SAJOT_The Experiences of blended learning Amongst undergraduate students in health science education_IA._ZSdocx.docx

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An exploration of undergraduate health science students' experiences of blended learning as pedagogy: a rapid review

Abstract

Introduction: Blended learning is defined as the combined use of in-person and online learning, through interactive multimedia and face-to-face engagement with curriculum content. Recently, higher education institutions have experienced major inevitable changes in teaching and learning approaches, sparking interest in the exploration of these approaches- including blended learning.

Aim: To explore undergraduate health sciences students' experiences of blended learning.

Method: A rapid review was conducted between 18th-22nd February 2022 using the following databases: Pubmed, Ebscohost, Web of Science, Scopus, Africawide Information and CINAHL. Articles found were exported to Endnote, version 20.2.1. The Preferred Reporting Items for Systematic Reviews and Meta-analysis flow chart was used to document the search. The Critical Appraisal Skills Programme was used to appraise the articles, which were analysed using thematic analysis.

Findings: Eight quantitative articles were analysed and categorised on the hierarchy of evidence. Three themes emerged: 1. Student engagement and perceptions of blended learning, 2. Student academic performance, and 3. Challenges of blended learning.

Conclusion: Positive experiences of blended learning were reported, including: significant improvement of student academic performance, higher levels of satisfaction and an increased student engagement. Ineffective online learning platforms and/or technological devices resulted in students experiencing anxiety and frustration.

Key words: Blended learning, higher education institutions, undergraduate, health sciences.

INTRODUCTION

A current notable interest exists in the investigation of eclectic teaching and learning methods used while combining traditional face-to-face with online methods of teaching and learning for students in higher education[1]. Many higher education institutions have recognised the need for students to shift from traditional methods of learning to a more creative, blended learning approach. Blended learning incorporates the conventional learning style with a synchronous and/or asynchronous online learning component. Blended learning significantly differs from that of online learning, where the face-to-face component does not exist[2]. By adopting the blended learning approach, students are innovatively exposed to curriculum content through the use of digital resources such as online lectures, quizzes, and narrated PowerPoint presentations to further their knowledge and consolidate their understanding of content within their curriculums[3]. Blended learning thus encourages a self-directed learning environment that grants continual access to information, knowledge, and practice tools[4].

With blended learning in effect globally, the need to evolve with changes within higher education is pivotal to curriculum planning. Blended learning has the potential to enhance students' learning experience, improve students' motivation, is an effective way for achieving learning objectives[5], and is cost effective[6]. Borba et al. (2016) emphasises that as an advantage of blended learning, students' studying time is more flexible, allowing them to independently manage their time[7]. In contrast, Liu et al. (2016) asserts that, unless successfully planned and implemented, blended learning presents with limitations due to the dependence on technological resources or tools through which content is delivered[2]. Additionally, the expense of preparing the content and continuous costs for platform maintenance and updating may contribute further to challenges being experienced as a result of blended learning[2].

Due to a lack of exploration of blended learning amongst undergraduate health science education, a need to synthesise and thoroughly explore recent literature regarding students' experiences of blended learning is imperative. Our review aimed to explore undergraduate health science students' experiences and level of engagement through the use of blended learning as an approach. The review was guided by the following research question: What is the effectiveness of blended learning amongst undergraduate students in health science education? As such, this review highlights and offers insights into the strengths and limitations of the blended learning approach as pedagogy.

METHOD

Study Design

A rapid review is a resource-efficient, and time-sensitive approach to knowledge synthesis[8]. The PICOT format[9] was used as a guide to formulate the research question: What are the experiences of blended learning amongst undergraduate students in health science education? The PRISMA flow diagram[10] was utilised to keep record of the articles (see Figure 1 below) that were included in the review process and ensure methodological rigour[11].

Search Strategy

The reviewers conducted the search between the 18th and 22nd February 2022, using the following databases: Pubmed, Web of Science, Scopus, Africawide Information via Ebscohost and CINAHL via Ebscohost. The search string used to conduct the search included the following search and Boolean terms: Blended learning OR hybrid learning OR computer aided learning OR integrated learning AND Undergrad* OR Bachelor's degree OR First degree OR baccalaureate OR Health Sciences OR Medical Sciences OR Allied Health Sciences (Education, Medical, Undergraduate [MeSH Terms] - only used on PubMed) AND Effectiveness OR Efficacy OR Usefulness (Outcome Assessment, Health Care [MeSH Terms] - only used on Pubmed) AND Tertiary institution OR Higher education OR Higher learning institutions.

