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Md Kharul Bin Rakib, Che Ghani bin Che Kob, Arman Shah & Arasinah

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Md Kharul Bin Rakib, Che Ghani bin Che Kob, Arman Shah &
Arasinah

Universiti Pendidikan Sultan Idris (UPSI)

Email: mdkharul87@gmail.com

Abstract

This academic study is aimed accurately at the established validity of critical thinking questionnaires in the TIG Welding Training Modules based precisely on Project Based Learning (PBP) in the Subject (DJJ3032) of Mechanical Workshop Practice 3 in Polytechnic Malaysia. This study represents a quantitative approach that uses the survey method to influence an excellent opinion through a questionnaire related to the content of critical thinking. The research sample consists precisely of 8 vicariously experienced experts in the chosen field of welding in Malaysia. The findings show that this research instrument maintains the moral content validity.

Keywords: Content validity, questionnaire instrument, Critical Thinking, Mechanical Workshop Practice 3, Project Based Learning, Polytechnic Malaysia.

Introduction

The purpose of this academic study was precisely to validate the critical thinking questionnaire of the TIG welding training module based on Project Based Learning (PBP) in the academic subject (DJJ3032) of Mechanical Workshop Practice 3 in Polytechnic Malaysia.

Latterly, the ultimate challenges resolutely faced by the education organizations are precise to sufficiently develop critical thinking skills to properly accommodate the specific needs of potential employers for a skilled workforce in the local industry (Khan, 2015). In addition, the consistent findings of Abdul Ghani (2012) found that engineers in Malaysia did not possess critical thinking skills. According to the academic studies by Azizi using the California Critical Thinking Skills Test (CCTST) instrument on the 100 final year students in four technical universities,

typically exposed that the notable lack of considerable emphasis on the effective teaching of critical analytical skills in the engineering-based education system. According to the study by Mohd on the Intellectual Engineering graduates on Intellectual Engineering stated that significant differences were seen in Critical Thinking Skills. This means precisely that the present education system needs to accurately indicate a more holistic emphasis to all appropriate levels so that critical thinking skills can be properly applied from pre-school to university. In other words, Malaysian Polytechnic is undoubtedly among the prominent producers of engineers to discover the effective ways to overcome the problems of these critical graduates who accurately represent less critical thinking. It, therefore, shows that employers in the engineering sector in Malaysia need engineers who acquire critical analytical skills as well as other non-technical skills to support Malaysia to achieve the National Transformation 2050 successfully.

Research Objective

The validity of critical thinking questionnaire tools in the TIG Welding Training Modules based on Project Based Learning on the subject of Mechanical Workshop Practice 3 in Malaysian Polytechnic.

Methodology

This academic study is precisely quantitative using a survey method to identify the validity of the critical thinking instrument in the TIG Welding Training Module. In addition, the institute developed, needs to be reviewed by the field expert to obtain the validity of the instrument content in this study, the researcher conducts the validity of the critical content of critical thinking instruments to ensure the contents of the instrument are well-established and recognized quality.

The practical use of validity in the study is to accurately test the possible extent to which the accuracy of a measuring instrument studied in a study. According to Pallant (2007), validity refers to the extent to which a necessary tool used sparingly to measure the essential characteristics carefully studied in a study. This implies an instrument is considered to be valid and can be applied if it can measure what is supposed to be measured and an instrument or instrument of measurement is also valid when the construction of the tool meets or meets its function and objectives.

Simultaneously, according to Othman (2018), the validity is precisely a reliable accuracy marker of the academic study ie whether the study offers a realistic picture of the observed phenomenon studied or not. This validity process also needs to be done properly by responsible leading experts in the chosen field reasonably related to the exclusive content of the developed questionnaire. This coincides precisely with the accurate statement of Idris (2013) stating that to progressively increase the validity content of a research instrument, the academic researcher should eagerly seek views and constructive feedback from the expert to properly evaluate and ensure the essential elements in an effective instrument accurately represent the specific area to be studied. This is because the feedback and views of these experts are critically important for obtaining quality and acceptable institutions.

According to Anastasi (1997), the validity of the content accurately represents a systematic assessment of the excellent quality of an effective instrument. Therefore, it accurately measures the remarkable thing to be measured. Additionally, to ensure that the built-up is robust and applicable,

the specific percentage of the content validity of the effective instrument should be sufficiently taken into account. This is because of the moral validity of the findings properly obtained based precisely on alleged facts and able to give correct justification (Idris, 2013).

