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Transfer of Learning in Work-Based Learning Approach for Bachelor of Technology Program

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Abstract

This study examines the transfer of learning in the Work-Based Learning (WBL) approach among Bachelor of Technology (BTech) program graduates at Universiti Tun Hussein Onn Malaysia (UTHM). This study examines the relationship between trainee characteristics, training design, work environment, and virtual learning space with the effectiveness of learning transfer. Data were collected using a structured questionnaire and statistically analyzed. The findings showed that the level of learning transfer was at a moderate high level (Mean = 3.584), with virtual learning space recording the highest mean (Mean = 3.764), followed by trainee characteristics (Mean = 3.538), training design (Mean = 3.514), and work environment (Mean = 3.494). These results emphasize the importance of digital interaction and social engagement in facilitating learning transfer. This study recommends improvements in the design of WBL programs as well as strengthening university-industry collaboration to increase the employability of graduates.

1. Introduction

Human capital development is a critical factor in driving and sustaining a nation's economic growth. A highly skilled workforce is essential to support the transition of various economic sectors toward knowledge, technology, and innovation. In the context of Malaysia, the aspiration to become a developed nation by 2030 is reflected in the Twelfth Malaysia Plan (RMK-12, 2021-2025), which emphasizes the strengthening of human capital through Technical and Vocational Education and Training (TVET), fostering innovation and entrepreneurship, and promoting a knowledge-based economy.

The increasing demand for skilled technologists worldwide is driven by rapid technological advancements. To address this demand and enhance employability, many countries have introduced work-based learning (WBL) programs that integrate practical work experience with academic education. These programs aim to develop employability skills and better prepare students for the workforce. However, ensuring the standardization and effectiveness of these programs across different sectors and regions remains a significant challenge.

In Malaysia, the government has recognized the importance of aligning higher education with industry needs to improve education quality, particularly in technical and vocational fields. The introduction of the Bachelor of Technology (BTech) program by the Malaysian Technical University Network (MTUN) in 2019 marked a

significant step in strengthening the nation's TVET framework. The BTech program incorporates the WBL approach, providing students with a combination of academic learning and industry exposure to enhance their readiness for the workforce.

Despite the implementation of WBL in higher education, challenges persist in ensuring effective learning transfer among graduates. These challenges include trainee characteristics, training design, work environment, and virtual learning spaces, all of which influence the successful application of acquired knowledge and skills in real-world work settings. Understanding the level of learning transfer and its contributing factors is crucial for improving the effectiveness of the WBL approach in the BTech program.

This study aims to investigate the extent of learning transfer in the BTech program and identify key factors that contribute to graduate employability. By examining the relationship between trainee characteristics, training design, work environment, and virtual learning spaces, this study seeks to provide insights into optimizing WBL implementation to better align with industry needs.

1.1 Problem Statement

The effectiveness of learning transfer remains a significant concern in work-based learning (WBL) programs, particularly in the Bachelor of Technology (BTech) program implemented by the Malaysian Technical University Network (MTUN). Although the WBL approach aims to bridge the gap between academic learning and industry needs, several challenges hinder the successful transfer of knowledge and skills to the workplace.

One of the main issues is the characteristics of trainees, including their motivation, self-efficacy, and readiness to apply learned skills in real work settings. Some trainees exhibit low interest in assigned projects, lack persistence in completing tasks, or face difficulties in understanding complex work processes, which affects their ability to transfer learning effectively.

Additionally, the training design of the BTech program requires further evaluation to ensure its effectiveness. Despite the emphasis on hands-on experience, certain aspects, such as curriculum structure, assessment methods, and integration of industry-specific skills, may not fully align with workplace demands. The gap between university-based training and industry expectations may limit the extent to which graduates can apply their knowledge in real-world scenarios.

The work environment also plays a crucial role in learning transfer. Graduates often face challenges in adapting to industry practices due to differences in equipment, work culture, and support systems between academic institutions and the workplace. A lack of mentorship, inadequate supervision, and limited opportunities for hands-on practice further hinder the successful application of acquired skills.

Moreover, virtual learning spaces, which have become increasingly important in modern education, present challenges in maintaining engagement and providing effective feedback. While online platforms facilitate knowledge sharing, the lack of face-to-face interaction and practical exposure may reduce the effectiveness of learning transfer, particularly for technical and vocational training.

Despite the introduction of WBL in BTech programs, there is a lack of detailed studies assessing the extent to which learning transfer occurs and identifying the key factors influencing its success. Therefore, this study aims to fill this research gap by evaluating the level of learning transfer among BTech graduates and analyzing the relationships between trainee characteristics, training design, work environment, and virtual learning spaces. The findings will provide valuable insights for improving WBL implementation and ensuring that graduates are adequately prepared to meet industry demands.

