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Dropout in online higher education: a systematic literature review

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Abstract

The increased availability of technology in higher education has led to the growth of online learning platforms. However, a significant concern exists regarding dropout rates in online higher education (OHE). In this ever-evolving landscape, student attrition poses a complex challenge that demands careful investigation. This systematic literature review presents a comprehensive analysis of the literature to uncover the reasons behind dropout rates in virtual learning environments. Following the PRISMA guidelines, this study systematically identifies and elucidates the risk factors associated with dropout in online higher education. The selection process encompassed articles published between 2013 and June 2023, resulting in the inclusion of 110 relevant articles that significantly contribute to the discourse in this field. We examine demographic, course-related, technology-related, motivational, and support-related aspects that shape students' decisions in online learning programs. The review highlights key contributors to dropout like the quality of the course, academic preparation, student satisfaction, learner motivation, system attributes, and support services. Conversely, health concerns, financial limitations, technological issues, screen fatigue, isolation, and academic workload, emerge as significant limitations reported by online learners. These insights offer a holistic understanding of dropout dynamics, guiding the development of targeted interventions and strategies to enhance the quality and effectiveness of online education.

Keywords: Online higher education, Dropout, Systematic literature review, Online learning platforms, Virtual learning environments

Introduction

Online education has undergone a transformation, extending beyond conventional remote learning methods like online courses and video conferencing (Moore & Kearsley, 2011; Zhao, 2006). With the advent of the COVID-19 pandemic, higher education institutions rapidly embraced online learning, incorporating media and technology into pedagogy (Rahmat et al., 2022). This rapid transition, while ensuring educational continuity during lockdowns, has also revealed mental health concerns such as heightened anxiety and stress (Duan et al., 2020; Wang & Lehman, 2021). To enhance educational processes during these lockdowns, institutions recognized the need to augment their online capabilities (Maqsood et al., 2021).

Online and distance learning involve the delivery of lectures, virtual classroom meetings, and other instructional materials and activities using online platforms (Harasim, 2000; Holmberg, 2005). Amplified by the pandemic, this pedagogical shift has revolutionized higher education (HE), promoting equitable access to education for online learners (Liu et al., 2020; Mubarak et al., 2022; Yang & McCall, 2014).

A variety of online applications and tools (such as Blackboard, Moodle, Zoom, Microsoft Teams, Google Meet, Google Docs, Microsoft Office 365, and Dropbox) have been developed and are used to improve the learning experience, performance, and quality of online teaching (Hinojo-Lucena et al., 2019), despite challenges posed by infrastructure disparities (Adedoyin & Soykan, 2023). These online tools provide the flexibility necessary for students to harmonize learning with other commitments, such as family and work responsibilities (Lee, 2017; Rahmani & Groot, 2023a). Online learning increases content access and instruction flexibility without a time or location restriction.

However, amid these advancements, concerns have arisen regarding the effectiveness of online learning and its potential to ensure student success (Sitzmann et al., 2006; Zimmerman, 2012). Student dropout is one of the drawbacks of online courses. Generally, dropout refers to students who do not enroll for a certain number of subsequent semesters. The term “dropout” bears various interpretations, encompassing temporary absences and program non-completion (Grau-Valldosera & Minguillón, 2014). Similar terms are commonly used, some of which are synonyms (attrition, withdrawal, non-completion), while others are antonyms (retention, perseverance, continuation, completion, and success); the nomenclature surrounding dropout impacts how it is perceived and addressed (Ashby, 2004). It is important to determine who should be included in the definition of dropout (Nichols, 2010). It is common to define dropping out as failing a particular course. However, some authors (Lehan et al., 2018) have suggested looking at it from the perspective of the entire program, resulting in failure to graduate. It is also problematic because students may take a hiatus (for a number of semesters) and then re-enroll.

Higher education dropout rates have become a major issue since education authorities use them as quality indicators, influencing resource allocation dependent on (reducing) the dropout rate (Arce et al., 2015). Institutions endeavor to avert dropouts, given their implications for rankings and profitability. Dropouts pose a challenge for both students and education providers. Online learning providers must be concerned about course quality and the potential negative impacts on their rankings, earnings, and profitability (Liu et al., 2009). Dropping out of online classes makes students lose confidence in continuing their online education (Poellhuber et al., 2008).

The research on dropout in online higher education (OHE) has increased over the past decades, as official online programs have significantly higher dropout rates than face-to-face (f2f) programs (Grau-Valldosera et al., 2019). The research on dropout in OHE has surged due to the substantially higher dropout rates in online programs compared to face-to-face classes (Angelino et al., 2007). As a result, gaining a more thorough understanding of this phenomenon has become essential, identifying at-risk students early and implementing user-friendly online tools and effective preventative measures.

In the context of the COVID-19 pandemic’s acceleration of online learning, research has intensified into its impact on student outcomes and mental health (Rahmani &

Groot, 2023b; Zhang et al., 2021). Consequently, reviewing evidence on online learning's effect on dropout rates becomes paramount. A systematic review of the available evidence helps provide a more comprehensive overview of the determinants of and reasons why students abandon university-offered online courses using online tools, identify solutions to these problems, suggest remedies, highlight knowledge gaps, and provide recommendations for future research. This study aims to comprehensively analyze the factors contributing to online dropout in higher education and propose solutions to mitigate this problem. By identifying students at risk of dropping out and targeting interventions to reduce dropout rates in online education, the systematic literature review can help decision-makers and instructors to improve online education's quality and enhance student success. The findings of this review can help to inform the development of policies and strategies that can help to reduce dropout rates in online education, thus improving student success and satisfaction with online learning.

There are a few systematic reviews that have analyzed the elements that contribute to online dropout rates. de Oliveira et. al. (2021) offer a comprehensive review of learning analytics' role in preventing student dropout. Their study highlights the potential of learning analytics to identify at-risk students, offer targeted support, and boost engagement. Ethical considerations and training emerge as integral components of this dropout prevention strategy.

