Blended Learning in Higher Education: Diversifying Models and Practical Recommendations for Researchers

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Blended learning is gaining popularity because it has shown to be a successful method for accommodating an increasingly varied student body while enhancing the learning environment by incorporating online teaching materials. Higher education research on blended learning contributes to the blended learning literature. The ideas for future researchers are a vital component of research-based research articles. This study aims to consolidate the recommendations made for future studies. Research articles published in Scope-indexed journals over the past 5 years were analyzed in this context. Each cited passage from the research was read and coded independently in this analysis. After a period of time, the codes were merged into categories and themes. In the results section, direct citations were used to support the codes. The number of publications increased starting in 2017 and continuing through 2020. In the year 2020, most articles were published. Approximately half of the publications provide recommendations for future research. The researchers' recommendations were gathered under the titles "Research Content" and "Replication and Method" the researchers' recommendations were gathered.

Keywords: blended Learning, flipped classroom, recommendations for future studies, replication, methodology, research content

INTRODUCTION

Definition of Blended Learning

In November 2002, a few colleagues attending the Annual Sloan-C Conference on Online Learning in Orlando, Florida, discussed a novel phenomenon: college teachers combining face-to-face and online learning strategies and resources in their classrooms (Picciano et al., 2014) was. Blended learning, also known as hybrid learning or mixed-mode education, is an instructional approach that combines the use of one or two different learning methodologies with the more conventional model of instruction in a classroom setting (Graham, 2006; Lee et al., 2017; Thai et al., 2017;

Vasyura et al., 2020). Improving data analysis and computation skills has contributed to the popularity of the blended learning instructional style (Lu et al., 2018). Integration of face-to-face learning experiences in the classroom with online learning experiences in a thoughtful manner (Garrison and Kanuka, 2004). Learners engage in collaborative activities utilizing various online and offline resources in a mixed learning environment. Many different models of convergence between technologically enabled settings and more conventional ones, such as virtual labs, have been proposed (De Jong et al., 2013). Graham (2013) examined the many definitions of blended learning. He concluded that the word is most frequently used to refer to the practice of combining traditional face-to-face education with online learning.

Current State in Blended Learning

There are several recommendations available online on the appropriate face-to-face interaction ratio. For instance, 50 % of teaching can be completed online and 50 % in person (Bernard et al., 2009). However, Allen et al. (2007) suggest that the percentage of online classes should be anywhere between 30 and 79 %. Also, experts recommend a blending ratio of 60 % e-Learning and 40 % face-to-face learning for blended learning (Banyen et al., 2016).

On college and university campuses, the use of blended learning as a method of instruction is experiencing rapid growth (Bernard et al., 2009; Porter et al., 2014; ElSayary, 2021; Chen, 2022). Researchers have carried out implementation and study with the presumption that the blended learning application offers various advantages. They used blended learning in higher education studies (Suleri and Suleri, 2018).

These blended approaches encourage both individual learning and cooperation (Lim and Wang, 2016; Talan and Gulsecen, 2019) and enable more channels of communication among students as well as between students and their teachers (McCutcheon et al., 2018; Shu and Gu, 2018). Blended learning classes offer a unique environment in which to analyze the level of involvement shown by students (Hasanah and Malik, 2020). For students to successfully engage in the online components of the course, they will need to develop skills for navigating the various modalities of teaching and increasing their self-motivation level (Norberg et al., 2011; Baragash and Al-Samarraie, 2018; Bervell et al., 2020). It is believed that blended learning is a significant factor in determining academic achievement (Bernard et al., 2009; Means et al., 2013), student satisfaction (Zeqiri and Alserhan, 2021), and student retention rates (Pye et al., 2015).

It has been voiced in different studies (Cortez, 2020; de Brito Lima et al., 2021) that there is a "new normal" in many educational institutions and disciplines after COVID-19 and that blended learning approach has gained serious popularity in this context.

Blended learning preserves student-teacher connection and peer learning. Still, it also can be more adaptable because students may access a portion of their coursework online and the amount of time they need to spend in the classroom can be reduced (Phillips et al., 2016).

Some students have voiced issues (Maarop and Embi, 2016) with the design of courses that combine online with in-class delivery, although blended learning is appealing to institutions and has unrealized potential (Wang et al., 2015; Andreev et al., 2022). Blended learning courses combine online with in-class delivery (Bruff et al., 2013; Medina, 2018; Smolyaninova et al., 2021). Data indicates that the amount of student accomplishment influences the degree to which one is satisfied with blended learning (Owston et al., 2013; Fisher et al., 2017).

