

The Alignment between Career Interests and STEM Careers of Secondary School Students

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Abstract: Satisfaction in choosing a career is important and could be achieved when a person chooses his career in line with the personality and environment. This would usually create a strong job orientation. This study aims to identify the STEM career interest tendency of form two students and measure the relationship between career interests and STEM careers. This study used a survey design. A total of 53 form two students were involved as study respondents consisted of 14 males and 39 females. The instrument used was Career Exploration, adapted from the Self-Directed Search (SDS) test. Data were analysed descriptively and inferentially using SPSS Windows version 23.0. The findings of the study showed that Holland's three-point codes (Holland, 1989) for STEM careers were Social, Investigative, and Realistic (S-I-R). Most STEM interests fit the People-Things dimension. However, Chi-squared test showed significant misalignment between STEM careers and career interests ($\chi^2(5) = 10.87, p > .05$). Researchers suggested that career counsellors assess the importance of career interests in explaining and describing STEM careers. Future studies should emphasize on identifying the personalities and career interests of students before being employed as well as selecting more samples. Suggestions for further studies includes the study of the relationship between STEM career interests and parental influence, career alignment and job satisfaction, career alignment and job motivation, career alignment and achievement and productivity, gender characteristics and job satisfaction as well as career alignment and life satisfaction.

Keywords: Career Interests, Holland, STEM Careers, Personalities

I. Introduction

Career interest is the students' tendency of to a field and their interest in the job activities. If a person is interested in a career then the individual will work harder to achieve or get the job opportunity he is interested in [1]. Not only that, the students will be more eager to learn deeper in the areas of interest. The importance of aligning the field of career pursued by each student in terms of personality will be studied because it determines the success of a student in their career [2]. Holland Career Typology theory in 1986 was used as the basis for the development of the test instruments because this theory is easy to understand and can be tested empirically according to the suitability of the individual and the environment. This theory has three main components namely individual, environment and compatibility between the individuals and the environment. The career choice of an individual is based on personality and some other variables in the job background [3].

Holland who introduced Holland's Typological theory in 1985 and 1997 argued that career choice must be in line with individual characteristics. For example, for students who want to pursue a medical course, there are two trait personalities namely investigative and social which is believed to be important. Analysis, rationality, intellectual and curiosity are among the characteristics included in the investigative trait, while the social nature traits are empathy, friendliness, understanding and accommodating. When there is harmony between personality traits and environment traits, then the individual is said to be in alignment with the career.

An aligned career choice will be able to reduce and avoid job changes. The implication of this statement is the need to get the 'right individual for the right job' so that the employment can be increased to the optimum level. He also stressed that when there is an alignment between personality and environmental traits, then individuals are said to get the appropriate career. This alignment will in turn be showcased through the seriousness and skill in the individual's career. The studies of Norwati Mohd. Jab (1982), CheZaharaChe Mat (1992), Rohany Nasir (1981), and Habibah Md. So'ad (1991) has proven that individuals who do work that suits their personality are more likely to stay in the job than those who do the opposite. Holland Typological Theory in 1985 and 1997 describes a person's vocational behavior by looking at personality-environment interactions. This behavior is related to the effect of interaction between six personality types (Realistic, Investigative, Artistic, Social, Enterprising and Conventional) with a work environment that is said to have the same type. An individual is said to strive to find a work environment that is in line with his personality because that environment provides him the opportunity to use the skills, demonstrate the abilities and display the values he held [2].

The emergence of a new wave of technology known as 'The Fourth Industrial Revolution (Industry 4.0) and the era of 'Digital Economy' which resulted in an increasing employment opportunity for graduates specializing in STEM careers. According to the Ministry of Science, Technology, and Innovation (MOSTI), Malaysia needs 500,000 workers in the field of STEM by 2020. However, STEM field involvement among students in Malaysia is declining, not only in schools but in institutions of higher learning[4]. STEM careers require highly skilled individuals with complex problem-solving skills, oral and written communication skills, emotional intelligence, creative and the ability to be a leader as well as team members and to adapt to the world of Industrial Revolution 4.0 careers.

STEM education is a lifelong learning that integrates science, technology, engineering, and mathematics formally based on the curriculum. STEM education can also be implemented informally through co-academic and co-curricular activities. STEM education can contribute towards producing a society with STEM literacy as well as providing a highly skilled STEM workforce that can contribute to new innovations [5].

