Knowledge Transfer Programme at TAR UMT: Evaluating Learning Outcomes through a Structured Workshop

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Abstract
This study evaluates the effectiveness of a structured knowledge transfer initiative conducted by Tunku Abdul Rahman University of Management and Technology (TAR UMT), Johor Branch, as part of its Knowledge Transfer Programme (KTP). The one-day "Mushroom Cultivation Workshop for B40 Communities" aimed to improve participant understanding in three key areas: Basic Knowledge, Preparation and Management, and Care and Maintenance. Using a quasi-experimental pre- and post-test design, the workshop included 27 participants from the local community. Statistically significant improvements were observed in all three areas, demonstrating the programme's success in enhancing knowledge, practical skills, and confidence. The results confirm the effectiveness of structured, university-led knowledge transfer efforts in delivering measurable community benefits, underscoring the role of TAR UMT, Johor Branch, in supporting inclusive and applied learning for socio-economic development.
Keywords: Knowledge Transfer Programme, Structured Workshop, Learning Outcomes

Introduction

Introduction

The Knowledge Transfer Programme (KTP) is a structured initiative designed to bridge the gap between academic research and real-world applications by encouraging collaboration among universities, industries, and communities. It promotes the transfer of knowledge, theories, and skills from higher education institutions to external stakeholders, thereby boosting economic, social, and technological development (Saufi et al., 2018; Rashid et al., 2023). In Malaysia, KTP supports national policies such as the Tenth Malaysia Plan (RMK-10) and Vision 2020, which both prioritize knowledge-intensive activities as a way to turn the country into a high-income nation (Economic Planning Unit, 2010). Through knowledge transfer initiatives, higher education institutions can help address industry and community challenges, fostering innovation and sustainable development.

The concept of knowledge transfer has gained prominence as universities and research institutions recognise the importance of sharing their findings with broader audiences (Sharma & Garg, 2019). KTPs serve as a crucial mechanism for ensuring that academic research is not confined to scholarly publications but is instead applied to create meaningful societal impact (Geuna & Muscio, 2009). This process enhances learning experiences, professional development, and institutional reputation, as academics actively engage in real-world problem-solving (Firdaus et al., 2020). Furthermore, knowledge transfer programs contribute to economic growth by promoting innovation, technology transfer, and commercialisation, ensuring that academic research aligns with national development priorities (Kochenkova et al., 2015).

From a governmental perspective, KTPs play a critical role in shaping policy frameworks that support economic competitiveness and innovation ecosystems. These programs facilitate the dissemination of research-driven solutions to industries, enabling public investments in research to generate tangible economic and social benefits (Hewitt-Dundas, 2012). At the societal level, knowledge transfer programs enhance the quality of life by addressing pressing community challenges, translating academic research into practical applications, and fostering public understanding of science and technology (Firdaus et al., 2020; Paudel et al., 2021). Given the significance of KTPs in academia, policy, and society, it is essential to examine their effectiveness, identify challenges in their implementation, and explore strategies for optimizing their impact.

Background of Study

The Malaysian government has positioned knowledge transfer as a key component of national development, recognizing its potential to drive innovation, entrepreneurship, and industry-academia collaboration. The KTP initiative is embedded within five Key Result Areas (KRAs), focusing on education, economic growth, sustainability, and support for marginalized communities (Madon et al., 2021; Samsurijan et al., 2018). Through structured partnerships between universities and external stakeholders, KTPs create opportunities for knowledge sharing that benefit industries, public organisations, and communities.

Malaysia's New Economic Model (NEM) underscores the importance of knowledge transfer in fostering national productivity, creativity, and innovation. However, while KTPs have contributed to capacity-building and economic development, their implementation remains inconsistent across institutions. Variations in knowledge transfer mechanisms, differences in

resource allocation, and the absence of standardized evaluation frameworks have resulted in disparities in program effectiveness (Mohidin et al., 2017). Some initiatives have demonstrated success in enhancing entrepreneurial competencies and strengthening community resilience (Mamun et al., 2019), while others lack long-term sustainability due to inadequate impact assessments (Mohd et al., 2018). Addressing these gaps is crucial to ensuring that KTP initiatives achieve their intended objectives and deliver sustained benefits at the institutional, governmental, and societal levels.