The Importance of Recommendation for Future Studies

In addition to carrying out research responsibly, accurately reporting its findings is also an essential step (Pruzan, 2016). The fact that suggestions for future researchers are written in method books is considered important in terms of the research's quality and its Contribution To The Field. According to Sahu (2013), it is reasonable to anticipate that a successful research program will pave the way for many subsequent research initiatives. Each research report has a portion that focuses on how to expand or continue the current research program to shed more light on the knowledge base and resolve other connected programs that are working along the same lines as the recent research activity (Belonovskaya et al., 2021). A good researcher should also discuss in this part what limitations or gaps exist in the current study program and how these limitations might be solved in a future research program (Sahu, 2013). An essential component of the study report is the acceptance of suggestions, which indicate how the quality of future work may be enhanced and new routes for the continuation of research. These kinds of remarks can inspire ideas for additional study, point out areas that need to be addressed to improve the subject and serve as a valuable roadmap for rookie and expert researchers. An indication to the reader that the author has finished one stage of the research process and is contemplating moving on to the next step is for the author to state directions for future study in the conclusion of the research that is being prepared for publication (Mackey and Gass, 2015). No study was discovered in examining the literature that investigated the suggestion for future research portions of the studies on the subject of blended learning. Due to this, the previous research section could not be mentioned in the study. This work will contribute significantly in terms of offering a collective suggestion to future scholars on the subject of blended learning. In addition, it contributes to the research methodology by restating in broad terms the significance of the content of "recommendations for future researchers."

In light of this, the purpose of this study was to investigate the recommendations made for further research in the publications that have been published during the past 5 years on blended learning in higher education.

MATERIALS AND METHODS

This study may be categorized as a qualitative study since it is based on qualitative data analysis on data that was already published in other studies. As a result of the fact

FIGURE 1 | Flowchart on data collection.
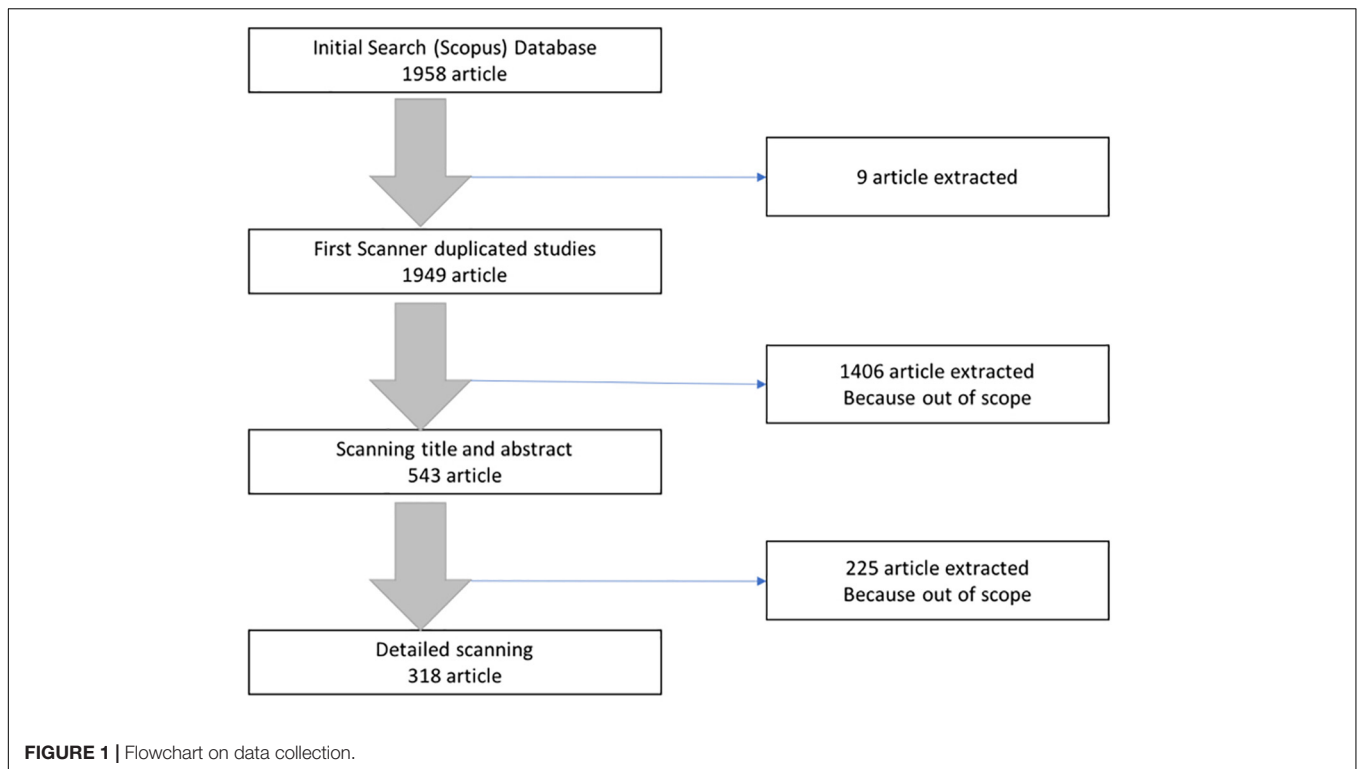
that the bibliometric information for the publications received throughout the study is also investigated, this information may also be assessed as part of the bibliometric study.

