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The Matching of Blended Learning Curriculum for the Development of New Generation: A Systematic Literature Review

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Abstract **- Blended Learning (BL) is a popular combine practice of online and face-to-face strategy in teaching and learning for encouraging active learning and improving students' academic performance. The transition to the use of blended teaching methods is more drastic when the world is shocked by the COVID-19 pandemic situation, where educational institutions need to implement the teaching transition by integrating online and offline courses throughout the pandemic period. This study conducts a systematic literature review on BL, based on PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) approach, to identify the effect of integration learning style and active learning to enhance blended learning. Web of Science and Scopus were used in the compilation of studies published between 2000 and 2021. Findings indicate that learning style and active learning can enhance blended learning curriculum in higher education students. This study seeks to contribute to the existing literature on blended learning especially the effect of learning style and active learning by conducting a thorough and unbiased review of previous studies, drawing more general conclusions about the integration of learning style and active learning towards blended learning and providing insights for future research.**

Index Terms - active learning, blended learning, learning style, systematic literature review.

INTRODUCTION

The epidemic of COVID-19 has brought major obstacles to the realm of education [1]. As a result of the unanticipated health catastrophe, educators were compelled to create and apply creative learning approaches in response to the epidemic. This condition necessitated that teachers and students forego typical face-to-face (F2F) lectures in favor of a completely virtual learning environment [2]. Educational elements such as universities, educators, guardians, and students are all seeking greater educational results. Universities, colleges, and schools face the same challenges, and they must determine which programs and services are critical to their purpose and vision; what student engagement in the teaching and learning process is beneficial; and how institutions may enhance students' achievements [3]. The biggest shift has been to remote learning, which has resulted in a large growth in the usage of distance learning technology and practices. Remote teaching is defined as "a temporary change of instructional delivery to an alternate delivery modality as a result of crisis conditions." It entails using remote teaching solutions for instruction or education that would otherwise be offered face-to-face, as blended or hybrid classes and will revert towards that structure once the critical situation has passed" [4].

The COVID-19 pandemic highlighted the need for new and creative approaches to successfully continue education in moments of crisis and unpredictability [1]. Therefore, the adoption of BL looks like one of the possible solutions to face major health challenges caused by the COVID-19 pandemic. Blended Learning (BL) is amongst the most popular methods with the use of digital technology in education [5]. In its most basic form, BL strives to mix face-to-face (F2F) and online settings, resulting in improved student engagement and more flexible experiential learning, with rich setups that go beyond the use of a convenient internet context repository to support face-to-face (F2F) courses [5]-[1]. Blended learning seems to be an extremely prevalent kind of e-learning that is especially well suited to the process of moving from conventional forms of learning to e-learning [6]-[7]. In recent years, blended learning has emerged as an intriguing type of learning delivery. Most universities have attempted to establish their own blended learning courses in order to provide another choice for lecturers and students who choose to swap some of their usual F2F engagement time with online education [8]. Furthermore, several of the issues of online learning, such as engagement and student isolation, may be encountered in BL. According to scholars and practitioners, developing BL experiences may be difficult since numerous factors must be addressed, such as the learning teaching, quality of educational experiences, applied pedagogical practices, and learning technologies [5]-[9]-[10]-[11]. In the midst of the COVID-19 epidemic, recreating the social features of F2F instruction in an online context grew more difficult. Online education necessitates teachers shifting from the conventional teaching paradigm to new teaching approaches that are also technologically compatible [12]. With little or no face-to-face connection with students, instructors have to look for other ways to replicate features of a stimulating and encouraging face-to-face educational environment [13]. Hence, academic personnel and institutions are under pressure to innovate their methods of teaching and learning in order to improve performance on these numerous measures. This has resulted in the adoption of a variety of educational techniques, notably innovation learning [14].

Effective learning is dependent on students' participation not just in the classroom, as well as in the ways they interact with resources and directions offered outside of the classroom [15]. Therefore, it has been my responsibility to think and implement the best model of blended learning curriculum to enhance students' engagement. Student engagement is core to teaching and learning

practice, as the highest level of student engagement is crucial for deep learning in the context of higher education. Additionally, blended learning approaches can be considered a success, if the necessity of management support for planning, design, and delivery of teaching and learning activities are well highlighted. Based on the background above, it is seen that there is still room for discussion of designing and implementing BL. This study is guided by two research questions, i.e.

What is the association between learning styles and BL curriculum?

What is the association between active learning and BL curriculum?

