"Application of Blended Learning System in Education; A qualitative survey of Systematic Literature Review"

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Abstract

The study is comprised of the Application of Blended Learning System in Education, this study was done qualitatively to analyze systematically the research articles from different data-bases. The methodology of the study consists of several methods and designs for proper analysis, a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Method was employed to yield the analysis of the study completely, that provided a standard peer-accepted methodology. The study followed systematic inclusion and exclusion strategy for assessment of articles included in the study. Some preferred data-base was collected and analyzed for this review study like science direct, research gate and sage journals to analyze the application of blended learning on discipline base, year of publication, publication venue of discipline, distribution of studies by subjects, country wise analysis, educational levels. The study revealed some psychological and behavioural outcomes associated for the blended learning in favour of the teaching and learning, blended learning supports the challenging tasks to both students and teachers that were observed in this study. Moreover, the obtained findings highlighted that BL was mostly investigated in higher education and targeted students in the first place. BL System was implemented mostly from developed countries, that call for cross-collaborations to facilitate BL adoption. Furthermore, the study noted that lack of ICT skills and infrastructure are the most encountered challenges involving teachers, students and institutions. The results of the study can create a roadmap to facilitate the adaptation of BL in schools which is the possible solutions to face the drastic challenges like Covid-19 pandemic for continuing education.

Keywords: blended learning, literature review, research trend, hybrid learning, flipped learning, distance education,

Introduction

Blended Learning (BL) is that educational approach which combines face to face system of education and virtual education and makes use of the technologies for managing teaching and learning. Blended Learning is used as the most frequently approach related to the application of Information and communication technology in education system (Ashraf, 2021). The solution for the challenging learning systems blended learning attempted to combined the different delivery of systems like collaboration software, web-based learning and knowledge based practices in education (Valiathan, 2002) researchers and practitioners have implemented different terms in their studies to approach to blended learning including targeted learning, 'brick and click' instruction, hybrid learning, (Seraji,2019) dual-mode instruction, (Zhang, 2016) blended pedagogies, (Seraji,2019) HyFlex learning, (Malczyk, 2019), multimodal learning and flipped learning (Lai, 2016).

The history of blended learning has implemented the mixture of tech-advances and smart teaching methods in learning system. In the 1960s, firstly mainframe computers started this journey with structured learning system. However in 1980s, Learning Management Systems (LMS) has made teaching and learning more interactive and flexible for students. A big year of (1998) switched the learning system to web-based learning that made learning materials and resources more assessable to the students and the combining classrooms with digital tools made learning more interesting and engaging and effective. Apart from that in 2010 the expansion of hybrid learning models was implanted in learning and finally in 2010 the expansion of mobile learning technologies has been adopted for shaping the learning system with the useful advent of system called Blended System of learning (Koze, 2010).

Online system of learning is the learning through the internet by using computer devices, gadgets and it has become one of the exciting and useful innovations as digital media applied in education system (Maradoni, 2019). Blended learning is the utilization of information and communication technology in education. Blended e- learning is the delivery of technology in education and training on teacher material both in online education and subject matter of substances (Maradoni, 2019). Blended learning provides a system of tools that enrich the value of learning traditionally (the conventional learning models, learning through textbooks, CD-ROMs, learning through internet and computer-based training) through which student can meet the challenges of global society (Maradoni, 2019). E-learning has become one of the exciting and hot innovations discussed as a digital media for education, because E-learning is a learning system using new methods by utilizing internet technology that can be accessed anytime and anywhere, learning is not only done in the classroom and only during class hours, but can also done outside of class hours when needed. Blended learning, is combining face-to-face and online education, is emerged as the predominant teaching model of the future education system (Marhabo, 2020). Studies have shown that blended learning can be used as innovative methodology involving information and computer technology

in education (Chen et al., 2005).

