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ORIGINAL ARTICLE

ERGONOMICS KNOWLEDGE AMONG ENGINEERING STUDENTS IN PULAU PINANG MALAYSIA

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ABSTRACT – Ergonomics knowledge helps in its right application and contributes significantly to the general well-being and safety of students. Ergonomics in Malaysia is a relatively new concept and yet to be considered an essential component of most organizations. The purpose of this study is to examine the engineering students in Universiti Teknologi MARA Cawangan Pulau Pinang (UiTMCPP), Malaysia on their ergonomics knowledge level. Questionnaires were distributed to 246 engineering students of mechanical, civil, chemical, and electrical in UiTMCPP and the responses were analyzed using SPSS version 15. The result of their ergonomics knowledge found that the average mean score and standard deviation were 2.74 and 1.21 respectively. It shows that their ergonomics knowledge level was moderate. The average mean score of the steps taken by the university management is 4.03 which is a high level. The university management and respective school must give regular ergonomics education and training for the students as well as university staff to increase the ergonomics knowledge to a better level.

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INTRODUCTION

The concept of ergonomics knowledge is a typical concept on the borderline of sciences and should be understood as a conscious analysis of ergonomics as an interesting problem area in the community. The design of tasks and tools that can be compatible with the people's limitations and capabilities is the field of ergonomics study. The task fitting to the people whether to a consumer product or in the workplace and provides opportunities for business by improving people well-being, reducing costs, productivity and reducing costs is called ergonomics [1]. The goal of ergonomics is to make sure the job fits the worker, instead of forcing the worker to conform to the job. Ergonomics is also a discipline systems-oriented which extends across all aspects of human activities either at the workplace or at home.

The main effort of ergonomics is to reduce the risk of injury to the workers, to improve productivity, and to improve the workers' well-being in which will give benefit to the organization [2]. The International Ergonomics Association (IEA) define that the human factors or ergonomics as the design and evaluation of the jobs, tasks, products, system, and environments, to perform them as the scientific discipline with the understanding of interactions among peoples and other elements of a system and also the profession that applies theory, data, principles, and methods to design to optimize human well-being and overall system performance [3].

A proper educational ergonomics program can improve the knowledge and practice of ergonomics principles, which can reduce the associated health risks. A systematic process for identifying, developing, analyzing, anticipating, and controlling ergonomics risk factors to ensure the safety and health of the students are the criteria to perform the educational program. The ergonomics knowledge and awareness program will help the students to become aware and know of the effects of ergonomics risks during performing their daily work [4]. Hence, ergonomic interventions and commencing an education before the students reach graduation or even earlier are needed by them.

Ergonomics awareness is the early step to gain knowledge and implement ergonomics effectively. The effort to implement ergonomics without knowledge and awareness may be tough and can affect student productivity, performance, injuries, illness, and cost. The indicator of the level of knowledge and awareness of ergonomics can be known or measured from the knowledge of the students and the display of their behaviour during work activities [5]. Thus, this study is aimed to identify the level of ergonomics knowledge of engineering students at Universiti Teknologi MARA cawangan Pulau Pinang (UiTMCPP), Malaysia, and to find out what actions need to be taken by the university management related to ergonomic issues for students. To date, surprisingly, the study related to the ergonomics knowledge among the engineering students in UiTMCPP is not yet been conducted. Through this study, it is hoped to be able to give awareness to all students at UiTMCPP about the importance of knowledge and practicing ergonomics while doing learning activities either in class or outside the classroom and also when they have worked. Once their level of ergonomic knowledge has been known, the top management of UiTMCPP and school can take appropriate action such

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as holding courses, seminars, workshops, awareness programmes, and include the ergonomic course or topic in the academic curriculum of their respective school.

REVIEW OF LITERATURE

Ergonomics in Malaysia is still in the infant stage and developing at a relatively slow pace in the field of research, education, and community practice [6]. Therefore, it should be disseminated and promoted to government and private sectors in various industries so that the employees and employers will become aware of the design concept of ergonomics workstations and workplaces. The awareness promoting of the principle of ergonomics that relate to computer use to the high school students in the regional area through ergonomics educational sessions were succeeded in increasing student knowledge of ergonomics [7]. The people who learn, understand, and implement the ergonomics will be used a minimum of energy efficiently and worked comfortably in the ergonomics working environment [8]. In 2013 Naeini and Mosaddad [9] have investigated ergonomics of knowledge and awareness on the engineering students in the technical university in Iran found that more than 71% of the students did not know the importance of ergonomics in their future jobs and not getting information about ergonomics during a study in the university.