The objectives of this study are to investigate the association of learning styles and active learning towards BL. Therefore, the findings of this study can be used as guidance for the education sector to enhance the BL curriculum for the development of the new generation.

METHODOLOGY

This section explains the approach utilised to obtain and analyse the available literature on the relationship of learning styles and active learning towards a blended learning curriculum. The preferred reporting items for the PRISMA method were used for the retrieval of all the available existing studies, to review the steps in the process (identification, screening, and eligibility) and for data abstraction and data analysis, as PRISMA caters to two resource databases, namely, Web of Science (WoS) and ScopusTwenty-eight (28) articles

A. PRISMA Method

Throughout the systematic review, PRISMA was applied in the area of blended learning to guide the data collection process [5]. PRISMA's benefits include the capability to (i) clearly define research questions; (ii) identify inclusion and exclusion criteria; and (iii) examine vast databases of literature within a defined time range [16]. As a result, PRISMA may conduct a thorough search for relevant literature or publications on learning styles and active learning towards blended learning curriculum among undergraduate students.

B. Resources

The literature for this review was mostly obtained from two databases, WoS and Scopus since they provide thorough searching facilities. WoS is an online citation indexing database that was created by the Institute for Scientific Information but is now managed by Clarivate Analytics and it contains over 30,000 journals [17]. It is one of the world's most well-respected scientific citation search engines and is frequently used as an academic library research tool due to its rich citation data [18]-[19]. Scopus, on the other hand, has over 75 million entries and 24,600 peer-reviewed articles from over 5000 publishers. Scopus is the biggest peer-reviewed abstract and citation literature database, with sophisticated tools for tracking, analyzing, and visualizing research, making the research process productive and efficient [20].

C. Eligibility and Exclusion Criteria

As can be seen in Table I, the eligibility criteria for inclusion in the review were (i) only journal articles, as they contain more complete and comprehensive reports of their research [21]; (ii) only English language articles were considered to facilitate searching and analysing the works of literature; and (iii) only articles that focus on learning styles and active learning relationship towards blended learning.

Table I. Inclusion and exclusion criteria.

Criterion	Eligibility	Exclusion
Literature type	Journal articles including case studies	Review articles, conference reports, and chapters from books
Language	English	Non-English
Discipline	Blended learning	Other than blended learning
The focus of the study	Learning styles and active learning relationship towards blended learning	Other than learning styles and active learning relationships towards blended learning

D. Systematic Review Process

The integrated systematic review of both databases was completed in four stages in October 2021. An integrated systematic review, according to [22], combines studies utilizing quantitative, qualitative, and mixed methodologies, resulting in a rich overview of publications using diverse research approaches. The initial step was to determine the keywords that will be utilized in the search process. Several keywords linked to learning styles and active learning relationships in connection to blended learning were chosen. Using the full functionality of WoS and Scopus, it was simple to retrieve literature. Table II shows the search strings being used in both databases.

The search strings matched a total of 629 papers from WoS and Scopus. A total of 217 duplicate papers were eliminated in the identification stage. Then, 205 papers were excluded during screening, and 143 papers were further removed in the eligibility stage. Upon completing this extremely difficult, time-consuming, and stringent systematic review [23], only 28 primary studies

that focused on the research topic were retained. Because the creation of a review methodology is essential for conducting a thorough systematic review [24], Fig. 1 depicts the PRISMA flow diagram utilised in this study.

Table II. Search string used in the SLR

Journal Database	Search String	Frequency of Hits
WoS	TOPIC: ("blended-learning*" OR "hybrid-learning*") AND TOPIC: ("learning-style*" OR "teaching-style*" OR "active-learning*") AND TOPIC: (“higher-education*” OR “higher-institution*” OR university*)	298
Scopus	(TITLE-ABS-KEY “blended learning” OR "hybrid learning*") AND TITLE-ABS-KEY ("learning style*" OR "teaching style*" OR "active-learning*") AND (“higher education” OR “higher institution*” OR university*))	331

E. Data Abstraction and Analysis

The shortlisted 28 papers were examined. The selected articles were summarized using descriptive analysis, and the research questions were addressed using content analysis. Before the entire paper study, the abstracts of the selected publications were examined. The raw data pertaining to the study questions were extracted. The final findings were documented, and the whole procedure was well documented in Fig. 1.