Data Collection

Scopus, one of the most widely used databases, was chosen to collect data. Scopus aids the research workflow's efficacy and efficiency (Why choose Scopus - Scopus benefits | Elsevier solutions, 2018). Scopus was selected as the database of choice since it indexes the top journals in the field of education and offers the necessary data for bibliometric research. "Blended Learning" and "Higher Education" were used as the study's search keys. In the study, the last 5 (2017–2021) years and the conditions of being a published article were added. As a result of the first search, 2657 articles were obtained. Since the publications will be included in the content analysis, the restriction that the broadcast language is English has been added. As a result of the search, 1958 articles were identified. The obtained data were downloaded in CVS format for analysis.

As seen in **Figure 1**, the selection and elimination process of the publications has been started. The 1958 article was primarily examined for duplication. Nine articles that did not meet the requirement were excluded from the study. The titles and abstracts of the 1949 article were reviewed. Studies that did not meet the following conditions were excluded from the scope.

(1) Being based on research
(2) no theoretical work or conceptual paper
(3) No meta-analysis and meta-synthesis work

(4) No systematic literature review study
(5) Not focusing only on distance education or face-to-face education
(6) Related to higher education
(7) Publication in English

As a result of the scanning, 1406 publications were excluded from the scope of the studies.

At the next stage, the full texts of the studies were reached. Content analysis of the study was carried out, and it was examined in detail whether it complied with the above conditions. As a result of the last review, 225 publications were excluded. There are 318 publications left for content analysis.

Data Analyzes

The articles retrieved as a consequence of scanning through the database were investigated in-depth, and it was determined whether or not they fulfilled the requirements of the research objective. At the level of deep analysis, the first thing that is done is to determine whether or not there is a distinct area for "recommendations for future studies." It has been pointed out that articles on this topic often include headings like "the limitations of the study," "Limitations," "Recommendations" and "Research Implications." Then we check that there is any recommendation for future researchers. In the following phase, if there is no particular section, other parts of the paper, such as the conclusion and discussion, were analyzed, and recommendations for future researchers were cited. Two authors are responsible for controlling all articles separately and determining excerpt-related sections. Then all teams read independently and coded
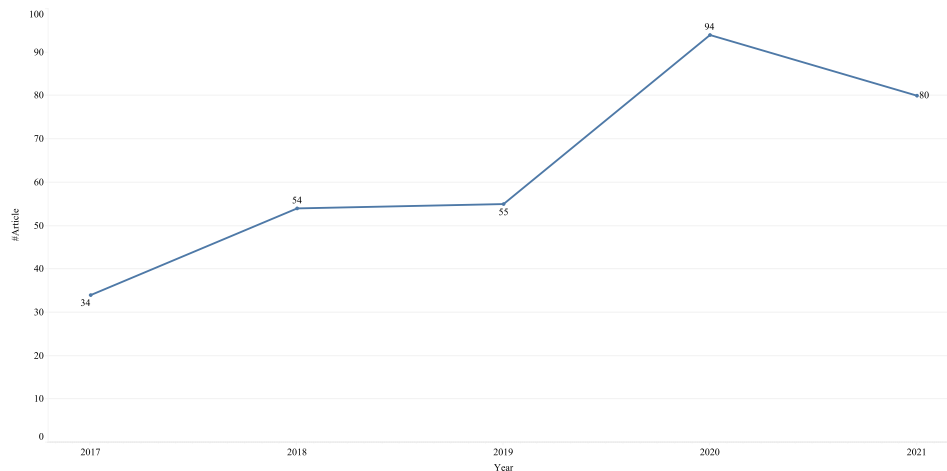
FIGURE 2 | Number of articles over year.

each excerpt. To assure reliability, the codes were refined until a consensus about their use could be reached. Code reliability was accepted 100 %. Then the codes were merged to form categories and themes. In the findings section, direct quotations were included to support the Codes.

FINDINGS

While presenting the study data, statistical information about the publications was first shared, and then the findings obtained from the content analysis were shared.

There was a rise in the number of publications beginning in 2017 and continuing through 2020 (**Figure 2**). The year 2020 saw the greatest number of publications. Even though there is a reduction in 2021, it is still significantly greater than in previous years. It is possible that the mandatory implementation of blended and remote learning procedures as a result of the pandemic caused the surge that occurred in the years 2020 and 2021.

As shown in **Figure 3**, according to total citation, Computer and Education is the first rank. The second rank is "Internet and Higher Education." Based on the number of articles, the first rank is "Education and Information Technologies" and the second order is "BMC Medical Education" with ten articles. The last rank is "SAGE Open" with four articles and 53 citations. Due to the technology dimension in blended learning, journals related to technology and the internet have naturally come to the fore.

When the papers with the highest citations were analyzed (**Table 1**), they were connected to the flipped classroom concept, which falls under the umbrella of blended learning. Although it was released later than the other nine studies, the one by Han and Ellis (2019) made it onto the list of the top ten. There are several research approaches and methodologies. Studies that follow participants over time are known as longitudinal studies. Other types of studies include qualitative and experimental research.