In some of the countries like Africa is still constrained by infrastructural challenges and policy challenges between other limitations. The technological advances must be adapted to carter the peculiarity of the environment under study. (Foluke, 2019) the challenges in implementation of blended learning in country like Kenya is stated that these challenges can be solved by providing solutions to bridge the digital divide through the adaptation of the hybrid version of software and then to employ the offline system software also. In the Kenian Country some handsets had been used in the implementation of blended learning system in higher education, some of the studies showed that handsets/tablets have been highly accepted as a learning tool due to its fruitful convenience (Foluke, 2019). However, in countries like Nigeria, Blended Learning system is still in infancy stage for implementation and has not taken its complete shape (Ololube, 2011) in teaching and learning, to identify the barriers in ICT use in the Nigerian universities for including inadequate funding, the limited computer and internet access and poor infrastructure facility, lack of trained teachers and faculty is observed (Ifinedo, 2007). However the private institutions are not facing with these challenges in the implementation of blended/hybrid advanced learning system in Nigeria (Ololube, 2011). More over the education system in India is facing numerous challenges like inability to extend the system to offer advancing system for implementing free and compulsory and mandatory education to every child, and to maintaining quality and increase quantity in curriculum, the education system in India failed to meet global market while preserving Indian values, and uncommitted teacher and teachers are ineffective (Sarkar, 2023). While addressing these challenges and the significant actions for reformation of education system India Blended Learning can partially aid the issues for the resolutions in education (Kundu, 2018) both the in-service and pre-service teacher training programmes are needed to undergo a vital change for preparing the instructors for employing blended learning environment (Sarkar, 2023) in the classroom, it may be argued that blended learning system is a reaction to the problems with our educational system (Sarkar, 2023) in India, the relevance of blended learning aligns seamlessly with the policy implemented by NEP-2020 with the vision for transforming education in India that claimed to combine traditional classroom instruction with the online elements and tools used directly address for multidisciplinary and skill oriented approach NEP-2020 established by National Educational Policy and implemented National Educational Technology Mission to ensure all educational institutions would have to access the technological advancement and infrastructure for blended learning.

Covid-19 Pandemic has highlighted several challenges attached with blended learning system. Particularly some international universities and school of Education globally took several steps for reducing classroom size combined with online via face to face classrooms to maintain regular and smooth classwork in the schools in both off-campus and on-campus. Government of India carried out many

policies and programmes including all stages of education primary, secondary and higher education to continue education at distances to ensure the continuity in education, different learning models BL with Moodle plate forms were used for teaching and learning purposes. In this context, stakeholders raised many concerns regarding the implementation of Blended Learning experiences, lack of infrastructure and competencies of teachers to employ the same, calling for further investigation in this regard. Several international organizations, such as UNESCO and ILO, claimed that teacher professional development for online and blended learning is one of the priorities for building resilient education systems for the future.

Some researchers and practitioners had pointed out blended learning experiences could be of complex in use, as the several features are needed to be considered, such as quality of learning, learning instruction, learning technologies/tools and applied pedagogies in education. Through the technology enabled learning model (Figure 1), the study aimed to answer the following six research questions:

RQ1. What are the trends of blended learning research in terms of publication year, geographic region and publication venue?

RQ2. What are the covered subject areas in blended learning research?

RQ3. Who are the educational levels participated in blended learning research?

RQ4. What are the most frequently used research methods (in systematic reviews) in blended learning research?

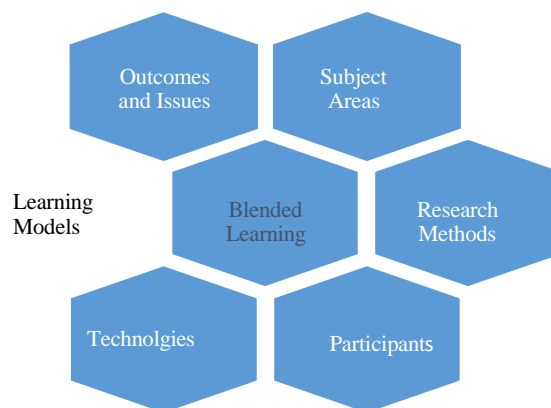RQ5. What are the learning outcomes of blended learning, as well as the associated challenges?

Fig. 1 shows the components of Blended Learning

Methodology of the study

This study represents a systematic review on Blended Learning (BL). Particularly this review study follows the Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA) Method that provides a standard peer-accepted methodology employed with a guideline, that are strictly followed in this study. For the quality assurance of the process of the study in contribution and replication and revision process, a complete review protocol was developed to describe the article selection criteria,

search strategy, quality assessment, data extraction and data analysis procedure for the study.

Selection Criteria and Search Strategy

The extensive search of research articles was undertaken in the highest and reputed database, Science direct, Sage journals and Research gate, (Table 1) following search strings were used, (blending learning substring) and (literature review substring).

ID	Database	URL
P1	Science direct	http://www.sciencedirect.com/
P2	Sage journals	http://sagejournals.com/
P3	Research gate	http://www.researchgate/net

Table 1 Shows the search engines of the data bases.

In the Blended learning substring: "Blended learning, blended education, or hybrid learning", or "flipped classroom" or "flipped learning or inverted classroom or mixed-mode of instruction".

Literature review substring: "Review, systematic review, or state-of-art" or "meta-analysis, or meta analytic study, or mapping study or overviews"

The database were searched and analysed by the two authors. After searching the relevant literature the investigators independently analysed the retrieved the articles by different categories of titles and abstracts. And papers that clearly were not systematic reviews such as descriptive, empirical and conceptual papers were excluded. The authors independently produced and eligibility criteria of assessment by carefully screening the full texts of the remaining papers based on the inclusion and exclusion criteria described in the Table 1. All the disagreement of the two authors were resolved before performing the eligibility criteria.