Many evaluations have concentrated solely on certain aspects, such as student engagement or course design, rather than investigating the factors leading to dropout. For example, Purarjomandlangrudi et. al. (2016) investigated the factors shaping student interaction and engagement in online courses. By categorizing these factors, their review provides practical insights for educators and course designers seeking to foster meaningful online interactions and reduce dropout rates. Chakraborty and Muyia Nafukho (2014) analysed engagement strategies for online courses. Emphasizing positive learning environments, community building, timely feedback, and technology integration, their findings resonate with educators and designers striving to create engaging online learning experiences. Lockma and Schirm's (2020) comprehensive review examined effective instructional practices in online higher education. The study underscored five critical factors: course design, student support, faculty pedagogy, engagement, and student success. These insights advocate for evidence-based practices to combat online dropouts.

One study investigated the conditions of Transitioning to Online Teaching and Learning, such as Sharadgah and Sa'di's (2022) qualitative research explored the transformation of traditional higher education institutions into online learning hubs. Their study identified eleven methodological categories, offering a roadmap for institutions navigating this transition.

Some studies have focused on special majors or open institutions dropout factors, such as Li and Wong's (2019) seminal study that investigated the factors underpinning student persistence in open universities. Through a comprehensive survey, they revealed a primary focus on student, institutional, and environmental factors. These findings offer valuable insights for developing retention strategies tailored to the unique dynamics of open education.

In the realm of STEM education, Li et. al. (2022) utilized learning analytics to dissect retention factors. Their review of significant publications uncovered seven key factors

and associated features influencing STEM retention. The study served as a compass for future research endeavors to enhance STEM retention practices.

In some studies that concentrated on a specific geographic location or kind of institution, several assessments are limited in scope. Hachey et. al. (2022) provided an integrative review of the literature on undergraduate student characteristics in post-secondary online learning in the U.S. The authors analysed factors that affect enrollment, retention, success, and/or college persistence in online learning. The review included demographic, academic, and non-academic factors. The findings suggested a need for better controls in future research and for including potential factors in a predictive model of undergraduate online learning success.

While previous systematic reviews have provided valuable insights into online student dropout in higher education, they often focus on specific domains of the influencing factors or employ methodologies limiting the comprehensiveness of the findings. Consequently, a gap exists in our understanding of how complex interactions between diverse factors, including the constantly changing online tools and digital technology environment, contribute to dropout within a comprehensive framework.

This systematic review addresses a gap in our knowledge by broadening the scope of investigation to include a broader range of potential dropout-related factors, such as those associated with digital technologies and online resources. We aim to gain a more comprehensive understanding of the current state of knowledge and identify areas that require additional research. This will ultimately guide efforts in developing more effective strategies and interventions to support online student success.

Method

This section outlines the systematic approach used to identify, select, and analyze relevant literature on dropout in online higher education. The methodological process ensures this systematic literature review's transparency, rigor, and credibility.

Design

We followed the PRISMA checklist to ensure a precise and repeatable approach to seeking and evaluating the literature. Although this approach has limitations in synthesizing data from different disciplines and evaluating a large quantity of context, it is appropriate for achieving our research objective (Crossan & Apaydin, 2010; Denyer & Tranfield, 2009).

The review process includes several steps: the search strategy, population, study selection and quality appraisal, data analysis, and results (Rahmani & Groot, 2023b). We conducted a systematic literature search using predetermined keywords and selection criteria, evaluate the chosen articles, and summarize their relevant results based on the review's goal using descriptive tables. This approach to applied review facilitates a comprehensive analysis of the current state of knowledge within a specific research area.

Search strategy

Our search strategy was designed to comprehensively capture relevant studies in the field of dropout in online higher education (OHE). We searched four prominent databases: ERIC, Scopus, EBSCOhost, and ScienceDirect. In addition to these databases, we

also utilized Google Scholar and each article obtained during the retrieval process was subsequently entered into [ResearchRabbit.ai](#) Beta3 for hand search of any new papers published until August 2023 to ensure comprehensive coverage of the literature.

Based on a careful analysis of key topics related to dropout research, we selected significant search phrases that would encompass various aspects of dropout across different typologies of online education, such as blended learning and fully online programs. To ensure precision, we excluded terms like “success” and “stop-out” due to their potential ambiguity about dropout. The resulting search phrases were meticulously crafted after undergoing multiple pilot searches to optimize their relevance (Table 1).

Inclusion and exclusion criteria

To ensure the inclusion of pertinent studies, we established a set of clear and well-defined criteria. We considered selected studies published from 2013 to August 2023,

Table 1 Search terms used for this systematic review

Search terms in each database

“systematic” AND “dropout”
“systematic” AND “dropout” AND “online”
“review” AND “dropout” AND “online”
“systematic” AND “dropout” AND “online” OR “university”
“review” AND “dropout” AND “online” OR “university”
“review” AND “dropout” AND “online” OR “university” OR “course”
“systematic” AND “dropout” AND “online” OR “university” OR “course”
“review” AND “dropout” AND “online” AND “course”
“systematic” AND “dropout” AND “course”
“systematic” AND “dropout” AND “course” AND “online”
“e-learning” AND “dropout” AND “higher education”
“technology enhanced learning” AND “dropout” AND “higher education”
“digital education” AND “dropout” AND “higher education”
“online education” AND “dropout” AND “higher education”
“dropout rate” AND “online education”
“student retention” AND “digital learning”
“e-learning” AND “attrition”
“distance education” AND “dropout”
“online courses” AND “student engagement”
“online program” AND “dropout”
“virtual classroom” AND “dropout”
“online course design” AND “dropout”
“digital technology” AND “higher education” AND “retention”
“virtual instruction” AND “student success”
“digital tools” OR “online learning” OR “e-learning” OR “technology-enhanced learning” OR “digital education” OR “online education” AND “dropout” AND “higher education”
“university student” AND “dropout rate” AND “online education”
“college” AND “retention” AND “digital tools”
“university student” AND “engagement” AND “virtual learning”
“online course design” AND “university student” AND “dropout rate”
“virtual instruction” AND “success” AND “University”
“University” OR “online education” AND “dropout factors”

ensuring the utmost currency and pertinence in our review. Peer-reviewed studies that specifically focused on dropout, persistence, or completion in online higher education were eligible for inclusion. Moreover, selected studies were required to provide substantial data and evidence regarding factors influencing dropout.