DESCRIPTIVE ANALYSIS

Twenty-eight (28) articles identified through Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) analysis were analysed. The analysis began by looking at the abstract then followed by the contents. This section aims to provide an overview of the papers dealing with the relationship of learning styles and active learning towards a blended learning curriculum. Three viewpoints were considered to accomplish this purpose:

A. Paper Distribution over Time

This section provides an overview of studies on the relationship between learning styles and active learning in the context of blended learning curricula. Except for 2017 and 2019, a negatively skewed distribution pattern is detected among the 28 articles examined and distributed between 2006 and 2021, suggesting the growing relevance of the blended learning curriculum in higher education, as illustrated in Fig. 2. Fig. 2 indicates that 3 over 28 publications were published between 2006 and 2010, 11 between 2014 and 2018, and 14 between 2019 and 2021. This statistic suggests that the publishing of these articles is on the rise, with more than half have been published in the previous ten years.

B. Paper Distribution across Journal

The distribution of 28 publications across 25 journals illustrates that the issue of learning styles and active learning towards blended learning is addressed in a wide variety of periodicals (Fig. 3). Three journals published two articles on the issue, while the remaining 22 journals published one paper apiece.

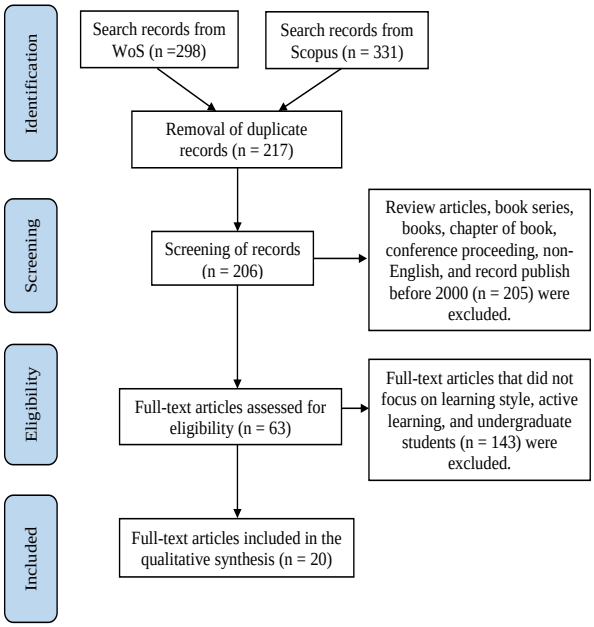

Fig. 1 The PRISMA flow diagram of the study

C. Methodology

Concerning the research methodology adopted, most papers are based on a questionnaire (n=18) and followed by an interview (n=3). Other than that, some studies also used mixed methods (n=4) and secondary data (n=3) for data collection. The mixed-method data collection is based on interviews and surveys.

CONTENT ANALYSIS

The 28 papers eligible for this study were evaluated in terms of (i) association of learning style to blended learning; and (ii) association of learning style to blended learning.

A. Association between Learning Style and Blended Learning

Analyses of these papers indicated that learning style and active learning impacted the enhancement of the blended learning curriculum. However, there are also study indicating that learning style and activity did not significant to blended learning curriculum. There are some learning approaches such as video, online exercise, forum discussion, gaming activities, case-based instruction, and others [26].

An analysis of the learning approach in blended learning curriculum, [6] found that students at the University of Rijeka, Croatia were satisfied with the learning approach. The authors implemented a blended e-learning model which integrates independent learning, problem-based learning (PBL), and online discussion. This study uses a survey method to investigate the student's satisfaction with the blended learning curriculum.

[14] provided some insights into the student perceptions of Active Blended Learning (ABL). According to the findings, a passive approach to blended learning might discourage students from completing such assignments. [8] conducted a survey to investigate the preferred students learning approach of New Jersey students. The findings indicate that they prefer visual presentations compared to verbal explanations. The authors conclude that involving technology was crucial for enhancing the blended learning curriculum. [28] explored the flipped classroom model (blended learning model) in a private university in Malaysia. They discovered that flipped classrooms may transform passive lectures into active learning while also providing a seamless learning experience.

By surveying 200 China's students to investigate student satisfaction of blended learning, [26] reveal that BL effectively improves clinical practice, enhancing student-centered learning, and acquiring relevant knowledge. Viable learning approaches were implemented such as creating a website that contains demonstration video, micro-lecturers, student-teacher communication, online exercises, and other approaches. [29] used a mixed-method technique to get feedback from Canadian students and instructors regarding the BL format. The results conclude that instructors need to use collaborative active learning to maintain the connection with students.