Figure 2 presents the study selection process as recommended by the PRISMA group. About 900 record of data was identified and analysed for the study. At first 250 papers were identified by their records of duplicates in all the three Science Direct, Research Gate and Sage Journals, After identification the screening of the papers (n=750) were identified and screened, the total of (n=485) Papers/records were excluded due to published in conference and or published in local magazines/journals. Further-more (n=265) papers were selected and fall under the target of full text papers, the methodologies included in the studies published but the reports were not retrieved were (n=160) papers. Then after the reports assessed for eligibility papers were (n=105) authorized and blind peer reviewed journals and methodology was used. At final stage of study a total of (n=92) papers were excluded due to not focus on Blended Learning and SLR and not published in reputed journal. Finally (n=13) research papers were included in the study.
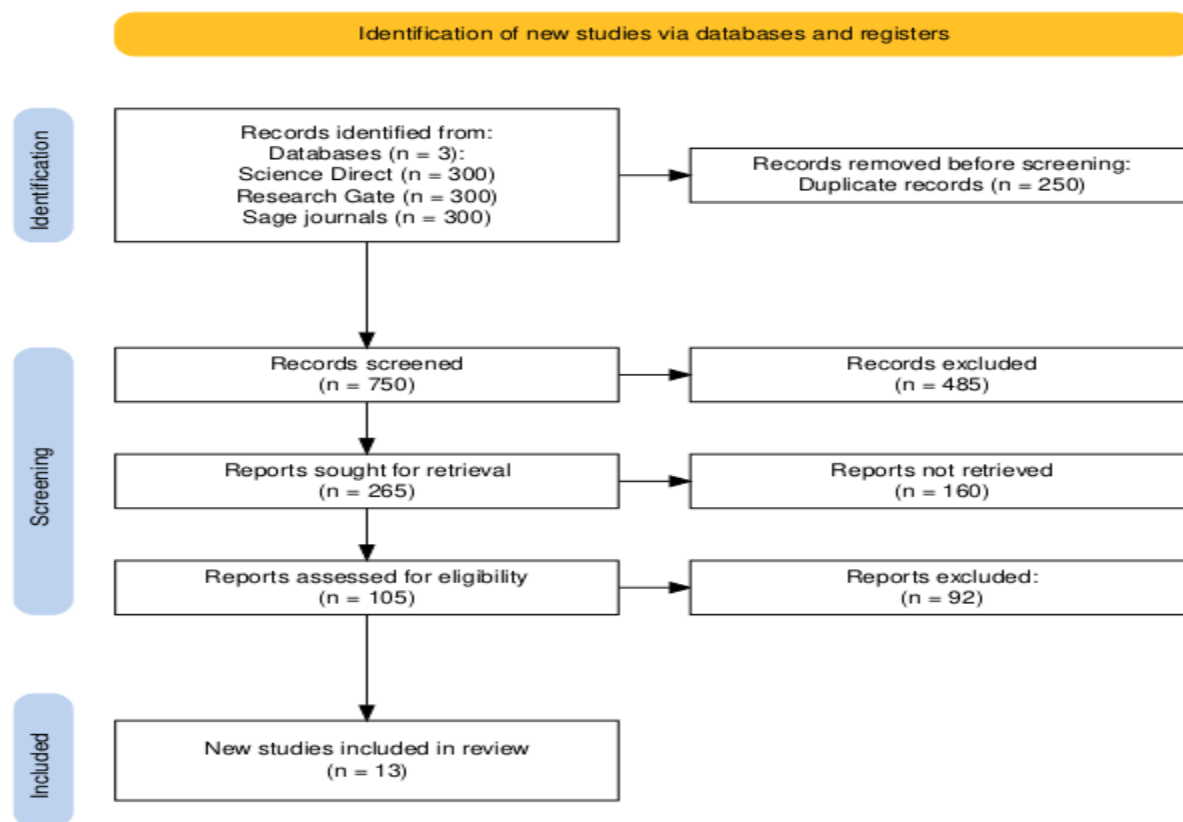
Figure 2 Flowchart of systematic review process

Quality Assessment

Inclusion and Exclusion Criteria

Inclusion	Exclusion
Journal article	Conference proceedings, book series, chapters in book, books and dissertations
Literature review	Not a literature review or papers that do not give details about the way of conducting the literature review, i.e., the method
Focus only on Blended Learning	Articles that centre exclusively on other types of learning or comparison between blended learning and other types of learning (eg, online learning, face to face learning)
Available as a full text	Not available as a full text.
Article written in English	Article in other language than English.

Table 2 shows the inclusion ad exclusion criteria of the studies involved in the study.