Problem Statement
Despite the strategic importance of KTPs, several challenges hinder their effectiveness. First, there is limited research on the long-term impact of KTP initiatives. Existing studies often focus on short-term project outcomes, neglecting the broader implications of knowledge transfer on industries, communities, and academia (Ahmad et al., 2022). Second, inconsistencies in knowledge transfer mechanisms have led to disparities in program effectiveness, with some institutions demonstrating successful collaborations while others struggle to establish sustainable industry partnerships (Mohidin et al., 2017). Third, the lack of standardized evaluation frameworks makes it difficult to assess the overall success of KTPs and their contribution to economic and social development (Firdaus et al., 2020). Finally, while knowledge transfer programs aim to engage local communities, many initiatives fail to adequately involve stakeholders, resulting in limited relevance and applicability to real-world challenges (Zulfarina et al., 2019).

Given these challenges, there is a need for comprehensive research to evaluate the effectiveness of KTPs, identify gaps in their implementation, and develop structured frameworks that optimize their impact. By addressing these issues, this study seeks to provide insights into improving KTP execution, ensuring that knowledge transfer initiatives contribute meaningfully to academia, government, and community development.

Purpose of Study
This study aims to evaluate the effectiveness of knowledge transfer programs (KTPs) in enhancing participants' skills and knowledge across three key areas: basic knowledge, preparation and management skills, and care and maintenance skills. Understanding the dynamics of knowledge transfer will enable researchers to develop tailored approaches that address the specific needs of different stakeholders, including universities, industries, and local communities.

Additionally, this study seeks to explore the role of public policy measures in supporting knowledge transfer initiatives. By identifying gaps in current research and examining best practices in KTP implementation, the study aims to provide practical recommendations for optimizing knowledge dissemination and application. Specifically, the research will investigate whether KTP participants experience significant improvements in their technical knowledge, management capabilities, and long-term skill retention following their engagement in knowledge transfer activities. These findings will contribute to the development of structured knowledge transfer frameworks that enhance economic and social impact.

This study will test the following hypotheses to assess the impact of knowledge transfer programs on participants' skill development:

- H_1: There is a significant improvement in participants' basic knowledge after attending the workshop.
- H_2: There is a significant improvement in participants' preparation and management skills after attending the workshop.
- H_3: There is a significant improvement in participants' care and maintenance skills after attending the workshop.

By evaluating these hypotheses, this study aims to provide empirical evidence on the effectiveness of KTP workshops, ensuring that such programs are structured, impactful, and sustainable in fostering knowledge transfer among participants.

Significance of the Study
Academic Institutions
This study contributes to academic institutions by providing insights into how knowledge transfer programs enhance research commercialisation, industry partnerships, and institutional reputation (Landry et al., 2010). The findings will help universities refine their knowledge exchange strategies, ensuring that academic research remains applicable and commercially viable. Moreover, by assessing the impact of KTPs on student training and skill development, this study supports efforts to improve graduate employability and entrepreneurship education.

Government
This research offers valuable insights for government policymakers, helping them refine strategies for strengthening Malaysia's innovation ecosystem (Kochenkova et al., 2015). The study's findings will assist in evaluating the effectiveness of KTPs in driving economic competitiveness, job creation, and productivity growth (Hewitt-Dundas, 2012). Additionally, by examining how well KTPs align with national economic priorities, this study ensures that public investments in research yield measurable societal benefits.

Community
At the community level, this study assesses how KTPs contribute to poverty reduction, sustainable agriculture, and skill development (Zulfarina et al., 2019). By evaluating the program's effectiveness in engaging marginalized groups, such as women and youth, the study supports policies promoting economic empowerment and social inclusion (Zamora et al., 2019). Furthermore, by exploring how KTPs enhance public awareness of science and technology, this research fosters a more informed and engaged society (Paudel et al., 2021).

