A META-ANALYSIS ON PUBLICATIONS FOR LECTURERS' PERCEPTION OF BLENDED LEARNING IN HIGHER EDUCATION FROM 2020-2022

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Abstract:

In this study, a meta-analysis was conducted on 14 articles published between 2020 and 2022, with the Fisher r-to-z transformed correlation coefficient used as the measure of outcome. A random-effects model was employed, using JAMOVI software, to calculate the average Fisher r-to-z transformed correlation coefficient, and the degree of heterogeneity was evaluated using the restricted maximum-likelihood estimator, Q-test for heterogeneity, and I^2 statistic. The findings revealed that the average correlation coefficient was positive as moderate effect size (0.3528) of the 14 studies. The study also provided recommendations for improving meta-analyses.

Keywords: meta-analysis, blended learning, studies, higher education, lecturers

1. Introduction

Meta-analysis is a statistical procedure used to combine the data or the findings from multiple studies (Higgins, 2018). Glass (1976) defined meta-analysis formally as the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings (Kulik and Kulik, 1989).

Meta-analysis is a statistical technique used to combine the results of multiple studies on a given topic to provide a quantitative summary of the findings. The technique originated in the field of medicine in the 1970s, but its use has since spread to many other fields, including psychology, education, and sociology (Glass et al., 1981).

A meta-analysis is a statistical technique used to combine the results of multiple individual studies on a particular topic or research question. The purpose of a meta-analysis is to obtain a more accurate and precise estimate of the overall effect size or relationship between variables by pooling the data from these studies (Borenstein,

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Hedges, Higgins, & Rothstein, 2009). This method helps researchers address inconsistencies or discrepancies across different studies and minimize the impact of individual study limitations (Borenstein et al., 2009). By doing so, a meta-analysis can provide more robust and reliable conclusions, contributing to evidence-based decision-making and the advancement of knowledge in the field (Glass, 1976).

Meta-analysis is a potent method for aggregating and condensing the information within a research domain, and for ascertaining the global estimate of the impact of a treatment by amalgamating multiple findings (Greco et al., 2013).

Meta-analysis research plays a crucial role in various fields by providing a systematic and quantitative approach to synthesizing the findings of multiple studies on a particular topic or research question (Borenstein et al., 2009). This technique offers several important benefits:

1) Increased statistical power: By pooling data from multiple studies, meta-analysis increases the statistical power to detect effects, especially those that may be too small to be identified in individual studies (Cohen, 1988).

2) Addressing inconsistencies: Meta-analysis helps identify and address inconsistencies or discrepancies between studies, allowing for a more accurate and precise estimation of the overall effect size or relationship between variables (Borenstein et al., 2009).

3) Minimizing bias: By taking a systematic and transparent approach to study selection, data extraction, and analysis, meta-analysis can help minimize the influence of individual study biases and improve the validity of research findings (Moher, Liberati, Tetzlaff, & Altman, 2009).

4) Generating new hypotheses: Meta-analysis can identify gaps in the existing body of research and generate new hypotheses for future studies, thus advancing knowledge in the field (Cooper, 2009).

5) Informing policy and practice: Meta-analysis findings can inform evidence-based decision-making in policy and practice by providing robust and reliable conclusions that can guide interventions, treatments, and other actions (Shadish, Cook, & Campbell, 2002).

1.1 Steps for Conducting the Meta-Analysis

There are 8 steps for conducting the meta-analysis (Hansen, Steinmetz, and Block, 2022) illustrated below:

- Step 1: Defining the research question;
- Step 2: Literature search;
- Step 3: Choice of the effect size measure;
- Step 4: Choice of the analytical method used;
- Step 5: Choice of software;
- Step 6: Coding of effect sizes;
- Step 7: Analysis;
- Step 8: Reporting results.

2. Problem Statement

Blended learning, which combines face-to-face instruction with online learning, has become increasingly popular in higher education due to its potential to enhance student learning outcomes and engagement. However, the effectiveness of blended learning varies depending on various factors, such as instructional design, technology use, and student characteristics, and the existing literature on blended learning in higher education is inconsistent. Therefore, there is a need to conduct a meta-analysis of studies on blended learning in higher education published in 2020-2022 to determine its overall effectiveness and identify the factors that contribute to its success.