When the studies are analyzed (**Figure 4**), it is found that 66 of the studies have a distinct part labeled "recommendations" "Future research" or "the limitations of the study" in which recommendations and proposals for more research might be made. In addition, 43 of the papers feature additional parts that contain recommendations for the continued study of blended learning. The word "suggestions" was used as the heading for 23 different articles that offered advice to professional practitioners. 111 of the 251 papers that did not have a distinct title for their suggestions had textual advice for future study. These recommendations were written in the articles. These recommendations were often provided in the form of a distinct paragraph inside the "result" section; however, in certain instances, they were voiced within the discussion sections of the respective articles. There was no future study suggestion on blended learning in any of the remaining 140 of the 251 publications.

When we classify according to the fields of the studies examined, 53 studies are composed of non-specific studies. Thirty-one studies are related to the STEM field covering physics, chemistry, mathematics, science, engineering, and environmental education. Considering the 21 studies in the field of health education together, the STEM field has the highest rate with a total of 52 studies. Language education comes next with 31 studies. The other 18 studies were conducted in social science, adult education, sport, and social work.

Content analysis was performed in the "future research proposals" section. These recommendations fall into two main categories (**Figure 5**). At the first level, they are research content, replication, and method. The codes in the first category are "Other data collection tools," "Arranging other activities" and "Focusing on components."

The authors recommended collecting data from other data sources during the research process. The researcher may have offered such suggestions because they had difficulties collecting in their context or because they needed different data to enrich the process. Other Data Collection Tools code is used for 80 studies.

FIGURE 3 | Compare the article's number and total citation based on journal.
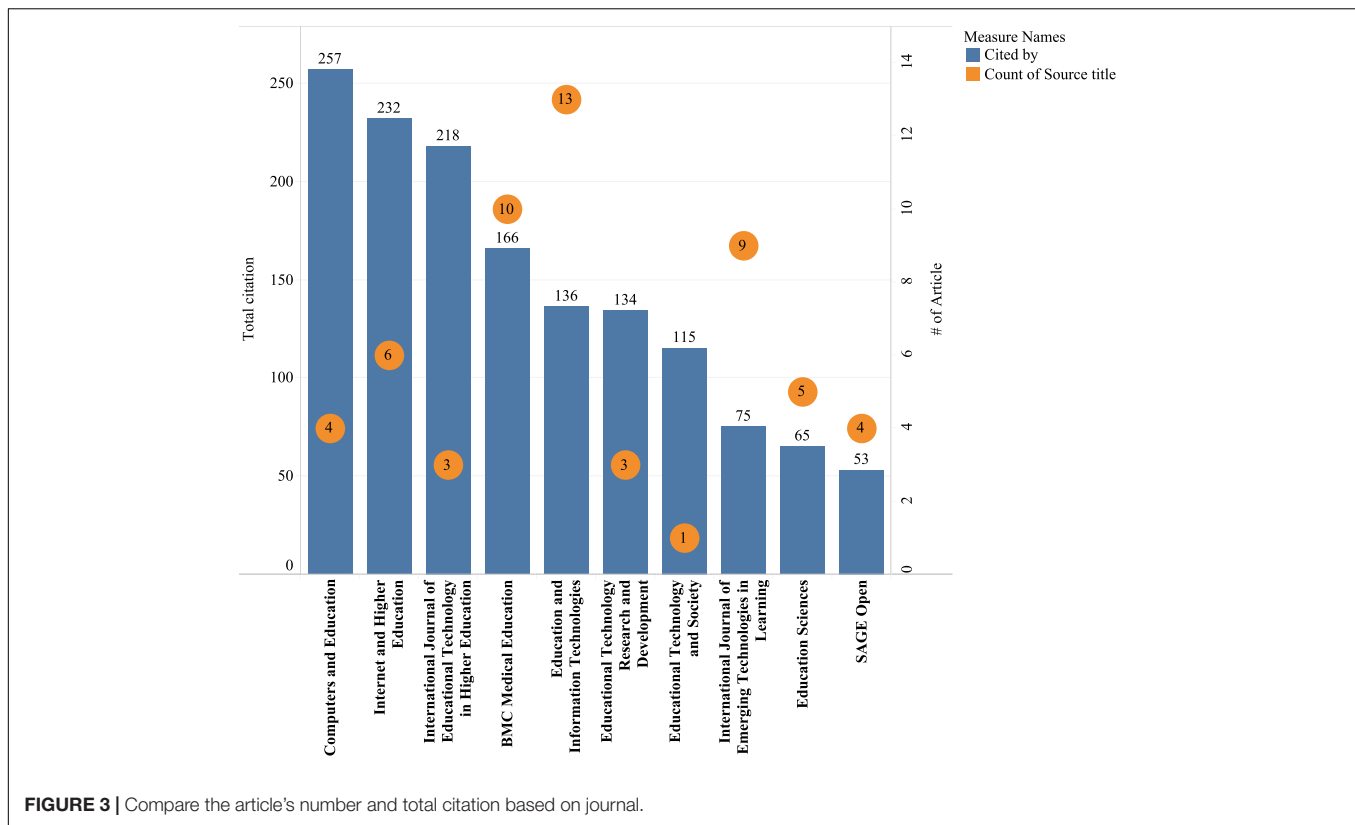
In the study conducted by Gjestvang et al. (2021), interviews were done with the participants during the data collection process. Based on this result, they stated that "*Further research on this topic should interview blended learning students at the end of the program*" in the recommendations.