For attaining at quality evaluation, A Measurement Tool to Assess Systematic Review (AMSTAR) checklist was employed. AMSTAR is a valuable tool to evaluate the systematic reviews conducted in any academic area. The AMSTAR checklist consists of 11 items that evaluate the reviews under guided protocol, avoid duplicity of study selection and data extraction, comprehensiveness of the search study, the inclusion of literature, the use of quality assessment, appropriateness of data synthesis and the documentation of conflicts of interests. Particularly, two authors recently assess the methodological tool including the AMSTAR checklist. The selected items were dated as "Yes" that

consists of the meaning and the item has been properly handled, (1 point). "No" indicate the possibility of the item that did not perform well, (0 points) or "not able" in this case of performance failure because the item was not applied, 0 points. All the disagreements in the scoring and analysis were resolved between both the authors.

Data Extraction

The technology based learning model was adapted in this study, which has been widely used in Blended Learning contexts as shown in the Figure 1. The model of blended learning is based on the six components: subject area, learning models, participants, issues and outcomes, and research methods and adopted technologies. The current study employed mostly used schemes from Blended Learning model and made proper adjustment to the description of coding schemes presented in Table 3 that was used in this study to answer the aforementioned research questions.

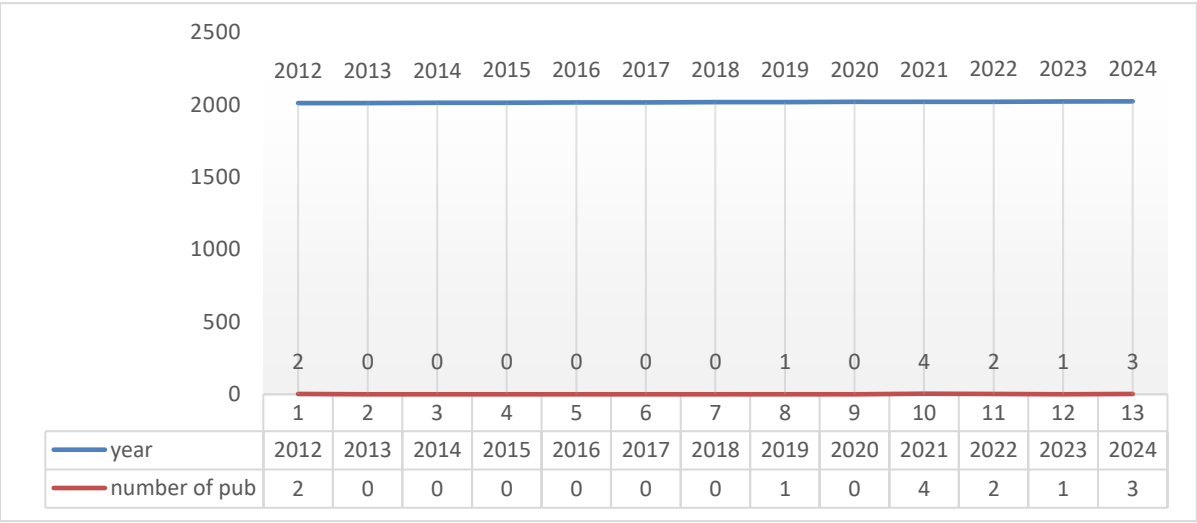| Items	Description	Coding
Year of publication	Year of publication	Year of publication
Nationality of the first author	Authors name	Authors name
Journal name	Journal name	Journal name
Subject area	The area of the conducted review	The scheme of the subject area where the study was conducted
Research methods	Whether the review in a systematic review or meta-analysis	Whether the paper is of literature review, the scheme of research methods mainly refers to the type of literature review including systematic review and meta- analysis review
Participants	Students, teachers, health professionals and staff of the institution	Scheme of participants according to common educational stages.
Educational level	Primary, secondary and higher education	Scheme of educational levels classified according to educational stages
Learning models	Different learning models of BL	Classification of BL model, Flipped model, Mixed model, Flex model, rotation model, Online practicing model, Supplemental model
Technologies	Different technologies used in the interventions to design the offline and online versions in the BL model	Technologies used like, online learning plate-form, videos, video lectures, face-book and tutorial etc.
Outcomes	BL outcomes and issues	Learning outcomes has been categorized into psychological outcomes such as perception, engagement, behavioural outcomes, academic performance etc.