1.2 Purpose of Study

This study aims to identify the level of learning transfer and its relationship with the Bachelor of Technology (BTech) program, which emphasizes the Work-Based Learning (WBL) approach in preparing graduates for employment. The study seeks to determine the key factors that contribute to graduate employability and assess the extent to which learning transfer occurs through WBL. By focusing on key aspects such as trainee characteristics, training design, work environment, and virtual learning spaces, this research will provide insights into the effectiveness of WBL in higher education. The findings will help evaluate whether graduates can successfully apply their acquired knowledge and skills in the workplace, ultimately improving the design and implementation of WBL programs. Additionally, the study aims to support higher education institutions, policymakers, and industry stakeholders in refining curricula and training strategies to enhance graduate employability. Through this research, recommendations can be made to strengthen industry-university collaboration, ensuring that BTech graduates are well-prepared to meet the evolving demands of the workforce.

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1.3 Research Objectives

The primary objective of this study is to examine the extent of learning transfer among graduates of the Bachelor of Technology (BTech) program that adopts the Work-Based Learning (WBL) approach. Specifically, this study aims to:

a. Identify the level of learning transfer in terms of graduate characteristics for the WBL program approach for the BTech program.
b. Identify the level of learning transfer in terms of training design for the WBL program approach for the BTech program.
c. Identify the level of learning transfer in terms of the workplace environment for the WBL program approach for the BTech program.
d. Identify the level of learning approach in terms of virtual learning spaces for the WBL program approach for the BTech program.
e. To identify the relationship between learning transfer factors for the WBL program approach for the BTech program.

The findings from this study will help improve the effectiveness of WBL programs and enhance the employability of BTech graduates by identifying the factors that significantly influence learning transfer.

2. Related Work

The Work-Based Learning (WBL) approach has gained increasing importance in technical and vocational education due to its effectiveness in bridging the gap between theoretical knowledge and practical application. In the context of the Bachelor of Technology (BTech) program, WBL plays a critical role in equipping graduates with industry-relevant skills to meet the demands of a dynamic job market (Jam & Puteh, 2022). Learning transfer, encompassing both generalization and retention of skills, is a key factor in ensuring the effectiveness of WBL (Baldwin & Ford, 1988). However, challenges such as misalignment of curriculum design with industry needs, lack of organizational support, and constraints in virtual learning environments remain significant issues that need to be addressed (Illeris, 2009; Adil & Nadeem, 2020). This paper aims to analyze the factors influencing learning transfer effectiveness in WBL and propose implementation strategies to enhance graduate outcomes.

Learning transfer is defined by Baldwin and Ford, (1988) as the process of applying knowledge and skills acquired during training to the workplace. Holton's conceptual model (2000) further highlights the importance of organizational support, training design, and trainee motivation in achieving successful transfer. Globally, WBL has been implemented in various forms, such as apprenticeships in Germany and sandwich courses in the UK (Perusso & Wagenaar, 2021). In Malaysia, WBL is applied in programs such as the Bachelor of Technology (BTech) to enhance graduate employability by providing real-world work experience (Zubaidah et al., 2022). While WBL shows significant potential, challenges such as technological limitations in virtual learning environments and varying trainee characteristics demand deeper attention (Núñez et al. 1998; Illeris, 2009).

The major challenges in implementing WBL include training design that is misaligned with industry needs, unsupportive workplace environments, and limited social interaction in virtual learning spaces. Irrelevant curricula hinder trainees from effectively transferring their learning to the workplace (Doherty & Stephens, 2021). Furthermore, a lack of support from supervisors and peers, along with technological constraints such as delayed feedback in virtual learning, exacerbates these issues (Adil & Nadeem, 2020). Trainee characteristics, such as self-efficacy, motivation, and readiness to learn, play a significant role but are often overlooked in WBL program design (Holton et al., 2000).

Key factors influencing the effectiveness of WBL include trainee characteristics, training design, workplace environment, and technology. Trainees with high motivation and self-efficacy are more likely to demonstrate successful learning transfer (Baldwin & Ford, 1988). Comprehensive training design that incorporates practical elements, such as industry projects and simulation training, enhances alignment with industry needs (Morbitzer et al., 2021). Additionally, support from supervisors and peers plays a vital role in ensuring that trainees can effectively apply their skills (Choi & Kim, 2024). Technology, such as virtual simulations, enriches trainees' learning experiences but requires strategic implementation to maximize effectiveness (Verkuyl et al., 2024; Zhang et al., 2022).

To enhance the effectiveness of WBL, several strategies have been identified. First, strengthening collaboration between universities and industries is essential to align curricula with labor market requirements (Jusoh, 2019). For example, industries can contribute to curriculum development and provide real-world work experience for trainees. Second, the use of digital technologies, such as virtual simulations and e-learning, should be expanded to offer flexibility and access to learning resources (Zakaria & Wilkie, 2021). Third, organizational support, including intensive mentoring and consistent feedback from supervisors, can help trainees overcome challenges in the workplace (Adil & Nadeem, 2020). Finally, the curriculum should be redesigned to include more practical elements, such as project-based training (El Kharki et al., 2021).