2.1 Significance of the Study

This study has several significant implications for higher education. By synthesizing and analyzing the findings of studies on blended learning, this study will provide a comprehensive understanding of the effectiveness of blended learning in higher education and identify the factors that contribute to its success. This information can be used to develop evidence-based guidelines for the design and implementation of effective blended learning programs in higher education. Furthermore, this study will identify gaps and limitations in the existing literature on blended learning in higher education, and provide recommendations for future research and practice. Ultimately, the findings of this study will contribute to the improvement of teaching and learning in higher education and help institutions to make informed decisions regarding the use of blended learning.

2.2 Research Questions

1) What is the overall effectiveness of blended learning in higher education from the view of lecturers based on studies published in 2020 -2022?
2) What are the methods, sample sizes, instruments, and statistics used in these studies?

2.3 Research Objectives

1) To conduct a comprehensive literature review of studies on blended learning in higher education published in 2020-2022.
2) To explore the methods, sample sizes, instruments, and statistics used in these studies.
3) To synthesize and analyze the findings of these studies using meta-analytic techniques to determine the overall effectiveness of blended learning in higher education.

3. Related Work

Blended learning, which combines face-to-face instruction with online learning, has become an increasingly popular approach in higher education. A meta-analysis is a quantitative research method that combines the results of multiple studies to provide a comprehensive understanding of a particular phenomenon. In recent years, several meta-analysis studies have been conducted to determine the overall effectiveness of blended learning in higher education. The following are related studies on blended learning in higher education, and meta-analysis studies on blended learning in higher education.

According to the study conducted by titled "Blended Learning in Action: Perception of Teachers and Students on Implementing Blended Learning," the results indicate that teachers have a positive attitude towards blended learning and recognize its potential benefits for future teaching practices (Pham et al., 2021).

In Leon's (2022) study titled "ESL Teachers and Students' Perceptions toward Blended-Learning during COVID-19 Pandemic," it was found that the participants shared a common view that blended learning did not have a favorable effect on students' learning in the "Purposive Communication" course (Leon, 2022).

Saboowala and Manghirmalani-Mishra (2020) conducted a study titled "Perception of In-Service Teachers towards Blended Learning as the New Normal in Teaching-Learning Process Post COVID-19 Pandemic." The study found that the attitude of teachers towards blended learning was influenced by their educational background and experience in implementing online teaching and learning. In particular, their perception of study management and classroom environment differed. However, the implementation of blended learning for the professional development of school teachers after the pandemic could provide opportunities for collaborative learning among different educational societies worldwide, leading to an improvement in constructivist learning (Saboowala and Manghirmalani-Mishra, 2020).

The study "An Evaluation of EFL Teachers' Perceptions of Blended Learning" by Ismayana et al. (2020) found that the teachers' perceptions of their skill and experience with blended learning were not influenced by their gender. Additionally, their perceptions of interaction and communication when using blended learning were not affected by gender. The study also found that gender did not have an impact on the teachers' perceptions of the effectiveness and flexibility indicators of blended learning (Ismayana et al., 2020).

In Mulyono et al.'s (2007) study titled "EFL Teachers' Perceptions of Indonesian Blended Learning Course across Gender and Teaching Levels," it was found that a lack of sufficient training and support in blended learning was the main challenge faced by teachers in designing and managing blended learning activities. This obstacle prevented teachers from effectively addressing technical issues that arose during blended learning practices (Mulyono et al., 2007).

In their study titled "Attitudes of Teachers and Outstanding Students towards Blended Learning in Light of the Covid-19 Pandemic in Jordan," Ayasrah et al.

(2022) found that there were no significant differences in the attitudes of teachers and outstanding students towards blended learning during the Covid-19 pandemic based on gender. However, based on the grade level, the study revealed a weak inverse relationship between the teachers' tendency towards blended learning and their teaching experience, as perceived by outstanding students (Ayasrah et al., 2022).

Several meta-analyses have been conducted on blended learning in higher education, one of which is the 2017 study by Vo, Zhu, and Diep. Their research focused on the effects of blended learning on student performance at the course level and revealed that STEM students tend to benefit more from blended learning than from traditional classroom instruction. The study's overall effect size was deemed moderate (Vo et al., 2017).