	2500													
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	2000													
	1500													
	1000													
	500													
		2	0	0	0	0	0	0	1	0	4	2	1	3
	0													
		1	2	3	4	5	6	7	8	9	10	11	12	13
year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
number of pub		2	0	0	0	0	0	0	1	0	4	2	1	3

Table 3 shows the coding scheme for analysing the collected data

Figure 3 shows the distribution of studies by publication year

Country	Number of studies
South Africa	2
USA	2
China	1
Malaysia	2
Indonesia	1
Thailand	1
Netherland	2
Nigeria	1
Finland	1
Total	**13**

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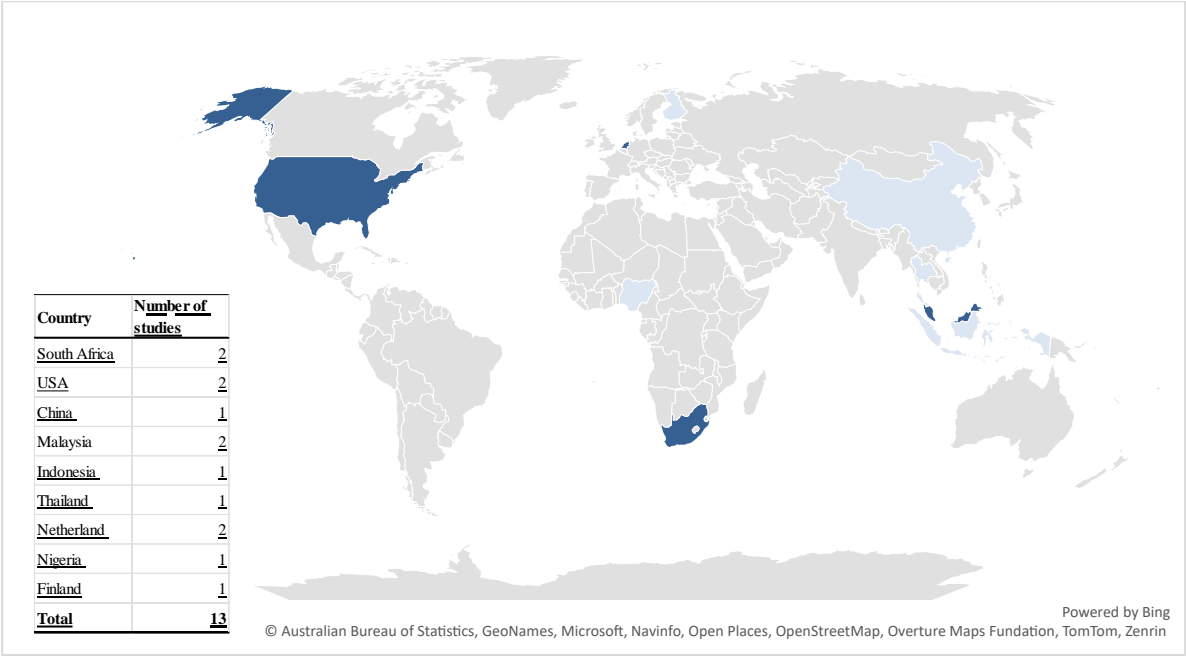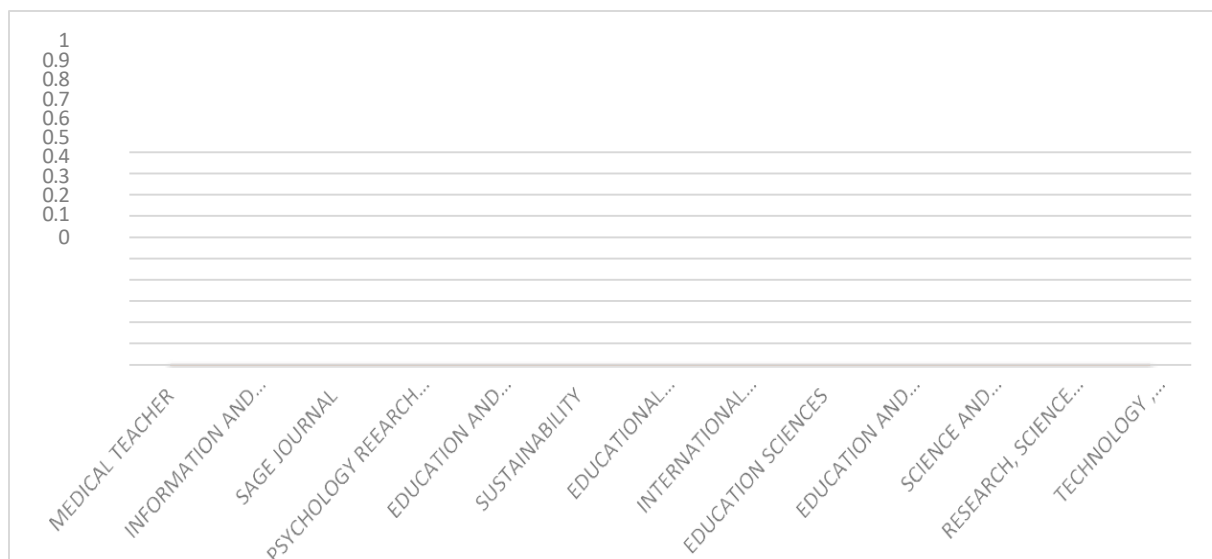
Figure 4 shows the distribution of studies per country