The effectiveness of WBL can be measured through various methods, including trainee performance evaluations, graduate and employer satisfaction surveys, and the use of indicators such as graduate employability rates (Kementerian Pengajian Tinggi, 2023). These assessments not only provide insights into the program's effectiveness but also offer data for continuous improvement. By utilizing rubrics and appropriate assessment tools, institutions can evaluate the extent to which trainees transfer their learning to the workplace.

In conclusion, WBL is a critical approach to equipping graduates with the skills needed to meet labor market demands. However, the effectiveness of learning transfer depends on curriculum design, organizational support, and the strategic use of technology. Therefore, educational institutions must enhance collaboration with industries to ensure curricula are more relevant and aligned with market needs. Investment in digital technologies and supervisor training is also vital to support trainees' learning experiences. Further studies are recommended to delve deeper into factors such as trainee motivation and self-efficacy in influencing learning transfer. With a more strategic approach, WBL can improve graduate employability and contribute to the development of a competitive workforce.

3. Methodology

In this study, the use of a method called the quantitative approach will be used. This method allows for accurate and objective measurement of the study variables and allows for the generalization of the findings to a larger population (Thompson et al., 2020). In this study, survey study data was collected through a questionnaire specifically designed to measure various aspects of learning transfer. The choice of using this questionnaire is because data can be collected directly from graduates in a short period of time and the results can be generalized accurately and effectively based on the population to be studied. The population for this study consists of BTech graduates of the Faculty of Technical and Vocational Education (FPTV) at Universiti Tun Hussein Onn Malaysia (UTHM) who have completed the WBL program. The study employed a stratified random sampling technique to ensure that graduates from different BTech programs were proportionally represented in the sample. The stratification process ensured that each program contributed proportionally to the overall sample, thus improving the representativeness and reducing sampling bias. In determining the sample size, the researcher used the Krejcie and Morgan table as a reference and the Krejcie and Morgan calculation in determining the sample size. Krejcie and Morgan calculation is a method used to determine the sample size required from a population so that the research results can be relied on and have a certain level of confidence. Therefore, based on the Krejcie and Morgan table, with a population of 299 graduates, the total sample size required is 171 graduates (n = 171). Therefore, to determine the sub-sample for each BTech graduate, the researcher used the sample determination method used by (Yunus, 2015) in his study as follows:

No. Sub-Samples required for each training institute = Ni/N×n
Where;
Ni = Number of graduates for each course
N = Total population of trainees
n = Total sample size (according to the sample size determination table)
Example of sub-sample calculation for air conditioning graduates;
Number of samples Hvac graduates = 35/299×171
= 20 people

Based on the formula above, the distribution and number of sample sizes of graduates required for each course are as shown in the table below. Therefore, the total sample by the researcher is 171 graduates. Based on Table 1, the details of the total population and the number of sample sizes BTech graduates of the Faculty of Technical and Vocational Education (FPTV) at Universiti Tun Hussein Onn Malaysia (UTHM) who have completed the WBL program.

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Table 1 *Study population and sample*

BTech Course	Total Graduates	Number Sample Size
Bachelor of Food Service Technology with Honours	54	31
Bachelor of Building Construction Technology with Honours	58	33
Bachelor of Technology in Refrigeration and Air Conditioning with Honours	35	20
Bachelor of Technology in Industrial Electronic Automation with Honours	56	32
Bachelor of Technology in Electrical Maintenance Systems with Honours	54	31
Bachelor of Technology in Welding with Honours	28	16
Bachelor of Technology in Industrial Machining with Honours	14	8
Total	N= 299	n= 171

Based on several types of items found in the study instrument, the researcher used the 5-level Likert scale because it provides convenience in measuring the perceptions of the respondents. With five answers to choose from, it offers many answer choices without complicating the assessment process for the respondents. In addition, using the 5-level Likert scale increases the reliability and validity of the survey because it reduces the confusion and fatigue of the respondents that can occur with long or short scales. Studies from South (2022); Chyung (2007), also support the use of this measure and state that it provides a better framework for comprehensive research to obtain better data. Table 2 shows that the 5-level Likert scale.

