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Acquiring Practical and Soft Skills Through Field Work among Science Students in Higher Education Institutions

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Abstract

Practical and soft skills are the components that have significant impact on the development of outstanding human capital. This study aims to examine the mastery level of practical and soft skills. Practical skills include the ability of students to carry out work in the field, the ability of students to handle work equipment and on the student's manipulative skills. While soft skills involve student's collaborative and communication skills. 130 science students at a higher education institution participated in this study. Through the use of a questionnaire-based survey method, this study is quantitative. Findings showed practical skills that include the ability of students to carry out field work are at a moderate level, while the level is high for the student's ability to handle work equipment and on the student's manipulative skills. The level of soft skills, which include collaborative and communication skills, is high. One of the implications is to continue field work in ensuring the developing of human capital among students. It is also advised to do further study on various skills in accordance with their relevance to help students prepare for the demands of the profession.

Keywords: Practical Skills, Soft Skills, Science Students, Field Work, Higher Education Institutions

Introduction

The current globalization that has changes the economy from production-based to knowledge-based emphasizes the formation of a workforce that is knowledgeable, skilled and capable in applying the knowledge possessed in the production process while achieving high output. According to this demand, Malaysia is observed to have begun to implement a major change in obtaining workforce skills to ensure the country's progress is achieved. Thus, the emergence of the knowledge-based economy and the relationship between skills and performance at work has contributed to the importance and increased demand for generic skills. According to Masrakin and Ramli (2018), companies must consider graduates' abilities and talents in addition to their academic credentials in order to meet the demands of today's job market. Graduates' marketability truly indicates how well diverse parties have been able to build capable human capital.

Enhancing practical and soft skills through fieldwork conducted at universities is one of the activities that might help develop human capital. Fieldwork is a more efficient method of delivering education that may spark students' interests. Additionally, this teaching method can boost students' desire for academic success, make learning enjoyable, and enhance their skill mastery (Jenal, 2018). The country's desire to produce knowledgeable and skilled individuals is the main factor towards the status of a developed and high-income country. Therefore, in order to realize this goal, educational institutions are given the main role to produce graduates who not only have excellent academic results but also have a high level of skill mastery. Students are provided the opportunity and space to engage in independent activities during fieldwork. The goal of the learning is to create student of high values and to help them develop their own talents so they are prepared to take on challenges of modern education (Hamzah & Ishak, 2021).

The necessity for students to compete for jobs after graduation in the 21st century is frequently mentioned as being related to their soft skills. The potential of students to grow in science while also gaining extended employment in life is causing an increase in graduate rivalry, which is in accordance with the current trend of modernization (Ling et al., 2020). Without a sure, the number of bright people is growing, which is also one of the reasons that graduates are currently facing difficulties in the struggle for employment. Nowadays, the industry demands that graduates have a mastery of soft skills in order to be qualified for work. Therefore, students' soft skills can be developed through a range of fieldwork activities to help them become competitive in the job.

The adoption of this study is crucial since it has served as the primary foundation for determining how employable graduates are to live their lives after graduation. Students will be able to perform work in the field, ensuring tasks are completed, operate work equipment to guarantee a task is successful, and handle work equipment efficiently based on the practical skills they have learned through fieldwork. While it will be feasible to guarantee that students have communication skills for delivering evidence and understanding in public as well as collaborative abilities for collaborating, for the purpose of learning soft skills. To accomplish the study's objectives, it is necessary to investigate the degree of mastery of these skills.

Literature Review

Fieldwork Among Science Students

Fieldwork is an activity that takes place outside of the classroom to apply learning theories in a real-world setting and necessitates a variety of abilities to be successful. According to the Ministry of Higher Education (MoHE) (2020), among the strategies outlined in the Entrepreneurship Action Plan Higher Education Institutions 2021-2025 to overcome the upcoming challenges is the effort to nurture the talents and values of graduates. This strategy intends to support the success of graduates who are knowledgeable, highly competent, sustainable, and competitive. Therefore, one of the required components of the science curriculum for student instruction is fieldwork activities. Fieldwork experiences can introduce students to the field early and help them develop a variety of abilities. Research that is conducted in the field using a theoretical framework is also regarded as a sort of scientific fieldwork (Siregar, 2019).