The education process includes providing adequate comfortable conditions, without violating the health of students and allows the execution of assigned tasks must be fulfilled to ensure the goals of education will be achieved. The educators should be able together with their students to work comfortably, efficient, and safe, as well as to friendly use devices and software. The possibility of application of ergonomics knowledge is perceived, which contributes that many problems of students in this field can be solved appropriately. The importance and benefits of ergonomics application in the workplace are to improve and detection of various problems that surround the training and education process [10]. Therefore, three main sections where ergonomics can contribute to the quality of education are the protection of the health of students, the creation of a comfortable studying environment, and customizing the process of education based on the student`s abilities.

The graduate students give a demonstration of a statistically significant improvement in the knowledge of ergonomics after they completed the ergonomics educational session on the awareness of body mechanics relative to laptop workstation design [11]. In 2016, Meel [12] studied on the college students in Rajasthan India found that who have taken computer subject have more ergonomic awareness than who does not have taken computer subject in term of a computer used ergonomically and those students will be exposed to Work-related Musculoskeletal Disorders (WMSDs). The attitude, knowledge, and practice of dental students of the University in Iran were improved by an ergonomics educational program [13].

The students are possibly seated incorrectly at their computer workstations, desk, and chairs whether in the classroom or at home while studying or working for more than eight hours every day. The ideal of the environmental study is different for each student and the important components that should be checked are minimal distractions, adequate lighting, and comfort. The primary goal of ergonomics is to eliminate and reduce stress, injuries, and disorders associated with bad posture, overuse of muscles, and repeated tasks. When the students implementing ergonomics in their study environments so that the students can maintain better physical well-being, posture, and studying well [14]. The undergraduate students and dental professionals in Saudi Arabia should be learned dental ergonomics and implemented them in their daily practice in the clinics to provide a comfortable working environment [15].

A recent study by Zabinska [16] on 130 employees in small and medium-sized enterprises in the Silesian Voivodeship found that most employees have a low level of ergonomic awareness and who have a knowledge of the correct posture during the working activities have a problem with its practical application. The postgraduate dental students in various colleges in India reported that they were lacking in awareness and understanding for practicing on the types of ergonomically equipped chairs in dental clinics but they were agreed that working in improper correct posture can affect their health in the future [17]. The learning method through face-to-face or video will give a different impact on acceptance and understanding of knowledge. The students can be better understand the appropriate subject by watching a video. It was proven that the mechanical engineering students in one of the universities in Malaysia where the results show that their ergonomics knowledge increases after learning through watching the video of basic ergonomics principles at work compared to face-to-face in the classroom [18].

RESEARCH METHODOLOGY

The final year undergraduate engineering students of the School of Civil Engineering, Mechanical Engineering, Electrical Engineering, and Chemical Engineering at Permatang Pauh campus of UiTMCPP were involved in this study. The total number of respondents was 246 students. The final year students were selected as respondents in this study because they were considered had been a lot of knowledge since they have already studied for three years in the university and one year more to be graduated and probably have a job immediately.

The data collection process involves the use of a questionnaire which is distributed by the researcher directly to the respondents and at the same time completed by them. The questionnaire consists of two parts; the first part was used to get the background information of the respondents such as age, gender, and faculty. The second part was used to get the respondent's ergonomics knowledge and steps that should be taken by the university management on the ergonomic issues. The Likert scale was used in this study with a scale of 1 to 5. Scale 1 to show strongly disagree and 5 strongly agree. The Statistical Package for the Social Sciences (SPSS) version 15.0 was used in the data analysis and presented

in descriptive statistics such as mean, frequency, and percentage. The results will be shown as the indicator of ergonomics knowledge level for engineering students in UiTMCPP.

