**Int. j. adv. multidisc. res. stud.** 2022; 2(3):120-124

**Received:** 28-03-2022
**Accepted:** 08-05-2022

International Journal of Advanced Multidisciplinary Research and Studies

**ISSN: 2583-049X**

# Analysis Student's Career Based on Social Cognitive Career Theory to Develop Students' STEM Career Interests

**[1] Ronal Watrianthos, [2] Decky Antony Kifta, [3] Hendra Sahputra Batubara, [4] Sukardi Sukardi, [5] Syahril Syahril**
[1, 2, 3] Post Graduate Student, Technology and Vocational Education, Universitas Negeri Padang, Padang, Indonesia
[4, 5] Technology and Vocational Education, Universitas Negeri Padang, Padang, Indonesia

Corresponding Author: **Ronal Watrianthos**

**Abstract**
This research attempts to present a profile of students' career interests in Science, Technology, Engineering, and Mathematics (STEM) in Indonesia. This study used a descriptive survey research approach. The STEM-Career Interest Survey was utilized to collect data (STEM-CIS). The survey sample consists of 270 online questionnaires created with Google Forms. Analyzing students' mean STEM-CIS data per question item was performed to define each part of social-cognitive career theory (SCCT). Based on the findings of the STEM-CIS, the average STEM career interest of students in science is 3.35, technology is 3.50, engineering is 2.93, and mathematics is 3.40. A review of Social-Cognitive Career Theory in the STEM sector finds that the technology profession has the highest average score in a vote of 270 students, according to the research findings. The average result expectations score for the technology industry is 4.43.

**Keywords:** STEM, Students' Career, Social-Cognitive Career Theory

## 1. Introduction

The influence of a person's career choice affects them personally. As a result, one poor action might completely alter one's future. Making decisions regarding one's future job is a challenging process for everyone. Those who do not fit in are more likely to be unproductive and inefficient in the workplace. Every student face one of the most challenging and perplexing decisions of their lives when choosing a career. The decision-making process is complicated because it incorporates many aspects that are closely interwoven [1]. When starting, it might be challenging to choose a job route and develop a career-related identity. Some students may not feel prepared to make a career decision because they lack information about the field and potential employers. Students can participate in career exploration to aid in the selection process by actively obtaining and accessing career-related information and gathering information about career opportunities, reflecting on how their current behavior integrates with future careers [2].

STEM education refers to teaching, learning, and integrating the disciplines of science, technology, mathematics, and engineering, emphasizing real-world solving problems. STEM education is divided into four categories: science, technology, engineering, and mathematics. Education in STEM is focused on activities that prepare students for the growth of the new competitive period. Soft skills such as problem-solving, higher-order thinking abilities, and collaborative work are the primary emphasis of STEM learning activities, where the majority of the learning takes place. STEM activities in the classroom can help to improve the quality of the learning process and the consequences of the students' learning. In various categories, including academic success, attitudes, motivation, and higher-order thinking skills, students' learning outcomes differ. Furthermore, according to some research, the learning process and learning results can vary depending on various circumstances, including the subject of study, the length of time spent studying, and even the sort of ambient settings [3].

Using data from the World Economic Forum's Future of Jobs Report 2020, the organization anticipates that 85 million jobs will be eliminated by automation technology by 2025. Meanwhile, a new division of labor between humans, robots, and algorithms will create 97 million new positions. This condition shows that future work will necessitate recruiting qualified human resources in the STEM fields who are also proficient in critical thinking. Unfortunately, this continues to be an issue for Indonesia's younger population. PISA 2018, conducted by the Organization for Economic Cooperation and Development (OECD), reveals that Indonesian students' math competence score is only 72 out of 78 nations. Their science competency score is only ranked 70 out of 78 countries. Over the previous 10-15 years, values in both categories have remained below the world

average and have stagnated or declined [5].