Figure 5 shows the distribution of studies by publication venue

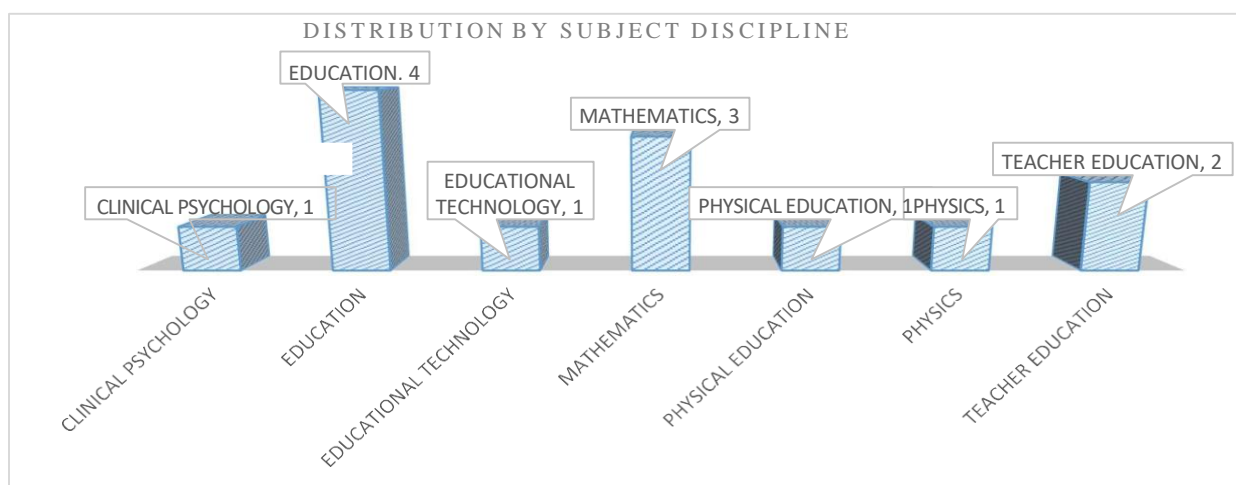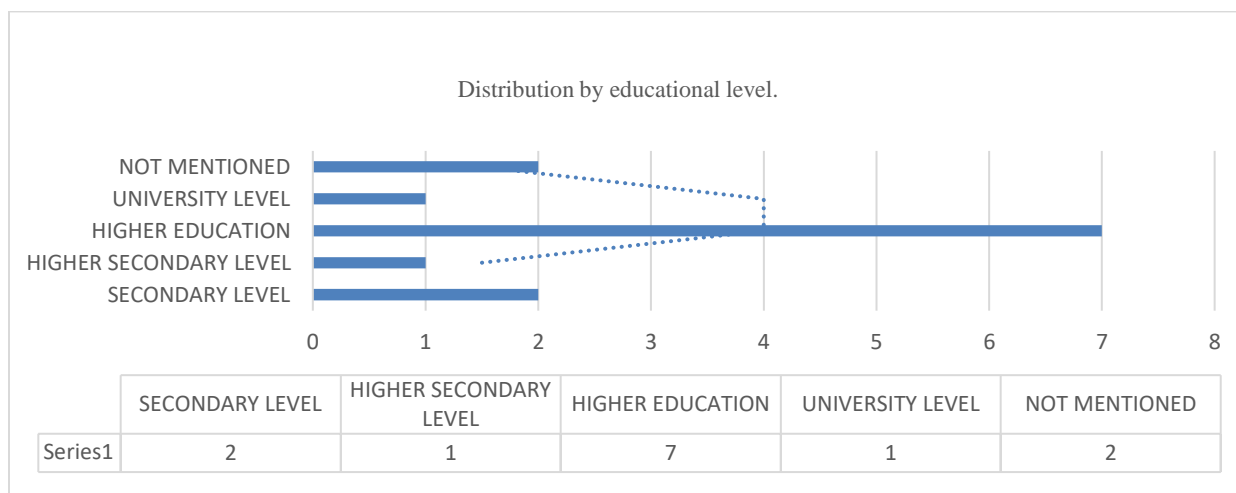Figure 6 shows the distribution by subject discipline