Study Selection and Screening Process

The above-mentioned databases were divided and distributed amongst the researchers for the screening process. The results found on each database were exported to EndNote version 20.2.1, where duplicates were excluded. The remaining articles were then exported to Rayyan where the inclusion and exclusion criteria (see Table I below) were applied for the title and abstract screening process. Articles were excluded based on the relevance of their title to the research question. Thereafter, the selected articles were divided amongst the researchers for abstract screening. The inclusion and exclusion criteria were once again applied in full-text screening to conclude the screening process and finalise the studies selected. These studies for review were critically discussed and evaluated for confirmation of inclusion amongst the researchers.

Table I: Inclusion and Exclusion Criteria

Researchers made use of the following inclusion and exclusion criteria to refine the search:

Inclusion	Exclusion
Qualitative and quantitative articles published from January 2017 to August 2022 were considered	All grey literature and articles published before 2017 were not considered
Published, peer-reviewed literature, written in English	Articles that do not align with blended learning as a concept, and is not related to the research question
Students that are registered for undergraduate health sciences education at a higher education institution. The ages of the students were not considered as a factor	Postgraduate students and students that are registered for education programs outside of health sciences education

ASSESSMENT OF METHODOLOGICAL QUALITY

Risk of Bias Appraisal

The researchers collectively appraised the selected articles in an effort to increase the confirmability of the rapid review and reduce its risk of bias[11]. Critical appraisal tools was applied to identify the risk of bias. This review made use of the Critical Appraisal Skills Programme (CASP) checklists[12] and the Mixed Method Appraisal Tool (MMAT)[13]. This provided a systematic process through which the strengths and weaknesses of the research studies were identified.

Data Extraction

The researchers used a data extraction table that included the following criteria: author, date, design, level of evidence, and key findings. Data that was relevant to the research question was unearthed and tabulated below, see Table II.

Data Analysis

Thematic analysis[14] was used to analyse the articles for review and focused on identifying common themes that answered the research question. Themes were formulated after the identification of common codes that addressed specific constructs in line with the research question and aim. Thereafter, the themes were used to synthesize the findings leading to the discussion and conclusions[14].

RESULTS

Study Selection and Rationale

The total number of articles found from the initial search was 1018. From this, 87 duplicates were found on EndNote version 20.2.1 and were excluded from the review, resulting in 931 articles. These articles were screened by title and abstract, and subsequently resulted in 34 articles being eligible for full-text screening. These 34 articles were then screened and evaluated based on the relevance of each article to the research question, aim and objectives. From this, 15 articles remained after full-text screening. These remaining 15 articles underwent critical appraisal, of which eight of the articles were found to be trustworthy, valid, reliable, and relevant to the review. Therefore, eight articles were included in the rapid review and knowledge synthesis process (see Figure 1 below).