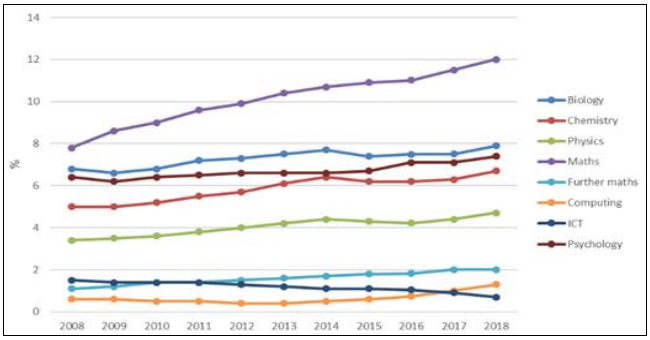


**Fig 1:** Popularity of STEM subjects [4]

Schools have a responsibility to encourage student's interest in STEM fields and to help them improve their professional skills. The character shown in the film is a school counselor that provides pupils with career counseling services in a school setting. The ability to retain student interest in studying is critical, particularly in STEM-related subjects. Numerous factors impact a student's high school career decision. However, school counselors may aid in the development of reasonable result expectations and self-efficacy in all students by promoting positive outcome expectations and boosting self-efficacy. However, there has been an increase in the need for STEM graduates, particularly in Indonesia. A supply of graduates must meet those requirements to improve Indonesia's chances of becoming a globally competitive player in the face of Industry 4.0. As a result, students must have access to the information they may require, such as employment opportunities and academic pathways, to achieve their goal of pursuing a career in the STEM fields [6].

It was discovered in this survey of seventh and ninth-grade students in the four Canadian Atlantic provinces that students in secondary schools had an inadequate understanding of STEM occupations. Additionally, students with poor mathematical self-efficacy (MSE) show a lower interest in jobs in the science, technology, engineering, and mathematics fields. Experiential learning about STEM occupations can improve students' interest in pursuing a career in science, technology, engineering, and mathematics (STEM) [7]. Other studies have revealed that schools have an important influence in orienting students toward careers in the STEM fields. The research results demonstrate that studies have a wide range of results regarding the examined STEM orientation characteristics but are all positively associated with the school impact. Following the theoretical integration and comparison of the findings, it was determined that methodological and theoretical challenges exist for future research on the effects of school orientation and STEM [8].

According to studies on STEM career trajectories among high school students, students' ability to construct successful strategic plans is limited. However, students' ability to develop effective strategic plans is also limited. Students' perceived capacity to deal with situations in the face of prospective obstacles and their contact with their parents may contribute to their assurance and confidence in their future employment [9]. Other researchers have found that race, gender, socioeconomic level, interest in mathematics, and science self-efficacy are the most critical determinants of STEM job goals. The race is the most important predictor of STEM career aspirations. It is recommended that career counselors in schools and other associated career services contexts consider these significant criteria when identifying high school students interested in STEM career alternatives and when implementing career interventions to promote these students' career progression [10].

By utilizing the STEM-CIS instrument, the researchers want to present an overview of students' STEM career interests based on their involvement in SCCT activities. In each question item, certain aspects of SCCT are examined in order to provide school counselors with information that may be utilized to promote kids' interests in STEM-related professions. Some of the proposed activities are also considered throughout student career counseling. SCCT is a well-established theory for examining the relationship between people, their environment, and their cognitive processes in career development.

Specifically, it hypothesizes how self-efficacy and projected outcomes interact with personal inputs and environmental factors during the professional development procedure [11]. SCCT is essentially drawn from social cognitive theory and has been used in STEM research to explain career-related behaviors and expectations in students ranging from high school to college age [12].

## 2. Research methods

This study employs a descriptive survey approach, with data collected from an online survey conducted using Google Forms and distributed across social media networks. The sample included 270 students between the ages of 13 and 15 from various schools throughout Indonesia. This study employed the back translation method to administer the STEM-CIS (STEM Career Interest Survey), which measures interest in careers in science, technology, engineering, and mathematics (STEM). From 0.245 to 0.644 ($r_{table}$ = 0.2356), the validity of the Indonesian translation instrument was found to be valid. The reliability of the Indonesian translation instrument is measured by the Cronbach Alpha coefficient, which ranges between 0.852 to 0.911.

Each question item in the instrument is separated into four areas of study, with 44 questions in total. Each field of study consists of 11 question items, one for each subject of study. The sample was asked to respond to each topic by selecting one of five answer options: strongly disagree (1), slightly disagree (2), neutral (3), agree (4), disagree strongly (5), disagree strongly (6) [13]. To describe the level of student interest in STEM occupations, the mean of the sample replies is used as a proxy. The social-cognitive career theory (SCCT) was used to analyses each question item to determine the factors contributing to high and low student interest in STEM-related occupations. After analyzing, counsellors are provided recommendations for career counselling actions to carry out with their clients.

## 3. Results and discussion

The results of the STEM-CIS survey are divided into four categories of study: Science, Engineering, Technology, and Mathematics (STEM-CIS). Each field has eleven question items - the average for each field is shown in the graphic below.