Table 2 *Description of the Likert scale in the Instrument of study*

Description Scale				
1	2	3	4	5
Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree

The questionnaire instrument developed and used involves six parts, namely Parts A, B, C, D, E and F. In Part A of this study, it concerns the demographics of graduates. The remaining sections (B-F) focus on graduate characteristics (Section B), training design (Section C), work environment (Section D), virtual learning spaces (Section E) and, most importantly, learning transfer (Section F). The instrument used in this study was adapted from the previous validated study by Yunus (2015), which investigated learning transfer in the Malaysian Skills Training System. The researcher adapted the questionnaire from a previous study because the characteristics found in this study have similarities in terms of study variable items from (Yunus, 2015). The researcher has obtained permission from the original researcher to use the questionnaire. To ensure validity, the questionnaire underwent content validation by experts in Technical and Vocational Education and Training (TVET) to confirm the relevance and clarity of the items. In addition, the reliability of the instrument was assessed using Cronbach's alpha coefficient to evaluate internal consistency among the items.

Through this questionnaire, the level of learning transfer and its relationship to the BTech program that emphasizes the Work-Based Learning approach can be analyzed and evaluated through stratified random sampling respondent data. The following Table 3 shows the main items used in the questionnaire of this study.

Table 3 *Main items in the instruments of study*

Construct	No. Item	Total
B. Graduate Characteristics	1-13	13
C. Training Design	17-31	17
D. Work Environment	32-48	17
E. Virtual Learning Space	49-60	12
F. Learning Transfer	61-72	12

The data collection process was conducted through online surveys and direct distribution to selected respondents. Participants were given clear instructions on completing the questionnaire, ensuring a high response rate. Ethical considerations were adhered to, including informed consent and anonymity of responses. To analyze the data, descriptive and inferential statistics were applied. Descriptive statistics, including mean and standard deviation, were used to summarize trends, while inferential statistics, such as Spearman's rank-order correlation was used in this study to examine the relationship between variables because the data do not meet the assumptions required for parametric correlation analysis such as Pearson correlation. Spearman correlation

is a non-parametric statistical technique that is suitable for analyzing ordinal data or data that are not normally distributed.

4. Result

4.1 Result Demographic

This section presents the demographic analysis of the respondents involved in this study. A total of 171 graduates who participated in the Work-Based Learning (WBL) program were selected through stratified random sampling. The collected data were analyzed using descriptive statistical methods, including mean, frequency, percentage, and mean rank order. The demographic information of the respondents was gathered in Section A of the questionnaire, which covered key background variables relevant to the study. The results from this analysis provide an overview of the respondents' characteristics, ensuring a comprehensive understanding of the sample population.

Table 4 *Demographic profile of respondents*

Demografic	Frequency (Number)	Percentage %
Cohort		
Cohort 1	83	48.5 %
Cohort 2	88	51.5 %
Total	171	100 %
Gender		
Male	97	56.7 %
Female	74	43.3 %
Total	171	100 %
Age		
23 – 25 Years	86	50.3 %
26 – 28 Years	76	44.4 %
29 Years and above	9	5.3 %
Total	171	100 %
Bachelor Program		
Industrial Electronic Automation (BBN)	21	12.3 %
Welding (BBX)	14	8.2 %
Building Construction (BBY)	57	33.3 %
Industrial Machining (BBO)	3	1.8 %
Refrigeration and Air Conditioning (BBZ)	29	17.0 %
Electrical System Maintenance (BBJ)	16	9.4 %
Food Service (BBS)	31	18.1 %
Total	171	100 %

The demographic analysis of the respondents provides a comprehensive overview of the sample characteristics. In terms of cohort distribution, the respondents were almost equally divided, with 51.5% (88 respondents) from Cohort 2 and 48.5% (83 respondents) from Cohort 1. This indicates a balanced representation of graduates from different cohorts. Regarding gender, the majority of respondents were male, accounting for 56.7% (97 respondents), while females comprised 43.3% (74 respondents). This suggests a slight gender imbalance, with a higher participation of male graduates in the WBL program. The age distribution of respondents shows that most graduates (50.3%) were between 23 and 25 years old, followed by 44.4% in the 26 to 28-year-old range, and a smaller proportion (5.3%) aged 29 years and above. This indicates that most graduates are in their mid-20s, reflecting the typical age range of recent graduates from the program. In terms of the bachelor's program, the highest number of respondents came from the Building Construction (BBY) program (33.3%), followed closely by Food Service (BBS) (18.1%) and Refrigeration and Air Conditioning (BBZ) (17%). Other programs had relatively lower participation, such as Industrial Electronic Automation (BBN) (12.3%), Electrical System Maintenance (BBJ) (9.4%), Welding (BBX) (8.2%), and Industrial Machining (BBO) (1.8%). These figures suggest that certain programs, particularly Building Construction and Food Service, attracted a higher number of students compared to others.

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The demographic findings highlight that the sample population is well-distributed across cohorts and primarily consists of younger graduates, predominantly male. The majority of respondents are concentrated in specific bachelor programs, with Building Construction and Food Service being the most represented fields. These insights provide a foundational understanding of the respondent group, which is essential for further analysis of the study's objectives.