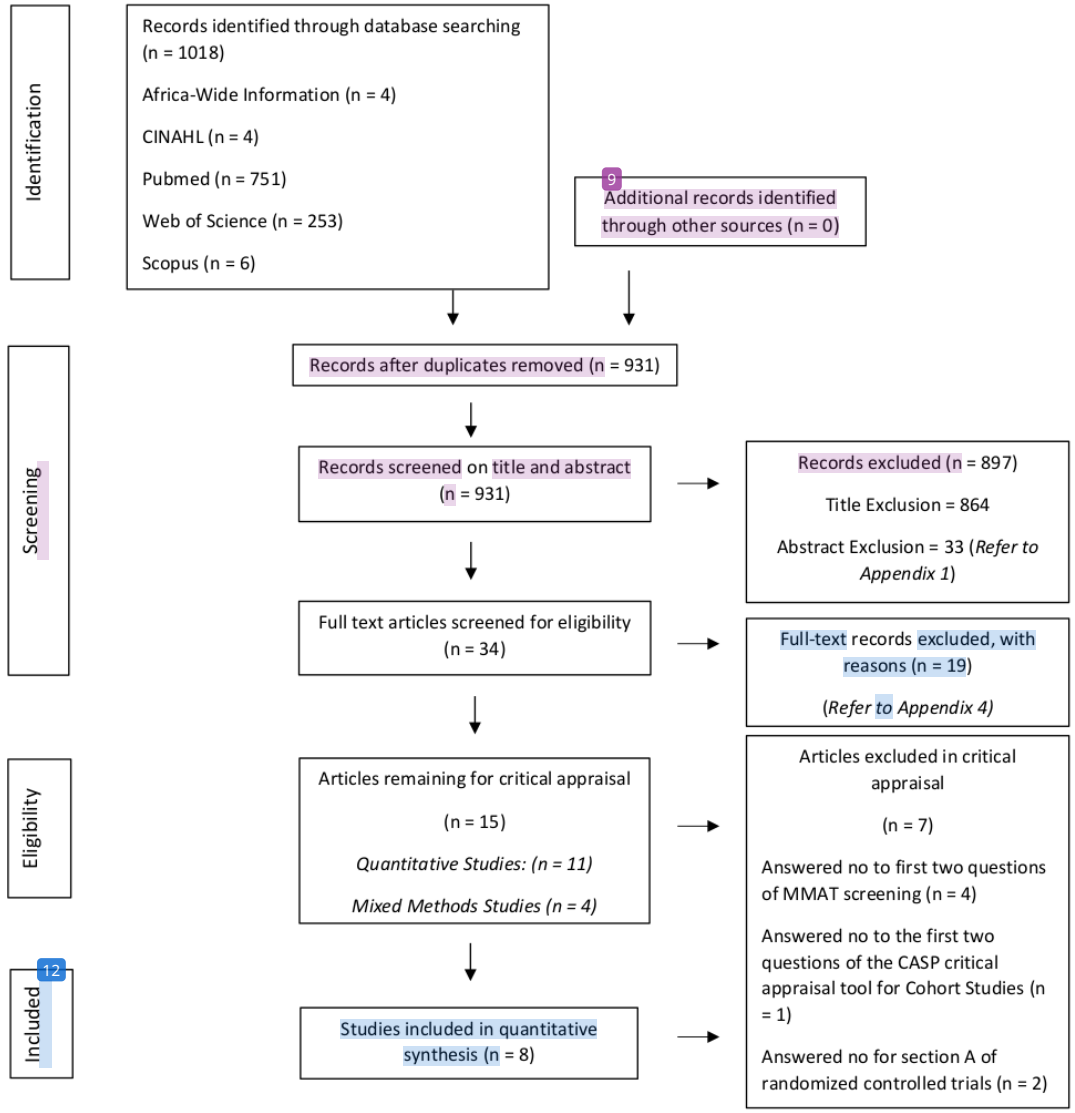

Figure 1: Prisma Flow Diagram

Data Extraction/Characteristics of Included Studies

All eight articles were quantitative studies. One study was a prospective analytical intervention study, three were quasi-experimental studies, one non-randomised experimental trial, one longitudinal design, one cross sectional design and one randomised controlled trial. These articles were situated globally, namely: Saudi Arabia, Palestine, Norway, China, Singapore, Spain, Korea, and South Africa. The characteristics of the various studies are outlined in the data extraction table below.

Table II: Data Extraction

Author (year)	Title	Design	Level of evidence	Key findings
Alsharif et al. (2021)	Effectiveness of WhatsApp as a Part of a Hybrid Learning Environment: An Opportunity for Post-COVID-19 Pandemic Pedagogy	Prospective analytical intervention study	Quantitative: Level (III-2) - Cohort study	Blended learning improved the academic performance of students compared to traditional learning environments
Alshawish et al. (2021)	Comparison of blended versus traditional classrooms among undergraduate nursing students: A quasi-experimental study	Quasi-Experimental Study	Quantitative: Level (III-2) Cohort Study	Blended learning approach improved students' outcomes and that their level of satisfaction was higher Blended learning can be a viable option to maintain and increase students' satisfaction. Innovative environment positively influences students' engagement and success.
Brønlein et al. (2021	A blended learning teaching strategy strengthens the nursing students' performance and self-reported learning outcome achievement in an anatomy, physiology and	Quasi-experimental study	Quantitative: Level (III-2) Cohort Study	Students reported higher satisfaction with the blended learning approach Students scored higher on their national exams with the blended learning approach