Means and his colleagues conducted a meta-analysis on the effectiveness of online and blended learning. They discovered that, on average, students in online learning environments performed slightly better than those who received instruction in a traditional face-to-face setting. The advantage of online learning over face-to-face instruction was statistically significant in studies comparing blended learning to traditional face-to-face instruction, but not in studies comparing purely online versus face-to-face conditions (Means et al., 2013).

According to the study conducted by Platonova et al. (2022) titled "Blended Learning in Higher Education: Diversifying Models and Practical Recommendations for Researchers," the analysis showed an increase in the number of publications from 2017 to 2020, with 2020 having the highest number of publications. Although there was a decrease in 2021, the number of publications was still substantially higher than in previous years. This could be attributed to the compulsory adoption of blended and remote learning methods due to the pandemic, which led to the surge observed in 2020 and 2021 (Platonova et al., 2022).

In the study "A meta-analysis of the effectiveness of interventions promoting self-regulated learning on academic achievement in online and blended environments in K-12 and higher education," conducted by Xu et al. (2022), the results indicated that self-regulated learning (SRL) interventions had a moderate positive impact on academic achievement among learners in online and blended environments. The study found that SRL interventions were effective for learners in various educational settings, including elementary, secondary, and higher education, as well as informal adult education (Xu et al., 2022).

On the other hand, in Yu's (2021) study titled "A meta-analysis of effects of blended learning on performance, attitude, achievement, and engagement in different countries," it was found that blended learning did not have a significant impact on improving student engagement in academic activities. Additionally, the study did not reveal any noteworthy differences in student performance between blended and non-blended learning (Yu, n.d.).

These studies provide strong evidence for the effectiveness of blended learning in higher education in spite of challenges explored by few studies. However, they

highlighted the importance of considering various factors that can affect its effectiveness. Future studies should continue to explore these factors and their interactions to develop evidence-based guidelines for the design and implementation of effective blended learning programs in higher education. The main focus of this study is to explore how lecturers perceive blended learning in higher education, using a meta-analysis of studies published in 2020 - 2022.

4. Methodology

The research conducted a meta-analysis of studies published in 2020-2022 in light of lecturers' perceptions of blended learning in higher education. The researcher used electronic databases such as Google Scholar, Semantic Scholar, and Elicit AI to search for relevant studies and obtained a total of 87 papers, and then applied inclusion criteria to select only quantitative studies that investigated lecturers' perceptions of blended learning in higher education. Non-quantitative papers, non-lecturers' perceptions in higher education, and studies that did not report sufficient data for the calculation were excluded. As a result, 14 studies were included in the meta-analysis (Figure 1), which was conducted using Excel sheet and JAMOVI software. To calculate effect sizes of each study, Cohen's d calculation was examined, and the Interpretation Cohen's Standard Category was determined (Table 1).
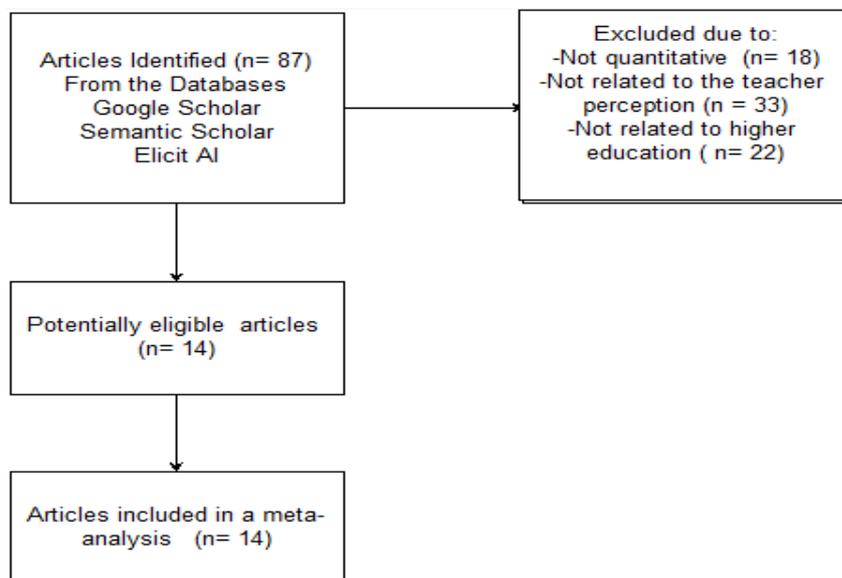