4.2 The Level of Learning Transfer in Terms of Graduate Characteristics for WBL Program Approach for the BTech Program

To address the first research question, "What is the level of learning transfer in terms of graduate characteristics for the WBL program approach in the BTech program?", the researcher will analyze the mean scores and their interpretations to determine the level of graduate characteristics that support learning transfer. Additionally, the standard deviation will be utilized to provide further insight into the variability of graduate characteristics in facilitating learning transfer through the WBL program approach, as presented in Table 5.

Table 5 *Analysis of mean score and standard deviation for graduate characteristics*

No	Item	Mean Score	Interpretation Mean Score	Standard Deviation
B1	Graduates need to believe in themselves to use the skills learned in training	3.47	Moderately high	1.109
B2	A tenacious spirit must be present in graduates to deal with all challenges in the workplace that prevent the use of new skills	3.55	Moderately high	1.279
B3	Existing experience is necessary to facilitate graduates in carrying out tasks in training	3.69	Moderately high	1.047
B4	Existing knowledge is necessary to facilitate the implementation of tasks in training	3.60	Moderately high	1.310
B5	Graduates need to feel excited to use the skills learned in the workplace	3.24	Moderately high	1.264
B6	Friends who have succeeded give the graduates the encouragement to do their work better	3.48	Moderately high	1.220
B7	The nature of interest can help trainees quickly become skilled in doing work	3.43	Moderately high	1.282
B8	Positive thinking when doing work can help solve complex problems	3.53	Moderately high	1.170
B9	Focus in doing work is important to further improve work performance	3.55	Moderately high	1.170
B10	Graduates who learn quickly in a work process will quickly become skilled in doing a task	3.55	Moderately high	1.182
B11	The rules that have been set must be followed even if graduates do not agree with the rules	3.53	Moderately high	1.144
B12	The nature of responsibility must be present in carrying out the tasks assigned	3.74	Moderately high	1.192
B13	Good role models from colleagues regarding the work process need to further improve work performance	3.64	Moderately high	1.119
	Average	3.54	Moderately high	0.501

Based on the table 5, The analysis of graduate characteristics shows that all items scored a moderately high mean (3.24–3.74), indicating consistent agreement on their importance. The highest-rated characteristic was responsibility (B12, mean = 3.74), while excitement about applying skills in the workplace was rated lowest (B5, mean = 3.24). Key traits like perseverance, focus, and adaptability (B2, B9, B10, mean = 3.55) were also emphasized. Standard deviations ranged from 1.047 to 1.310, indicating moderate variability in responses. The

overall average mean was 3.54 (SD = 0.501), highlighting the importance of traits like responsibility, experience, and role models in supporting graduates' effective use of learned skills.

4.3 The Level of Learning Transfer in Terms of Training Design for WBL Program Approach for the Btech Program

Based on the second research question, "What is the level of learning transfer in terms of training design for the WBL program approach for the BTech program?", the researcher will analyze the mean scores and their interpretations to determine the level of training design that support learning transfer. In addition, standard deviations will be used to provide further insight into the variability of graduate characteristics in facilitating learning transfer through the WBL program approach, as presented in Table 6.

Table 6 *Analysis of mean score and standard deviation for training design*

No	Item	Mean Score	Interpretation Mean Score	Standard Deviation
C1	Creating a real work environment in training makes it easier for graduates to understand the work process.	3.54	Moderately high	0.961
C2	Employers/industry supervisors experience time constraints to explain in detail a work process at a training center.	3.43	Moderately high	1.254
C3	Employers/supervisors need to provide assignments that allow graduates to practice what they have learned.	3.58	Moderately high	1.129
C4	Employers/supervisors need to provide the necessary resources to enable graduates to practice what they have learned.	3.35	Moderately high	1.339
C5	Feedback from graduates who have already worked is necessary to help prospective graduates gain information regarding new technologies in the industry.	3.35	Moderately high	1.291
C6	Existing experience of employers/industry supervisors is necessary to help graduates understand the work process more easily.	3.54	Moderately high	1.149
C7	The equipment provided by the industry must be complete for graduates to carry out their tasks.	3.60	Moderately high	1.276
C8	The training programs provided should help graduates further improve their work performance.	3.51	Moderately high	1.200
C9	Collaboration between universities and industry is necessary to introduce new technologies to prospective graduates.	3.44	Moderately high	1.266
C10	The Standard Operating Procedure (SOP) provided is necessary as a guide for graduates if they forget during the work process.	3.55	Moderately high	1.215
C11	The work steps taken must prioritize work safety.	3.61	Moderately high	1.207
C12	More and more opportunities arise in terms of work if graduates practice what they have learned.	3.68	Moderately high	1.108
	Average	3.51	Moderately high	0.503

The analysis of training design characteristics indicates moderately high agreement across all items, with mean scores ranging from 3.35 to 3.68. The highest-rated item was the importance of graduates practicing learned skills to increase work opportunities (C12, mean = 3.68). Meanwhile, the necessity of providing resources (C4, mean = 3.35) and feedback from graduates regarding new technologies (C5, mean = 3.35) received slightly lower emphasis. Key factors such as creating a realistic work environment (C1, mean = 3.54), ensuring proper equipment (C7, mean = 3.60), and prioritizing work safety (C11, mean = 3.61) were highlighted as essential for improving graduate performance. Standard deviations ranged from 0.961 to 1.339, showing moderate variability in responses. The overall average mean was 3.51 (SD = 0.503), emphasizing the importance of realistic training environments, collaboration with industries, and access to necessary resources in enhancing graduate readiness for the workplace.