Literature Review
Definition and Dimensions of Knowledge Transfer
Knowledge transfer (KT) refers to the process of disseminating both explicit knowledge, such as documented information, formal procedures, and technologies, and tacit knowledge, including skills, expertise, and personal experiences, across individuals, institutions, and national boundaries (Fabiano et al., 2020; Klimova, 2020; Ferrer-García et al., 2021). This transfer can be executed through formal mechanisms such as patents, training programmes, licensing, and structured knowledge transfer offices, as well as informal approaches including

interpersonal networks, collaborations, and student exchange initiatives (Pagani et al., 2020; Barros et al., 2020). In universities, particularly within research-intensive institutions, KT has emerged as a fundamental institutional objective that links academic outputs with industrial, governmental, and societal applications (Klimova, 2020; Fabiano et al., 2020; Barros et al., 2020). The effectiveness of KT is contingent upon the integration of codified and experiential knowledge into adaptable systems that respond to the evolving requirements of academic, commercial, and policy landscapes. In Malaysia, the Knowledge Transfer Programme (KTP) further institutionalises this agenda by promoting university–community and university–industry engagement through structured initiatives (Madon et al., 2021; Samsurijan et al., 2018).

The Importance of Knowledge Transfer in Socioeconomic Development
KT plays a pivotal role in advancing innovation, economic dynamism, and sustainable national development. By facilitating the diffusion of research-driven knowledge and technological capabilities, KT contributes to the development of novel products, services, and entrepreneurial models that bolster organisational adaptability and enhance national economic performance (Singh & Dhir, 2023; Fabiano et al., 2020; Klimova, 2020). It also fosters resilience by enabling institutions and industries to respond to socioeconomic disruptions such as pandemics or economic downturns with agility and evidence-based strategies (Zygmunt & Zygmunt, 2025; Singh & Dhir, 2023). Crucially, KT narrows the gap between academic inquiry and practical application, ensuring that university-generated insights inform and improve real-world policies and practices (Lundmark et al., 2023; Ferrer-García et al., 2021). In this regard, KT is essential to realising sustainable development objectives, promoting societal well-being, and ensuring informed decision-making in both public and private sectors (Grigorescu et al., 2021; Ferreira et al., 2020). Programmes like Malaysia's KTP reinforce this mission by systematically embedding knowledge dissemination and impact-driven collaboration into the national higher education agenda (Madon et al., 2021; Samsurijan et al., 2018).

International Practices and Policy Priorities in Knowledge Transfer
Globally, the design and emphasis of KT initiatives vary according to national priorities and institutional capacities. In China, KT supports the innovation strategies of multinational corporations and human capital development (Cheng et al., 2022; Singh & Dhir, 2023), while in the Visegrad Group comprising Hungary, Poland, Czechia, and Slovakia KT enhances SME resilience and fosters economic modernisation (Zygmunt & Zygmunt, 2025; Jankowska et al., 2020). The European Union has institutionalised KT within policy frameworks focusing on renewable energy, regional development, and environmental protection (Grigorescu et al., 2021; Ferreira et al., 2020). Italy emphasises regional innovation through strong university–industry linkages (Grimaldi et al., 2020), whereas Ghana leverages KT through diaspora engagement and the enhancement of social capital (Wang et al., 2023). Countries such as the United States, Brazil, France, and Taiwan use academic exchanges, joint research, and transnational technology transfer to strengthen innovation ecosystems (Pagani et al., 2020; Barros et al., 2020; Singh & Dhir, 2023). These international practices demonstrate the global recognition of KT as a cornerstone for building competitive, knowledge-based, and sustainable societies. In Malaysia, the KTP reflects a similar strategic intent, integrating global best practices into local institutional frameworks to strengthen university–stakeholder collaborations (Madon et al., 2021; Samsurijan et al., 2018).