Excluded from consideration were non-English articles, grey literature, non-research publications such as reports, newspapers, and magazines, and studies unrelated to online higher education, such as those focusing on traditional face-to-face programs and Massive Open Online Courses (MOOCs). We also excluded studies lacking a transparent methodology or evidence to substantiate their findings, ensuring the quality and rigor of the selected literature.

Study selection and quality appraisal

Upon obtaining search results, we used Endnote X9.3.1 to manage duplicates. The first author initially assessed titles and abstracts to the inclusion criteria. Full-text articles were acquired for research that could not be ruled out during the first screening. We used the open-source artificial intelligence tool ASReview (<https://asreview.nl/>, version 1.2.1) for priority screening to cross-check screening findings. Our study selection process involved three successive filters. In order to determine if an article was relevant to OHE dropout factors and online tools, the titles and abstracts of publications that passed the first filter were examined in the second filter. The third filter reviewed the complete text of articles that had made it through the first and second filters to see if they fulfilled our inclusion and exclusion criteria and connected to a significant topic. After carefully examining their findings, the reviewers agreed to a comprehensive list of publications.

Data analysis and synthesis

We employed a synthesizing interpretative technique for data analysis to ensure a comprehensive and insightful synthesis of the selected studies. Our primary focus was on presenting outcomes in a manner that prioritizes their legitimacy and trustworthiness. To achieve this, we implemented transparent data synthesis procedures.

To enhance the reliability of our findings, we adopted multiple assessment procedures. Each contributing author independently reviewed their findings to ensure a rigorous analysis. The gathered data were carefully analyzed and categorized, resulting in a comprehensive summary table, which is presented as Additional file 1: Table S1. This table encompassed various aspects of the included studies, such as publication details, authors, study focus, methodology, sample and population characteristics, dropout factors, research questions, and other important comments.

Our methodology employs a systematic and thorough approach to investigating dropouts in online higher education. By incorporating the aforementioned refinements, our study aims to provide valuable insights into the factors influencing dropout, contributing to the advancement of knowledge in the field of online education.

Results

In this section, we summarize our findings to provide a general overview of what has been produced in the dropout literature in OHE from 2013 to extending up to August 2023.

The search identified a total of 6732 articles with relevance to drop out in the context of online higher education (OHE). After removing 2731 duplicate articles, a remaining of 4001 articles was subjected to further analytical consideration. Among these, 1136 articles were directly aligned with online learning, whereas the remaining 2865 articles failed to meet the relevant criteria. Subsequently, a detailed assessment was conducted on 813 full-text articles from the subset of pertinent articles, ultimately resulting in the inclusion of 110 articles for detailed analysis. It is noteworthy that the exclusion of 703 articles was predicated on distinct grounds, encompassing: (1) the association with campus-based dropout phenomena, (2) relevance to Massive Open Online Courses (MOOCs), and (3) focus on anticipatory dropout rate prognostications, (4) having low quality.

To enhance transparency, we created a visual flow diagram that depicts the search results, screening process, and selection decisions. Figure 1 shows a PRISMA flow chart with search results, screening results, and selection outcomes.