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4.4 The Level of Learning Transfer in Terms of the Workplace Environment for WBL Program Approach for the Btech Program

Based on the third research question, "What is the level of transfer of learning in terms of the workplace environment for the WBL program approach for the BTech program?", the researcher will analyze the mean scores and their interpretations to determine the level of workplace environment that support learning transfer. In addition, standard deviations will be used to provide further insight into the variability of graduate characteristics in facilitating learning transfer through the WBL program approach, as presented in Table 7.

Table 7 *Analysis of mean score and standard deviation for workplace environments*

No	Item	Mean Score	Interpretation Mean Score	Standard Deviation
D1	Graduates should avoid being silent in discussions.	3.44	Moderately high	0.985
D2	Feeling bored easily while doing work should be avoided by graduates	3.51	Moderately high	1.280
D3	A reprimand will be given if graduates do not follow work procedures even if it speeds up the work process without compromising quality.	3.66	Moderately high	1.076
D4	It takes a long time to adapt to a new work environment.	3.30	Moderately high	1.379
D5	Self-satisfaction can be fulfilled by further improving existing skills through continuous learning.	3.33	Moderately high	1.269
D6	Higher performance ratings will be given if graduates are able to practice what they have learned.	3.58	Moderately high	1.230
D7	Graduates can work without supervision by using the skills they have learned.	3.44	Moderately high	1.194
D8	Colleagues need to be patient if graduates have difficulty applying new skills.	3.54	Moderately high	1.140
D9	Encouragement from colleagues is necessary in using the skills learned.	3.31	Moderately high	1.221
D10	Feedback from more skilled colleagues is necessary in practicing new skills learned.	3.49	Moderately high	1.244
D11	Guidance from instructors/supervisors is necessary to discuss ways to apply the skills learned in the workplace.	3.60	Moderately high	1.166
D12	Employers/industry supervisors need to regularly discuss with graduates to resolve problems they encounter.	3.47	Moderately high	1.191
D13	The employer/industry supervisor must provide an explanation of the work before the trainee begins the task.	3.76	Moderately high	1.158
	Average	3.49	Moderately high	0.481

The analysis of work environment characteristics shows moderately high agreement across all items, with mean scores ranging from 3.30 to 3.76. The highest-rated item was the need for employers/supervisors to provide clear explanations of tasks before graduates begin their work (D13, mean = 3.76). Conversely, the lowest-rated item was the time it takes for graduates to adapt to new work environments (D4, mean = 3.30). Key aspects such as ensuring guidance from supervisors (D11, mean = 3.60), patience from colleagues when graduates face challenges (D8, mean = 3.54), and reprimands for not following work procedures (D3, mean = 3.66) were emphasized as significant factors in the workplace. Standard deviations ranged from 0.985 to 1.379, indicating moderate variability in responses. The overall average mean was 3.49 (SD = 0.481), highlighting the importance

of clear communication, ongoing guidance, and supportive colleagues in helping graduates effectively apply their skills in the workplace.

4.5 The Level of Learning Transfer in Terms of Virtual Learning Spaces for WBL Program Approach for the Btech Program

Based on the Fourth research question, "What is the level of learning transfer in terms of virtual learning space for WBL program approach for BTech program?", the researcher will analyze the mean scores and their interpretations to determine the level of virtual learning space that support learning transfer. In addition, standard deviations will be used to provide further insight into the variability of graduate characteristics in facilitating learning transfer through the WBL program approach, as presented in Table 8.

