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Students' Perspectives on Quality Assurance and Sustainable Higher Education: Evidence from the Faculty of Economics and Business, Universiti Malaysia Sarawak

Farhana Ismail*, Phang Yi Fun, and Nur Zaimah Ubaidillah

Faculty of Economics & Business, Universiti Malaysia Sarawak, Malaysia

*Corresponding Author Email: ifarhana@unimas.my

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Abstract

This study examines the influence of quality assurance practices on students' knowledge, skills, competencies, and employability within higher education. Survey data were collected from students at the Faculty of Economics and Business, Universiti Malaysia Sarawak (UNIMAS), and analysed using the Partial Least Squares Structural Equation Modelling (PLS-SEM) technique. The results indicate that institutional infrastructure, technological facilities, the quality of teaching and learning processes, practical training, and student research activities significantly enhance students' knowledge, skills, and competencies. Furthermore, student research activities exert a positive and direct effect on employability outcomes. The findings underscore the importance of strengthening quality assurance mechanisms to ensure that higher education institutions effectively contribute to both academic and professional development. Policy implications suggest that improving quality assurance across teaching, learning, and research dimensions is essential to enhance graduate employability, develop key competencies, and foster the sustainability of higher education.

Keywords: Quality Assurance, Competencies, Employability, Higher Education, Students, Sustainability

Introduction

Education is the driving force behind a nation's development. The talents nurtured through a strong education system form the foundation of a country's future progress and prosperity. Quality assurance, therefore, plays a critical role in shaping the learning experiences that cultivate these future pillars. Ensuring the sustainable development of education quality is essential for Malaysia to produce graduates who can effectively meet the demands of national economic and social development. This effort is crucial not only for strengthening academic disciplines and improving professional structures but also for meeting global expectations, particularly as "Quality Education" has been identified as the

fourth goal in the Sustainable Development Goals (SDG) 2030 Agenda. In line with this, Malaysia must continue to enhance and reform its quality assurance mechanisms, especially within the higher education sector.

Over the past decade, many countries, including Malaysia, have increasingly recognised the strategic importance of education and invested significantly in improving educational standards. Education is vital for individual advancement and societal progress, as a nation's prosperity depends heavily on the presence of a skilled, innovative, and adaptable workforce. Higher education, in particular, plays a key role in driving economic development. On one hand, education enhances human capital, fosters scientific and technological advancement, and contributes directly to wealth creation. On the other hand, imbalances in educational expansion, unresponsive curricula, and conservative teaching approaches can hinder economic growth. Thus, understanding the dual effects of education on development and managing the relationship between both effectively is essential for national progress.

In Malaysia, quality assurance has become a cornerstone of effective quality management, particularly in the education sector. It functions as a mechanism to ensure that educational standards are consistently met and continuously improved. Within higher education, quality assurance provides confidence that institutional processes, academic programmes, and student outcomes align with established benchmarks and stakeholder expectations. Its overarching aim is to uphold educational excellence, strengthen institutional accountability, and contribute to the sustainable advancement of the education system. Effective implementation of quality assurance frameworks can support continuous reform, enhance teaching and learning, and elevate the overall competence of graduates. In recent years, Malaysian higher education institutions have demonstrated resilience, innovation, and adaptability in applying quality assurance principles, leading to improvements in programme quality and institutional performance. These achievements highlight the central role of quality assurance in maintaining the integrity and relevance of higher education, despite the rapid massification of the sector.

As Malaysia continues to expand its higher education system, it is crucial to ensure that growth is matched with strong quality assurance structures. Uncontrolled expansion without robust quality frameworks can lead to persistent structural and systemic challenges. The quality of higher education can be viewed from two dimensions: macro quality and micro quality. Macro quality refers to the overall system, its structure, scale, and alignment with national development goals and societal needs. Micro quality, in contrast, focuses on the delivery of education and the extent to which students acquire the knowledge, skills, and competencies needed to meet labour market demands. Balancing these two dimensions is essential to ensure that expansion is accompanied by sustained relevance, accountability, and quality.

In this context, the challenge of maintaining quality amid rapid higher education expansion has become increasingly significant. The rising unemployment rate among degree and diploma holders, reaching 4.4% in 2020 (The Edge Market, 2021), reflects a growing gap between educational outcomes and labour market expectations, further exacerbated by the COVID-19 pandemic. These trends underscore the need to examine how higher education institutions prepare students with the knowledge, skills, and competencies required for

employment. Accordingly, this study focuses on students from the Faculty of Economics and Business (FEB), UNIMAS, to explore their perceptions of higher education quality and its influence on employability. By analysing both macro-level elements, such as institutional processes and micro-level factors including teaching quality, infrastructure, and learning resources, the study aims to provide a comprehensive understanding of how quality assurance mechanisms shape graduate readiness. The findings are intended to inform policymakers, educators, and institutions in strengthening quality assurance frameworks, improving employability, reducing brain drain, and advancing Malaysia's long-term sustainable development in line with SDG 4: Quality Education.

Literature Review

The quality of higher education is critical for the sustainable development of a country, reflecting the collective efforts and perspectives of key stakeholders, including policymakers, educators, and students. Elements such as university infrastructure, access to modern technology, the quality of teaching and learning processes, practical training, and student research activities significantly influence graduates' knowledge, competencies, skills, and employability. Consequently, numerous researchers have examined the relationship between quality assurance in higher education and graduate employability.