Students can acquire a topic through their observation of their environment as part of this fieldwork-based learning approach. Students can gain a deeper understanding of the discipline of work through fieldwork, such as in the workplace, which is actually very different

from the college classroom setting. According to Jenal (2018), fieldwork is a good way for students to get their first taste of the workplace, solve problems, and learn about careers in the field they are studying. Thus, learning outside of lecture times also enables greater, quicker adaptability and enhancement of students' knowledge and experience. Students are better able to organise their prior knowledge and use it in practical settings when learning concepts are connected to the actual world. Students can experience the surroundings and learn about the working circumstances in the actual world through field work activities.

Mastery Level of Practical Skills Through Fieldwork

The practical skills of students are frequently required for their effectiveness in operating work procedures, their capacity to succeed in activities during work, and their proficiency in using work equipment in the field. Therefore, another talent that falls under practical skills is manipulative skills that are effective when manipulating work equipment. Students' practical abilities are evaluated through fieldwork in order to determine their level of comprehension and their capacity to apply theoretical information in the field site. Manap and Buntat (2021) claim that students who rely solely on knowledge are inadequate to meet the demands of a developed, strong, and competitive industry. The industry is now concentrating on qualified individuals with a high level of integrity combined with the requirement for practical abilities in addition to the knowledge that is already known theoretically. The level of practical skill mastery becomes a crucial goal for students to reach because it determines how marketable graduates are to employers.

Implementing problem-based learning, where science process skills will be used, is one of the activities in teaching and learning science that are strongly related to practical skills. Students who are working on their science process skills undertake experiments that combine their classroom learning with practical experience. This teaching method works well in allowing students to demonstrate their talents in the activities they complete. By referring to a variety of resources as the early formation of the learning process, students can identify problems from existing knowledge using the problem-based learning technique in order to overcome issues that arise during scientific research, students must handle procedures in the most effective way possible. Through problem-based learning activities, it is possible to observe how individuals handle tools and their abilities for investigations. Therefore, it can be proven that problem-based learning forms an effective learning process (Yahya et al., 2020) that encourages students to explore learning through real-world situations and helps them develop their experimental skills.

There is also a requirement for manipulative skills that support students' ability to operate equipment in the development of human capital. The importance of manipulative skills may be established from the empowerment of science concepts, which also helps students perform better in science curriculum, according to Han et al. (2018) study. Therefore, this empowerment can be implemented in the experimental class during class time or outside of lecture like fieldwork. This provides a valuable and engaging learning experience by allowing students to handle the task directly. Emphasis on manipulative skills is a talent that is necessary for every student to master in order to ensure that the fieldwork activity's goal can be achieved. As a result, this ability can also guarantee that all the tools used during fieldwork are appropriate for the tasks at concern.

A balanced student will emerge as a result of the use of an active, environment-appropriate teaching methodology. Thus, it is obvious that having practical skills will be extremely important in the global workplace once students graduate. According to Yusof and

Mohiddin (2018), industrial training programmes are considered as helping to raise the credibility of students to become professional workers in a variety of disciplines in addition to creating quality graduates. One semester of instruction, spanning between four and six months, is used to develop students' academic and practical abilities as well as their undiscovered talents (Ngadiman & Jamaludin, 2018). Students will have the chance to perform actual work that requires the application of their knowledge and abilities through industrial training. In order to ensure that work assignments can be completed, students will better understand and be able to use each function of the tools and techniques used in the workplace. As a result, new skills might be discovered over time through the completion of each assignment activity.

Mastery Level of Soft Skills Through Fieldwork

Soft skills, in addition to the practical skills gained through fieldwork, serve an essential part in the development of a student's personality. National education nowadays plays a crucial role in ensuring that human capital development is accomplished by offering activities that include students in training themselves in all Human Skills-related aspects (Rameshan & Hamzah, 2022). The mastery of these abilities is essential for overcoming the graduates' marketability dilemma, as they lack the skills required for job markets. As a result, the MoHE soft skills module was created based on several kinds of learning theories, including cognitive, behaviourist, and social theories. These theories are the basis for the development of soft skills modules and structures that are frequently utilised by Public Institutes in Malaysia. The theory of multiple intelligences and the theory applied during the teaching and learning session are considered to have a good impact on the potential and career development of graduates, according to a study by (Zakaria and Daud, 2021).