In line with others researchers, [30] indicate that teaching style is crucial to maintaining the equivalent of the subject provided. This study was done in Japan. [13] conducted a mixed-method study on the use of online discussion forums among students in Cape Town University (South African) to support a face-to-face learning environment. The study was chosen students in the Vector Calculus course as their sample. The result for the interview and survey approach indicate that online forums did support the development of the learning community especially blended learning.

[31] set out a survey of 500 undergraduate students to examine the effect of blended learning (flipped classroom) on UK students. According to their findings, flipped classrooms can improve the student experience by making a typically tough topic feel more approachable. [32] provided some insights into how learning styles can affect the blended learning approach among students in Germany's university. Their findings show that incorporating novel concepts and interactive digital technologies like learning management systems (LMS) and active learning during lectures enhances student achievement.

[15] investigated the UK student engagement in blended learning tools. OneNote Class Notebook was used as a digital workspace for students in the UK. The study suggests that lecturers, as higher education professors, must be more successful in using learning styles for a blended learning curriculum. [33] surveyed 50 students to investigate the suggested learning styles for blended learning in South Africa's university. According to statistical studies, more active online tools, such as multiple choice and graphing questions, were more useful in enhancing student performance.

[3] examined the association of learning styles to blended learning (knowledge management techniques and active learning model) in Indonesia. The survey results indicate that the learning style which is knowledge management is significantly related to the blended learning curriculum. [34] investigate the study to examine the effect of a web-based GIS mapping environment on enhanced blended learning. The findings of a survey and interviews with 36 students from a public institution in Eastern China show that using web-based GIS mapping tools to create customized maps and overlay map layers improves thinking skills.

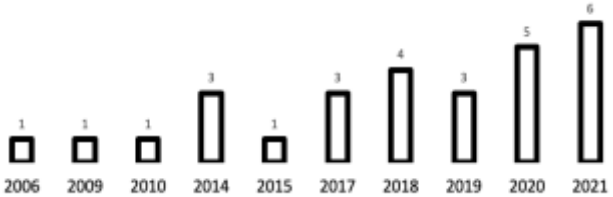

Fig. 2 Publication of papers over time

[12] conducted a survey with students at the Philippines' University for Chemistry subject. They demonstrate that consulting with students about the teaching style is vital for determining whether students are following along with the lecture and for identifying

various components of online teaching that need to be altered properly. [35] conducted a survey of 207 students to investigate the effects of student enrolment and learning motivation on learning performance in blended learning. The result reveals that teaching presence was found to have a positive impact on learning performance. These findings emphasize the importance of course design from a teaching standpoint in blended learning contexts.

[36] examine the impact of blended problem-based learning (bPBL), which includes conversation, self-efficacy, self-directed learning, active involvement, and the tutor's perceived authority, on tutorial group functioning and students' degree of acceptance of e-learning features. In this study, they compare knowledge gain between problem-based learning (PBL) and blended problem-based learning (bPBL). The result from multiple regression analysis indicates that knowledge gain was significantly better in the bPBL.

[37] survey 49 Chinese students to investigate the effect of an individualized intervention approach on students' course performance and learning behaviors in a blended course. According to the findings, individualized learning interventions can successfully increase students' learning habits, attitude, motivation, self-efficacy, and academic performance in a blended learning environment. [38] investigate the students' experience of learning through a blend of face-to-face and online discussion. The findings reveal that there has an association between students' conceptions of learning towards blended learning curriculum (in terms of quality of learning). Discussion styles can improve the quality of learning.

[39] investigated the relationship of the learning model to blended learning curriculum which focuses on students' academic outcomes. According to the findings of this study, the learning model adopted encourages the social interaction of debate and the development of new ideas, so this connection has an influence on students' academic outcomes. [40] studied the effect of the learning approach of blended learning in Florida on students' outcomes. The blended learning methodology used included a mix of traditional classrooms, flipped classes, and aspects of distant learning complemented with a variety of multimedia tools. The acquired data demonstrated a statistically significant rise in the students' outcomes following the modernization of the sessions.

[41] provided some insight into the relationship between blended learning to the students' motivation and success. Involving 62 students in Germany, the results reveal that teaching-learning activities environment in blended learning enhanced students' performance and motivation. [42] investigated the effect of web-based gamified software on Discrete Mathematics students in higher education institutions (HEI) in Mexico. The statistical data show that using MiniBool has a providing a positive impact on learning and leads to higher academic achievement than using the standard teaching-learning approach.