Also, "*Further study should also focus on variables such as the participants' English level, motivation level, autonomy level, learning style, and gender while measuring students' perceptions of the blended course*" (Wang et al., 2021) and "*Further studies are planned to monitor the engagement, satisfaction, and learning outcomes of students as the subject evolves over a series of semesters.*" Fisher et al. (2017) quotes were made to more than one data collection tool. The inclusion of such data collection aspects will also differentiate the research process.

The second code is "arranging other activities": this code includes suggestions for differentiating the activities done in the learning process. It is coded in 19 articles. For example, "*future research can focus on investigating student engagement in learning scenarios aimed at presenting new content rather than being limited to revision lessons* (de Brito Lima et al., 2021)." As stated, it is recommended that future studies produce new content.

It is suggested to include other activities according to the course scope in which the blended learning process is applied. These suggestions are mostly seen in studies where language teaching is used. For example, a "*Conducting similar studies that measure the effect of blended learning on some aspects related to English learning such as vocabulary, spelling, and pronunciation*" recommendation was presented

based on the results of the study in which blended learning was applied in English teaching by Hijazi and AlNatour (2020).

The other code is "Focusing on other components." In this coding, blended learning is used regarding the subject of the applied course and other components related to the concept taught. This code was used in 20 studies. In the survey conducted by Hasanah and Malik (2020), the "*Future researchers are expected to widen the implementation of the blended learning model not only in the employability aspects related to critical thinking and communication skills but also in other competencies based on the discipline on which they focus.*" proposal was presented. Similarly, based on the result of the study by Mese and Dursun (2019), "*future studies could conduct with different kind of elements.*" was proposed. In addition, in the survey by Nurkhin et al. (2020), suggestions were made on the use of LMS, which is a component of blended learning. The quote in the study is as follows: "*It is hoped that future researchers will be able to improve the ability of online learning management systems they can better implement blended PBL.*"

The replication category contains suggestions to repeat the research under certain conditions. The authors generally support conducting studies that are somewhat similar to the investigation. In this category, "Other disciplines," "Implementing other courses," "Diverse sample," "Other participants" and "Larger sample" stand out. "Deep analyzes" and "Long term effect" branches were evaluated in replications and methodology categories.

TABLE 1 | Top 10 most cited article.

Paper	Title	T.Citation
Thai et al. (2017)	The impact of a flipped classroom design on learning performance in higher education: Looking for the best "blend" of lectures and guiding questions with feedback	205
Kintu et al. (2017)	Blended learning effectiveness: the relationship between student characteristics, design features, and outcomes	176
Lu et al. (2018)	Applying learning analytics for the early prediction of students' academic performance in blended learning	115
Manwaring et al. (2017)	Investigating student engagement in blended learning settings using experience sampling and structural equation modeling	77
Han and Ellis (2019)	Identifying consistent patterns of quality learning discussions in blended learning	51
McCutcheon et al. (2018)	Online learning versus blended learning of clinical supervisee skills with pre-registration nursing students: A randomized controlled trial	48
Shu and Gu (2018)	Determining the differences between online and face-to-face student–group interactions in a blended learning course	48
Arrosagaray et al. (2019)	A comparative study of Spanish adult students' attitudes to ICT in the classroom, blended and distance language learning modes	48
Cabi (2018)	The impact of the Flipped Classroom model on students' academic achievement	46
Baragash and Al-Samarraie (2018)	Blended learning: Investigating the influence of engagement in multiple learning delivery modes on students' performance	43