Okorie and Akubuilo (2013) emphasized that without effective quality assurance mechanisms, the sustainability of tertiary education in Nigeria would remain elusive, advocating for technology-based teaching and learning approaches to maintain and improve educational quality. Similarly, data from the Department of Statistics Malaysia (2020) revealed that the graduate unemployment rate rose to 4.4%, largely due to the effects of the COVID-19 pandemic, which also caused a 5.1% decline in graduate participation in the labor force. These figures illustrate how external factors and inadequate educational quality can directly affect graduate employability and broader economic resilience.

Kahveci et al. (2012) highlighted that quality assurance represents a holistic approach encompassing all processes within higher education institutions, ensuring that students and stakeholders receive the expected quality outcomes. In the same vein, Ruiz and Junio (2012) argued that quality assurance must be integrated into institutional management and strategic planning. As higher education systems evolve, quality assurance mechanisms must adapt to remain effective, requiring sustained effort, timely policy interventions, and regular updates informed by the perspectives of students and other stakeholders, especially as technological and educational contexts continue to change.

Yuan et al. (2021) found that quality assurance has a significant and positive impact on higher education globally, particularly through its influence on accreditation, institutional accountability, and program evaluation. Likewise, Stukalo and Lytvyn (2021) demonstrated that higher education standards should integrate the Sustainable Development Goals (SDGs) at both institutional and national levels, noting that embedding SDG-related capacity within internal quality assurance processes can strengthen program-level outcomes. Herlambang et al. (2021) proposed a conceptual framework for understanding quality management factors in higher education, revealing that the relationship between institutional facilities and research activity is the strongest, whereas the link between practical activities and employability is the weakest. They recommended developing institutional policies that

enhance educational quality and improve graduates' knowledge, skills, and competencies in alignment with labor market demands.

Despite this growing body of literature, most studies have primarily focused on institutional frameworks, management practices, and policy implementation, with limited attention given to students' perspectives as key stakeholders in the quality assurance process. Students are directly affected by the quality of teaching, learning, facilities, and institutional management, making their insights essential for meaningful and sustainable improvements. Furthermore, while recent research has begun to explore the integration of sustainability principles and the SDGs into higher education quality frameworks, there remains a gap in understanding how students perceive the relationship between quality assurance and the sustainability of higher education. This gap is particularly relevant in the Malaysian context, where higher education institutions must balance rapid expansion, global competitiveness, and sustainable development. Therefore, this study explores students' perspectives on quality assurance in higher education within the context of sustainability, focusing on the Faculty of Economics and Business at Universiti Malaysia Sarawak.

Data and Methodology

Sampling Design

The study employed a five-point Likert scale in the questionnaire to measure responses based on the research questions. A score of 1 indicated "very dissatisfied," while a score of 5 represented "very satisfied." The questionnaire comprised eight key items that formed the core of the instrument and served as the basis for the research hypotheses.

- **Infrastructure and technical equipment.**
  Infrastructure and technical equipment represent the fundamental resources required by students to support their learning. Establishing adequate infrastructure and facilities often requires substantial time and financial investment. These resources encompass the physical and technical systems that provide essential public services for students' academic and social needs, facilitating smooth educational and economic activities. They constitute the material foundation necessary for societal survival and progress. Well-developed facilities and equipment enhance the learning environment, provide convenience, and reduce obstacles faced by students.
- **Content of the educational process.**
  The content of the educational process refers to the materials, curriculum, and pedagogical content used throughout the teaching and learning process. It involves the collaborative participation of educators and learners in applying diverse instructional strategies and educational resources to achieve academic objectives and deliver new knowledge to students.
- **Teaching staff.**
  Teaching staff refers to the overall competency and professional capacity of educators. This includes indicators such as teachers' academic and professional qualifications, cultural literacy, pedagogical proficiency, moral standards, and other essential attributes required for effective instruction. The term "teaching strength" reflects the collective quality derived from these attributes and qualifications.
- **Teaching activities.**
  Teaching activities generally refer to structured classroom-based instruction conducted within defined teaching units. These activities represent the core form of educational

engagement within an institution. Each teaching activity functions as an integrated system composed of interrelated stages, with each stage serving distinct educational purposes within the broader learning process.

- **Research activities.**
  Research activities encompass systematic processes of inquiry, beginning with the collection and analysis of information to generate new insights and inform behavioural or institutional change. In higher education, such activities are vital for advancing knowledge, fostering innovation, and supporting evidence-based improvements in teaching and learning practices.
- **Practical activities.**
  Practical activities refer to learning experiences undertaken by students either independently or under the guidance of instructors. These activities are closely linked to students' real-life experiences and social contexts, emphasizing the practical application of theoretical knowledge. They enable students to integrate and apply their learning in authentic settings, thereby reinforcing the connection between education and societal needs.
- **Knowledge, skills, and competencies.**
  Knowledge, skills, and competencies constitute the essential capabilities students must acquire during their studies. Knowledge and experience are developed through both behavioural and cognitive engagement, while skills are cultivated through continuous practice and application. As knowledge and skills are interdependent, an effective learning process requires their integration to foster well-rounded student development.
- **Employability.**
  Employability refers to the set of attributes and competencies that enable graduates to apply their academic learning effectively in the workplace. It is not limited to university coursework or activities but reflects the capacity to translate acquired knowledge, skills, and experiences into professional contexts. Enhancing employability, therefore, involves bridging academic preparation with the practical demands of the labor market.