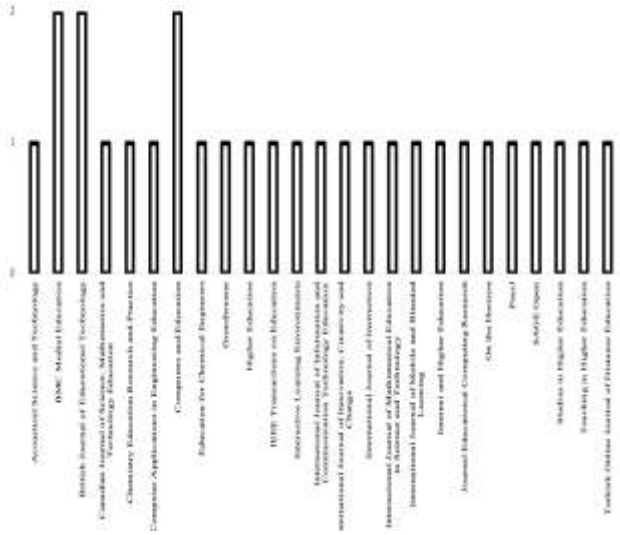

Fig. 3 Publication of papers across multiple journals

[43] examined the learning approaches' effect on the learning outcome of undergraduate nursing students at H university South Korea. According to the findings, the blended learning instructional approaches improved students' knowledge, problem-solving skills, and learning pleasure in the public healthcare course. This study indicates the viability of using the flipped classroom in conjunction with TBL as a blended learning technique capable of improving nursing students' learning outcomes. [44] surveyed Brazil's university students. According to the results, learning analytics can be used to promote self-regulated learning in flipped classrooms, helping students identify strategies that can increase their academic performance.

[45] investigated how learning styles enhanced blended learning among 64 students in Introduction to Statistics course. The results conclude that redesigned blended learning based on students learning styles is vital to enhance the blended learning curriculum in Malaysia. To ensure a successful teaching and learning process, online teaching materials must be properly selected. In tandem with other researchers, [46] conclude that blended learning, employing flipped pedagogy and centered on active learning, may be more effective than a lecture, particularly in narrowing the achievement gap between white and non-white students.

[47] studies the effect of learning styles and forms of teaching on the university's students in Slovakia. Contradicting to other researchers, the results indicate that the learning styles and form of teaching do not affect academic achievement.

Association between Active Learning and Blended Learning

While active learning has its axis in pedagogy centered on the activity of the student and his or her involvement in the process of teaching and learning [27].

[26] conducted a study of 200 university students in China. The study revealed that students' active learning, enhanced the blended learning curriculum for clinical students' in China. [31] investigate whether adopting a flipped-classroom approach to teaching foundation-level statistics improves accessibility to the subject for first-year undergraduate business and management students, as compared to a traditional lecture-based approach. The flipped classroom appears to enhance the student experience by making a traditionally difficult subject feel more accessible. In turn, students must be prepared for class to be able to participate in the active learning element.

[15] examine the effect of the OneNote Class Notebook as a digital workspace for students in the UK. The study reveals that student engagement to the lecturers' approach (OneNote Class Notebook) is important to enhance their blended learning. [3] conducted a study to examine the relationship between active learning and blended learning curriculum. The findings indicate that active learning was significantly correlated with the blended learning curriculum.

[48] did a study to explore the relationship between students' learning styles and their online participation in a blended learning course. The results indicate that the student's participation in online activities was influenced by their learning styles. According to the data, active learning students greatly improved the blended learning curriculum, and they are more likely to participate in information access, interactive learning, and network learning. [35] surveyed 207 students to investigate the effects of student enrolment and learning motivation on learning performance in blended learning. The result reveals that students' enrolment positively influences learning performance. These findings emphasize the significance of students enrolling in mixed learning situations.

[49] surveyed to examine the students' learning styles and their views on blended learning. Contradicting to other researchers, the overall findings affirm that there are no significant differences between students' achievement levels according to their learning styles.

Distribution of Number Blended Learning Articles across Countries

According to the number of articles selected (see Fig. 5), China and the United Kingdom have the most publications, each with three studies. This could be associated with the rapid evolution of the science and technology academic sector in both China and the United Kingdom [50], which has prompted scholars and educationalists to innovate to provide more adjustable educational experiences by integrating both offline and online surroundings [51]. Moreover, the results indicate that countries that have plenty of resources of infrastructure and education disclosed to build BL experiences and settings [5].