These two key soft skills—collaborative and communication skills—are frequently emphasised by all participants in this study. A collaborative skills approach to learning enables students to collaborate and engage in small groups. By assisting and providing a solution to a problem, collaborative learning promotes students' productivity. Group activities develop mutual need and an encouraging dependence on one another (Abu Kasim & Tasir, 2022). Along with sharing ideas to build upon and utilise their own experiences, strategies, and knowledge, students are also expected to respect one another's viewpoints by encouraging and supporting others. A study by Radin and Yasin (2018) that claims collaborative skills also give students possibilities in a more balanced learning environment from physical, emotional, spiritual, and intellectual elements supports this claim. It is obvious that collaboration helps students learn concepts better.

General communication abilities can help students learn more and offer them a better comprehension of a task. This skill-based approach can help students become more socially adept and more comfortable speaking in front of groups and the general public. According to Rameshan & Hamzah (2022), high-quality public speaking exercises can improve students communication confidence. The ability to master this talent is crucial for each student's ability to communicate vital information with charm and attractiveness. In order to influence other people's perceptions, attitudes, and behaviours of other parties in order gain acceptance for a task, communication skills are also an essential component. (Ibrahim & Mahbob, 2021). Thus, it is evident that developing students' practical and soft skills through field work is vital to assuring their success.

Methodology

Through the use of a questionnaire-based survey method, this study is quantitative. The items for the questionnaire were made available online via a Google Form link. The samples are randomly selected from 130 students who enrolled in science related programme from Faculty of Science and Technology, Universiti Kebangsaan Malaysia (UKM).

A questionnaire that was used in the set of surveys that was given out was modified from research by Othman, Ramli, and Sukor in 2018 and Mat et al. in 2017. The content of questionnaires created from modified sources is improved to align them with the study's objectives. The research tool, a questionnaire, is divided into three parts, with Part A containing demographic information about the respondents, including gender, year of study, and level of study. Part B includes field work with 19 items to demonstrate mastery of practical skills. While component C contains 13 items that measure soft skill expertise on the job. There are 32 items in all, each measuring the degree of skill proficiency using a five-point Likert scale.

Experts also assessed the research questionnaire to assess the validity of the research instrument. The chosen experts are professionals with a background in the industry whose expertise is directly tied to the students' practical and soft skills. When measuring instrument reliability, the Cronbach Alpha value (0–1) is used; the closer the number is to 1, the more reliable the questionnaire item is. The examined subconstructs are listed in Table 1.

Table 1
Constructs of practical skills

Subconstruct	Definition	Item
Students' Ability to Carry Out Field Work	Ensuring that every task and issue that arises during fieldwork can be successfully managed by using knowledge and exchanging ideas.	8
Student Ability in Handling Work Equipment	The success of a task is determined by a student's capacity for using and operating appropriate equipment.	5
Manipulative Skills	Possessing the hands-on abilities necessary to complete a task quickly and precisely while applying scientific equipment.	6

Table 2
Constructs of soft skills

Subconstruct	Definition	Item
Collaborative Skills	Involves the sharing of information and ideas in achieving common progress and ensuring that teamwork can be implemented with the proliferation of new creative and innovative ideas.	6
Communication Skills	Increase knowledge and provide a clear understanding of the field work activities held to increase the network and showcase the talent skills possessed.	7

Information from the Google Form was used to collect data and SPSS software was used for statistical analysis. In this study, the level of mastery of each analysed subconstruct is

determined by identifying the mean, standard deviation, frequency, and percentage. Three levels—high, medium, and low—are used to categorise the level of mastery of practical and soft skills acquired during fieldwork. Table 3 shows the various ways the mean score might be interpreted in order to classify the skill level.