Sampling Size

The participants in this study are faculty Economics Business UNIMAS students. The research is based on a questionnaire completed by 364 respondents from West and East Malaysia who studied at the UNIMAS School of Economics. Faculty of Economics, Business has three major categories: Economics, Accounting and Finance, and Business Management. These questionnaires are for undergraduate students from the Faculty of Economics and Business, UNIMAS. Students from the same faculty but different courses who are in different years. According to the subject of this research, students need to have used and understood the equipment and facilities of the university.

Hypothesis

The hypotheses tested in this study are as follows:

H1: The infrastructure and technical equipment provided by universities have a positive influence on students' knowledge, competencies, and skills.

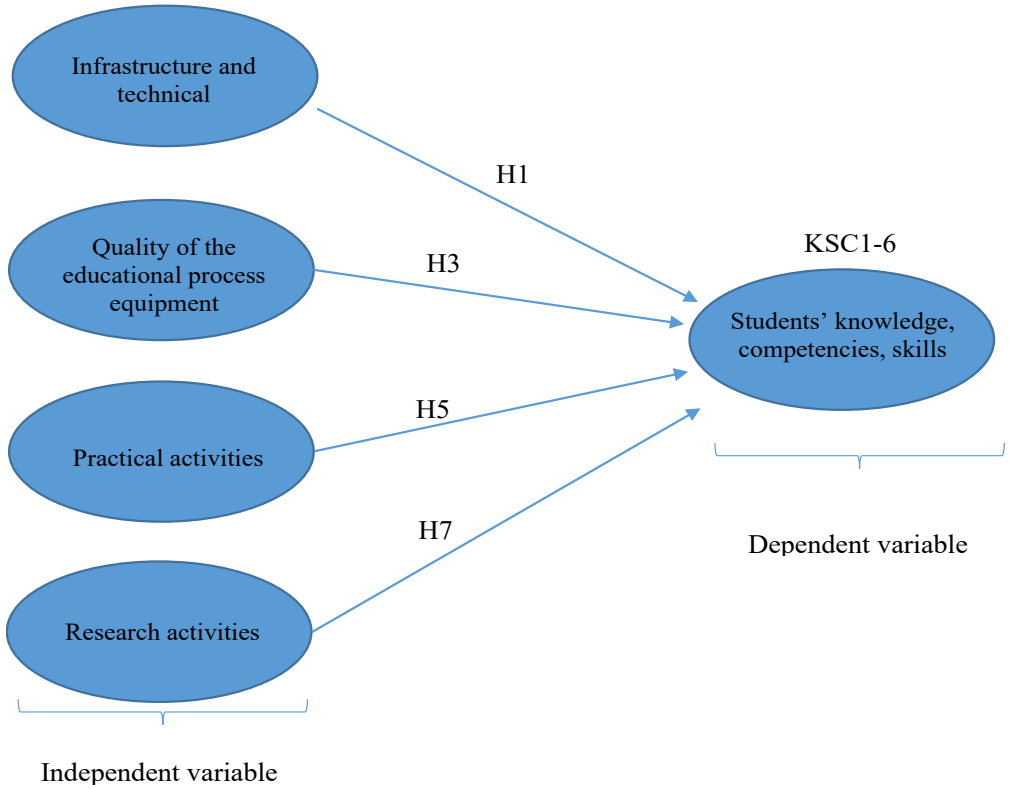
H2: The infrastructure and technical equipment provided by universities have a positive influence on students' employability.

H3: The quality of the educational process has a positive influence on students' knowledge, competencies, and skills.