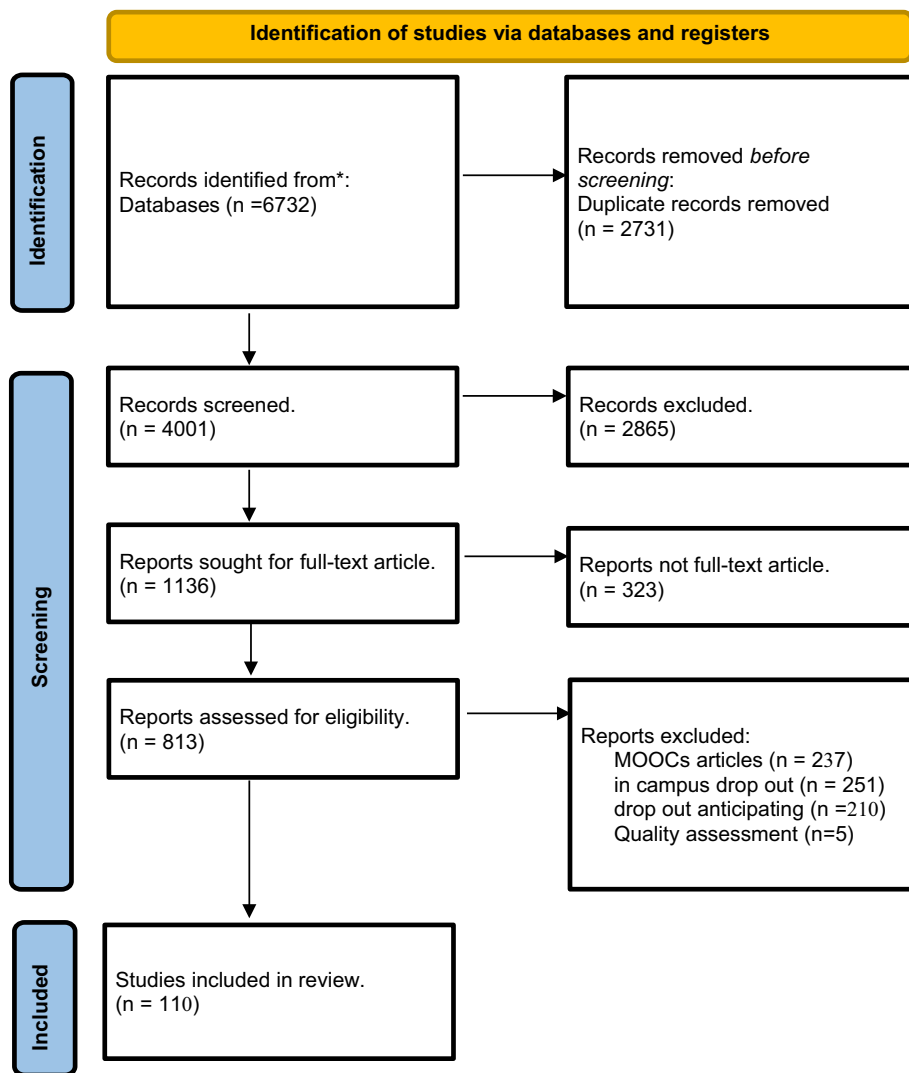


Fig. 1 PRISMA flow chart

Quality assessment rules (QARs)

The final step in this study involves evaluating the quality of the research papers collected. To ensure the papers' quality and relevance to our research objectives, we used five Quality Assessment Rules (QARs). Each paper was rated on a scale from 1 to 5 based on its adherence to these QARs, which were formulated based on our understanding of the current research landscape in this field and the research gap our paper aims to address. The papers were assessed for their ability to meet high research standards while adequately addressing our research question, as detailed in Additional file 1: Table S2. For each of the five QARs, a score was assigned as follows: "fully answered" = 5, "above average" = 4, "average" = 3, "below average" = 2, and "not answered" = 1. The paper's ranking was determined by adding up the scores for all ten QARs. Papers with a score of 5 or higher were accepted, while those below this threshold were excluded.

The QARs focused on objectives, methodology, findings, limitations, implications, and contributions to the field.

The five Quality Assessment Rules (QARs) are as follows:

QAR1: Are the objectives and research questions clearly stated?

QAR2: Is an appropriate methodology used to address the research questions?

QAR3: Are the findings supported by data and evidence?

QAR4: Are limitations and implications discussed?

QAR5: Does the study contribute to knowledge in the field?

Study characteristics

The study characteristics section provides insights into the included articles in this systematic review, such as year of publication, geographical location, methodological approach, data collection, and method. This information is available in Additional file 1: Table S3.

Most of the articles were published between 2021 and 2023 (52.7%), while from 2017 to 2020 with 30% and from 2013 to 2016 with 17.3% of articles were ranked second and third. This highlights an increased interest in dropouts due to the COVID-19 pandemic's impact on remote learning in higher education.

The United States emerged as the leading contributor, followed by Asia and Europe. Various methodological approaches were employed, with quantitative methods being the most prevalent (38.2%), followed by qualitative (25.4%), mixed methods (26.4%), and systematic approaches (10%).

A survey/questionnaire emerged as the predominant methodological choice for data collection, utilized by over 54% of the articles. Interviews were employed by 15.4% of the studies, whereas academic/institutional databases served as the data source for 10.9% of the articles. Moreover, some studies explored information from other articles. In certain cases, researchers employed a mixed-method approach, combining different methods such as interview surveys or interview-database analyses.

Online factors related to dropout

The factors related to online dropout in higher education are presented in Additional file 1: Table S4. Factors are classified in five categories, Demographic factors, Course-related factors, Technology-related factors, Motivational factors, and Support-related factors, and each category has some subcategories. Within these categories, both positive and negative influences on dropout rates are discussed.

motivational factors, with 15 factors (25.4%), have the biggest impact on dropout, then course related factors, with 12 factors (20.3%), are in second place. Technology-related factors and demographic factors, with 11 factors (18.6%) and 1.7% difference with course related factors, stand in third place, and in the last place, we can see support related factors with ten factors and 16.9 percent.

Demographic factors

In examining dropout factors within online higher education, 11 distinct demographic factors have been identified as potential contributors. These factors have been thoroughly investigated and detailed in 110 articles (refer to Additional file 1: Table S4). Among these, certain factors exhibit a negative influence. To elaborate, student skills have emerged as a significant factor affecting dropout, as evidenced by the frequency of the references in the academic literature. Studies (see the references Additional file 1: Table S5), have underscored the pivotal role of student skills in dropout. With eight mentions in total, it is one of the most important factors affecting dropout. Additionally, adverse effects are associated with factors such as students' knowledge, highlighted in works by Bağrıacık Yılmaz and Karataş (2022), de Oliveira et al. (2021), Lang (2022), and Utami et al. (2020) English as a Second Language (ESL) education, examined in studies by Hachey et al. (2022), Prada et al. (2020), and Sauvé et al. (2021), as well as living conditions, explored by Mubarak et al. (2022), Voigt and Kötter (2021).

Conversely, a distinct set of factors demonstrates positive effects on dropout rates. Notably, health issues and anxiety, as highlighted in nine studies (see the references in Additional file 1: Table S5) are mentioned most often. Additionally, age demonstrates a positive correlation with reduced dropout rates by Behr et al. (2020), de Oliveira et al. (2021), Hachey et al. (2022), Hassan et al. (2019), Li et al. (2022), Prada et al. (2020), Sauvé et al. (2021), and Stoessel et al. (2015). Similarly, financial issues, as evidenced (Bağrıacık Yılmaz & Karataş, 2022; Grau-Valldosera et al., 2019; Li et al., 2022; Radovan, 2019; Sauvé et al., 2021; Uzir et al., 2023; Voigt & Kötter, 2021; Zhou et al., 2020) exhibit positive effects with a collective total of eight mentions. Other positive factors are as follow: disability (Hassan et al., 2019; Sauvé et al., 2021), cultural norms and issues (Rudhumbu, 2021), previous experience with technology (Odunaike et al., 2013), parents' level of education (de Oliveira et al., 2021; Sacalã et al., 2021; Sauvé et al., 2021; Stoessel et al., 2015; Uzir et al., 2023).