Table 3
Mean Score Interpretation Range

Mean Score	Interpretation
1.00 – 2.33	Low
2.34 – 3.66	Moderate
3.67 – 5.00	High

Source: Ahmad (2002)

Findings

130 people participated in the study, of whom 81 (62.3%) female and 49 (37.3%) male provided data for the study. There were 95 Malay students (73.1%), 16 Chinese students (12.3%), 10 Indian students (7.7%), and nine bumiputera students (6.9%), it was discovered. According to the respondents, a total of 76 people (58.5%) were enrolled in bachelor's degree programmes, and a total of 54 people (41.5%) were enrolled in master's degree programmes.

Mastery Level of Practical Skills Through Fieldwork

Table 4 shows the mean, standard deviation and level of mastery for the sub-construct of practical skills through field work.

Table 4
Level of Mastery for the construct of practical skills (n=130)

Subconstruct	Mean	Standard Deviation	Level
Students' Ability to Carry Out Field Work	3.65	0.75	Moderate
Student Ability in Handling Work Equipment	3.74	0.78	High
Manipulative Skills	3.73	0.72	High

According to Table 4, each sub-construct's mean score range, standard deviation, and level of practical skill mastery through field work are shown. The ability to conduct field work, the first sub-construct, had a mean of 3.65, a standard deviation of 0.75, and was at a moderate level. While for the sub-constructs of students' ability to handle work equipment (mean = 3.74, s.d = 0.78) and manipulative skills (mean = 3.73, s.d = 0.72) and was quite high.

Table 5 provides information on the mean of the highest and lowest items for each subconstruct of practical skills.

Table 5
Mastery level of practical skills by item (n = 130)

Num.	Subconstruct	Percentage		Mean	Standard Deviation
		Agree	Disagree		
Students' Ability to Carry Out Field Work					
1.	I have knowledge in the field related to the assigned task.	90.8% 118	9.3% 12	4.25	0.64
2.	I am able to handle tasks during field work.	92.3% 120	7.7% 10	4.46	0.64
3.	I am able to apply related knowledge practically.	91.6% 119	8.5% 11	4.45	0.65
4.	I am able to complete the tasks given during the field work.	94.6% 123	5.4% 7	4.48	0.60
5.	I am not interested to follow prescribed field work instructions.	6.1% 8	93.8% 122	1.56	0.92
6.	I am able to solve problems encountered in carrying out field work.	80.0% 104	20.0% 26	4.10	0.80
7.	I have the skills to give good recommendations.	85.4% 111	14.6% 19	4.18	0.67
8.	I do not know how to master the skills of carrying out the task given.	10.0% 13	90.0% 117	1.68	1.04
Students' Ability in Handling Work Equipment					
1.	I am skilled in using work equipment in the field.	84.7% 110	15.3% 20	4.12	0.69
2.	I am able to handle work equipment well.	92.4% 120	7.7% 10	4.28	0.62
3.	I am able to handle the equipment in accordance with its stated purpose.	89.2% 116	10.8% 14	4.26	0.64
4.	I know every function of the equipment used.	70.8% 92	29.2% 38	3.86	0.79
5.	I often make mistakes in handling science equipment during fieldwork.	15.3% 20	84.7% 110	2.18	1.15
Manipulative Skills					
1	I am able to operate science equipment properly.	91.5% 119	8.5% 11	4.32	0.62
2	I am able to use science equipment to complete tasks accurately.	89.2% 116	10.8% 14	4.25	0.64
3	I know every function of science equipment that is	71.5% 93	28.4% 37	3.88	0.82

	appropriate to perform a task quickly.				
4	I know how to use every scientific equipment.	77.0% 100	23.1% 30	4.02	0.72
5	I do not store science equipment properly after use.	5.3% 7	94.6% 123	1.41	0.87
6	I am able to clean science equipment well.	93.9% 122	6.2% 8	4.48	0.67

According to Table 5, there are two categories of data: agree (strongly agree and agree) and disagree (neutral, disagree, strongly disagree). It can be shown that 123 participants (94.6%) who agree with the statement "I am able to complete the tasks given during field work" at the highest level, are capable of performing the first subconstruct of practical skills, which is the ability to carry out field work. The lowest level of consent for "I don't like to follow the prescribed field work instructions" is 8 respondents (6.1%).