Senior Lecturer, Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia (UTHM) Dr Shahiron Shahidan said, STEM education is a priority for schools and universities towards dignifying and strengthening the field to the younger generation. He said STEM education emphasizes the concept based on 4C components, namely communication, cooperation, creativity and critical thinking as contained in the 21st century learning (PAK-21) as well as higher order thinking skills (HOTS) required in any field of work. Exposure to STEM should be implemented at an early stage. This is because, the initial exposure to STEM activities can positively have a high impact on a student's perception of the science stream. As a result, it can also increase students' interest in STEM and increase their tendency to choose and pursue STEM at a higher level. This will eventually increase the number of graduates who venture into the career field based on STEM [6].

The level of STEM knowledge of an individual has a direct impact on the intention to pursue STEM careers in the future [7]. Lack of knowledge will put students at risk by rejecting STEM-based career paths as a potential option for them in the future. As a result, students' interest in a STEM career will diminish, which will negatively affect their desire to participate in activities that serve to enhance STEM career knowledge and awareness. School counsellors play an important role in exposing students to the field of STEM that is being actively promoted in the outside world.

In short, it is important for students to be equipped with specialized knowledge and skills to face the challenges of STEM career, thereby continuing to contribute to the national productivity and the development through innovations. In addition, the importance of career fields alignment for each student in terms of personality will be studied because it determines the success of a student in a career. Career alignment is said to be able to help deal with any job-related dissatisfaction and problems to avoid the occurrence of job changes in a short time. This is because job alignment enhances motivation, satisfaction, achievement, productivity, and job retention [2].

In relation to the above discussion, this study presents some research questions to be studied: (1) What is the specific profile of the STEM career interest characteristics of secondary school students? (2) Is there an

alignment between personality types
andSTEMcareers?

II. Methodology

The research design was a quantitative in the form of survey. The population to be investigated was secondary schools students in Kajang. A total of 53 Form 2 students from SMK Sungai Ramal Kajang which consisted of 39 girls and 14 boys aged 14 years was chosen through purposeful sampling. They were selected as respondents because they are at the stage of making the choice for the streams most suitable in Form 4 based on career intentions, interests, and aspirations. The instrument used in this study is Xplorasi Inspirasi Kerjaya Impian (Dream Career Inspiration Exploration), a copyright of AmlaHj. Mohd. Salleh 2012 and it is a test of career interests planned for career counselling, career planning, and career exploration. The Dream Career Inspiration Exploration is an inventory that assesses the importance of career (Holland, 1997), according to personality types such as realistic, investigative, artistic, social, enterprising, and conventional.

This study used questionnaires that contained three sections, A, B and C. The measurements are made according to the three domains of behaviors, namely the preferred domain in section A which includes things that one likes to do, the domain of abilities in section B, that are things that can be done and the domain of knowledge in section C, that is the type of job that students know. Each section contained 30 items and the total of all items were 90. Before answering the test, respondents need to fill in their profiles containing items to obtain personal data of respondents including gender, age, parents' occupation, and ambition. This questionnaire was answered with the aim of identifying the most dominant career interests possessed by the students, identifying the Holland three-point code among the students, and then looking at the alignment between the types of career interests and STEM careers.

The validity of the test has been obtained from several studies conducted among school students and among people working in various technical, vocational, and professional fields over the past two decades (Amla Salleh). All research data and information obtained from the questionnaire were entered and analysed using the Statistical Package for Social Science (SPSS Windows version 23.0) software to obtain descriptive and inferential statistics. Descriptive research is intended to determine the actual situation that occurs during a study[2]and inferential statistics were used to analyse the data to test the hypothesis.

III. Results & Discussion

The data obtained from the questionnaire were analysed using the descriptive statistics to obtain STEM career profile and career interest profile. The results obtained were shown Table 1 and Table 2.

A cross tabulation analysis between gender and STEM careers found that female was more likely to choose the science field that were 22 people while male was more likely to choose the technology field that were five people. Twenty-four (24) people were in science, 6 students in technology, 10 students in engineering, 4 students in mathematics and 9 students in non-STEM careers. Fifty-three (53) respondents were involved including 14 males and 39 females.

The profile of students' career interests in this study is a combination of Social, Investigative and Realistic. The three personality traits that scored the highest were Social (24) in the first dominance category, followed by Investigative (12) in the second dominance category and Realistic (15) in the third dominance category. Holland (Holland, 1989) three-point code for STEM careers in this study was Social-Investigative-Realistic (S-I-R). Most STEM interests fit the People-Things dimension.