Knowledge Transfer in Agriculture and Mushroom Cultivation

Knowledge transfer plays a vital role in agriculture, helping farmers and cultivators adopt better practices and boost productivity (Shukla et al., 2023; Kavitha et al., 2019). This is especially true in mushroom cultivation, where the technical skills needed for successful growth, preparation, and management are more specialized. Structured workshops have proven to be an effective way of teaching these practical skills, blending both theoretical learning and hands-on experience (Shirur et al., 2019). Previous studies highlight how structured training programs in agriculture can lead to measurable improvements in participants' abilities (Kavitha et al., 2019). This section will explore existing research on knowledge transfer, structured workshops, and how learning outcomes are assessed in agricultural training, focusing on mushroom cultivation.

Research on knowledge transfer in agriculture has focused heavily on sustainable farming practices and the adoption of new technologies (Reina-Usuga et al., 2022; Cawley et al., 2023). Effective knowledge sharing is crucial for improving productivity and maintaining food security. However, challenges like limited access to information, a lack of formal training, and resistance to change often hinder the successful transfer of knowledge (Cawley et al., 2023). In mushroom cultivation, there are unique knowledge gaps due to the specialized nature of the practice, requiring targeted educational efforts. Studies have shown that hands-on training and guided learning can significantly improve the adoption of best practices in farming, including mushroom cultivation (Kavitha et al., 2019).

Structured Workshops as a Learning Approach

Structured workshops are widely recognized as an effective method of adult education, especially for skill-building (Shirur et al., 2019). Unlike traditional lecture-style learning, workshops combine theory with practical demonstrations, allowing participants to engage directly with the material. Studies have shown that structured workshops not only improve knowledge retention but also promote a deeper understanding compared to more passive learning methods (Shirur et al., 2019). In agricultural education, workshops have been successfully used to teach farmers and cultivators various skills, such as organic farming, pest control, and irrigation techniques (Baby et al., 2022). The effectiveness of these workshops is often evaluated through pre- and post-test assessments, which help measure knowledge gains.

Measuring Learning Outcomes in Agricultural Training

Measuring learning outcomes is a key part of evaluating the success of any training program (Manyam et al., 2020). Various methods have been used to assess the effectiveness of educational interventions, with pre- and post-test comparisons being one of the most reliable (Afifah et al., 2022). The paired-sample t-test is commonly used in educational research to assess whether there's a significant improvement in knowledge after a training session. Studies in agricultural education have applied this statistical method to evaluate the impact of training programs, showing that structured learning methods can lead to measurable improvements (Afifah et al., 2022). Additionally, factors such as trust, participant engagement, hands-on practice, and instructor expertise have been found to play a key role in the success of training outcomes (Mesfin et al., 2023; Cawley et al., 2023).

Application to Mushroom Cultivation Training

Several studies emphasize the importance of structured training in improving mushroom cultivation practices (Shirur et al., 2019). Research indicates that individuals who undergo formal training in mushroom farming tend to achieve higher success rates in areas such as cultivation, harvesting, and pest management compared to those who learn on their own (Shukla et al., 2023). The structured workshop model provides a systematic approach to learning, ensuring that participants grasp essential concepts and best practices. This study builds on previous research by evaluating the effectiveness of a structured workshop in mushroom cultivation, using the paired-sample t-test to measure improvements in participants' knowledge and skills.

In conclusion, the literature consistently supports the effectiveness of structured workshops in facilitating knowledge transfer in agricultural education. Previous studies have demonstrated that structured learning interventions lead to significant improvements in participants' skills, particularly when combined with hands-on training (Mesfin et al., 2023). The use of paired-sample t-tests to assess learning outcomes has been well-established, providing strong evidence of the effectiveness of these training methods (Afifah et al., 2022). This study adds to the existing body of research by applying these principles to mushroom cultivation training, offering valuable insights into the role of structured workshops in enhancing participants' skills and knowledge. By bridging the gap between theoretical knowledge and practical application, structured workshops remain an essential tool in agricultural education.