It has been found that for the second practical skill subconstruct which is students' ability in handling work equipment, "I am able to handle work equipment well," as many as 120 participants (92.4%) reach the highest level. 20 participants (15.3%) agree that "I frequently make mistakes in handling science equipment during field work," which is the lowest level.

With 122 of the participants (93.9%) agreeing "I am able to clean science equipment well", this third subconstruct of practical skills—manipulative skills—shows the highest level of agreement. The lowest level, "I do not store science equipment properly after use," had a total of 7 participants (5.3%).

Mastery Level of Soft Skills Through Fieldwork

Table 6 shows the mean, standard deviation and mastery level for the sub-construct of practical skills through field work.

Table 6
Mastery Level for the construct of soft skills (n=130)

Subconstruct	**Mean**	**Standard Deviation**	**Level**
Collaborative Skills	4.02	0.69	High
Communication Skills	4.05	0.75	High

According to Table 6, each sub-construct's mean score range, standard deviation, and level of practical skill mastery through field work are shown. Collaborative skills, with a mean score range of 4.02 and a standard deviation of 0.69, and communication skills, with a mean score range of 4.05 and a standard deviation of 0.75, are two sub-constructs that have been analysed and are at a high level.

Table 7 provides information on the mean of the highest and lowest items for each subconstruct of soft skills.

Table 7

Mastery level of soft skills by item (n = 130)

Num.	Subconstruct	Percentage		Mean	Standard Deviation
		Agree	Disagree		
Collaborative Skills					
1	I am able to work in a group.	93.9% 122	6.2% 8	4.69	0.61
2	I am able to discuss with group members.	96.9% 126	3.1% 4	4.72	0.52
3	I am able to share ideas with group members.	93.1% 121	6.9% 9	4.52	0.63
4	I cannot accept if the ideas criticized by group members.	6.9% 9	93.1% 121	1.52	0.97
5	I have the ability to present creative ideas.	80.0% 104	20.0% 26	4.15	0.77
6	I am able to share information with group members.	93.1% 121	6.9% 9	4.53	0.65
Communication Skills					
1	I am able to express ideas clearly in order to advance knowledge.	92.3% 120	7.7% 10	4.42	0.63
2	I am able to make the listener understand what I want to convey.	88.5% 115	11.5% 15	4.39	0.69
3	I am able to demonstrate my public speaking talent.	86.2% 112	13.8% 18	4.36	0.74
4	I am able to make presentations in public.	89.2% 116	10.8% 14	4.35	0.67
5	I do not feel confident sharing my opinion in public.	13.1% 17	86.9% 113	1.93	1.11
6	I am able to expand my network from good communication skills.	88.5% 115	11.5% 15	4.46	0.72
7	I am able to demonstrate my skills while conducting fieldwork.	90.0% 117	10.0% 13	4.46	0.67

Based on Table 7, which displays the item's level of soft skill capability. It has been shown that "I am able to discuss with group members" as many as 126 persons (96.9%) achieve the highest level for the first sub-construct of soft skills, which is collaborative skills. While the lowest level, "I cannot accept if my ideas are criticised by group members," was reported by a total of 9 persons (6.9%).

The second sub-construct, which measures communication skills, has 120 participants (92.3%) who agree and score at the highest level, indicating that "I am able to express ideas

clearly in order to advance knowledge." 17 persons (13.1%) were counted at the lowest level, indicating "I am not confident to share my opinion in public."

Discussion

To practise the learning that will influence how students' human capital is formed, the quality of the country's existing educational system is required. The battle for human capital in today's job market is becoming increasingly intense due to globalization's rising influence. Graduates' marketability once they enter the workforce depends not solely on their knowledge and intelligence, but also on their ability to master personal skills. Implementing studies regarding student skill mastery is essential since it has taken the lead in determining how marketable graduates will be in their after graduation lives.

Regarding the level of practical skill mastery, data from the first sub-construct, which measures the ability to carry out fieldwork, demonstrates that science students are capable of completing the tasks given during fieldwork. This shows clearly that students may successfully finish an assignment when they have a high level of knowledge and understanding regarding it. Chotimah and Suryani (2020) research, which says that fieldwork assignments can provide exposure in order to help students understand what needs to be done, supports this claim. As a result, the student's understanding of the task can improve the preparation of the delivered work in accordance with the study's findings. Science students are not among those who do not choose to follow the specified field work instructions, as evidenced by the fact that even the students listen to every instruction in order to guarantee the smoothness of the task.