The examination of demographic factors highlights their significant roles in influencing dropout rates in online higher education. By recognizing the interplay of both negative and positive elements, educators and institutions can better tailor their strategies to mitigate challenges and cultivate an environment conducive to students' persistence and achievement in the digital learning landscape (See Fig. 2).

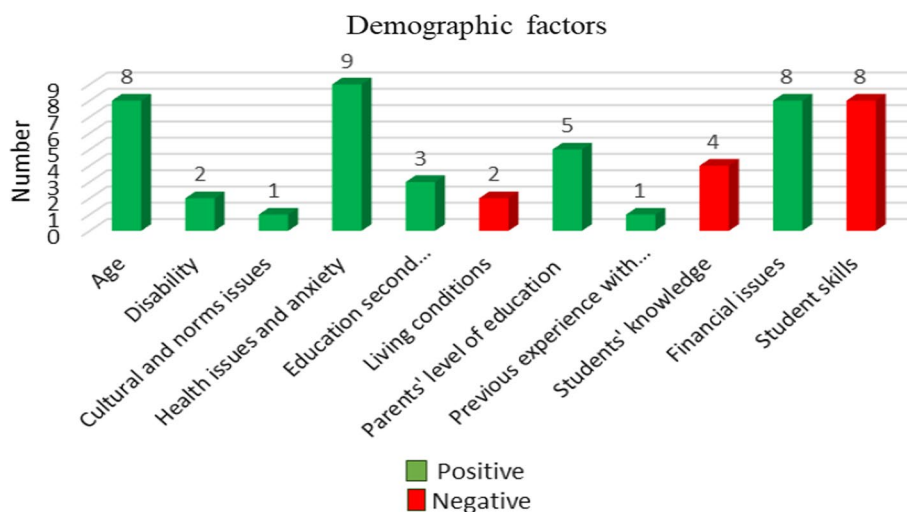


Fig. 2 Demographic factors

Course-related factors

The examination of factors related to course design and preparation revealed a comprehensive list of 12 distinct factors. Starting with those that have the most negative effects, the primary factor of concern is the online course design, layout and content. This factor has been widely studied in various research, including 31 studies (see the references in Additional file 1: Table S5). The second most significant factor in this category is academic preparation, which has been studied in 22 studies (see the references in Additional file 1: Table S5). Additional factors contributing negatively include the quality of videos in homework methodology (Kanetaki et al., 2021; Li et al., 2022; Montelongo & Eaton, 2020), Learning quality (Naciri et al., 2021; Purarjomandlangrudi et al., 2016) orientation to online instruction prior to coursework commencement (Lockma & Schirm, 2020), Total learning time (Buck, 2016; de Oliveira et al., 2021; Kanetaki et al., 2021), Course success (Bağrıacık Yılmaz & Karataş, 2022; Kanetaki et al., 2021; Li et al., 2022; Rosser-Majors et al., 2022; Zhou et al., 2020), time management skills (Buck, 2016; de Oliveira et al., 2021; Eliasquevici et al., 2017; Elsaary, 2021; Lee & Choi, 2013; Radovan, 2019; Xavier & Meneses, 2021, 2022; Zou et al., 2021) and online accessibility to educational material (Lang, 2022; Vezne et al., 2022).

On a brighter side, some factors have a positive impact on dropout rates. These factors include academic workload and time availability, which have been highlighted in 15 studies (see the references in Additional file 1: Table S5). Similarly, transition difficulties and adaptation have been identified as positive factors in select studies, namely those by Behr et. al. (2020), Eliasquevici et. al. (2017), and Xavier and Meneses (2022) with three collective mentions.

The examination of course-related factors highlights their crucial role in influencing dropout rates in online higher education. By thoroughly understanding these factors, educators and institutions can enhance their teaching methods, curriculum design, and support systems to cultivate an environment that encourages student engagement, motivation, and success in the digital academic realm (See Fig. 3).