The pilot study was used to test the validity and reliability of question items selected in the questionnaire before the actual survey was conducted. In addition, it can identify problems that may arise during the questionnaire. Cronbach`s Alpha is also known as coefficient alpha (α) is an indicator to measure the reliability of the obtained data. The pilot study was conducted on 20 respondents from the School of Mechanical, Civil, Electrical, and Chemical Engineering. As a result, the value of the alpha coefficient obtained is 0.83 which shows that questionnaires have high reliability and the variables in this study can be measured well. If the value of the alpha coefficient is less than 0.6, which means that low-value reliability, it is necessary to improve the items in the research instrument to increase the value of the coefficient alpha [19].

The interpretation of the level of ergonomics knowledge possessed by the respondents is used in this study based on 5 level scale of the average mean score which is developed by Best [20] and Degang [21] is shown in Table 1. Very high and high level (3.5 – 5.0) indicates the respondent has extensive knowledge of ergonomics and awareness and high confidence about details. Moderate level (2.5 - 3.49) indicates a moderate knowledge of ergonomics but with some uncertainty about details. Low and very low level (1.0 – 2.49) indicates inadequate or less knowledge of ergonomics with less uncertainty about details. These scales are commonly used for the interpretation of the five-point Likert scale in the descriptive analysis.

Table 1: Interpretation of mean score

Scale	Mean range	Level	Score range
5	Strongly agree	Very high	4.5 – 5.0
4	Agree	High	3.5 – 4.49
3	Unsure	Moderate	2.5 – 3.49
2	Disagree	Low	1.5 – 2.49
1	Strongly disagree	Very low	1.0 – 1.49

RESEARCH FINDINGS AND DISCUSSION

Table 2 shows the personal characteristics according to gender, age, and faculty for 246 respondents involved in the study. According to descriptive statistics, it was found that 86.2% (212 students) of the respondents are men and 13.8% (34 students) are women. The percentage of men is higher than women due to the educational trend in Malaysia in engineering courses. Most of the respondents (77.6%) were in the final semester because the students whose age is 23 years old were intake from the matriculation or foundation program and 24 years old were diploma holders. The results show that the majority of the students were in civil engineering (37.8%) and fewer students in chemical engineering (12.2%). The number of chemical engineering students was less than the other three engineering faculty because of low yearly enrollment.

Table 2*:* Personal characteristics

No	Characteristics	No of respondents	Percentage (%)
1	Gender		
	Men	212	86.2
	Women	34	13.8
2	Age (years)		
	22	55	22.4
	23	96	39.0
	More than 24	95	38.6
3	Faculty		
	Mechanical	57	23.2
	Civil	93	37.8
	Electrical	66	28.8
	Chemical	30	12.2

The results of the respondent's knowledge of ergonomics are shown in Table 3. The results found that the score of the average mean and standard deviation obtained are 2.74 and 1.21 respectively. The result shows that their level of ergonomic knowledge is moderate. Item 1 recorded the highest mean score of 2.94 while item 4, having the lowest mean score of 2.50 in which both results showed a moderate level. The respondents who have seen and heard of the ergonomic term in various media were 32.5% and 23.6% know the ergonomics from their friends. It means that most of them know about ergonomics from the media. It was observed that only 32.1% have read an issue related to ergonomics and 32.5% of the students know and understand the meaning of ergonomics. The university management seemed does not help the

students to know the ergonomics because only 24.4% of the students have seen the ergonomic word on the notice board in the UiTMCPP. It shows that the university still does not have the awareness to implement the ergonomics to the students as well as the university staff. Those who know about ergonomics are the result of their initiative to find the information about ergonomics by themselves or may have a subject or topic in their courses.

Table 3: Ergonomics knowledge (%)

Statement	1	2	3	4	5	Mean	Standard deviation
I have seen and heard the word ergonomics on billboards, TV, radio, newspaper, etc.	16.3	17.1	34.1	21.5	11.0	2.94	1.21
I have read an issue related to ergonomics.	17.5	23.6	26.8	24.8	7.3	2.81	1.20
I know and understand the meaning of ergonomics.	17.5	23.6	26.4	24.0	8.5	2.82	1.22
My friend has told me about ergonomics.	24.8	30.1	21.5	17.1	6.5	2.50	1.21
I've seen the word ergonomics on the poster/notice board in UiTMCPP.	22.8	21.1	31.7	19.5	4.9	2.63	1.17
Average						2.74	1.21

The level of ergonomics knowledge either high or low occurred not only among engineering students at UiTMCPP but also elsewhere in either public or private colleges and universities in Malaysia or developing countries abroad. The researchers who have investigated ergonomics issues in Malaysia found that the low ergonomics in Malaysia are contributed by a poor local educational emphasis and also poor corporate education and training [6]. The level of knowledge and awareness of ergonomic practice among medical students and physiotherapists in Pakistan was very low where only 28.67% have heard ergonomics words [22].