	SECONDARY LEVEL	HIGHER SECONDARY LEVEL	HIGHER EDUCATION	UNIVERSITY LEVEL	NOT MENTIONED
Series1	2	1	7	1	2

Figure 7 shows the distribution by educational level of Blended Learning Trends

Results and discussions

Figure 3 shows that the study on blended learning in clinical health care of education students (Rowe, Frantz and Bozalek, 2012) investigated how blended learning to be incorporated in clinical settings and health education, and second study on blended learning in teacher preparation programs (Keengwe and Kang, 2012) revealed that the effectiveness of BL practice in the teacher education. Blended Learning as Instructional Media and learning interaction through BL between educators and students can take very effective way by involving digital education, teaching and learning through BL affect student motivation and academic achievement and will provide accessibility to the students moreover (Ashraf et al 2021) identified that BL was mostly investigated on higher education level and targeted students in the first place. Blended learning study in combination of online and Face-to-Face Learning mode implemented at COVID-19 situations in the World by (Singh, Steele and Singh 2021) blended learning provides a valuable tips and a suitable runway to the educational system that could be adopted by the stakeholders like teachers faculty and administrators in current scenario as well as in the future times for teaching and learning. Ramalingam et al (2022) educators and practitioners should carefully adopt suitable technological tools and materials to be utilized in their teaching and learning. Hill and Smith (2023) blended learning is expressed as the learning through flexibility, inclusivity and accessibility and recognising the need for structures and support, Pratama and Roesdiyanto (2022) learning system has been good at improving students' physical and motor skills. Precharattana et al (2023) learning through activities improves all the challenging steps through hands on activities provided through the opportunities of blended learning interest and creativity is totally is involved. Egara and Mosimege (2024) a significant gender difference of mean score of learners who learned through the mathematics used blended learning system and the study favoured to the female students for recommendations for adopting the BL in education.

Subject Area	Systematic Review	Meta- Analysis Review	Systematic and Meta-Analysis Review	Total
CLINICAL PSYCHOLOGY	1	0	0	1
EDUCATION	2	0	1	3
EDUCATIONAL TECHNOLOGY	1	0	0	1
MATHEMATICS	0	0	1	1
MATHEMATICS	1	1	1	3
PHYSICAL EDUCATION	0	1	0	1
PHYSICS	1	0	0	1
TEACHER EDUCATION	1	0	1	2
Total	7	2	4	13

Table 4 shows the distribution of studies by research method and subject area

The Table 4 shows that most reviews were systematic reviews. The investigator noted that systematic literature review usually composed of objectives, research questions and a research approach

included with inclusion and exclusion criteria (Liberati et al 2009), in the systematic review researchers can come with qualitative result in response to their aims, only the few review conducted were meta-analysis to reveal the effect of blended learning and casual factors identifying for further research. Only three studies among all the thirteen studies were combined with all the research methods in their studies which quantitatively analyse the results in a comprehensive manner. liu et al (2016) studies the effectiveness of knowledge acquisition in health subject learners and then introduced his study with the meta analysis to highlight that BL has a significant predetermined effect than on traditional non-blended learning health subject learners, researchers are able to address the extent to which BL is completely effective in the learning showing most studies conducted through systematic reviews liu et al (2016).

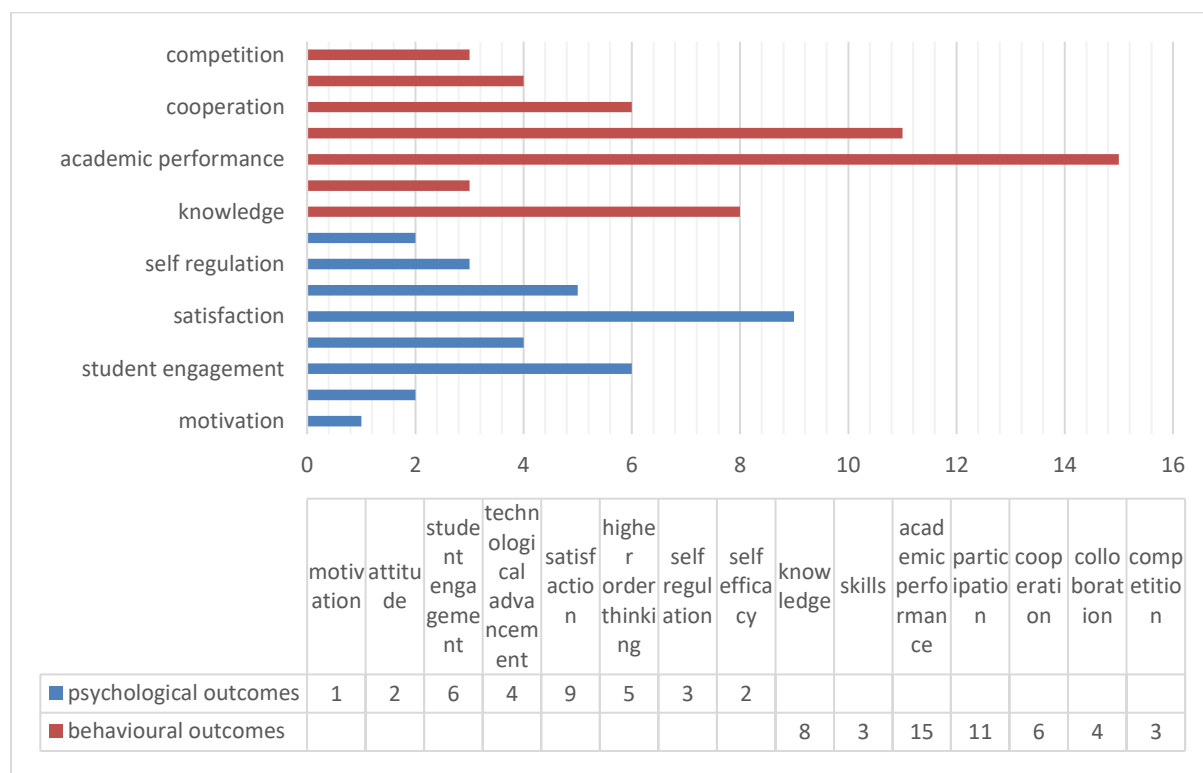|	motivation	attitude	student engagement	technological advancement	satisfaction	higher order thinking	self regulation	self efficacy	knowledge	skills	academic performance	participation	cooperation	collaboration	competition
■ psychological outcomes	1	2	6	4	9	5	3	2							
■ behavioural outcomes									8	3	15	11	6	4	3