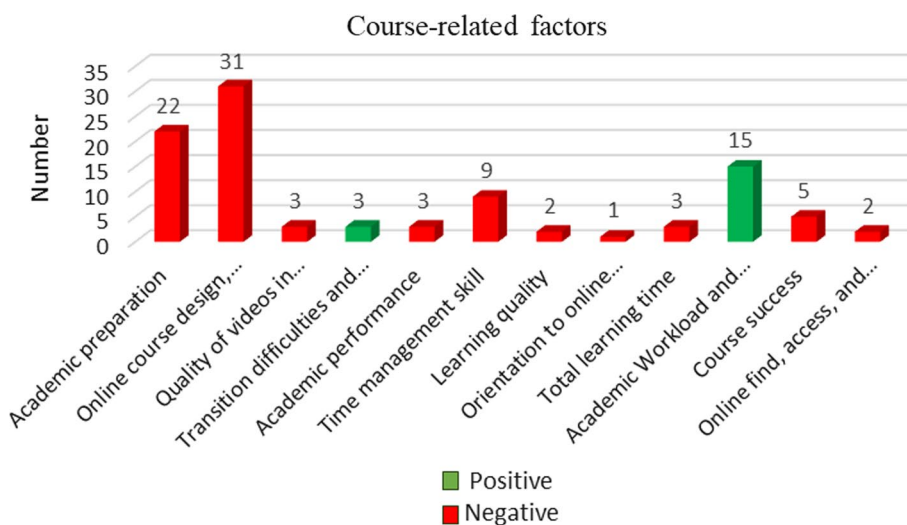


Fig. 3 Course-related factors

Technology-related factors

In line with the main theme of this article, an essential category relates to factors related to technology. Within this category, we have identified 11 distinct elements associated with dropout rates in the context of online higher education and its reliance on digital tools. Foremost among these factors is the quality of systems, information, and services, which is a recurring concern, as evidenced by the research of Bağrıacık Yılmaz and Karataş (2022), Chakraborty and Muyia Nafukho (2014), Grau-Valldosera et al. (2019), Machado-da-Silva et al. (2014), Maiolo et al. (2023), Naciri et al. (2021), Prabowo et al. (2022), Safsouf et al. (2019), Sharadgah and Sa’di (2022), Tao et al. (2018) and Uzir et al. (2023). This factor has the most significant negative impact on dropout rates, with a total of 11 mentions across various articles. Similarly, the suitability of the Virtual Learning Environment (VLE) emerges as another critical factor associated with negative effects on dropout rates. This factor has been explored in studies by Bağrıacık Yılmaz and Karataş (2022), Daniels and Lee (2022), Laux et al. (2016), Mansor et al. (2021), Sadaf et al. (2019), Safsouf et al. (2019), and Zou et al. (2021). Additional factors contributing negatively include online technical skills (Gibbings et al., 2015; Kordrostami & Seitz, 2022; Shaikh & Asif, 2022; Xia et al., 2022), Perceived usefulness (Naciri et al., 2021; Radovan, 2019; Safsouf et al., 2019), User-friendly and skilled technical infrastructure support team (Naciri et al., 2021; Odunaike et al., 2013; Page et al., 2020).

On the other hand, factors positively contributing to student retention include Internet connectivity, which is a crucial prerequisite for online engagement. This factor is supported by the works of Almendingen et al. (2021), Attree (2021), Buck (2016), Mansor et al. (2021), Naciri et al. (2021), Nicklen et al. (2016), Pérez (2018), Rahman (2021), Tuma et al. (2021), Willging and Johnson (2019), and Zou et al. (2021), totaling 11 citations. Furthermore, the presence of necessary equipment, such as webcams, emerges as a pivotal positive factor in student retention. This is underscored by the works of Händel et al. (2022), Mansor et al. (2021), Naciri et al. (2021), Rahman (2021), Safford and Stinton (2016), Tuma et al. (2021), and Zou et al. (2021), additionally, issues with

technology (Christopoulos et al., 2018; de la Peña et al., 2021; de Oliveira et al., 2021; Mokoena, 2013; Nicklen et al., 2016; Safford & Stinton, 2016; Safsouf et al., 2019; Willging & Johnson, 2019) are the most influential factors in this category, with 8 mentions. Other positive factors, such as power failure (Rahman, 2021; Zou et al., 2021) perceived security (Händel et al., 2022; Safsouf et al., 2019), have also been identified as relevant contributors to students’ continued participation in the digital learning environment.

Technology-related factors have a dual impact on dropout rates, with systemic quality and Internet connectivity demonstrating the most influential and positive effects, and considerations like VLE suitability and equipment access manifesting in negative and positive consequences for online higher education retention (See Fig. 4).

Motivational factors

Within the realm of motivational factors, we have identified 15 distinct elements, encompassing both positive and negative aspects. These factors collectively play a critical role in influencing dropout rates in online higher education.

When considering negative factors, Student Satisfaction and Achievement emerge as paramount contributors to dropout rates. This is demonstrated through 21 comprehensive studies (see the references in Additional file 1: Table S5). Learner’s motivation, a crucial psychological driver, has received significant scholarly attention. This is evident in research conducted by a multitude of scholars, including a total of 19 citations (see the references in Additional file 1: Table S5). The essential facet of study management skills, crucial for maintaining engagement, has been addressed in works by scholars (see the references in Additional file 1: Table S5). Furthermore, the positive impact of self-regulation on student engagement is demonstrated in 13 studies (see the references in Additional file 1: Table S5). Additionally, students’ online studying activities play a significant role in influencing dropout rates, as depicted in 13 studies (see the references in Additional file 1: Table S5). These studies collectively contribute to our understanding of this aspect. Conversely, a range of negative motivational factors has also been observed.

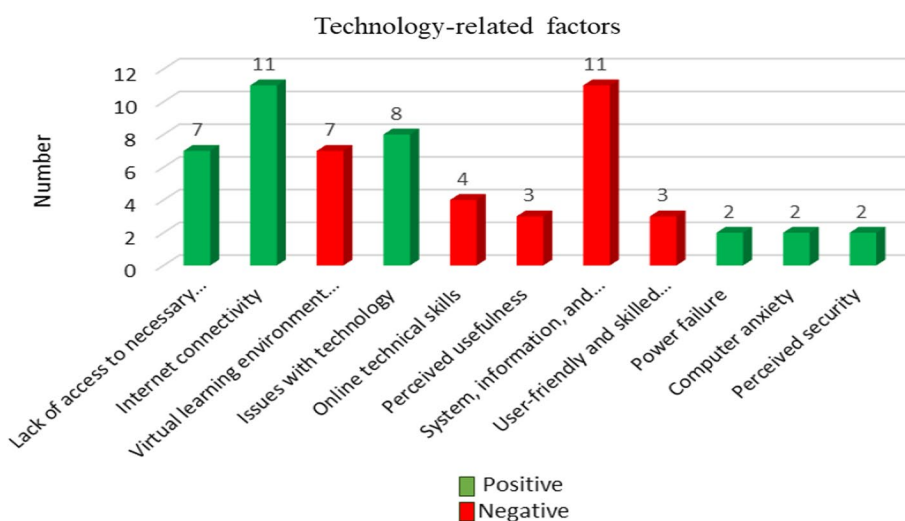


Fig. 4 Technology-related factors

Self-Efficacy, a fundamental factor in determining learner success, is addressed in research by Amoozegar et. al. (2022), Garris and Fleck (2022), Ilyas and Zaman (2020), Lee et. al. (2013), Lockma and Schirm (2020), Rosser-Majors et. al. (2022), Safsouf et. al. (2019), Sage et. al. (2021), Vayre and Vonthron (2017), and Zou et. al. (2021). Self-Esteem emerges as a relevant aspect in studies conducted by Madleňák et. al. (2021), Nicklen et. al. (2016), Shabbir et. al. (2021), and Wang and Lehman (2021), Participation’s role in influencing dropout rates is explored by Coussement et. al. (2020), Elsayary (2021), Fabian et. al. (2022), Hensley et. al. (2021), Inder (2022), Li et. al. (2022), Madleňák et. al. (2021), Montelongo and Eaton (2020), Pellas and Kazanidis (2015), Solé-Beteta et. al. (2022), and Vezne et. al. (2022), additionally, the influence of facilitation of social connectedness and likelihood of succeeding in similar future tasks is explored by Shaikh and Asif (2022), and Kanetaki et. al. (2021), respectively.