A reported survey showed that the medical university students in the United Arab Emirates who are aware of computer ergonomics is 44%, the students who had read documents on ergonomics put the principles into practice and the proper education can improve the knowledge and practice of ergonomic principles [4]. Similarly, Kalghatgi et al. [23] found that the dental students had behavior toward ergonomics and awareness in dental practice and also indicated that the high attitude scores stronger acceptance of the guidelines of ergonomics principles during routine dental procedures. The majority (32.8%) of the computer science engineering and information technology students from a private engineering college in Karnataka India were unaware of ergonomics and suggested to the college management to include ergonomics courses in their educational curricula [24].

Table 4 shows the results of the steps that should be taken by the university management with an average mean score of 4.03 and a standard deviation of 0.86. The result shows that the respondents had a high level of awareness where the university management should take action and solve any problem on ergonomics issues. It was observed that 82.1% of the respondents were agreed in which the comfortable and conducive study area should be prepared by the university. The respondents (79.7%) were needed to exposure to ergonomics practice in the workplace and to understand the method of ergonomics implementation. They (74.4%) also believed that the ergonomics briefing, training, and courses can help them to improve ergonomics knowledge. Similarly, 72.4% of them said that one of the effective ways to increase the knowledge and awareness of ergonomics is the campaign through a poster around the campus area and also in the office, classroom, workshop, and laboratory.

Table 4: Steps should be taken by the university management(%)

Statement	1	2	3	4	5	Mean	Standard deviation
All students should be given practical exposure to the need for ergonomics practice in the workplace.	0.0	6.5	13.8	47.2	32.5	4.06	0.85
Programs such as briefing, courses, and seminars should be organized for all students.	1.6	5.3	18.7	51.6	22.8	3.89	0.87
Poster and campaign on ergonomics awareness must be all-inclusive in the campus area.	1.2	3.7	22.8	43.5	28.9	3.95	0.88
Preparing a comfortable and conducive study area with ergonomic features is the responsibility of university management.	0.8	1.6	15.4	39.0	43.1	4.22	0.82
Average						4.03	0.86

The ergonomics risk will be increased to the students through transportation to the campus, assignments at home, laboratory works, and classroom activities. Thus they should be given information about these risks to make sure that

they will be aware and can be getting more knowledge of ergonomics by themselves. New approaches to the technology of education and ergonomics learning are needed to reduce the risks and ensure students are not denied the lucky chance to become productive people for the next generation. Educational ergonomics can make a significant contribution to the educational performance of knowledge and awareness of ergonomics but the application of ergonomics to education has received only limited attention [25].

The university management and respective school are supposed to provide an adequate condition to be fulfilled which allows the execution of assigned tasks without violating the health of students. The application of the ergonomic knowledge is perceived can be solved many problems of work-related musculoskeletal disorders (WMSDs) and musculoskeletal pain or discomfort to the health students such as headache, back pain, neck pain, eye vision, carpal tunnel syndrome, tendonitis, and stress. The risk factors that influence the prevalence of WMSDs among students are student posture, anthropometrics and furniture, computer use, and vision [26]. The ergonomics training program is the key element to improve skills and abilities in reducing ergonomic hazards and to increase ergonomics knowledge of people [27]. Ergonomics is an old term and for whom everybody knows but follows less practice then became much suffers [28]. The students should be received a suitable awareness and ergonomics educational program before they reach graduation or even earlier from the respective faculties.