Table 8 *Analysis of mean score and standard deviation for virtual learning spaces*

No	Item	Mean Score	Interpretation Mean Score	Standard Deviation
E1	Sharing video applications related to skills learned with friends is necessary to strengthen social relationships.	3.48	Moderately high	0.875
E2	Graduates can collaborate with friends in completing assignments through the internet.	3.65	Moderately high	1.294
E3	Searching for information from the internet (YouTube, Google, etc.) is necessary to complete tasks quickly.	3.74	Moderately high	1.162
E4	Graduates can share information with friends about internet search results obtained related to the work process.	3.75	Moderately high	1.223
E5	Searching for information from the internet (YouTube, Google, etc.) is necessary to provide initial exposure to new technologies.	3.76	Moderately high	1.105
E6	Searching for information via the internet (YouTube, Google, etc.) can develop independence in finding information in trainees.	3.74	Moderately high	1.145
E7	Searching for information from the internet (YouTube, Google, etc.) can create a desire to explore information related to skills in the trainee.	3.74	Moderately high	1.074
E8	Information from the internet is necessary to quickly obtain new information related to work processes.	3.68	Moderately high	1.186
E9	Mobile communication facilities (cellphones, smartphones, tablets, laptops) are necessary for graduates to communicate with friends quickly.	3.89	Moderately high	1.134
E10	The use of mobile devices (cellphones, smartphones, tablets, laptops) is necessary for rapid information sharing among graduates.	3.93	Moderately high	1.057
E11	The use of mobile devices (cellphones, smartphones, tablets, laptops) is necessary to make it easier for graduates to obtain information at any time.	4.04	high	1.011
	Average	3.76	Moderately high	0.490

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The analysis of virtual learning spaces highlights a moderately high level of agreement across most items, with mean scores ranging from 3.48 to 4.04. The highest-rated item was the necessity of using mobile devices to access information at any time (E11, mean = 4.04), which was interpreted as high. The lowest-rated item was the importance of sharing video applications with friends to strengthen social relationships (E1, mean = 3.48). Key aspects of virtual learning spaces include the collaborative use of online platforms, such as sharing search results with peers (E4, mean = 3.75) and completing assignments through internet collaboration (E2, mean = 3.65). Internet searches were recognized as vital for rapid task completion (E3, mean = 3.74), providing exposure to new technologies (E5, mean = 3.76), and fostering independence in finding information (E6, mean = 3.74). Standard deviations ranged from 0.875 to 1.294, showing moderate variability in responses. The overall average mean was 3.76 (SD = 0.490), underscoring the importance of virtual learning spaces in enhancing collaboration, exploration, and continuous learning for graduates.

4.6 The Relationship between Learning Transfer Factors for the WBL Program Approaches the BTech Program

Based on the last research question, "Is there a significant relationship between the factors of graduate characteristics, training design, workplace environment, and virtual learning space on learning transfer for the WBL approach?" The researcher used Spearman's correlation coefficient to see the significant relationship between the factors of graduate characteristics, training design, workplace environment, and virtual learning space on learning transfer for the WBL approach. This study has two variables, namely the dependent variable and the independent variable. The dependent variable for this study is learning transfer while the independent variable for this study is the learning transfer factors (graduate characteristics, training design, workplace environment, virtual learning space). The results of the Spearman correlation coefficient can be referred to in table 9.

Table 9 *Results of the Spearman correlation coefficient*

Significant relationship between graduate characteristics and learning transfer for the WBL approach			
		Transfer of Learning	Characteristics of graduates
Transfer of Learning	Spearman Correlation	1	0.594**
	Sig. (2-tailed)		<.001
Characteristics of graduates	Spearman Correlation	0.594**	1
	Sig. (2-tailed)	<.001	
Significant relationship between training design and learning transfer for the WBL approach			
		Transfer of Learning	Training Design
Transfer of Learning	Spearman Correlation	1	0.511**
	Sig. (2-tailed)		<.001
Training Design	Spearman Correlation	0.511**	1
	Sig. (2-tailed)	<.001	
Significant relationship between work environment and learning transfer for WBL approach			
		Transfer of Learning	Work environment
Transfer of Learning	Spearman Correlation	1	0.460**
	Sig. (2-tailed)		<.001
Work environment	Spearman Correlation	0.460**	1
	Sig. (2-tailed)	<.001	
Significant relationship between the virtual learning space and the transfer of learning for the WBL approach			
		Transfer of Learning	virtual learning space
Transfer of Learning	Spearman Correlation	1	0.604**
	Sig. (2-tailed)		<.001
virtual learning space	Spearman Correlation	0.604**	1
	Sig. (2-tailed)	<.001	

The Spearman correlation analysis revealed significant positive relationships between graduate characteristics, training design, work environment, virtual learning spaces, and the transfer of learning in the

Work-Based Learning (WBL) approach. Graduate characteristics demonstrated a strong positive relationship with the transfer of learning ($r = 0.594$, $p < 0.001$), indicating that traits such as self-confidence, responsibility, and adaptability are crucial for effectively applying learned skills in the workplace. Similarly, training design also showed a significant positive correlation with learning transfer ($r = 0.511$, $p < 0.001$). This highlights the importance of well-structured training programs that include realistic environments, clear feedback, and adequate resources in ensuring the successful application of training outcomes.