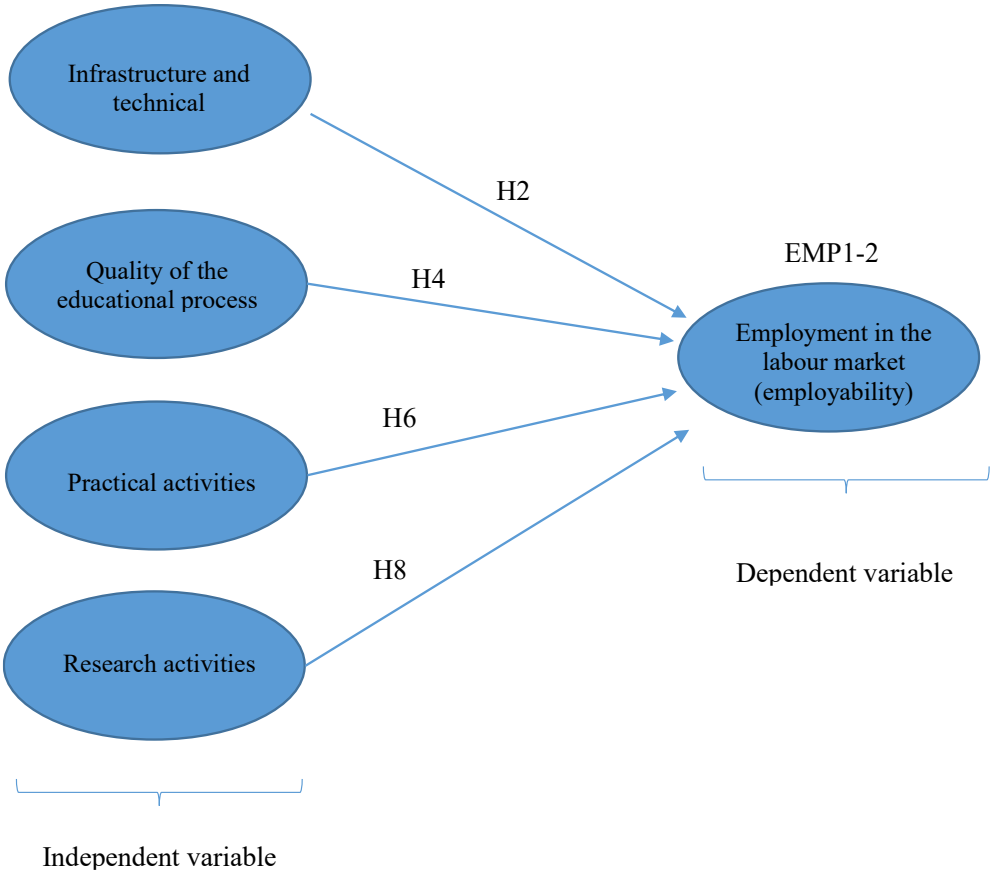
H4: The quality of the educational process has a positive influence on students' employability.
H5: Practical activities have a positive influence on students' knowledge, competencies, and skills.
H6: Practical activities have a positive influence on students' employability.
H7: Students' research activities have a positive influence on their knowledge, competencies, and skills.
H8: Students' research activities have a positive influence on their employability.

Conceptual Framework

Model 1



Model 2



Data Collection

The study employed an online questionnaire distributed to students of the Faculty of Economics and Business at Universiti Malaysia Sarawak (UNIMAS) through various social media platforms. The questionnaire was developed using Google Forms and structured based on the study's research questions. Data collection was conducted at two different time points: the first distribution occurred in February, during the university's semester break, and the second in March, when lectures had resumed. The responses from both periods were compiled and subsequently analysed to obtain comprehensive insights into students' perspectives.

Data Analysis

This study employed the Partial Least Squares–Structural Equation Modelling (PLS-SEM) technique for data analysis. PLS-SEM is a variance-based structural equation modelling approach that focuses on causal relationships and has strong predictive capabilities. It operates through an iterative process that integrates principal component analysis with multiple regression analysis. Moreover, PLS-SEM allows the construction of hybrid models that combine different structural forms within the same analytical framework. Owing to its flexibility, PLS-SEM is particularly suitable for studies emphasizing prediction and theory development rather than pure theory confirmation. Data analysis in this study was conducted using the SmartPLS software application.

Results

Descriptive Statistics

All respondents in this study were undergraduate students from the Faculty of Economics and Business (FEB), Universiti Malaysia Sarawak (UNIMAS). A total of 364 students participated in the survey, with 26% male and 74% female respondents. The majority of respondents were Year 2 students (38%), followed by Year 3 (35%), Year 1 (25%), and Year 4 (1%). Additionally, only one student (0.3%) from Years 5 and 6 participated. In terms of residence, more than half of the respondents lived in urban areas, while 44% were from rural areas. The participants represented various programmes offered under the faculty, including Service Economics (26%), International Economics (20%), Marketing (16%), Business Economics (16%), Finance (10%), Corporate Management (9%), and Accounting (3%).

Table 1
Descriptive Statistics of Constructs

No.	Constructs	Mean	Standard Deviation
	Quality criteria		
1	Infrastructure and technical equipment	3.7277	0.74555
2	Content of the educational process	3.7431	0.58318
3	Teaching staff	3.8944	0.60925
4	Teaching activities	4.1981	0.65897
5	Research activities	3.9231	0.57937
6	Practical activities	3.9323	0.61554
	Academic outcomes		
7	Knowledge, skills, and competencies	3.929	0.62378
8	Employability	3.5742	0.74965

(Source: Survey results computed with IBM SPSS Statistics 26)

Table 1 presents the descriptive statistics of the constructs related to quality criteria and academic outcomes, encompassing eight key factors examined in this study. Overall, the mean values of these constructs ranged between 3.5 and 4.2, while the standard deviations ranged from 0.5 to 0.74. The relatively low standard deviation values (less than 1) indicate that most observed data points were closely clustered around their respective means, suggesting a consistent pattern in respondents' perceptions.

Measurement and Structural Model Assessment

An Exploratory Factor Analysis (EFA) was initially conducted to assess the psychometric properties of the scales used to measure higher education quality and academic outcomes before their inclusion in the PLS-SEM model. This approach was appropriate given the newly constructed scale. Subsequently, Confirmatory Factor Analysis (CFA) was performed using SmartPLS software (version 3) to validate the measurement model.

The Structural Equation Model (SEM) comprises three primary constructs: infrastructure and technical equipment, research activities, and practical activities, along with a secondary construct representing educational processes, which serve as indicators of quality standards. The model also includes two higher education outcome constructs, namely knowledge, skills, and competencies, and employability. As all variables measuring the

content of the educational process, teaching staff, and teaching activities were loaded under the same factor in the EFA, the educational process was treated as a second-order construct in the SEM framework.