Ergonomic knowledge is very important to learn by all university students, especially those who study in an engineering field and are in the final year of study before graduating. Therefore, they will be easily accepted to work in the companies that want to practice ergonomics in the workplaces because they can increase work productivity, improve a more comfortable and safe work environment and improve the employees' level of occupational safety and health. They can be an exemplary worker and guide the local communities to practice ergonomics either at work or anywhere in all activities of daily life. Those who do not have or lack knowledge of ergonomics, will not be able to practice ergonomics which will result in health problems such as back pain, shoulder pain, wrist pain, visual and hearing impairment, headaches, and work stress. It will result in decreased work productivity, not being able to focus 100% on any work being done, and decreased work attendance due to frequent sick leave. The effects and consequences are the same while they are still studying at universities such as frequent absenteeism, late submission of assignments, declining exam results, and limited association with their peers.

CONCLUSION

Ergonomics aims to ensure that types of equipment, class and laboratory activities, tasks, study area, and the environment fit each student as well as to reduce stress and eliminate injuries. This study revealed the knowledge of ergonomics level among engineering students in UiTMCPP and the results showed that they possess a moderate level of ergonomics knowledge. It can be seen by the average mean score value which shows a moderate level at 2.74. Once they have already known the knowledge of ergonomics so that can help them to practice in the company where they will work. The result of this study also shows that the students emphasized a need for ergonomics knowledge and the university management and respective school must take action to increase the students' ergonomics knowledge level in which the average mean score obtained is 4.03 which is a high level. The university management and respective school must play an important role to educate the engineering students about awareness and ergonomics knowledge and also should have established objectives to achieve ergonomics knowledge and practices for the students as well as university staff. The graduated engineering students might be hired in all different sizes of industrial firms and organizations so that the educational ergonomics program will have appropriated results that can help them practicing ergonomics in the workplace. Students are future workers, they must be provided with adequate knowledge of ergonomics before entering the world of work to avoid any injuries, affected health, and have a high work ethic and productivity. The findings of this study can provide an opportunity for other researchers in public and private institutes of higher learning respectively to conduct a similar study to get a more accurate picture of the level of ergonomic knowledge of engineering and non-engineering students in most universities in Malaysia.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

[1] D. MacLeod. "*The ergonomics edge: Improving safety, quality, and productivity"*. USA: International Thomson Publishing Inc, 1994.

[2] S. O. Ismaila. "A study on ergonomics awareness in Nigeria". *Australian Journal of Basic and Applied Sciences*, vol. 4, (5), 731-734, 2010.