The work environment was found to have a moderate positive relationship with learning transfer ($r = 0.460$, $p < 0.001$), emphasizing the role of supportive workplace conditions, such as guidance from supervisors, patience from colleagues, and adherence to clear work processes, in facilitating skill application. Notably, virtual learning spaces exhibited the strongest relationship with the transfer of learning ($r = 0.604$, $p < 0.001$). This underscores the critical role of digital platforms and tools, including online collaboration, resource sharing, and real-time access to information, in bridging the gap between training and workplace application.

The results of this analysis confirm that all hypotheses were successfully accepted. These findings demonstrate that graduate characteristics, training design, work environment, and virtual learning spaces significantly contribute to the transfer of learning in the WBL approach, with virtual learning spaces and graduate characteristics emerging as the most influential factors.

5. Discussion

This study examined the level of learning transfer among Bachelor of Technology (BTech) graduates at Universiti Tun Hussein Onn Malaysia (UTHM) through the Work-Based Learning (WBL) approach. Overall, the findings showed that the level of learning transfer was in the moderate category, reflecting room for improvement in several key aspects such as graduate characteristics, training design, work environment, and virtual learning space.

Graduate characteristics, including motivation, self-efficacy, and willingness to learn, play an important role in determining the effectiveness of learning transfer. Graduates who are more motivated and have high self-efficacy are more likely to apply the skills and knowledge they have learned. This is in line with the study of Baldwin and Ford, (1988), which emphasized that student motivation is one of the main factors in the learning transfer process. However, the findings of this study showed that the level of graduate characteristics was still in the moderate high category, indicating the need for additional efforts by institutions to foster this element through more intensive training programs.

Relevant and practical training design is also one of the key elements in enhancing learning transfer. This study found that training design was at a moderate high level. Training that is poorly tailored to industry needs or does not involve the use of the latest technology can hinder the effectiveness of the transfer process. This finding is in line with the study of Holton et al., (2000), who emphasized that training design should provide sufficient practical opportunities to ensure that learning can be applied in real work situations.

The work environment was found to have a significant influence on the effectiveness of learning transfer. Yunus, (2015) emphasized that the support of supervisors, colleagues, and a conducive work atmosphere are key to ensuring that students can apply their knowledge in a real-world context. However, the findings showed that the work environment was at a moderate high level, with several respondents reporting a lack of feedback from supervisors and a lack of guidance at work. Adil et al., (2020) also stated that a less supportive work environment can hinder trainees' motivation to transfer learning. Therefore, it is important for the industry to create a work culture that supports the trainees' learning process.

The virtual learning space factor also recorded the highest level of effectiveness in this study. The use of digital technology such as learning management systems (LMS) and e-learning is seen to help students access learning content more flexibly. Yunus, (2015) also emphasized the importance of integrating digital technology in supporting student learning, especially in the context of WBL. A study by Zakaria & Wilkie, (2021) supports this finding by emphasizing that the use of virtual simulations can improve students' understanding of learning content. However, the challenges of maintaining student engagement and ensuring high-quality learning experiences need to continue to be addressed by institutions.

The relationship between factors such as graduate characteristics, training design, work environment, and virtual learning spaces was also found to be significant. This finding supports Holton et al., (2000) conceptual model, which states that learning transfer is the result of a combination of various elements, including internal factors such as individual motivation and external factors such as organizational support. Therefore, to ensure the effectiveness of WBL, a comprehensive and integrative approach is needed.

Overall, the findings of this study confirm that the level of learning transfer is in the moderate high category. This indicates that there is room for improvement in the implementation of WBL programs, especially in terms of increasing supervisor support, improving training design, and utilizing digital technology more strategically. With concerted efforts between universities and industry, the effectiveness of learning transfer can be enhanced, thus ensuring that graduates are better prepared to face challenges in the workplace.

6. Conclusion

Overall, the discussion and study showed that the Work-Based Learning (WBL) approach in the Bachelor of Technology (BTech) program at UTHM has successfully increased the level of learning transfer among graduates, with significant support from factors such as graduate characteristics, training design, work environment, and virtual learning space. Despite the strengths such as supervisory support and curriculum relevant to industry needs, challenges such as moderate high graduate motivation and the use of learning technology still need to be improved and require further attention. This finding emphasizes the need for stronger collaboration between universities and industry, as well as innovation in training design to ensure that the effectiveness of WBL can be optimized in the face of technological changes and future job demands.

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Conflict of Interest

There is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Faizal Amin Nur Yunus, Amirul Afiq Ahmad Majdi;* ***data collection:*** *Amirul Afiq Ahmad Majdi;* ***analysis and interpretation of results:*** *Faizal Amin Nur Yunus, Amirul Afiq Ahmad Majdi, Mohd Bekri Rahim, Khairul Anuar Abd. Rahman, Mohd Nizamuddin Razali;* ***draft manuscript preparation:*** *Faizal Amin Nur Yunus, Amirul Afiq Ahmad Majdi. All authors reviewed the results and approved the final version of the manuscript.*

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