Figure 1: Included and Excluded Studies

Table 1: Category Effect Size Index

Effect Size Index	Interpretation
≤ 0.2	Low
0.2- 0.8	Medium
≥ 0.8	High

5. Results and Discussion

5.1 General Characteristics of the Study

Table 2: The list of Authors and the Titles of Research between the years 2020 and 2022

No	Authors	Titles	Years
1	Rabiya Saboowala et al. (2020)	Perception of In-Service Teachers Towards Blended Learning as the New Normal in Teaching-Learning Process Post COVID-19 Pandemic	2020
2	Dominique Verpoorten, et al. (2020)	Blended Learning in Higher Education: Faculty Perspective through the Lens of the Planned Behaviour Theory	2020
3	Deana Ismayana, et al. (2020)	An Evaluation of EFL Teachers' Perceptions of Blended Learning	2020
4	Herri Mulyono et al. (2021)	EFL Teachers' Perceptions of Indonesian Blended Learning Course Across Gender and Teaching Levels	2021
5	Bokolo Anthony Jnr. (2021)	An Exploratory Study on Academic Staff Perception Towards Blended Learning in Higher Education	2021
6	Said Abubakar (2021)	Lecturers' Perspectives on Blended Learning Approach at Private Universities in Mogadishu: Using Multiple Regression Analysis	2021
7	Said Ibrahim, et al. (2021)	University ESL Instructors' Reflections on the Use of Blended Learning in their Classrooms	2021
8	Ritimoni Bordolo, et al. (2021)	Perception towards Online/Blended Learning at the Time of Covid-19 Pandemic: an Academic Analytics in the Indian Context	2021
9	Phuong-Tam Pham, et al. (2021)	Blended Learning in Action: Perception of Teachers and Students on Implementing Blended Learning in CTU	2022
10	Crisanta Tolentino-De Leon, (2022)	ESL Teachers And Students' Perceptions Toward Blended Learning During Covid-19 Pandemic	2022
11	Samer Ayasrah, et al. (2022)	Attitudes of Teachers and Outstanding Students towards Blended Learning in Light of the Covid-19 Pandemic in Jordan	2022
12	Hani Atwa, et al. (2022)	Online, Face-to-Face, or Blended Learning? Faculty and Medical Students' Perceptions During the COVID-19 Pandemic: A Mixed-Method Study	2022
13	Cao Thi Xuan Lien, (2022)	Language Teachers' Perception and Practice of Adopting Blended Learning to Adapt to the New Normal	2022
14	Erhan ?engel, et al., (2022)	Reflection of Academicians in Using Blended Learning	2022

The results depicted in Figure 1 represent the percentage of research papers on blended learning in higher education that were eligible for inclusion in the study and were published in the years 2020, 2021, and 2022. The data shows that 21% of the eligible articles were published in 2020. In 2021, the percentage of eligible articles increased to an estimated 36%, and in 2022, the percentage further increased to 43%.
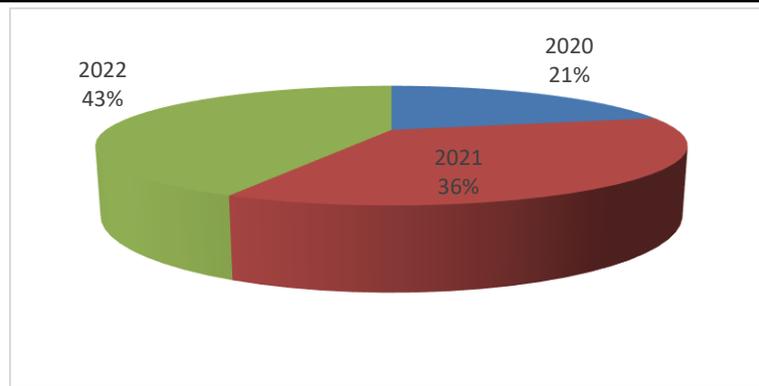
Figure 2: Frequency of Year of Publication