[3] International Ergonomics Association (IEA). "Definition and domains of ergonomics". Available: http://www.iea.cc/whats/. 02 February 2018.
[4] N. Shantakumari, R. Eldeeb, J. Sreedharan, and K. Gopal. "Awareness and practice of computer ergonomics among university students". *4th Annual Scientific Meeting of Gulf Medical University Poster Proceedings.* 1(S2), S11-S14, 2012.
[5] I. Musonda, and J. Smallwood. "Health and safety: Awareness and implementation in Botswana`S construction industry". *Journal of Engineering, Design, and Technology*, vol. 6, (1), 81-90, 2008.
[6] H. S. Loo and S. Richardson. Ergonomics issues in Malaysia. *Journal of Social Sciences*, vol. 8, (1), 61-65, 2012.
[7] J. Sawyer and J. Penman J. "Ergonomics and computer use: Increasing the awareness of rural secondary school students". *HFESA 47th Annual Conference 2011, Ergonomics Australia*, 1-5, 2011.
[8] Z. A. Muin and M. Sapri M. "Level of organization awareness on the importance of ergonomics to health and safety at the workplace". *4th International Conference on Business and Economic Research. Bandung, Indonesia. University Technology of Malaysia*, 970–992, 2013.
[9] H. S. Naeini and S. H. Mosaddad. "The role of ergonomics issues in engineering education". *Procedia - Social and Behavioral Sciences*, 102, 587 – 590, 2013.
[10] A. Zunjic, G. Papic, B. Bojovic, L. Matija, G. Slavkovic, and P. Lukic. "The role of ergonomics in the improvement of quality of education". *FME Transactions*, vol. 43,(1), 82-87, 2015.
[11] J. B. Peter, D. B. Katharine, R. C. Jessica, L. F. Jenna, L.L. Hannah, I. M. Paloma, and N. M.Julie. "Benefits of laptop computer ergonomics education to graduate students". *Open Journal of Therapy and Rehabilitation*, 2, 25-32, 2014.
[12] M. P. Meel. "A study of ergonomic awareness in computer education among college students of Jhunjhunu District". *International Research Journal of Commerce Arts and Science*, vol. 7, (10), 10-16, 2016.
[13] S. Gharekhani, A. Tirgar, M. Seyyed, and H. Gholinia. "An interventional ergonomics program assessment of dental students". *Biosci. Biotech. Res. Comm*. vol. 9, (4), 814-820, 2016.
[14] A. Maitland. "Applying ergonomics benefits students' study habits". Available: https://oaklandpostonline.com/16260/life-arts/applying-ergonomics-benefits-students-study-habits/. 14 February 2019.
[15] F. Alyahya, K. Algarzaie, Y. Alsubeh, and R. Khounganian. "Awareness of ergonomics and work-related musculoskeletal disorders among dental professionals and students in Riyadh, Saudi Arabia". *The Journal of Physical Therapy Science*, 30, 770-776, 2018.
[16] I. Zabinska. "Awareness of ergonomic working conditions among employees". Scientific papers of Silesian University of Technology Organization and Management series no. 142. 181-195, 2020.
[17] N. Ramesh, J. Divya, and P. Anandkumar. "Knowledge, awareness, and practices about ergonomics among dental postgraduate students – A cross-sectional study". *International Journal of Scientific Study*. Vol. 8, (7), 35-40, 2020.
[18] I. I. Ibrahim, Jumintono, I. Kanafi, H. Hafnidar, B. Haryono, Y. Farida, S. Rosa, F.S. D. Murwaningtyas, A. Esteka, and R. Isaskar. "Increasing Students Awareness of Safety Designing Workplace Base on Ergonomic Principle Using Video". *Universal Journal of Educational Research*,vol. 8, (12), 6902-6907, 2020.
[19] Z. Tasir, and M. S. Abu. *Analisis data berkomputer (computer data analysis). SPSS 11.5 for Windows*. Malaysia: Venton Publishing (M) Sdn Bhd., 2003.
[20] J. W. Best. *Research in education*, 5th edition. Eaglewood Clifs New Jersey, Prentice Hall, 1981.
[21] M. Degang. "Motivation toward English language learning of the second year undergraduate Thai students majoring in Business English at an English-medium university". Master's project M.A. Graduate School, Srinakharinwirot University. Bangkok Thailand, 2010.
[22] S. Muhammad, Kashmala, I. F. Sumaira, and A. Sana. "Awareness of ergonomics among the physiotherapy and medical students". *Pakistan Journal of Rehabilitation*, (2), 31-37, 2013.
[23] S. Kalghatgi, K. V. V. Prasad, K. G. Chhabra, S. Deolia, and C. Chhabra. "Insights into ergonomics among dental professionals of a dental institute and private practitioners in Hublie Dharwad Twin Cities, India". *Safety and Health at Work*, 5, 181-185, 2014.
[24] M. S. Sirajudeen and S. S. M Siddik. "Knowledge of Computer Ergonomics among Computer Science Engineering and Information Technology Students in Karnataka, India". *Asian Journal of Pharmaceutical Research and Health Care*,vol. 9, (2), 64-70, 2017.
[25] T. Smith. "Educational ergonomics: Educational design and educational performance". *15th Triennial Congress of the International Ergonomics Association and the 7th Joint Conference of Ergonomics Society of Korea/Japan Ergonomics Society, Seoul, South Korea*, 1-13, 2001.
[26] P. Grimes, and S. Legg. "Musculoskeletal disorders (MSD) in school students as a risk factor for adult MSD: a review of the multiple factors affecting posture, comfort, and health in classroom environments". *Journal of the Human-Environment System*, vol. 7, (1), 1-9, 2004.
[27] M. S. Haval. "A literature review of ergonomics programs". *3rd International Engineering Conference on Developments in Civil & Computer Engineering Applications*, 191-202, 2017.
[28] M. Emran. "Ergonomics-follow and keep well". Editorial. *KYAMC Journal*, vol. 11, (2), 57-58., 2020.