The researcher has provided a complete copy of the TIG Welding Training Module which contains the introduction, objectives goals of the module, the basis of the theory used, the overall content and the attachment of the teaching aids. Critical thinking questionnaire instrument TIG welding module provided for comprehensive review and objective evaluation and specific recommendations by the independent panel. The selection of skilled groups in this study is based on expertise, experience and relevance with the contents of the instrument developed. In this study, the criteria for specialist selection are based on (i) expertise and knowledge in the field of TIG / GTAW welding. (ii) expertise and experience in the field of welding (iii) expertise and experience in language (iv) experienced practitioners or welders and (v) Malaysian Polytechnic welding and casting book makers. Experienced practitioners or lecturers in the field of welding are further defined by ensuring that they understand and implement teaching and learning in Malaysian Polytechnic. The list of expert panels is like table 1 below.

Table 1: Expert Panel Profiles

Expert Panel	Biodata and experience
P1	<ul style="list-style-type: none"> ✓ Malaysian Polytechnic Lecturer in welding ✓ Teaching in the field of welding for 25 years until now
P2	<ul style="list-style-type: none"> • Malaysian Polytechnic Lecturer in welding field • Experienced teaching welding approximately 10 years • Has been a producer of welding courses at Community College
P3	<ul style="list-style-type: none"> ○ Polytechnic lecturer in welding field ○ Teach welding workshops about 13 years ○ Experts in arc, gas, TIG and MIG welding bases from 2005 to 2018
P4	<ul style="list-style-type: none"> ▪ Welding lecturer in polytechnics ▪ Experienced welding work in the continental sime tire for 10 years and taught in welding field at Sarawak Polytechnic for 5 years and then pursued polytechnics in behrang for 4 years until now ▪ Experience in the welding field for about 10 years.
P5	<ul style="list-style-type: none"> ✓ Working as a welding advisor at JOTAC Academy ✓ Expertise in welding more than 40 years ✓ Experienced engineering engineer LTD in 1977 and worked with SIRIM in 1980 and became UITM (mechanical faculty) lecturer in 2008.

	<ul style="list-style-type: none"> ✓ Expertise in SMAW, GMAW, FCAW, GTAW, SAW, SW, welding consultant and inospectery production of welding parameter and bend geometry for 40 years ✓ Approval of mechanical and master credentials in welding and CSWIP ✓ Issuance of 8 techical papers on GMAW, FCAW, SAW, FW ✓ Supervisor to 6 master students and 50 bachelor degree students.
P6	<ul style="list-style-type: none"> ✚ Welding Lecturer in polytechnics ✚ Skills in Welding ✚ Experience teaching welding for 7 years ✚ Specialist in arc welding, MIG and TIG for 7 years
P7	<ul style="list-style-type: none"> ❖ Malaysian Polytechnic Welding Lecturer ❖ Experience teaching welding (Arka, MIG and TIG) for 12 years ❖ Expertise in arc welding, MIG and TIG ❖ Graduated MLVK stage 2 welding.
P8	<ul style="list-style-type: none"> ✓ Malaysian polytechnic welding lecturer ✓ TIG welding expertise and safety ✓ Experience of TIG welding for 16 years ✓ Approvals and certificates in 3G and SMAW ✓ Publishing of tungsten inert gas arc welding books (GTSBN-978-967-12450-03)

Assessment of the validity of the content of the instrument was made using the questionnaire of the contents of the instrument which required the assessor to provide the answer in the form of five-point namely: (1) strongly disagree, (2) disagree, (3) disagree, (4) agree and 5) Strongly agree. The data were accurately analyzed using the prevalent method of accurately calculating the validity of instrumental content proposed by Tuckman. Tuckman stated that expert judgments that typically exceed the 70% coefficient value retain good content and have acquired a significant level of academic achievement. Effective instruments with a high content of validity will result in the achievement of the specific objectives that researchers want to accurately measure. The formula for score assessment is as follows:

$$\frac{\text{Expert Score Amount}}{\text{Maximum Score}} \times 100\% = \text{The achievement of the validity of the Content}$$

Data analysis

The consistent findings of the criticality instinct of critical thinking in the TIG welding training module consist precisely of the overall content validity of the TIG Welding Training Modules based on the adaptation from the Student Activity Survey Form. As a result of the eight person expert

assessment, the value of the content validity of the TIG Welding Training Module can be seen in Table 2 below:

Table 2: Content Validity Overall by Item for TIG Welding Training Module

Item	Validity Of The Content Specialist								AVERAG E	Expert view
	1	2	3	4	5	6	7	8		
1. Modul Latihan Kimpalan TIG membantu saya menilai secara konsisten apabila berhadapan dengan masalah	100	100	100	80	80	80	100	60	87.5	Accept
2. Modul Latihan Kimpalan TIG membantu saya berfikir secara konkrit apabila menghadapi masalah yang rumit.	100	100	100	80	80	80	100	80	90	Accept
3.Modul Latihan Kimpalan TIG membantu saya dalam mengenal pasti punca permasalahan yang berlaku dan ini merupakan langkah pertama yang akan saya ambil dalam menyelesaikan sebarang masalah.	100	100	40	80	100	100	80	80	85	Accept
4. Modul Latihan Kimpalan TIG membantu saya berfikir dan merancang terlebih dahulu apa yang perlu dilakukan apabila ingin menyelesaikan masalah.	100	100	100	80	80	80	80	80	87.5	Accept
5.Modul Latihan Kimpalan TIG membantu saya dalam mengambil kira pelbagai sudut pandangan dan perspektif lain dalam penyelesaian masalah.	100	100	60	80	80	60	100	60	80	Accept
6. Modul Latihan Kimpalan TIG membantu saya membezakan hujah yang mempunyai asas yang benar atau sebaliknya dengan baik.	100	100	100	80	80	80	100	60	87.5	Accept
7.Modul Latihan Kimpalan TIG membantu saya menilai maksud yang tersirat semasa perbincangan.	100	80	100	100	80	100	100	80	82.5	Accept
8.Modul Latihan Kimpalan TIG membantu saya sentiasa menggabungkan idea dari pelbagai perspektif untuk penyelesaian masalah.	100	100	100	80	80	80	100	80	90	Accept
9.Modul Latihan Kimpalan TIG membantu saya menggunakan kreativiti sendiri dalam penyelesaian masalah yang dihadapi.	100	100	100	60	100	80	100	60	87.5	Accept
10. Modul Latihan Kimpalan TIG membantu saya dalam membuat keputusan melalui proses penyaringan yang ketat bagi menyelesaikan masalah.	100	100	100	60	80	80	100	80	87.5	Accept
11.Modul Latihan Kimpalan TIG membantu saya dalam membuat penilaian semula terhadap semua kaedah penyelesaian masalah yang telah dilaksanakan.	100	100	100	80	80	100	100	80	92.5	Accept
12.Modul Latihan Kimpalan TIG membantu saya berfikir secara terperinci terhadap implikasi yang berlaku hasil daripada keputusan yang dibuat.	100	100	100	80	80	80	100	80	90	Accept
13. Modul Latihan Kimpalan TIG membantu saya sentiasa mencuba dan terus mencuba untuk menyelesaikan sebarang masalah yang mendatang.	100	100	100	80	80	80	100	80	90	Accept
14. Modul Latihan Kimpalan TIG membantu saya berusaha dengan gigih selagi saya tidak dapat mencari penyelesaian masalah yang saya hadapi.	100	100	100	80	80	80	100	80	90	Accept
15.Modul Latihan Kimpalan TIG membantu saya berkeyakinan dalam menangani masalah apabila berhadapan dengan situasi baru.	100	100	100	80	80	100	100	80	92.5	Accept

16. Modul Latihan Kimpalan TIG membantu saya mengambil kira faktor persekitaran dalam penyelesaian masalah.	100	100	100	80	80	100	100	80	92.5	Accept
17. Modul Latihan Kimpalan TIG membantu saya dalam memudahkan menyesuaikan diri dengan pelbagai situasi.	100	100	100	80	100	60	100	100	92.5	Accept
18. Modul Latihan Kimpalan TIG membantu saya selesa bekerja dengan orang yang berbeza budaya.	100	100	100	80	80	80	100	80	90	Accept

Based on Table 2, the overall percentages for each specific item in the developed questionnaire were more than 80%. The researcher found the lowest percentage was 80 percent for item five. The most significant percentages of the most significant content were 92.5 percent ie for items 11, 15, 16 and 17, this content indicates the validity of critical thinking instruments in the TIG Welding Training Modules is achieving high achievement levels. Therefore based on the general analysis of the percentage value is 88.61% more than 70%. Tuckman (1981) stated that expert judgments that exceed the 70% coefficient value maintain good content validity and have acquired a high level of academic achievement. This means the level of validity of the critical thinking instrument in the TIG Welding Training Module is reliable and has a strong consistency. Put differently, the critical thinking technology of TIG Welding Training Modules based on Project Based Learning is believed to increase the critical thinking of Malaysian Polytechnic students. The expert panel's validity value is above .06 ie the minimum value set for acceptance.

Conclusion

The leading researcher successfully developed a critical thinking questionnaire instrument in the TIG Welding Training Module based precisely on a specific and complete Project Based Learning for Polytechnic Malaysia. The consistent findings of the criticality of the critical thinking media content show that the content of this specific intent is valid and of good quality and can be properly applied. It is expected that the critical thinking tools in the TIG Welding Training Modules will enhance the achievement of polytechnic students in turn to create human capital that will catalyze the development of the country later.

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Corresponding Author

Md Kharul Bin Rakib, Department of Engineering Technology, Faculty of Technical and Vocational Education, Universiti Pendidikan Sultan Idris, 35900 Tanjung Malim, Malaysia,
Email: mdkharul87@gmail.com

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