Figure 2 displays the distribution of research instruments used in the studies that were included in the meta-analysis, showing the proportion and frequency of the three research instrument employed. These instruments are mixed-instrument (a combination of questionnaire and interview), questionnaire, and questionnaire with a focus group discussion. The data in the figure reveals that 71.4% of the studies used a questionnaire. Mixed-methods, which involve using both mixed-instrument (questionnaire and interview), were used in 21.4% of the studies, while questionnaire with a focus group discussion was used in only 7.1% of the studies.
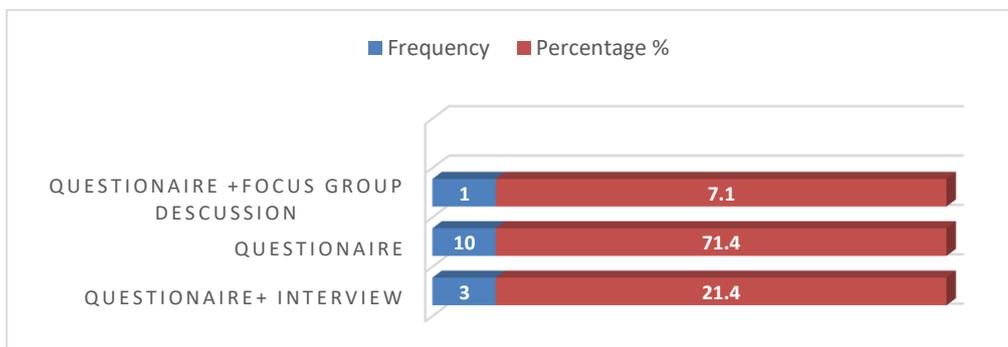
Figure 3: Frequency of Research Instrument

Figure 3 shows the frequencies of the types of statistics used in the study. The weighted means reached the first rank (15%), while other ten statistics got the same percentages (7%).
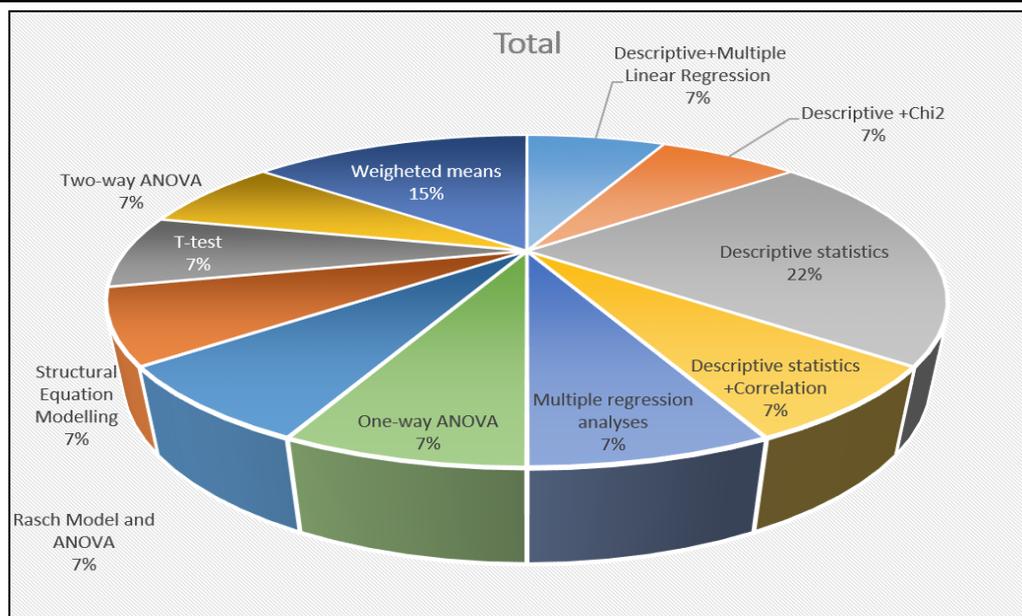
Figure 4: Frequency of Types of Research Statistics

5.2 Meta-Analysis Results

Correlation Coefficients (r, N)

Table 3: Random-Effects Model (k = 14)

	Estimate	**se**	**Z**	**p**	**CI Lower Bound**	**CI Upper Bound**
Intercept	0.353	0.0903	3.91	< .001	0.176	0.530
	.	.	.	.	.	.