Methodology

This study employed a quantitative, quasi-experimental pre-test and post-test design to evaluate the effectiveness of a mushroom cultivation workshop. A total of 27 participants were involved, all of whom represented individuals from low to middle-income communities (B40 group) residing in the Segamat district of Johor, Malaysia. Participants were selected using a non-probability convenience sampling method, allowing the inclusion of individuals who were readily accessible and willing to participate, with the primary inclusion criterion being an interest in mushroom cultivation, regardless of prior experience. The intervention was delivered as a one-day workshop structured around three key modules: (1) Basic Knowledge of Mushroom Cultivation, (2) Preparation and Management of Mushrooms, and (3) Care and Maintenance of Mushrooms. Each module incorporated a progression of instructional techniques, including lectures to provide theoretical foundations, demonstrations based on Bandura's observational learning principles, and hands-on activities designed to reinforce practical and psychomotor skills. This multi-modal approach aimed to accommodate various learning styles and enhance the transfer of knowledge and skills. To measure the impact of the intervention, pre-test and post-test assessments were administered before and immediately after the workshop using standardized five-point Likert scale questionnaires that aligned with the learning objectives of each module. The instruments were reviewed and validated by subject matter experts to ensure content accuracy and relevance, and participants received assistance from researchers during administration when necessary to ensure comprehension. Data were analysed using IBM SPSS Statistics Version 29, with a paired-sample t-test conducted to determine statistically significant differences in scores, thereby evaluating the effectiveness of the workshop. Although the study offers useful insights, the small sample size (n = 27) may limit the statistical

power and generalizability of findings; future studies should consider larger samples to enhance robustness. Additionally, the absence of a control group, a common limitation in quasi-experimental designs, restricts causal inference. Nonetheless, this limitation is acknowledged, and future research may benefit from alternative methods such as interrupted time series or synthetic control approaches (Nianogo et al., 2023; Shadish, 2001) to mitigate bias and strengthen internal validity.

Data Analysis
Descriptive Statistics

To evaluate the effectiveness of the mushroom cultivation workshop, participants' competencies were assessed across three core domains: Basic Knowledge of Mushroom Cultivation (CAT1), Preparation and Management of Mushrooms (CAT2), and Care and Maintenance of Mushrooms (CAT3). A total of 27 participants completed both pre-test and post-test assessments. Table 4.1 presents the descriptive statistics for each domain.

Table 4.1
Descriptive Statistics for Pre- and Post-Test Scores across Workshop Domains

Domain	Assessment	M	SD	N	SE
CAT1	Post-Test	4.25	0.42	27	0.08
	Pre-Test	1.78	0.67	27	0.13
CAT2	Post-Test	4.28	0.41	27	0.08
	Pre-Test	1.86	0.76	27	0.15
CAT3	Post-Test	4.22	0.45	27	0.09
	Pre-Test	1.75	0.73	27	0.14

Paired Samples t-Tests

To test the hypotheses regarding improvements in participants' competencies, three paired-sample t-tests were conducted, comparing pre- and post-test scores in each domain. Results are summarised in Table 4.2.

Table 4.2
Results of Paired-Sample t-Tests for Pre- and Post-Test Comparisons

Domain	M Difference	SD	SE	95% CI (Lower, Upper)	t	df	p
CAT1 (H_1)	2.47	0.68	0.13	2.20, 2.74	18.84	26	< .001
CAT2 (H_2)	2.42	0.76	0.15	2.12, 2.72	16.54	26	< .001
CAT3 (H_3)	2.47	0.79	0.15	2.16, 2.78	16.33	26	< .001

Result and Discussion

A paired-sample t-test was conducted to compare participants' scores in the Basic Knowledge of Mushroom Cultivation (CAT1) before and after attending the workshop. The pre-test scores (M = 1.78, SD = 0.67) were significantly lower than the post-test scores (M = 4.25, SD = 0.42). The mean difference of 2.47 was statistically significant, t(26) = 18.840, p < 0.001. These results indicate a substantial improvement in participants' understanding of basic mushroom cultivation following the workshop.

The observed improvement may be attributed to participants' intrinsic interest in mushroom cultivation, with many attending the workshop to explore it as a viable entrepreneurial opportunity. These findings are consistent with those reported in previous research. For instance, Baby et al. (2022) also documented significant knowledge gains following similar interventions, suggesting that well-structured, hands-on training can effectively enhance participants' understanding of mushroom cultivation.