According to Table 2, convergent validity and reliability were evaluated using SmartPLS. The results demonstrated that all factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) values exceeded the recommended thresholds of 0.7, 0.7, 0.7, and 0.5, respectively. This confirms that all measurement criteria were satisfactorily met. Furthermore, discriminant validity was assessed using the Fornell and Larcker criterion (Fornell and Larcker, 1981; Alarcón et al., 2015), which compares the square root of AVE with the inter-construct correlations. The results indicate that the square roots of the AVE values for each construct were greater than the correlations between constructs, thereby confirming discriminant validity.

Table 1
Convergent Validity and Reliability

Construct	Items	Loadings	Cronbach's Alpha	rho_A	CR	AVE
Infrastructure and technical equipment (INF)	INF_1	0.869	0.950	0.955	0.959	0.771
	INF_2	0.862				
	INF_3	0.917				
	INF_4	0.905				
	INF_5	0.901				
	INF_6	0.904				
Educational process (EP) Second-order construct	CON	0.874	0.970	0.971	0.973	0.651
	TST	0.912				
	TAC	0.922				
Content of the educational process (CON)	CON_1	0.909	0.945	0.945	0.958	0.819
	CON_2	0.922				
	CON_3	0.927				
	CON_4	0.900				
	CON_5	0.867				
Teaching staff (TST)	TST_1	0.871	0.944	0.948	0.956	0.786
	TST_2	0.911				
	TST_3	0.894				
	TST_4	0.878				
	TST_5	0.898				
	TST_6	0.899				
	TST_7	0.853				
	TST_8	0.886				
Teaching activities (TAC)	TAC_1	0.756	0.961	0.962	0.967	0.786
	TAC_2	0.900				
	TAC_3	0.915				
	TAC_4	0.907				
	TAC_5	0.926				
	TAC_6	0.905				
Research activities (RAC)	RAC_1	0.858	0.943	0.944	0.953	0.717
	RAC_2	0.864				
	RAC_3	0.866				
	RAC_4	0.855				
	RAC_5	0.812				
	RAC_6	0.873				
	RAC_7	0.841				

	RAC_8	0.801				
Practical activities (PAC)	PAC_1	0.884	0.962	0.963	0.969	0.815
	PAC_2	0.895				
	PAC_3	0.915				
	PAC_4	0.901				
	PAC_5	0.893				
	PAC_6	0.916				
	PAC_7	0.917				
Knowledge, skills, and competencies (KSC)	KSC_1	0.901	0.946	0.947	0.957	0.788
	KSC_2	0.898				
	KSC_3	0.865				
	KSC_4	0.912				
	KSC_5	0.883				
	KSC_6	0.867				
Employability (EMP)	EMP_1	0.972	0.941	0.941	0.972	0.945
	EMP_2	0.972				

Note: CR—composite reliability; AVE—average variance extracted.
(Source: Authors with SmartPls 3)

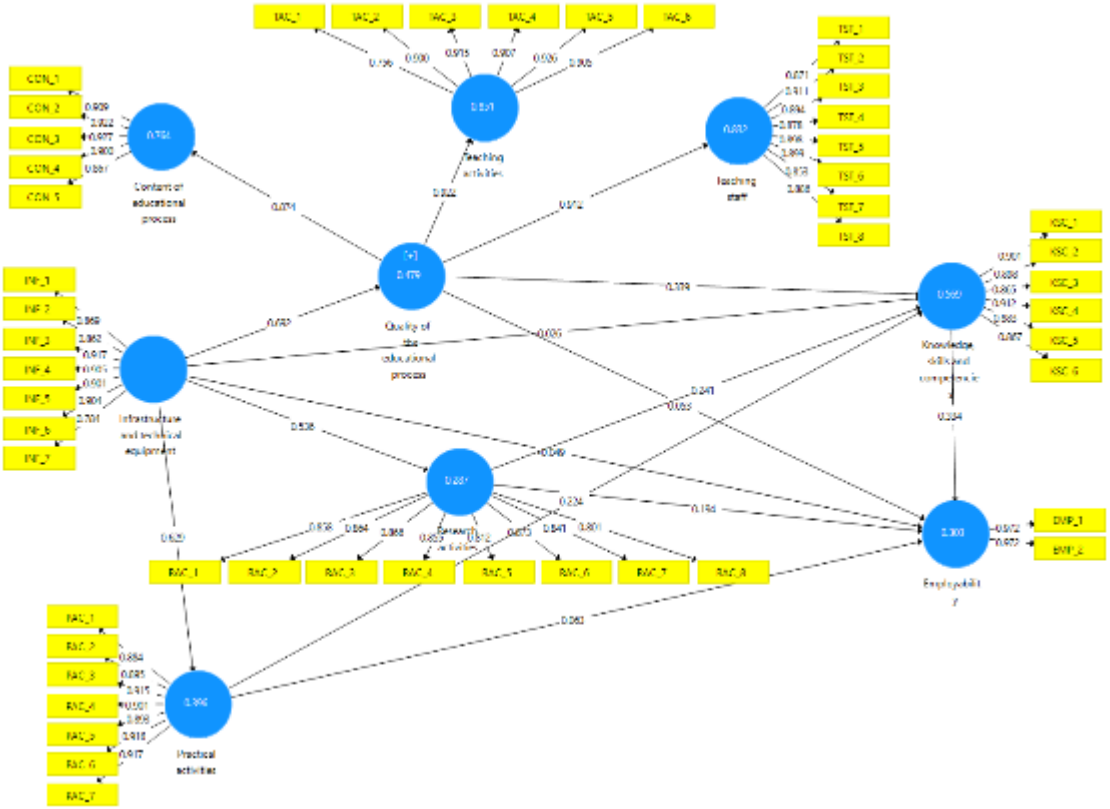


Figure 1. PLS-SEM model.
(Source: Author with SmartPls 3)