The "Other disciplines" code was generally used for studies where blended learning studies were recommended to be applied to other disciplines and was coded six times. For example, as a result of the López-Pellisa et al. (2021) survey in the writing assignment, the authors suggested, "*Future research could be expanded to other academic contexts, within and beyond the humanities, and to other languages.*" In the study by Dakduk et al. (2018), a sample was taken to cover the whole University. The authors recommended more specific studies involving different disciplines. The authors offer their suggestions: "*In future research with executive education, comparing different professional areas and program content (finance, marketing, human resources, and management) should be considered since those variables could modify the relationship to adopt new technologies in executive education.*"
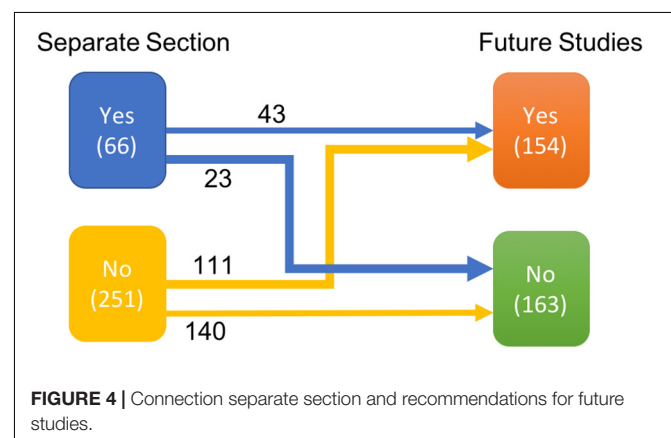
The code of "Implementing other courses" is used for suggestions about doing studies that are done in a narrower scope or that are not done within the scope of one course within the scope of the other course. Twenty-seven articles of recommendation in this context were encountered. For example, the study by Ghazal et al. (2018) did not specify a specific course. Based on this result, the authors used the expression "*Based on these limitations, future research designs may consider examining how different types of courses and activities can influence students' perception of the LMS environment.*" to suggest that the study
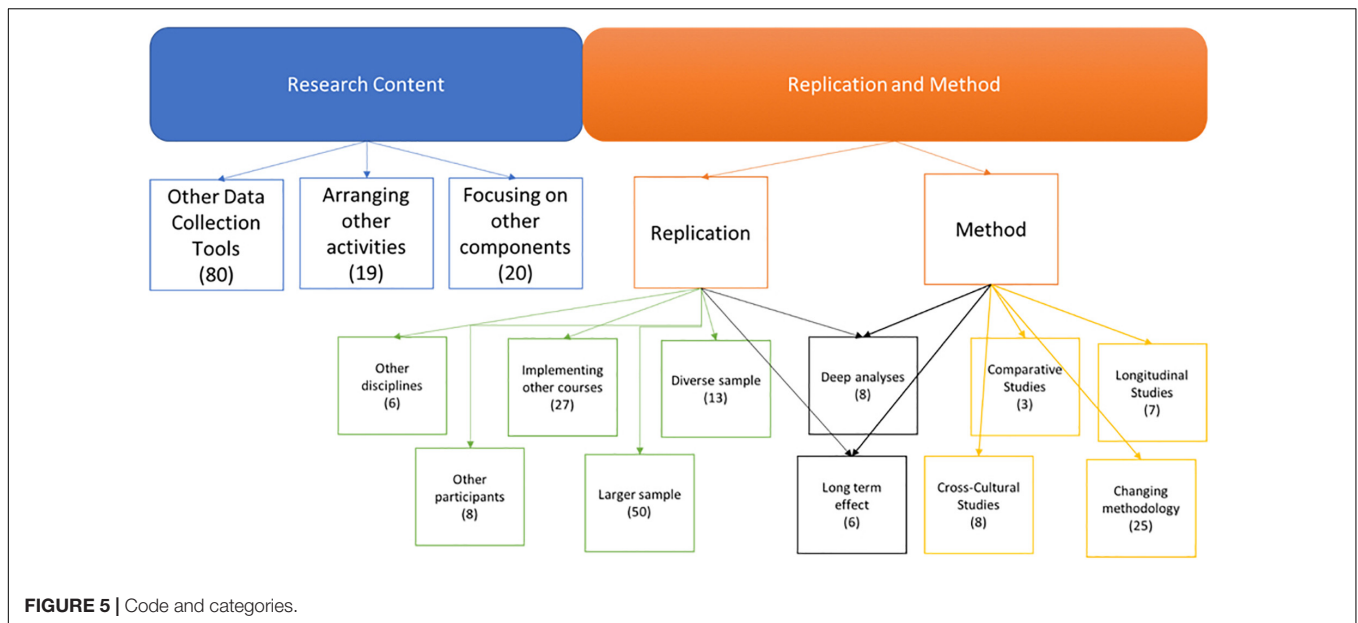
be carried out within the scope of a specific course. Hinojo-Lucena et al. (2020), on the other hand, did their work within the scope of the Applied Sciences I course. Based on the results of the study, it then proposes to do it more specifically in the courses in the second year. The authors suggest, "*For future lines of research, it is proposed to analyze this teaching and learning process in the second year of Basic Vocational Training and other modules.*" The study conducted by Bayyat (2020) wanted it to be applied in different theoretical and practical courses. The author used the phrase "*Future research can explore other dimensions in different theoretical and practical courses, cultures, and societies.*" for this suggestion.

The "Other participants" code suggests that the authors should collect data from different participants in future studies. This code was used in 8 studies. In the study conducted by Manzanares et al. (2017), only data were collected from students, and he suggested that teachers be included in future studies. The recommendation was, "*In this study, student-teacher, student-content, and student-system interactions have been analyzed. However, in future investigations, student-student and teacher-system relations will be studied to analyze whether these behavioral patterns influence the results of student learning and can predict the detection of at-risk students.*" It was also stated that other data sources would be needed.

Similarly, in the study by Zimba et al. (2021), collecting data from students and administrators was suggested. The authors stated, "*We recommend that a comparative study be conducted with social work educators in distance-teaching institutions since all participants in this study were from contact teaching institutions. We also recommend more research on BL that includes the voice of the students and university administrators.*"

The work meant to be explained with the "diverse sample" code is the enrichment of the group. This code was used for 13 runs. This code includes suggestions such as collecting data across the country and collecting data from different education levels. The study by Xu et al. (2020) included students at a particular university. Based on this result, the authors proposed, "*Further studies of online learning, in more diverse settings and with random assignment of students, will be required to confirm the potential benefits of blended learning.*" Similarly, "*Future research*

FIGURE 4 | Connection separate section and recommendations for future studies.