A subsequent paired-sample t-test was conducted to assess participants' knowledge related to the Preparation and Management of Mushroom (CAT2). The pre-test scores (M = 1.86, SD = 0.76) were significantly lower than the post-test scores (M = 4.28, SD = 0.41). The mean difference was 2.42, $t(26) = 16.542$, $p < 0.001$, indicating notable knowledge enhancement in this domain.

Comparable improvements have been reported in previous studies; for instance, Kanpal et al. (2024) found an 81.54% increase in knowledge related to the preparation of mushroom materials. Such improvements are essential, as proper preparation and management practices underpin the success of mushroom cultivation. By acquiring this foundational knowledge, participants are more capable of launching and managing small-scale mushroom enterprises. As noted by Baby et al. (2022), the confidence developed through such experiential learning may further encourage entrepreneurship within this sector.

Lastly, a paired-sample t-test was conducted for the domain of Care and Management of Mushroom (CAT3). The pre-test mean (M = 1.75, SD = 0.73) was significantly lower than the post-test mean (M = 4.22, SD = 0.45), resulting in a mean difference of 2.47, $t(26) = 16.326$, $p < 0.001$. This outcome suggests that participants significantly improved their ability to manage and care for mushrooms after attending the workshop.

This aligns with previous findings on knowledge acquisition in pest and disease management. For example, Kanpal et al. (2024) reported an 86.15% knowledge gain in this area, while Baby et al. (2022) observed a 74% increase. The acquisition of such knowledge is particularly crucial for preventing crop loss and ensuring long-term productivity. Furthermore, as highlighted in earlier studies, improved knowledge in pest and disease control supports the development of more sustainable and economically viable mushroom farming practices.

Evaluation of Workshop Effectiveness

All 27 participants completed a post-workshop evaluation, providing feedback on the perceived effectiveness of the programme. The overall evaluation score yielded a mean of 4.56 (SD = 0.58), indicating a highly positive reception and a high level of satisfaction. This suggests that most participants found the workshop to be effective and worthwhile. The relatively low standard deviation reflects consistent participant responses, reinforcing the workshop's success in meeting its learning objectives.

Conclusion

The outcomes of this study demonstrate the effectiveness of the structured mushroom cultivation workshop conducted under the Knowledge Transfer Programme (KTP) by TAR UMT. The significant improvements recorded in all three domains, consisting of basic knowledge, preparation and management, as well as care and maintenance, indicate that the

workshop successfully enhanced participants' understanding and practical skills. These findings suggest that structured, hands-on training is a meaningful approach to empowering communities, particularly among the B40 group, by equipping them with agricultural skills that have the potential to support income generation and strengthen food security.

The study reaffirms the important role of higher education institutions in leading knowledge transfer initiatives that contribute to national development goals. By translating academic expertise into practical applications, university-led programmes such as the KTP provide an effective platform to bridge the gap between research output and community needs. The knowledge and skills gained through such initiatives can further encourage small-scale entrepreneurship, reduce dependence on external support, and promote sustainable farming practices.

For future initiatives, it is recommended that follow-up assessments be conducted to evaluate the long-term application and sustainability of the knowledge acquired by participants. Monitoring whether participants have initiated mushroom cultivation or other agricultural ventures would provide deeper insights into the lasting impact of the programme. Such evaluations will be useful in refining the structure, delivery, and scalability of future knowledge transfer programmes aimed at uplifting marginalised communities across Malaysia.

Research Contribution
This study contributes theoretically by providing empirical evidence that structured, hands-on workshops under the Knowledge Transfer Programme (KTP) can significantly enhance both conceptual understanding and practical skills in agricultural training. It enriches the discourse on experiential learning and knowledge transfer by demonstrating its applicability to mushroom cultivation for the B40 community. Contextually, it addresses a gap in Malaysian rural development studies by showcasing a practical and adaptable university-led model that empowers local communities, fosters self-reliance, and aligns academic expertise with community needs. This model supports Malaysia's socio-economic development agenda and offers a replicable framework for similar socio-economic settings, reinforcing the strategic role of higher education institutions in advancing inclusive growth and sustainable livelihoods.

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