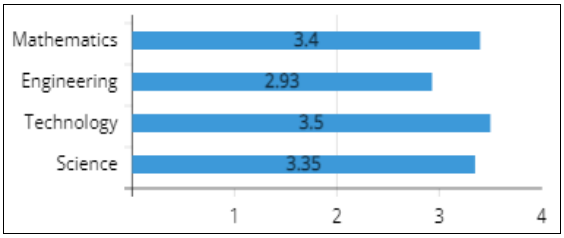


**Fig 2:** The Average for Each Field of the STEM-CIS Survey

Based on the figure above, it can be observed that the average for each field is somewhat lower than average. Averaging 3.35 out of 5 for science and 3.50 out of 5 for technology, the STEM-CIS instrument measures interest in STEM occupations among high school students in grades 3 through 12. As stated in Table 1, the average score achieved by employing the STEM-CIS instrument and assessing different features of SCCT is obtained as given in the following table.

**Table 1:** Average Score Achieved by Employing The STEM-CIS Instrument and SCCT Features (n=270)

| SCCT Features | No. | Science | Technology | Engineering | Mathematics |
|---|---|---|---|---|---|
| Self-Efficacy | 1 | 3.27 | 3.60 | 2.96 | 3.46 |
| | 2 | 3.67 | 3.71 | 2.97 | 3.73 |
| Personal Goals | 3 | 3.30 | 3.64 | 2.91 | 3.32 |
| | 4 | 3.69 | 3.84 | 3.07 | 3.94 |
| Outcome Expectations | 5 | 3.69 | 3.84 | 3.12 | 3.66 |
| | 6 | 3.56 | 4.43 | 3.06 | 3.52 |
| Interest | 7 | 3.20 | 3.82 | 2.82 | 3.06 |
| | 8 | 3.38 | 3.44 | 2.95 | 3.37 |
| Contextual Support | 9 | 2.81 | 3.02 | 2.60 | 2.92 |
| | 10 | 3.15 | 3.35 | 2.77 | 3.25 |
| Personal Input | 11 | 3.16 | 3.36 | 3.04 | 3.18 |
| | 12 | 3.14 | 3.34 | 3.02 | 3.16 |

**Self-Efficacy**

Science has two items with average values of self-efficacy of 3.27 and 3.67 on the self-efficacy scale. This demonstrates that the average student is confident in his or her ability to achieve high marks in science class. It is relatively high for students to believe in their abilities in the subject of technology, with an average value of 3.60 for item number 1 and 3.71 for item number 2. These results imply that students have a strong sense of self-efficacy when it comes to completing activities that require technology. Compared to the other four disciplines of study, engineering students had the lowest average level of self-efficacy. For item number 1, the average self-efficacy of engineering students is 2.96, and for item number 2, the average self-efficacy is 2.97. This might be because students are not entirely aware of activities that require procedures.

When it comes to mathematics, item number 2 has the greatest average student self-efficacy with a score of 3.73. A student's sense of self-efficacy is critical in determining whether or not they will pursue a profession in the sciences, technology, engineering, or math. However, self-efficacy may be both an input and an output, depending on how behavior and the environment interact. It can also be output due to how behavior and the environment interact.

**Personal Goal**

Based on the data in Table 1, it is clear that the typical individual's scientific aim is rather lofty. Personal goals are measured by item number 3 and item number 4 in science, with average scores of 3.30 and 3.69, respectively. When the averages for items 3 and 4 are compared, it can be seen that students have a greater inclination to work harder in science class than they do to intend to utilize science in their future jobs. It was discovered that a significant portion of the reason for this was that working in science was highly demanding and intricate. Consequently, they set aside suggestions that they pursue a profession in Science, Technology, Engineering, and Mathematics (STEM). On technology, item number 3 receives an average rating of 2.91 out of five stars. This data demonstrates that many students are aware of the importance of technology in their future jobs. However, item number 4 had a better overall average of 3.07. As a result, kids are more likely to learn how to use technology to assist them in achieving academic achievement. It is possible to assume from these two factors that more pupils are not future-oriented.

Compared to the other fields, item number 3 had the lowest average score of 2.91 in engineering. In contrast, item number 4 had the lowest average of 3.07 points. These two question items suggest that students have not yet grasped the significance of methods for their future jobs, but they are aware that school activities that use techniques can be beneficial to them in the short term. In mathematics, item number 3 received 3.32 points, while item number 4 received the highest average of 3.94 points. This strengthens the assumption that students are still more concerned with their current activities than with their future ambitions.