Note: Tau² Estimator: Restricted Maximum-Likelihood

Table 4: Heterogeneity Statistics

Tau	**Tau²**	**I²**	**H²**	**R²**	**df**	**Q**	**p**
0.312	0.0972 (SE= 0.0444)	92.3%	12.985	.	13.000	283.758	< .001

The analysis was carried out using the Fisher r-to-z transformed correlation coefficient as the outcome measure. A random-effects model was fitted to the data. The amount of heterogeneity (i.e., tau²), was estimated using the restricted maximum-likelihood estimator (Viechtbauer, 2005). In addition to the estimate of tau², the Q-test for heterogeneity (Cochran 1954) and the I² statistic are reported. In case any amount of heterogeneity is detected (i.e., tau² > 0, regardless of the results of the Q-test), a prediction interval for the true outcomes is also provided. Studentized residuals and Cook's distances are used to examine whether studies may be outliers and/or influential in the context of the model. The rank correlation test and the regression test, using the standard error of the observed outcomes as predictor, are used to check for funnel plot asymmetry. A total of k=14 studies were included in the analysis. The observed Fisher r-to-z transformed correlation coefficients ranged from 0.0080 to 1.1042, with the majority of estimates being positive (100%). The estimated average Fisher r-to-z transformed

correlation coefficient based on the random-effects model was 0.3528 (95% CI: 0.1759 to 0.5297). Therefore, the average outcome differed significantly from zero (z = 3.9082, p < 0.0001). According to the Q-test, the true outcomes appear to be heterogeneous (Q (13) = 283.7579, p < 0.0001, tau² = 0.0972, I² = 92.2987%). Although the average outcome is estimated to be positive, in some studies the true outcome may in fact be negative. An examination of the studentized residuals revealed that one study (Bokolo Anthony Jnr., (2021)) had a value larger than ± 2.9137 and may be a potential outlier in the context of this model. According to the Cook's distances, none of the studies could be considered to be overly influential (Table 5). Neither the rank correlation nor the regression test indicated any funnel plot asymmetry (p = 0.7837 and p = 0.0792, respectively).

Table 5: Forest Plot
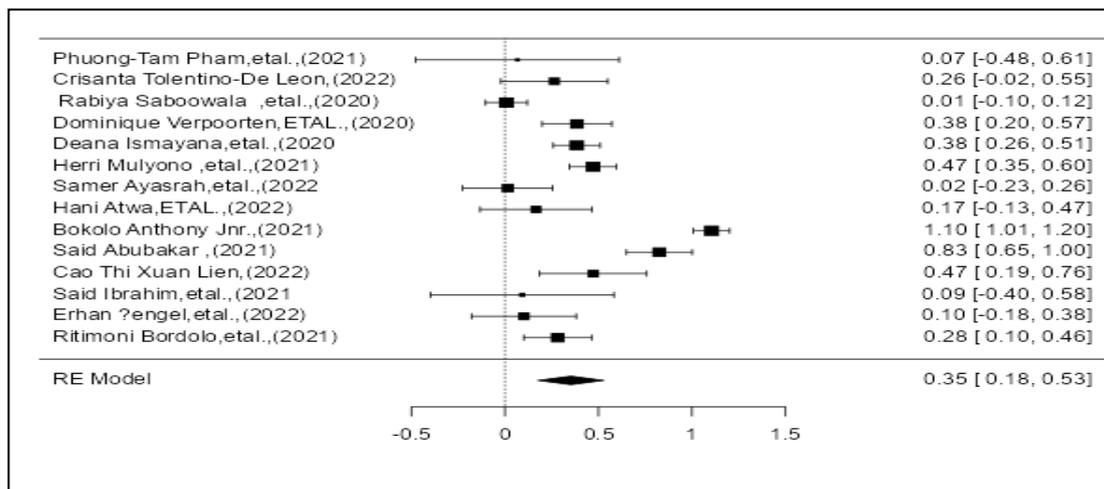
Table 6: Publication Bias Assessment