On a positive note, factors such as screen fatigue and concentration issues demonstrate their impact on studies (Banovac et al., 2023; de Oliveira et al., 2021; Kanetaki et al., 2021; Luburić et al., 2021; Potra et al., 2021; Shabbir et al., 2021; Solé-Beteta et al., 2022; Tuma et al., 2021; Wang & Lehman, 2021; Zou et al., 2021) collectively cited 10 times. Additionally, the significance of students’ expectations is highlighted in research by Mokoena (2013), Purarjomandlangrudi et. al. (2016), Sadaf et. al. (2019), Safsouf et. al. (2019), Salinas and Stephens (2015), Uzir et. al. (2023), Xavier and Meneses (2021, 2022), and Zhang et. al. (2022) accumulating 9 citations. The impact of students feeling isolated is recognized in works by Almendingen et. al. (2021), de la Peña et. al. (2021), de Oliveira et. al. (2021), Glover et. al. (2018), Gunasekara et. al. (2022), Prada et. al. (2020), Rosser-Majors et. al. (2022), and Willging and Johnson (2019) with eight instances of citation. Additional positive factors in this category include difficult conversations, as detailed by Attree (2021), Montelongo and Eaton (2020), and Solé-Beteta et. al. (2022), as well as procrastination, explored by Sage et. al. (2021).

The interplay of motivational factors underscores their crucial role in influencing dropout rates within online higher education, with careful considerations of both positive and negative factors shaping students’ commitment and retention (See Fig. 5).

Support-related factors

This category encompasses ten distinct factors influencing online higher education dropout rates. Among the negative factors within this category, teacher’s personality

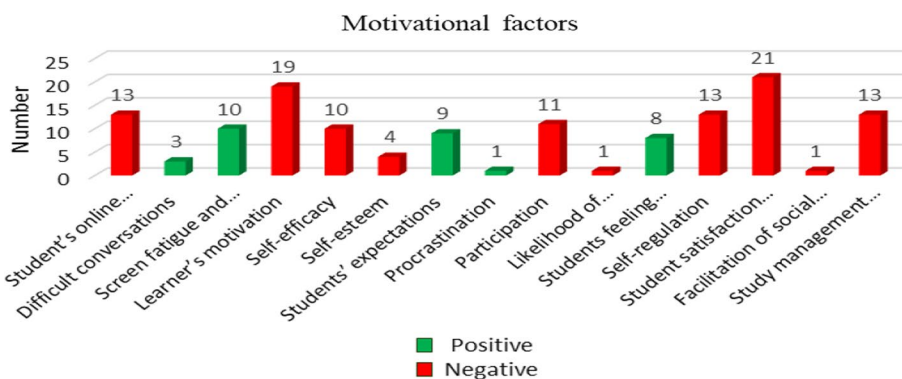


Fig. 5 Motivational factors

and expertise emerge as significant contributors, with 13 studies (see the references in Additional file 1: Table S5). Academic support for students ranks as another noteworthy negative factor, as evident in 12 studies (see the references in Additional file 1: Table S5). Additional negative factors include the presence of a good learning environment, noted by Bağrıacık Yılmaz and Karataş (2022), Buck (2016), Chakraborty and Muyia Nafukho (2014), Naciri et. al. (2021), and Shaikh and Asif (2022).

Switching to positive factors, socio-economic status (SES) has been identified as a significant influencer in dropout rates, as indicated by research conducted by Behr et. al. (2020), de Oliveira et. al. (2021), Hachey et. al. (2022), Hassan et. al. (2019), Prada et. al. (2020), Ren (2022), and Sacalã et. al. (2021) collectively cited seven times. The absence of support, as noted by Bağrıacık Yılmaz and Karataş (2022), Martin et. al. (2021), Rosser-Majors et. al. (2022), Sadaf et. al. (2019), Stoessel et. al. (2015), and Xavier and Meneses (2022), represents another noteworthy positive factor, along with lack of a conducive study environment at home, as explored in works by Behr et. al. (2020), Buck (2016), Fabian et. al. (2022), Naciri et. al. (2021), Rahman (2021), and Voigt and Kötter (2021) resulting in 6 citations. Moreover, the absence of teacher presence is shown to be a significant positive factor in dropout rates, addressed in research by Attree (2021), Kim and Kim (2021), Lockma and Schirm (2020), Morrison (2021), Vezne et. al. (2022), and Zou et. al. (2021) also amassing six citations; Further positive factors in this category include response latency, length, time of day, and message frequency in forums, as evidenced by studies by Amoozegar et. al. (2022), Dixson et. al. (2017), and Sharadgah and Sa’di (2022), Additionally, the institution’s level and size contribute positively to dropout rates, as outlined in research by Behr et. al. (2020), and Uzir et. al. (2023).

The interplay of support-related factors underlines their substantial impact on dropout rates within online higher education, encompassing both negative and positive facets that contribute to students’ engagement and persistence (See Fig. 6).