One approach to prepare students for the workplace is field work, especially when they are exposed to practical skills that require them to be able to use work equipment (Impak & Mustapha, 2020). This claim is supported by the study's findings for the second sub-construct of the level of practical skill mastery, which indicate that science students are able to handle work equipment. The proper use of tools for a task depends on their being handled with care and for the intended purpose. This finding is consistent with a study done in 2020 by Impak and Mustapha, who pointed out that students had a high mean score value for their ability to handle work equipment and ensure smooth operation in the workplace. In the context of this study, students are considered to be capable of operating work equipment when all field-based equipment has a clearly defined purpose, and indirectly, when the vast majority of students handle science equipment correctly.

Next, it demonstrates that science students are competent at cleaning scientific equipment for the third sub-construct, which is manipulating abilities. When students have been learned how to properly handle science equipment while working on practical tasks since starting school, their equipment handling skills can be seen clearly at a high level. According to Kizilaslan (2019), practical work can actively engage students in science learning by sparking their interest and curiosity as well as enabling them to use a variety of skills, scientific knowledge, and conceptual understanding while carrying out experiments. When university students get the chance to conduct real-world experiments, this definitely helps to strengthen their manipulating skills. As a result, when students handle the equipment carefully, they have no difficulty cleaning equipment. In reality, the study's findings indicate that the majority of students properly keep science equipment upon use.

As for the level of soft skill mastery, the data from the first sub-construct, which is collaborative skills, demonstrates that scientific students are able to work with others and have discussions in groups. This indicates plainly that students have no issues working

together to complete a task in a group. As a result, lecturers frequently expose their students to group learning through teaching and learning session. This is due to the fact that it is easier to complete group projects successfully due to an abundance of innovative ideas from many thoughts. Ahmad and Majid (2018) provide group discussions as an example of a collaborative activity that will boost output and quality of work in support of this claim. In order to finish a task, students must collaborate to make sure that each person expresses their distinct views and thoughts. The majority of these abilities are developed by students, who learn to respect one another, listen to others' opinions and make conclusions while refraining from criticising them.

In terms of the second sub-construct of soft skills, communication skills, it demonstrates that science students are able to express ideas clearly in order to advance knowledge. When students wisely embrace the chance to share their thoughts and experiences with those around them, they can demonstrate their talents for effective communication in the framework of this study. A mastery of communication skills can result in the capacity to influence listeners understand what is being conveyed. Ahmad and Majid (2018) support this claim by stating that employers also place an emphasis on the mastery of communication skills in the workplace, which necessitates clarity in information delivery. Learning efficient communication skills also enables students to build more professional networks. This promotes student involvement by giving them more chances to excel in the industry and express their skills. The study's results also show that most students are confidence to express their thoughts in public according to their developed communication skills.

Conclusions

Overall, the study into the level to which scientific students have mastered both practical and soft skills through fieldwork is essential for guareanteeing the development of student human capital. The development of outstanding human capital will be able to enhance the employability of students after they graduate and the standard of the economy in industry. The level of mastery for the students' practical skills, which include their ability to perform field work, is modest, but it is high for their skill in operating work equipment and manipulative skills. However, all two of these abilities are at a high level when it comes to the mastery of soft skills, which include communication and collaboration skills. Employers need this competence in order to operate in the sector.

This research is expected to act as a guide for upcoming researchers along with management in higher education institutions in order to enhance students' skills. University programmes and learning activities can be held by implementing skill requirements to sharpen students' skills. The implementation of leadership programmes, volunteer work, and public speaking that comprise components of skills that need to be acquired can produce the application and development of student skills. As a result, the institute will be able to generate skilled and high-quality human capital in addition to these talents.

The fact that this study was restricted to FST UKM science students who were engaged in fieldwork limits its scope. The results of this study indicate that the study's scope and location be expanded in order to better determine the level of practical and soft skill proficiency. As a result, it is advised to include a few more skills to be studied in accordance with their relevance to help students get ready for the demands of the workplace.

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