Figure 1 presents the Partial Least Squares Structural Equation Modelling (PLS-SEM) framework used in this study. Once the fundamental quality criteria of the measurement model were satisfied, the analysis proceeded to evaluate collinearity, the coefficient of

determination (R^2), effect size (f^2), and the significance and relevance of the model paths. The corresponding results are illustrated in Figure 1.

Regarding the predictive value of the structural model, the R^2 coefficients for the endogenous variables were calculated. The results show that R^2 for Knowledge, Skills, and Competencies (KSC) was 0.569, while R^2 for Employability (EMP) was 0.303. This indicates that the quality criteria of higher education collectively explained more than half of the variance in students' knowledge, skills, and competencies, and approximately one-third of the variance in employability.

According to Cohen's definition, the f^2 effect size measures the change in R^2 when an exogenous variable is removed from the model. The effect size is interpreted as small (≥ 0.02), medium (0.15), or large (0.35). The results reveal that the quality of the educational process, research activities, and practical activities had a small effect on knowledge, skills, and competencies in terms of f^2 magnitude.

Testing Research Hypotheses

To test the research hypotheses, bootstrapping was conducted using SmartPLS software with 5,000 resamples. According to Hair et al., the number of bootstrap samples should exceed the number of valid observations in the original dataset, with 5,000 resamples being the recommended standard. Within the structural model, both the direct and indirect relationships among variables were examined to assess their correlations and significance levels. Path coefficients, corresponding t-statistics, and bias-corrected confidence intervals were analysed to determine the strength and reliability of the hypothesised relationships.

Table 3
Hypotheses Testing (Direct Effects)

Hypothesis	Relationship	Std. Beta	Std. Error	t-value	95% BCI	Decision	F^2
H1	INF→KSC	0.026	0.055	0.465	-0.164, 0.076	Not supported	0.002
H2	INF→EMP	-0.049	0.061	0.801	-0.081, 0.136	Not supported	0.001
H3	QEP→KSC	0.339	0.072	4.713***	0.194, 0.475	Supported	0.076
H4	QEP→EMP	0.053	0.087	0.069	-0.118, 0.225	Not supported	0.001
H5	PAC→KSC	0.224	0.069	3.277*	0.085, 0.353	Supported	0.039
H6	PAC→EMP	0.063	0.093	0.678	-0.110, 0.248	Not supported	0.002
H7	RAC→KSC	0.241	0.062	3.854***	0.128, 0.375	Supported	0.048
H8	RAC→EMP	0.194	0.087	2.232*	0.021, 0.357	Supported	0.018

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; INF- Infrastructure and equipment; QEP- Quality of educational process; PAC- Practical activities; RAC- Research activities; KSC- Knowledge, skills, and competencies; EMP- Employability. (Source: Authors with SmartPls 3)

Table 3 presents the results of hypothesis testing for the direct effects in this study. The findings indicate that Hypotheses H1, H2, H4, and H6 were not supported, as their p-values exceeded 0.05. In contrast, Hypotheses H3, H5, H7, and H8 were supported, with p-values below 0.05. Specifically, the results show that infrastructure and technological equipment had no significant impact on knowledge, skills, and competencies (β = 0.026, ns) and no direct effect on employability (β = -0.049, ns), thereby failing to support Hypotheses 1 and 2. The quality of the educational process, which comprises the content of the educational process, teaching activities, and research activities, demonstrated a positive and statistically significant relationship with knowledge, skills, and competencies (β = 0.339, $p < 0.001$). However, it did not have a significant effect on employability (β = 0.053, ns), thus supporting Hypothesis 3 but not Hypothesis 4.

Furthermore, practical activities were found to have a positive and statistically significant effect on knowledge, skills, and competencies (β = 0.224, $p < 0.05$), but no significant effect on employability (β = 0.063, ns), supporting Hypothesis 5 but not Hypothesis 6. Finally, research activities showed a positive and statistically significant effect on both knowledge, skills, and competencies (β = 0.241, $p < 0.001$) and employability (β = 0.194, $p < 0.05$), thereby supporting Hypotheses 7 and 8.

Discussion

This study developed a research model to examine the relationship between several quality assurance characteristics in higher education and their effects on students' knowledge, skills, competencies, and employability. The findings from hypothesis testing provided partial support for the proposed relationships, as discussed below.

The first two hypotheses (H1 and H2) focused on the influence of infrastructure and technological facilities on students' learning outcomes and employability. Contrary to expectations, these hypotheses were not supported, indicating that facilities and equipment did not significantly influence students' knowledge, competencies, skills, or employability. While Herlambang et al. (2021) found that facilities and research activities are strongly related to educational outcomes, this study revealed regional and institutional differences that may explain the lack of significant impact. Specifically, students' perceptions and the quality of university facilities vary across institutions, which could influence how infrastructure contributes to learning and employability outcomes.