FIGURE 5 | Code and categories.

could expand the study in diverse educational settings (Zhu et al., 2021)" and "*Similar studies could be conducted with different participants at other educational levels to reach a general result and make comparisons* (Talan and Gulsecen, 2019)," it has been suggested to work with various samples by applying it at different education levels.

The "Larger sample" code is especially used by researchers working with small groups. They have recommended working with large study groups to generalize the studies. This code was used for 50 runs. The perception of the study group as small also depends on the study methodology. For example, in the study by Zeqiri and Alserhan (2021), data were collected from 369 people. The authors suggested a "larger sample" based on the study's results. The authors expressed this: "Finally, a larger and more balanced sample would benefit this study *to generalize findings on students' satisfaction with blended learning.*" In the study conducted by Sitthiworachart et al. (2021) on the e-Business Course, there were 25 participants in the sample. Based on the study results, the authors "*further studies need to be conducted to measure the impact of the proposed blended learning activities on a larger sample or with higher-achieving students.*" suggested working with a larger group. Again, according to the result of the study conducted by Moradimokhles and Hwang (2020) on 60 nurses, the statement "*Furthermore, the study could be extended to investigate these issues in other students, as the participants of this study were nursing students.*" work is recommended.

The "deep analyzes" code was used eight times for studies where the authors suggested deep research should be done. According to the results of the study by Dooley et al. (2018), the authors interact with the expression, "*Further studies are required to understand better the behavior of students interacting with online resources, and the patterns of behavior associated with engagement and academic performance*" with online resources and the patterns of behavior associated with engagement and

academic performance. Again, as a result of the study by Bouilheres et al. (2020), "*Deeper studies are needed to determine the appropriateness and effectiveness of each activity and/or learning material used in the delivery of every program having implemented a Blended Learning Model.*" is suggested to carry out a detailed study. On the other hand, Taylor et al. (2018) stated that more detailed analyzes are needed to make sense of the concepts. The authors expressed this: "*Further research could investigate more deeply the actual meanings of these terms through focus groups with both faculty and administrators.*"

Studies in which the "long-term effect" code is expressed in the limitations of a study are short-term. To express this awareness, the authors suggest that future researchers measure their long-term effects. This code has been used in 8 publications. For example, in the study by Simko et al. (2019), the statement "*A future study should consider the long-term outcomes of flipped courses and whether reported initial successes outlast the instructors who first delivered the courses.*" is included. In the study by Shimizu et al. (2019), the expression "*we recommend future research to investigate long-term effects of bPBL*" was used.

The researchers also suggested the "Comparative Studies" code, which was used 3 times in the studies, to conduct comparison studies. Based on the results of the study conducted by Zimba et al. (2021) on social work education, the authors said, "*We recommend that a comparative study be conducted with social work educators in distance-teaching institutions since all participants in this study were from contact teaching institutions.*" was suggested. On the other hand, Sanjeev and Natrajan (2019) suggested that a comparison study should be made by differentiating blended learning with the statement, "*There can be a comparative study of different formats of blended learning.*"

The "Longitudinal Studies" code was used in seven studies. The researchers considered their studies cross-sectional and suggested longitudinal studies for future studies. Based on the

result of the study by Yorganci (2020), she proposed, "*Besides, longitudinal studies also should be carried out to clarify the effects of FL approach on the learning outcomes in the long term.*" Ghazal et al. (2018) suggested a longitudinal study to visualize the LMS interactions used fully. For this suggestion, the authors used the expression, "*Future studies may also consider conducting a longitudinal study to increase the ability to make causal inferences related to the students' use of LMS.*"

The "Changing methodology" code used in a total of 25 studies is one of the most common codes used by researchers. Researchers suggest that the study be repeated by changing the method or research approach. For example, in the study conducted by Yang and Kuo (2021), they used a qualitative approach. On the other hand, researchers suggested planning experimental research with the statement, "*For future studies, pre-and post-tests on global literacy are suggested to provide statistical evidence of global literacy improvement.*" The study by Engelbertink et al. (2021) used a non-experimental approach based on Interviews and online survey data. The authors were randomized with the statement, "*Further research using a Randomized Controlled Trial among our students will yield more insight into the engagement and motivation of the students using the course, its effectiveness, and the role of PT in this respect,*" proposed a study. Yick et al. (2019) said "*A qualitative research design may provide a detailed understanding about the response and preferences of students on the use of blended learning and their perceived experiences of online learning in the first year of fashion education. A pre-test and post-test design can also help examine differences in improvements in SRL and sewing techniques before and after using online modules.*" suggests replicating the study by changing the method.

DISCUSSION

The number of publications increased beginning in 2017 and continuing through 2020. The number of publications peaked in the year 2020. A result of the bibliometric study covering 2012–2020 by Limaymanta et al. (2021) stated that most publications were made in 2019. This result may be due to the fact that not all publications of 2020 were included, as the study covered the period until November 2020. However, it has been determined that there has been an increase in the number of articles in recent years. In this process, the effect of the pandemic may be. During the pandemic process, many institutions have preferred online, blended learning methods (Alsarayreh, 2020; Andrzej, 2020). Researchers have researched blended learning to examine this compulsory condition (e.g., Subandowo et al., 2020; Zhu et al., 2021).