**Outcome Expectation**

Item 5 had a relatively high average score of 3.69 in the category of science. This data demonstrates that students understand the necessity of doing well in science to prepare for their future careers after high school. Aside from that, item number 6 in the science sector obtained an overall average score of 3.56 out of 5. In the subject of technology, item number 5 obtained the most significant overall average rating of 3.86 compared to the other fields. Item numbers 5 and 6 in the technical category have the lowest average scores compared to the other fields.

In mathematics, the average score for question number 5 is 3.66, while the average score for question number 6 is 3.52. Even while many students recognize that mathematics may be beneficial to their future employment, many students are still unaware of the types of work available in the field of mathematics.

**Interest**

Item number 7 had an average score of 3.20, while item number 8 received an average of 3.40 in the scientific field. This difference in mean implies that students love learning

science in class but are less likely to pursue a career in science due to this discrepancy. Some students acknowledged that obtaining science-related positions would be extremely tough during interviews. Item number 7 gets an average rating of 2.87, while item number 8 has an average rating of 2.95 in the category of technology. This suggests that students are more engaged in studying and, in particular, in utilizing technology to aid them in classroom tasks. However, they are less interested in pursuing a career in the field of technology itself.

In engineering, item number 7 has an average of 2.82, and item number 8 has an average of 2.95, such that it is low among other disciplines. Researchers assume that the low average is caused by the lack of student awareness about engineering activities and forms of jobs in the engineering profession. While in mathematics, item number 7 and item number 8 obtained an average of 3.06 and 3.37, respectively. Besides being difficult for pupils to work in mathematics, the sorts of work in mathematics are also not commonly understood by students. This causes pupils to be less interested in working in the discipline of mathematics.

**Contextual Support**

In the discipline of science, the average for question number 9 is 2.81, while question number 11 is 3.15. While in the subject of technology, question number 9 has an average of 3.02, and number 11 is 3.35. Based on this average, it can be claimed that many students do not have a role model in the field of technological jobs. In the discipline of engineering, question number 9 is 2.60, and question number 10 is 2.77, making it the lowest among all fields. Among the elements of SCCT, the average for contextual assistance in engineering is likewise the lowest. This is because many students do not grasp engineering tasks and professions of engineering. In addition, due to insufficient expertise in engineering, students often find it challenging to discover role models that operate in this profession. In mathematics, problem number 9 has an average of 2.92, whereas problem number 11 has an average of 3.25. Based on these data, it is apparent that many students cannot decide whether one has a career in mathematics. This is because students' understanding of the sorts of careers in mathematics is insufficient.

**Personal Input**

In science, the averages are 3.16 and 3.14. This chart indicates that students' self-efficacy in the subject of science is still insufficient. Meanwhile, although the average is the highest among other fields in the field of technology, namely 3.36 and 3.34, it still demonstrates that students are not happy with a career in technology. Engineering earned the lowest averages of 3.04 and 3.02, while mathematics was 3.18 and 3.16. Based on the average of the two fields, it further strengthens those students do not have adequate self-confidence and self-efficacy for a career in the STEM sector.

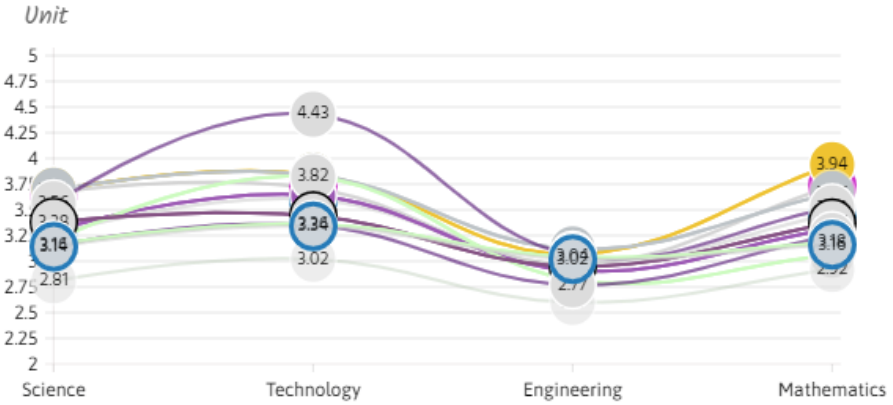


**Fig 3:** Analysis of Social-Cognitive Career Theory in the STEM Sector

In a survey of 270 students, a review of Social-Cognitive Career Theory in the STEM sector reveals that the technology field has the highest average score, according to the study results. In terms of outcome expectations, the technology sector has an average score of 4.43, as shown in Figure 3. When it comes to outcome expectations, they are defined as the expected results of engaging in specific behaviors [3]. For example, financial, social anticipation, and self-evaluation are all categories that have similar result expectancies and hence influence behavior while choosing a career. Career counseling strategies are influenced by the significance of outcome expectations, which impacts the repercussions of actions [11].