	biochemistry course – A			
Gong et al. (2021)	Application of blended learning approach in clinical skills to stimulate active learning attitudes and improve clinical practice among medical students	Non-randomized experimental trial	Quantitative: Level (III-2) Cohort Study (Merlin et al, 2009)	The student satisfaction survey showed that blended learning was significantly more effective for acquiring relevant knowledge, enhancing student-centered learning and improving clinical practice.
Shorey et al. (2018)	Blended learning pedagogy designed for communication module among undergraduate nursing students: A quasi-experimental study	Pre-test and post-test quasi-experimental design	Quantitative: Level (III-2) Cohort Study	Participants had enhanced satisfaction levels with blended learning pedagogy, better attitudes in learning communication skills, and improved communication self-efficacies
Lozano-Lozano et al. (2020)	A Blended Learning System to Improve Motivation, Mood State, and Satisfaction in Undergraduate Students: Randomized Controlled Trial	Two-armed, prospective, single-blind, Randomized Control Trial	Quantitative: Level (II) - Random control trial	The blended learning method had significant improvements in motivation, mood state, and satisfaction compared to traditional teaching.

Yoo et al. (2021)	Adaptations in Anatomy Education during COVID-19	Quantitative-longitudinal	Quantitative: Level (III-2) Cohort Study	Findings revealed that students preferred online lectures over traditional large group lecture-based teaching because it allowed them to acquire increased self-study time, study according to their individual learning styles, and repeatedly review lecture videos.
Ravat et al. (2021)	Blended Teaching versus Traditional Teaching for Undergraduate Physiotherapy Students at the University of Witwatersrand	Cross-sectional	Quantitative: Level 5: prospective cohort	Blended teaching produced larger positive effect on students' performance in their theoretical examinations compared to the student performance when using traditional teaching methods

Risk of Bias

The quantitative hierarchy by the National Health and Medical Research Council (NHMRC)[15] was used to situate the eight articles according to their position on the hierarchy. These articles were classified as randomized controlled trials and cohort studies. None of the articles found were classified as systematic reviews.

Seven studies reflected low bias with only one study displaying moderate risk:

Lozana-Lozana et al.[16] indicated low risk of bias as the participants were randomly assigned to groups using a statistics software as well as a blind evaluator to limit any bias. The study utilized a 5-point Linkert scale as well as a tool specifically designed for the study by two external lecturers who were not involved in the study. Similarly, Ravat et al.[17] displayed various indicators to suggest low bias. This included the 5-point Likert scale in addition to convenience sampling and student exam marks as an objective measure to reduce bias. Articles by Gronlien et al.[18] and Yoo et al.[19] both indicated low risk of bias as a result of the use of objective and subjective measurements. Both these studies included external evaluators to verify examination scores with the use of a 5-point Likert scale. These studies also made use of questionnaires as an additional form of data

collection. Low risk of bias was also displayed by studies conducted by Shorey et al.[20] and Alsharif et al[21]. These studies made use of convenience sampling to eliminate selection bias as well as objective measures such as the Blended Learning Satisfaction Scale, the Communication Skills Attitude Scale and validated questionnaires respectively, both studies making use of a 5-point Likert scale to further minimize bias. Alshawish et al.[22] was another study that displayed low risk. The study was thorough in its methodology and analysis with objective measures used, anonymity in relation to evaluations conducted online as the noting of confounding variables that influenced the study results.

The study by Gong et al.[23] unearthed a moderate risk of bias. While the research made use of a 4-point scale formulated by researchers specifically for this study, there was no randomisation of participants since the participants could choose if they wanted to be part of the experimental group or not. This created potential systematic bias.

Synthesis of Results

Analysis of the eight included articles revealed the following themes: 1. Student engagement and perceptions of blended learning, 2. Student academic performance, and 3. Challenges associated with blended learning.

1. **Student engagement and perceptions of blended learning**

The current review found that undergraduate health science students had overall positive perceptions of blended learning, with high levels of enthusiasm, improved satisfaction levels, and an increase in self-efficacy, motivation and mood[16,18,20,21-23]. In addition, convenience and accessibility to curriculum content was highlighted as some of the key findings and advantages of blended learning, allowing the students to access the content at their own leisure[17,19,22,23]. In their study, Yoo et al.[19] further emphasized that students were able to repeatedly review the recorded lecture videos, and thus were able to tailor their learning to their needs and pace, ultimately enhancing their self-directed learning experience[21].

Three of the included articles reported that the use of social media, mobile learning applications as well as online resource platforms as part of blended learning contributed to students having positive perceptions of the blended learning approach[16,21,23]. In particular, Lozano-Lozano et al.[16] highlighted that the diversity in the delivery of curriculum content catered to the different learning styles of the students, essentially contributing positive perceptions of blended learning as an approach.