In contrast, the findings show that the quality of the educational process, represented by the quality of course content, teaching staff, and instructional activities, had a significant and positive effect on students' knowledge, skills, and competencies (H3). This supports the argument that pedagogical quality plays a crucial role in developing essential graduate attributes. Poza-Vilches et al. (2019) similarly emphasized that competencies are closely linked to the teaching process and can be strengthened through sustainability-oriented education. To prepare students for complex, real-world challenges, universities must focus on nurturing critical and interpretive skills through effective curriculum design and innovative teaching approaches.

However, the quality of the educational process did not have a direct and significant impact on employability (H4). This suggests that while teaching quality enhances academic

competencies, it may not immediately translate into better employment outcomes. Employability is likely influenced by other factors such as students' learning attitudes, adaptability, and engagement with experiential learning opportunities. In an era characterized by rapid technological advancement, individual initiative and lifelong learning may play a more decisive role in determining employability than the formal quality of the educational process alone.

The third supported hypothesis (H5) highlights those practical activities have a positive and significant effect on students' knowledge, skills, and competencies. This finding aligns with Okolie et al. (2022), who argued that practical activities such as work placement learning (WPL) positively and significantly enhance students' knowledge, skills, and competencies by fostering learning self-efficacy and task value, which in turn promote active engagement in practical skills acquisition. Nevertheless, the study found that practical activities did not significantly affect employability. This aligns with Herlambang et al. (2021), who observed that practical activities have the weakest association with employability when compared to facilities and research engagement.

Finally, the last two supported hypotheses (H7 and H8) emphasize the critical role of research activities in enhancing students' academic and employment outcomes. Consistent with Gora et al. (2019), the findings indicate that participation in research contributes positively and directly to students' knowledge, skills, competencies, and employability. Engaging in research encourages analytical thinking, problem-solving, and innovation, attributes that are highly valued in the labor market.

To further understand the complex interplay between higher education quality and academic outcomes, this study also examined mediation effects. Indirect (total and specific) effects were analyzed using a bootstrapping procedure with 5000 resamples to ensure robust estimation of statistical significance and confidence intervals. These mediation analyses provide deeper insights into how different quality assurance components interact to shape both academic and employability outcomes.

According to Table 4, there were both positive direct impacts ($\beta = 0.194$, $p < 0.05$; $\beta = 0.241$, $p < 0.001$) and positive indirect effects ($\beta = 0.080$, $p < 0.001$) of research activities on employability and on knowledge, skills, and competencies. However, infrastructure and technological tools had no significant effects on knowledge, skills, and competencies ($\beta = 0.026$, ns), leading to the rejection of Hypothesis 1. When considering the relationship between infrastructure, technological equipment, and students' academic capabilities, the results show that positive indirect effects outweighed the insignificant direct effects ($\beta = 0.026$, ns). As shown in Table 4 (lines 1 to 4), this relationship is effectively mediated by educational processes, practical activities, and research activities.

These findings suggest that within higher education institutions, having modern technological infrastructure alone is insufficient. Regardless of its quality, infrastructure does not directly influence the development of students' competencies unless it is effectively integrated into teaching and learning practices. For instance, teachers' use of specific software tools and students' access to professional databases for research and practical learning can strengthen the indirect positive effects of infrastructure.

Infrastructure and technical equipment also did not have a significant negative impact on employability, as indicated in Table 4 (β = 0.049, ns), thus rejecting Hypothesis 2. The relationship between employability and technical infrastructure appears to be complex. After accounting for direct effects (β = 0.049, ns) and negligible specific indirect effects through knowledge, skills, competencies, and practical activities (Table 4, rows 6 to 8), the findings indicate that other mediating variables, such as research and teaching quality, play a partial competitive mediation role (Table 4, rows 9 to 12).

Table 2
Indirect effects

Relationship	Std. Beta	Std. Error	t-value	95% BCI	Type of mediation
INF→KSC^a	0.505	0.044	11.538***	0.421, 0.593	
INF→QEP→KSC^b	0.235	0.052	4.515***	0.136, 0.338	Indirect-only (Full mediation)
INF→PAC→KSC^b	0.141	0.043	3.251**	0.053, 0.225	Indirect-only (Full mediation)
INF→RAC→KSC^b	0.129	0.037	3.511***	0.064, 0.211	Indirect-only (Full mediation)
INF→EMP^a	0.357	0.050	7.098***	0.261, 0.457	
INF→KSC→EMP^b	0.009	0.019	0.450	-0.029, 0.048	Direct-only (No mediation)
INF→QEP→EMP^b	0.037	0.061	0.602	-0.084, 0.157	Direct-only (No mediation)
INF→PAC→EMP^b	0.039	0.060	0.658	-0.075, 0.163	Direct-only (No mediation)
INF→RAC→EMP^b	0.104	0.048	2.167*	0.011, 0.203	Competitive (Partial mediation)
INF→QEP→KSC→EMP^b	0.078	0.025	3.123*	0.034, 0.134	Competitive (Partial mediation)
INF→PAC→KSC→EMP^b	0.047	0.020	2.363*	0.013, 0.090	Competitive (Partial mediation)
INF→RAC→KSC→EMP^b	0.043	0.016	2.636**	0.017, 0.080	Competitive (Partial mediation)
QEP→EMP^a	0.113	0.035	3.207*	0.049, 0.188	Indirect-only (Full mediation)
PAC→EMP^a	0.075	0.031	2.388*	0.020, 0.143	Indirect-only (Full mediation)
RAC→EMP^a	0.080	0.028	2.878**	0.034, 0.142	Complementary (Partial mediation)