When the studies are evaluated, it is determined that 66 of the studies have a section labeled "recommendations" "Future research" or "the limitations of the study" in which recommendations and requests for more research may be made. Additionally, 43 publications provide supplementary sections with recommendations for future study. 111 of the 251 articles without a defined title for their proposals had textual recommendations for further research. Only about half of the studies have recommendations for future research. However, this section, which is seen both as a contribution of researchers to the field and as a part of the research process (Sahu, 2013; Mackey and Gass, 2015), has not been taken into account.

The suggestions made by the researchers were gathered under the categories of "Research Content" and "Replication and Method." The maximum number of "Other Data Collection Tools" codes was determined in the "Research Content" category. Researchers consider it important to diversify data sources. The diversity of data in many areas provides convenience in controlling the accuracy of data in research (Massey et al., 2016). Another code is "Arranging other activities." Blended learning can have rich content, including face-to-face and online content and teaching approaches. According to Medina (2018), if it is to serve as a support source—a means to an end—that expands the scope of traditional instructional and learning actions while simultaneously fostering independent and lifelong learning skills and practical uses of technology, effective blended learning must become more personalized, flexible, and on-demand. This situation can offer diversity to researchers. "Focusing on other components" is the last code in this category. Because there are different design approaches in blended learning design, research can focus on various components because there are different design approaches (Alammary et al., 2014; Manwaring et al., 2017; Thai et al., 2017).

For the transfer of work to other domains, there are two codes in the Replication category: "Other disciplines" and "Implementing other courses." While the first code's researchers concentrated on various disciplinary applications by evaluating a larger region, the others were more interested in the immediate environment and proposed that it be used to analogous courses. This finding appears to be the researcher's decision in several ways. For example, Thai et al. (2017) "To confirm the current findings and evaluate additional "blends" in higher education, this study must be replicated with students from different courses and universities" have justified the replication. In the Replication category, the "Larger sample", "Diverse sample" and "Other participants" branches are related to the sample size. Whether the number of people in the sample is large or small depends on the research methodology (Chatterjee and Diaconis, 2018; Lakens, 2022). But researchers care about working with a larger sample. The "larger sample" code was used the most in the codes related to sampling.

"Deep analyzes" and "Long term effect" were the codes we approved in both the replication and method categories. Both codes suggest that additional investigation into the integrated learning process is needed. Due to the variety and enrichment of the instruments employed in the blended learning process (Engelbertink et al., 2021), as well as necessary processes such as the pandemic, long-term research on blended learning will be required (Dziuban et al., 2018; Subandowo et al., 2020).

"Comparative Studies" "Cross-Cultural Studies" "Longitudinal Studies" and "Changing methodology" are all sections of the methodology category. In blended learning implementations, there is a wide range of methodologies such as quantitative approach (Han and Ellis, 2019), experimental method (Hijazi and AlNatour, 2020), and qualitative approach

(Taylor et al., 2018). With this understanding, the authors believe that their study may be applied to various situations and methodologies.

CONCLUSION

The number of publications increased starting in 2017 and continuing through 2020. In the year 2020, most articles were published. When the studies are examined, it is discovered that 66 of them have a section labeled "recommendations" "Future research" or "the limitations of the study." In addition, 43 of the papers have sections with research recommendations. There were textual recommendations for future research in 111 of the 251 publications that did not have a label for their ideas. Approximately half of the publications provide recommendations for future research. The STEM field has the highest rate in selected studies. The researchers' recommendations were gathered under the titles "Research Content" and "Replication and Method" the researchers' recommendations were gathered. "Other Data Collection Tools" is the most coded category under "Research Content." Diversification of data sources is important to researchers. The Replication category has two codes for the transfer of work to other domains: "Other disciplines" and "Implementing other courses." The Replication category's "Larger sample" "Diverse sample" and "Other participants" branches all deal with sample size. The study strategy determines whether the sample size is large or small. The "larger sample" code was the most common among the sampling-related

codes. In both the replication and procedure categories, we accepted the codes "Deep analyzes" and "Long term effect" The category "Comparative Studies" includes subsections such as "Cross-Cultural Studies, " "Longitudinal Studies, " "Changing methodology" and "Methodology."

Only publications from journals indexed in the Scopus database were included in the study, which is one of the study's limitations. In the course of the investigation of the recommendations made in the research, content analysis was performed on the statements made by the authors. There has been no investigation into whether or not the intended published research scope is appropriate. The "Recommendations for future research" section might be examined for its level of quality by researchers in the future. It is possible to determine whether the codes produced by investigations of the same kind in several fields are field-independent. In addition, our investigation was limited to papers based on previous research. The breadth of data sources may be enlarged without more limits being added, as the focus of future research will be on theoretical investigations. In addition, it will be of use to researchers in that it will remind them of the significance of "recommendations for future research".

AUTHOR CONTRIBUTIONS

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