Five of the included articles found that student engagement had improved when using blended learning in comparison to traditional face-to-face approaches[18-20,22,23]. Students found the blended learning approach to be flexible, making it more convenient for their learning experience and understanding of content[19,21,22], resulting again in improved attitudes towards learning.

Students reported overall satisfaction with knowledge acquisition[23], as students were more actively engaged with their academic expectations when using the blended learning approach, both in the classroom and in online discussion activities[17,18,20,23].

Student Academic Performance

The current review found that blended learning were more effective and had consistently superior effects on knowledge acquisition and health science education outcomes when compared to traditional face-to-face approaches[17-19,21-23]. Students felt as though they were able to understand and conceptualise key concepts easier when using the blended learning approach[17]. Similarly, it found that students using the blended learning approach had a better understanding of theoretical content and obtained significantly higher theoretical marks as compared to those using the traditional face-to-face approach[17-19,21,22]. However, there was no significant difference in these students' clinical performance and marks, indicating that the transfer of theoretical knowledge to the clinical platform was not improved by the higher theoretical marks[17,19,23].

Challenges of blended learning

Some studies found that lecturer availability was one of the key challenges experienced by students using the blended learning approach. Since students were able to access curriculum content at their own time, they expected lecturers to be available for assistance at all times[20,21]. Some students found using the blended learning approach more difficult to navigate than using traditional approaches[22]. As a result of limited class time and the necessary clinical skills required within health science education, a lack of opportunity existed for students to practice these skills in a face-to-face manner- with students being expected to set aside time for this in their own learning environment[23]. However, Gong et al.[23] recognised the above as a challenge and prosed that methods within the curriculum be introduced to assist students in mastering their clinical skills.

Although one of the advantages of using blended learning was the use of technological devices[16], some students experienced anxiety and high levels of frustration when online learning platforms and/or technological devices were not working sufficiently[18], essentially hindering their learning process[19,21]. Similarly, connectivity challenges interrupted students' ability to learn, however since

they were able to revisit the content at any time on various platforms they were able to overcome these challenges[17].

DISCUSSION

Higher levels of student satisfaction, increased student engagement in curriculum activities and an improved academic performance were found to support the use of blended learning. The current review found that blended learning provides students with an opportunity to learn in more conducive environments that aided their learning experience and enhanced their academic performance[17,21,22].

Geng et al.[24] found that blended learning provides students with the opportunity to be more self-directed in their learning process. Blended learning's integrated approach allows for student learning to go beyond the classroom environment, as students tailor their learning needs to their learning styles. This contributes to the improvement of student learning outcomes and overall satisfaction and experiences of blended learning[24].

The current review echoes a previous study[25] that highlighted how interactions between students, staff and curriculum influenced engagement with content[21]- with technological platforms allowing for the improvement in these interactions[16,18]. Geng et al.[24] further elaborated that communication through these platforms encourages student's engagement and focus, contributing to collaboration between students and lecturers[24]. This collaboration further motivates students to be engaged in the learning process with peers to better consolidate curriculum content[25].

The findings indicated that the use of the internet as part of blended learning is opportune for the students as it is in sync with the current technological era[16,21,22]. The use of smartphones, for example, is considered an effective learning tool for improving academic performance within the blended learning approach[16]. However, it can be argued that some students may experience the use of technology as a disadvantage due to technical challenges[19,21]. Geng et al.[24] concurs with the above about the importance of technology readiness in blended learning. The authors stress that students with higher levels of technology readiness hold a more positive attitude toward technological learning media and platforms for communication. In contrast, students with a sense of discomfort and insecurity in adopting technologies may take a longer time to become efficient users of online learning platforms[25].

Conclusion

This review aimed to explore current literature on undergraduate health science students' experiences of blended learning. Positive experiences of blended learning among undergraduate health science students was found in the review, as students experienced an improved academic performance and higher levels of engagement when using the blended learning approach. Academic performance and student engagement in curriculum activities were found to be the most significant factors to consider when implementing a blended learning approach. However, the lecturers' perceptions and their level of training when using the blended learning approach could also be explored in future research, as this contributes to the outcomes of blended learning. The review had no qualitative articles included its synthesis, which indicates a gap in literature. As a result, the researchers recommend that future research employ a qualitative approach, allowing for a more meaningful and detailed understanding of the research topic. The findings in this review support the use of blended learning in undergraduate health science education, and therefore suggests that blended learning may be a feasible option to maintain and enhance student satisfaction.

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GENERAL COMMENTS

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