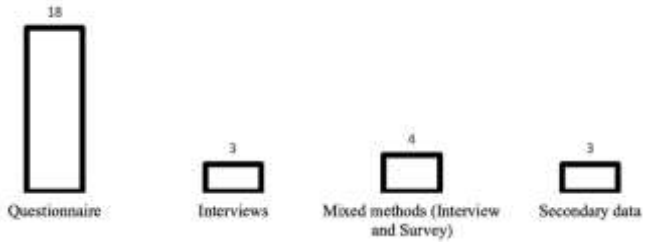

Fig. 3 Publish papers according to the adopted methodology

DISCUSSION

The purpose of this study was to conduct a systematic review of the available literature on blended learning among undergraduate students in higher education. A rigorous search of the current literature in two major academic databases, WoS and Scopus, yielded 28 relevant papers for analysis. Several insights were highlighted by the research. Two research questions were identified in the current study.

In response to the first research question, analyses of all 28 papers revealed that instructor learning styles are very important to engage the students for a blended learning curriculum. Most all the previous studies affirm that learning styles significantly affect the blended learning curriculum in higher education. The roles of lecturers in implementing effective and successful action learning are crucial [3]. They need to carefully select the tools for collaboration. Viable learning styles implemented, will enhance students' engagement in blended learning. A strong course learning system provides several options for student growth, such as extensive and simple access to course materials, rapid feedback on achievement through quizzes and examinations, and a supportive environment among friends and lecturers [45].

In response to the second research question, the mostly authors admit that student learning styles such as active learning are very important to enhance blended learning curriculum. There are need active students learning styles to participate and interact with the blended learning approach. Even though various teaching or learning approach like discussion, gaming activities, and others is prepared by instructors, it does not function if the student is not active and contribute to the learning process. Effective learning and teaching are dependent on students' participation not just in the classroom, as well as in the ways they interact with resources and instructions offered even outside the school environment [15].

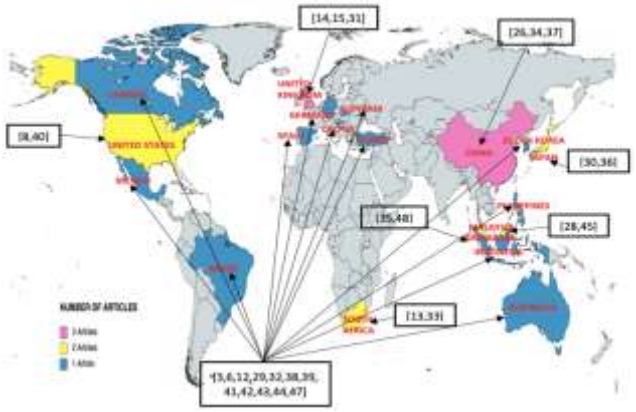

Fig. 5 Distribution and number of blended learning articles worldwide

CONCLUSION

This study utilized the systematic review method to explore the association between instructors' learning styles towards BL and the association of students' active learning towards BL among undergraduates' students. The findings indicate a positive relationship between learning style and active learning towards the BL curriculum. Investigating the relationship of learning styles and active learning to BL in a systematic manner is critical, as this could assist stakeholders (e.g., governments, educators, instructional designers, etc.) in facilitating the design and adoption of BL globally. The employment of technological teaching tools is critical in the knowledge society of the twenty-first century. The COVID-19 health crisis, which is harming humanity, has heightened the urgency of this need. Fixing these gaps improves understanding of the roles of learning styles and active learning in the development of a new generation. This understanding is crucial since COVID-19 has affected the world especially education systems which forced everyone especially education sectors to find an effective strategy to overcome the face-to-face learning approach. Therefore, the model integration learning styles and active learning in the BL curriculum are extremely suggested and proper to implement. The systematic review's findings provide a clear picture of how learning styles and active learning affect the enhancement of BL curriculum among undergraduate students; however, meta-analysis should be performed in the future to determine the effect of learning styles and active learning on BL curriculum.

Despite the significance of the revealed findings, there are some limitations to this study that should be acknowledged. For instance, in this study, a limited number of search keywords were applied within certain electronic databases. Furthermore, this study solely looks at the relationship between learning styles and active learning in the context of BL improvement. Moreover, it is recommended that to implement additionally search techniques entail (i) reference checking, which is the process of looking for extra articles in the list of references of a selected paper [52]; (ii) citation searching, the practice of examining possible or extra papers by utilizing the citation network that revolves around an original paper [53][18]; and (iii) if the researchers are unclear of the literature, they should consult an expert [21]. Additionally, future research should investigate different BL models with specific application domains to see how they affect students' psychological and behavioral outcomes.

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