students (20.1%) representing E and 618 students (37.9%) representing M.

Table 1: Gender Profile, Faculty and program of study

Demographics	Frequency	Percentage (%)
Gender		
Man	517	31.7
Women	1115	68.3
Total	**1632**	**100**
Faculty		
FST	618	37.9
FCAB	328	20.1
FTSM	190	11.6
FFAR	53	3.2
FPER	156	9.6
FSK	250	15.3
FGG	37	2.3
Program of Study		
Science	496	30.4
Technology	190	11.6
Engineering	328	20.1

Mathematic	618	37.9

5.1 Levels of Career Self -Efficacy among STEM Students

The findings of the study in table 2 show three levels of career self -efficacy among STEM students, namely low, medium and high levels. There are a total of 1078 students (66.1%) are at high level, 543 students (33.3%) are at medium level and 11 students (7%) are at low level.

Table 2: Levels of Career Self-Efficacy of STEM Students

Level of self -efficacy	Frequency	Percentage %
Low	11	7
Medium	543	33.3
High	1078	66.1

5.2 Differences in Self-Efficacy Between Gender Among STEM Students

The findings in table 3 show that there is no difference in the level of self -efficacy based on gender. t (1632) = .060, p> .05. However, the value of the level of self-efficacy among males is higher than that of female students. This indicates that there is no significant difference between Self- efficacy based on gender.

Table 3: Differences in Self-Efficacy between the Gender

Gender	Number (N)	Min	Standard deviation	The value of T	Significance Level
Man	517	2.6770	.49230	1.314	.060
Women	1115	2.6427	.48869	1.311	

5.3 Differences in Self -Efficacy Between STEM Fields

The findings in table 4 found that the value of t was significant (F (1, 1632) = 14.515, p = .000, p <0.05) for the life satisfaction level variable. Thus, these results indicate that there is a significant difference between student self-efficacy and STEM fields.

Table 4: Differences in Self -Efficacy between STEM Fields

Causes of variation	JKD	dk	MKD	F	Sig. p
STEM field					
Between groups	22,861	1	22,861	14,515	.000
In Group	2557.744	1631	1,575		
Total	2580,605	1632			

*significant in the direction of p <0.05

VI. Discussion and Implications

The results of this study clearly indicate that STEM fields of study influence students 'career self-efficacy. This is because an individual especially students need to have a certain strategy in their career development in the future especially jobs in the STEM field. In implementing career development strategies, long term target setting needs to be done for the next five to ten years [14]. Individuals with low self-efficacy are usually not interested in seeking information about careers and do not want to make the best decisions in career choices [15].

At in addition, educational institutions should also play an important role in maintaining and increasing students interest in STEM such as providing assistance in the success of programs organized by STEM students as well as holding various courses that can help improve students skills in STEM careers [16].

The implications of the study make it clear that STEM students need to be focused in decision making to improve career self-efficacy. The proposal for further study is to expand the study location and make comparisons in several educational institutions. The results of the analysis deductively prove that the use of current curriculum and teaching strategies and practices should be more focused on real world problems. The results of this study were conducted on six STEM secondary schools around the United States that practice different organizations [17].

Students need to be exposed to challenges and problems that always occur in daily life and need to be trained to use the knowledge learned to find solutions to problems that they faces. The academic performance of students exposed to STEM education is better than students who do not receive exposure to STEM education [18]. Through STEM Education, students are able to think more creatively and critically.

In addition, government, industry or private initiatives need to be further expanded so that it can provide more employment opportunities in the field of STEM to STEM graduates. STEM related career forums are held as one of the mediums for exposure to the general public about the latest demands of local and foreign industries for highly skilled manpower [10]. Therefore, a more formal and structured cooperation between the industry, NGO and the media with schools, colleges and universities needs to be established.

VII. Conclusion

Efforts to provide awareness to all parties need to be stepped up. The help and support of parents, schools, industry, NGO, the private sector and the mass media must play a role in this effort so that the goals that have been targeted in STEM education at the national level can be achieved for the good of the country and the nation in the future. Indirectly, this can help increase the percentage of students engaging in choosing science and technology fields in their studies.

Therefore, STEM activities are seen to be able to attract interest and increase students motivation in deepening their knowledge in the field of Science. Students should also be exposed to the challenges and problems that always occur in daily life and trained to use the knowledge learned to find solutions to problems. They will appreciate and feel more meaningful learning compared to conventional Science learning methods. Furthermore, with the exposure given is able to increase the level of self-efficacy of students careers in STEM and more inclined and bold to try to explore something new through activities conducted in STEM education.

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