Table 3 showed the Chi-square analysis (Test of Contingencies). Since the p-value was greater than the significant level ($\alpha = 0.05$), the results showed that there was no significant relationship between STEM career and career interest in students ($X^2(5) = 10.87, p > .05$). Thus, the null hypothesis failed to be rejected. Instead, we conclude that there was not enough evidence to suggest an alignment between STEM careers and career interests.

This study had shown that Form 2 students have an S-I-E pattern of personality, which is a pattern that is less consistent with the STEM career profession. This pattern is indeed present in the pattern variations found by other researchers. The Social, Investigative and Realistic characteristics that dominate this combination are

less consistent with the characteristics of the STEM career profession assumed by Holland. These personalities are important because the STEM career profession requires them to emphasize the concept of 4Cs that are communication, cooperation, creativity and critical thinking as embodied in 21st century learning (PAK-21) and high-level thinking skills (HLTS).

Based on the findings of the study and the conclusions that have been made, among the several things that need to be planned and emphasized are: (i) Identify the personality and career interests of form two students before being employed. In this case, the use of Inspiration Dream Career Exploration measurement tool needs to be given due consideration as this tool is proven to be valid, reliable, and suitable for use in local culture. (ii) Choosing many samples and not only based on gender factors but also should take into account the masculine-feminine characteristics of a person. This is because there are many careers identified as feminine and masculine in line with Holland's theoretical recommendations. Based on the findings of the study, several further studies can be conducted including studies on the relationship of STEM career interests and parental influence, career coordination and job satisfaction, career coordination and job motivation, career coordination and achievement and productivity, gender characteristics and job satisfaction, and the effect of career alignments on life satisfaction.

Table 1: STEM Career Profile

Dominance Category	Gender	Career interest						Total
		R	I	A	S	E	K	
First Dominance	Male	1	2	0	7	2	2	SIE
	Female	0	8	5	17	6	3	
Second Dominance	Male	2	2	0	5	3	2	SIK
	Female	0	10	4	12	5	8	
Third Dominance	Male	3	2	4	1	2	2	RIE
	Female	12	7	4	2	7	7	

Table 2: Career interest profile according to RIASEK

STEM interests * Gender Cross tabulation				
		Gender		Total
		Male	Female	
STEM interests	Science	2	22	24
	Technology	5	1	6
	Engineering	4	6	10
	Math	2	2	4
	Non	1	8	9
Total		14	39	53

Table 3: Chi-square (Test of Contingencies)

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.867 ^a	5	.054
Likelihood Ratio	10.617	5	.060
Linear-by-Linear Association	1.124	1	.289
N of Valid Cases	2431		

IV. Conclusion

Satisfaction in choosing a job is an important thing and will be achieved when a person chooses his career in line with the personality and environment and thus create a strong job orientation. Career selection is not an easy thing and a person will usually be influenced by the knowledge and factors that are in his environment during the career selection process. Therefore, this study aims to identify students' STEM career interests based on Holland personality. Students will be more eager to learn and delve into specific areas of interest. If a person is interested in a career, then the individual will strive more to achieve or get the job opportunity he is interested.

The results of the study found that these students are inclined to the type of Social personality. This group enjoys working with people in the form of helping, educating, training, guiding, and giving encouragement. They are very good at using words and are interested in human relationships. They are kind, generous, patient, friendly and responsible. The results of the study showed that there is no significant relationship between STEM career and career interest of the form two students of SMK Sungai Ramal. However, the findings of this study are not consistent with the findings of the previous studies. Therefore, the counsellors are expected to utilize the results of this study by understanding the impact of career interests on students' STEM career choices in the future. It was concluded that there was not enough evidence to suggest an alignment between STEM careers and career interests.

In order to safeguard the country's human capital, a larger scale study should be done again in the future by taking the samples from other secondary school students in Malaysia to confirm the findings of this study. The factors that influence the readiness of vocational stream students to choose a career in the field could also be studied [8]. Low levels of knowledge and inaccurate student perceptions limit students' interest in choosing a less known profession as a career. Efforts need to be focused on improving the level of knowledge and correcting students' perceptions of STEM careers. For a profession, the career characteristics that the students are interested in should be properly explained when giving a career consultation. Counsellors play an important role in stimulating career choice motivation among students.

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