Figure 9 shows the outcomes of the study effected by BL Challenges and Outcomes of the study

Figure 9 represents the learning outcomes evaluated in the 13 studies and the articles considered additionally. The findings were identified mostly from psychological field satisfaction, student engagement and higher order thinking while as the outcomes form the behavioural pattern of the studies were mostly identified by academic performance participation knowledge developed and cooperation of the faculty and stakeholders, it reflects that BL improves the academic performance of the students positively and helps to make psychological development among students. However, Atmacasoy and Aksu (2018) investigated students' engagement in participation and collaboration with academic performance in blended learning course. The study found that the challenging factor in psychological outcomes was motivation and attitude and self-efficacy of stakeholders due to which they were not trained properly for

implementing BL system in schools, while as the behavioural psychology revealed that the challenging and most difficulty was seen skills and competition of the participants.

Following through the Figure 9 seen that the students and teachers from different dimensions are lacking ICT skills that negatively affect the adaptation of BL as Atmacasoy and Aksu (2018) revealed that teachers with low ICT skills may not have positive attitude towards BL that is totally based on technological use. The teachers may observe difficulty in the ease of use of some technological tools like projectors making PPP slides while creating BL material for programming different courses like virtual classrooms recording and uploading video tutorials (Rasheed et al 2020) infrastructure is another difficult task for facilitating learning through BL system. It is still a predominant concern for overall institutions especially for developing countries Rasheed et al (2020) and in rural sectors (Kozma 2017) Therefore, the results of the study seemed compulsory for the institutions to improve ICT infrastructure in order to progress their education in general and education in particular for adopting and implementing BL strategy proven to be sufficient   in the concerned subject areas and disciplines.

Conclusion

The systematic literature review was conducted on blended learning revealed several findings according to each research questions the first two systematic reviews on blended learning were conducted in 2012. After that the study rapidly increased due to the development of education year by year the investigators reflected massive interest in the Blende Learning, more over based on global classrooms students are being facilitated for learning systems that benefitted for both the teachers and students in the competent world. Despite the studies that many studies focussed on the specific subjects and areas of educational disciplines and many studies not mentioned their subject area on Blended Learning. Mostly the studies targeted the students and stakeholders and overall neglected the major areas for the implementation of Blended Learning. Some studies conducted systematic reviews with qualitative analysis, further more studies should be done by adopting mixed strategy of analysis via both qualitative and quantitative methodology. The countries like South Africa, USA and Malaysia did many contributions to educational technology with the Implementation of the Blended Learning system. More than the flipped learning, blended learning can affect the students both psychological and behavioural outcomes. In terms of the psychological outcomes it may increase the self-regulation, satisfaction and engagement while learning in different domains particularly in health and social science. In addition to the behavioural outcomes the Blended Learning System supports the academic performance of the students in different subject areas. Due to the lack of ICT skills of the teachers and infrastructure facility seems the most challenging factor to the schools especially in rural areas for both the student and teachers. The findings of the study may innovate the curriculum and roadmap for school education. The implementation of Blended Learning System will contribute globally in the achievement of UN

Sustainable Development Goals, especially SDG-4, the equity and high quality education for all.

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