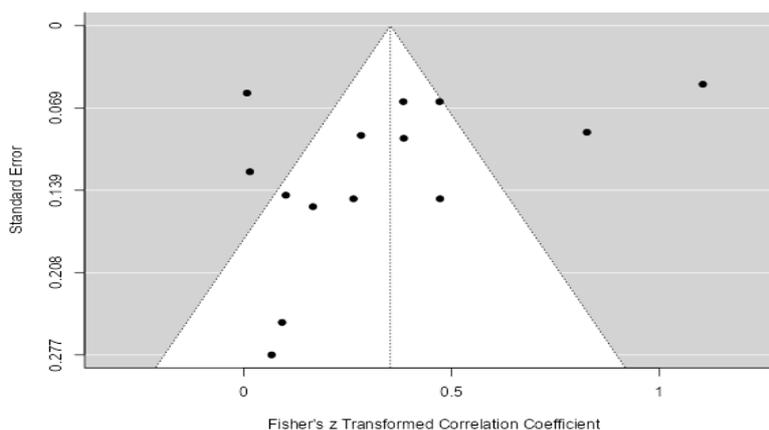| Test Name	Value	p
Fail-Safe N	1305.000	< .001
Begg and Mazumdar Rank Correlation	-0.056	0.784
Egger's Regression	-1.756	0.079
Trim and Fill Number of Studies	4.000	.
Note. Fail-safe N Calculation Using the Rosenthal Approach		

Figure 4: Funnel Plot

5.2 Discussion of Findings

Based on a meta-analysis of 14 articles using the random-effects model (0.3528), which suggests a moderate level of impact, several common issues or obstacles that may hinder the effectiveness of blended learning in higher education. These challenges are outlined below.

- Lack of faculty training and support: Faculty members may lack the necessary skills, knowledge, and support to effectively design and deliver blended learning courses (Namyssova et al., 2019).
- Technological challenge for some participants. This posits the notion that the use of technology in teaching and learning becomes a hindrance or a barrier for the teachers to deliver their instruction (Alvarez Jr, 2020).
- Student readiness and motivation: Student technology readiness plays a stronger role in impacting the teaching presence in a blended learning environment (Geng, Law, and Niu, 2019). Students may not be adequately prepared for the self-directed and independent nature of blended learning, or may lack the motivation to engage in online activities.
- Integration with face-to-face instruction: Ensuring that the online and offline components of blended learning are integrated and mutually reinforcing can be a challenge (Garrison & Kanuka, 2004).
- Assessment and evaluation: Designing effective assessment and evaluation methods for blended learning courses can be complex, and may require new approaches compared to traditional face-to-face courses (Bonk & Graham, 2012).

6. Conclusion and Recommendations

Based on the meta-analysis of 14 studies using Fisher r-to-z transformed correlation coefficients, the estimated average correlation coefficient was found to be 0.3528 (95% CI: 0.1759 to 0.5297). This indicates a positive correlation between the variables being studied. However, the Q-test for heterogeneity showed that the outcomes were significantly heterogeneous ($p < 0.0001$), with a tau² of 0.0972 and an I² of 92.2987%. Therefore, while the average outcome suggests a positive correlation, some studies may have found a negative correlation. A prediction interval for the true outcomes was calculated to be -0.2833 to 0.9889.

One study was identified as a potential outlier based on the examination of studentized residuals, but none of the studies were found to be overly influential based on Cook's distances. Finally, neither the rank correlation nor the regression test indicated any funnel plot asymmetry.

Based on these findings, it is recommended that future studies in this area take into account the potential for heterogeneity in their analyses and report a prediction interval for the true outcomes. Furthermore, researchers should examine their data for outliers and influential studies and consider the potential impact of these on their results.

Finally, the absence of funnel plot asymmetry suggests that publication bias is not a major concern in this meta-analysis.

Conflict of Interest Statement

The author declares that this article was not influenced by any personal or financial interests, and as a result, there is no conflict of interest.

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