Note: Total indirect effect[a]; Partial indirect effect[b]; * p < 0.05; ** p < 0.01; *** p < 0.001. INF- Infrastructure and equipment; QEP- Quality of educational process; PAC- Practical activities; RAC- Research activities; KSC- Knowledge, skills, and competencies; EMP- Employability.
(Source: Authors with SmartPls 3)

Since the direct effects of infrastructure and technological equipment on employability are weak while the indirect effects are positive, it can be inferred that these constructs act as inhibitory variables. Consequently, infrastructure and technological resources do not independently enhance students' employability in the labor market. However, when educational processes occur in well-equipped environments where teachers effectively use digital resources and students engage in applied research, these indirect benefits become evident. Such integration allows students to acquire transferable skills that indirectly strengthen their employability.

Regarding the effect of practical activities, the study found no significant direct influence on employability (β = 0.063, ns), thus not supporting Hypothesis 6. However, a positive indirect effect (β = 0.075, p < 0.05) through knowledge, skills, and abilities indicates a mediating role for these academic competencies. This suggests that practical experience enhances employability when it contributes to building knowledge and skill foundations rather than functioning independently.

The findings of this study have both theoretical and practical implications. Theoretically, the results provide a conceptual model that integrates direct and indirect relationships between higher education quality management components, student competencies, and employability outcomes. This comprehensive model contributes to existing literature by empirically confirming the complex interconnections among these constructs and advancing understanding of how quality assurance dimensions shape academic and career outcomes.

From a practical perspective, the results are valuable for higher education policymakers, university administrators, accreditation agencies, and students. For policymakers and administrators, the study provides empirical evidence to support decisions related to curriculum design, program development, and quality assurance practices. These insights can guide strategies that enhance student learning and employability outcomes. Furthermore, policymakers can use these findings to develop sustainability-oriented curricula that integrate critical thinking, research, and practical applications to prepare students for future challenges.

For accreditation and quality assurance bodies, understanding the relative weight and influence of various quality management dimensions may aid in refining assessment criteria and performance indicators. This ensures that evaluation systems emphasize not only institutional infrastructure but also the effectiveness of teaching and learning processes.

Finally, the study offers implications for students. The PLS-SEM model (Figure 1) demonstrates a positive relationship between knowledge, skills, competencies, and employability, emphasizing that competencies directly enhance students' employment prospects. Students who understand how different quality management aspects, such as teaching quality, research engagement, and practical activities, interact to shape their skills can better leverage these opportunities for career success. By developing a deeper awareness of these factors, students can actively participate in fostering a sustainable future while improving their employability in an increasingly competitive labor market.

Conclusion

This study was conducted to demonstrate that the development of higher education quality represents a unified process aimed at continuous improvement, particularly in light of the evolving structure of the national higher education system, the diversification of university financing channels, and the implementation of cost-sharing policies. Increasing demands from both the government and society for accountability in higher education have prompted continuous reforms in quality assurance practices. In response, Malaysia, like many other countries, is progressively enhancing its external quality assurance mechanisms through teaching evaluations, subject-specific assessments, and university rankings. Within

this context, the present research contributes by analysing the quality assurance framework of Universiti Malaysia Sarawak (UNIMAS).

With the advancement of global economic conditions, higher education systems worldwide have transitioned from elite to mass education, and subsequently toward universal education. Ensuring the quality of this expansion requires a robust quality assurance mechanism to maintain the sustainable development of higher education. As nations intensify efforts to expand access to higher education, equal emphasis must be placed on establishing and refining internal and external quality assurance systems.

The findings of this study indicate that the quality of the educational process and practical activities have a positive influence on students' knowledge, skills, and competencies. These results align with Poza-Vilches et al. (2019), who emphasized that such competencies are closely linked to teaching processes and can be strengthened through sustainability-oriented education. Teacher guidance and support services can best foster professional competencies related to educational sustainability through participatory and consultative approaches that integrate values, curriculum sustainability, and interdisciplinary learning. Similarly, Herlambang et al. (2021) observed that practical activities exhibit the weakest relationship with employability compared to facilities and research activities, reinforcing the need to strengthen experiential learning components in university programs.

Moreover, the study found that research activities positively influence students' knowledge, skills, competencies, and employability. This supports the assertion by Yuan et al. (2021) that quality assurance practices have a significant and positive effect on higher education outcomes from a global perspective. Additionally, Metilda and Neena (2017) highlighted that digital technology enhances both employability and learning capabilities among business graduates, further emphasizing the interconnectedness between academic quality, technological engagement, and graduate readiness.

In conclusion, the overall findings underscore that quality assurance plays a vital role in shaping students' knowledge, competencies, skills, and employability within higher education. Strengthening the mechanisms and practices of quality assurance through improved teaching quality, research engagement, and practical training will not only elevate academic standards but also better prepare graduates to meet the evolving demands of the labour market and contribute effectively to sustainable national development.

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