## 4. Conclusion

According to the STEM-CIS results, the average career interest in science was 3.35, 3.50 in technology, 2.93 in engineering, and 3.40 in mathematics. The SCCT analysis based on each question item on the STEM-CIS reveals the factors contributing to students' lack of interest in STEM occupations. Among them include a lack of knowledge and student curiosity regarding STEM jobs, a lack of student self-efficacy to engage in STEM areas, a student orientation that focuses on current activities rather than future ambitions, and a lack of externalities. Assistance from the educational and familial environments, according to the study results, a review of Social-Cognitive Career Theory in the STEM sector in a survey of 270 students showed that the technology sector has the highest average score. The technology sector has an average score of 4.43 in terms of result expectations.

## 5. References

1. Asma Shahid Kazi and Abeeda Akhlaq, “Factors Affecting Students’ Career Choice,” Journal of Research and Reflections in Education. 2017; 11(2).
2. Kleine AK, Schmitt A, Wisse B. Students’ career exploration: A meta-analysis. Journal of Vocational

Behavior. 2021; 131:p103645.
Doi: 10.1016/j.jvb.2021.103645.
3. Winarno N, Widodo A, Rusdiana D, Rochintaniawati D, Afifah RMA. Profile of Pre-Service Science Teachers Based on STEM Career Interest Survey. J. Phys.: Conf. Ser. 2017; 895:p012170.
Doi: 10.1088/1742-6596/895/1/012170.
4. CaSE. Rise in STEM popularity amongst A-level students.
https://www.sciencecampaign.org.uk/news-media/case-comment/rise-in-stem-popularity-amongst-a-level-students.html (accessed May 10, 2022).
5. Ghani Nurcahyadi. Era Digitalisasi, Minat Siswa pada Bidang STEM Terus Diasah, 2021.
https://mediaindonesia.com/humaniora/409671/era-digitalisasi-minat-siswa-pada-bidang-stem-terus-diasah (accessed May 10, 2022).
6. Li J, Mau WCJ, Chen SJ, Lin TC, Lin TY. A Qualitative Exploration of STEM Career Development of High School Students in Taiwan. Journal of Career Development. 2021; 48(2):120-134.
Doi: 10.1177/0894845319830525.
7. Blotnicky KA, Franz-Odendaal T, French F, Joy P. A study of the correlation between STEM career knowledge, mathematics self-efficacy, career interests, and career activities on the likelihood of pursuing a STEM career among middle school students. IJ STEM Ed. 2018; 5(1):p22. Doi: 10.1186/s40594-018-0118-3.
8. Reinhold S, Holzberger D, Seidel T. Encouraging a career in science: a research review of secondary schools' effects on students' STEM orientation," Studies in Science Education. 2018; 54(1):69-103.
Doi: 10.1080/03057267.2018.1442900.
9. Zhang L, Barnett M. How high school students envision their STEM career pathways," Cult Stud of Sci Educ. 2015; 10(3):637-656. Doi: 10.1007/s11422-013-9557-9.
10. Mau WCJ, Li J. Factors Influencing STEM Career Aspirations of Underrepresented High School Students. The Career Development Quarterly. 2018; 66(3):246-258. Doi: 10.1002/cdq.12146.
11. Lent RW, Brown SD, Hackett G. Toward a Unifying Social Cognitive Theory of Career and Academic Interest, Choice, and Performance. Journal of Vocational Behavior. 1994; 45(1):79-122.
Doi: 10.1006/jvbe.1994.1027.
12. Brown SD, Lent RW. Eds., Career development and counseling: putting theory and research to work, Third Edition. Hoboken: Wiley, 2020.
13. Ronal Watrianthos, Decky Antony Kifta, Hendra Sahputra Batubara, Sukardi Sukardi, and Syahril Syahril. Determining the Impact of Student Self-Regulation and Emotional Regulation on Collaborative Work Groups. International Journal of Advanced Multidisciplinary Research and Studies. 2022; 2(2).