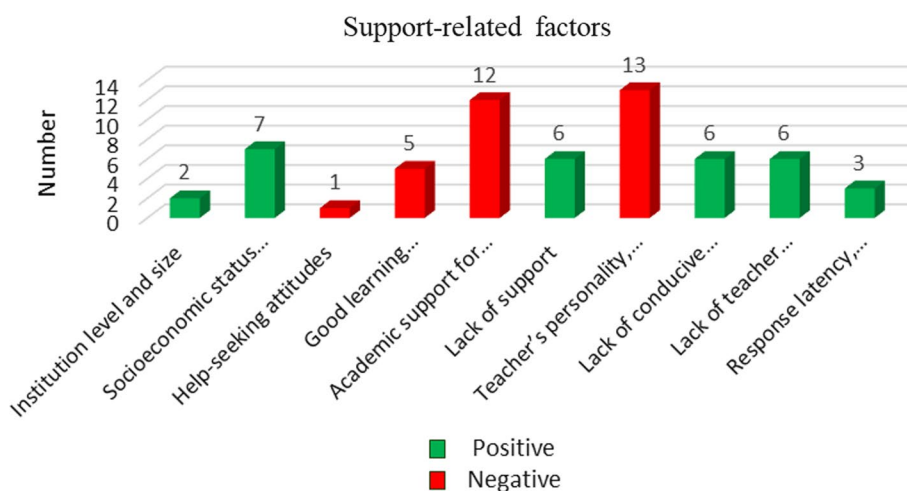


Fig. 6 Support-related factors

Discussion

This section synthesizes our findings to provide a comprehensive overview of the dropout literature. Based on an extensive review covering 11 years of research on dropout risk factors in online higher education, with a particular focus on online tools, we emphasize notable gaps and limitations in the current body of knowledge.

Exploring the factors that influence dropout rates in online higher education has provided valuable insights into the complex nature of this phenomenon. In our systematic literature review, we explored the multifaceted landscape of dropout rates in online higher education from a multiple perspectives. It examines various factors affecting why students drop out of online higher education. This detailed analysis shows how demographics, courses, technology, motivation, and support all interact to make the situation complex. By combining empirical evidence from diverse studies, a more complete understanding emerges, serving as a valuable resource for designing interventions and policies to promote student retention and academic success. In the following, we discuss some of the most important findings on the demographic, period-related, technology-related, motivational, and support factors.

Demographic factors that were shown in the result section give us a clear picture of factors that are related to students and may affect student's decision to drop out or persist in online higher education. Some factors showed us that we still need to monitor the students and their living conditions to help them focus on their courses. In contrast, the positive effect of health issues and anxiety on dropout show the need for institutions to foster a supportive and comfortable environment for students who have these challenges. The impact of pandemic-induced anxieties, compounded by stressors like inadequate study spaces and distractions, has detrimentally influenced students' commitment to their studies, as highlighted by Fabian et. al. (2022). This underscores the critical necessity for implementing effective strategies to address mental health and overall well-being, as these aspects serve as pivotal determinants in students' choices regarding their educational continuance (Sage et al., 2021).

Age, financial issues, and parental level of education also have been identified as contributors to positive outcomes, highlighting the role of life experience and stability in students' online learning journey. These show that factors outside the academic domain significantly influence students' ability to commit to their online learning.

By studying course-related factors linked to dropout, we can optimize instructional design manuals that may guide educators to implement effective strategies and may ultimately reduce dropout rates. Among the factors that strongly contribute to dropout rates in this category, the quality of online course design, layout, and content stands out as a pivotal element. Studies underline the correlation between course satisfaction, reduced dropout rates, and sustained commitment to distance learning. For instance, Mourali et. al. (2021) highlight the importance of a clear and logical structure for successful e-courses. It is crucial to begin with a description of the whole content, define objectives, present the syllabus, and mention information about duration and effort. Furthermore, the effectiveness of well-structured courses, enriched with rigorous and relevant content is underscored by Shaikh and Asif (2022), highlighting how clear instructions and engaging elements foster persistence while uninspiring or irrelevant components trigger attrition decisions. Although developing effective online instructional materials and

resources is time-consuming, it is a valuable process for student satisfaction in online courses (Sadaf et al., 2019).

Furthermore, an essential pre-study factor affecting student dropout is the prior education of students, especially the student's grade point average (GPA). GPA serves as an indicator of the student's ability to meet the level of performance required by the higher education system, which could also predict future dropout risk (Behr et al., 2020). A positive correlation between higher grades, enhanced achievements, and reduced inclination to drop out or switch degrees is observed (Li et al., 2022). Prior experience with online courses may also contribute to students' adaptability to the online learning mode (Pellas & Kazanidis, 2015). Furthermore, previous experience with distance or online learning improves awareness and boosts confidence (Shaikh & Asif, 2022). Also, we found some more negative factors that can help institutions and teachers to improve course quality and reduce dropout such as total learning time, course success and etc.

Also, some of them like time management skills have a negative effect on dropout and cause a student to persist in online higher education. The reason is that online learning requires self-regulation and effective time allocation due to the absence of a teacher. For example, Xavier and Meneses (2022) reveal that students in online higher education struggle to balance academic, work, and personal commitments often lead to feeling overwhelmed, ultimately eroding their persistence. In addressing this issue, Zou et al. (2021) underscore the importance of cultivating effective time management abilities to equip students with the means to navigate these challenges successfully. Failure to master time management can heighten the risk of dropout (Zou et al., 2021). Consequently, understanding the role of time management skills becomes crucial in implementing strategies that enhance students' ability to manage their responsibilities and persist in their educational journey.

In contrast some factors had positive effect on dropout. For example, many students feel overburdened by the overall semester workload, and this cumulative workload is often cited as one of the reasons for dropout in online education. This situation is often exacerbated by inadequate organization within specific courses, resulting in unclear expectations and a disorganized dissemination of educational content. Notably, the concern of excessive tasks and assignments is emerging as students perceive a workload that exceeds what is typically encountered within a conventional learning setting (Luburić et al., 2021).

One more positive factor that identified in result is transition difficulties and adaptation and this brings to light the difficulties that institutions and students may have adjusting to online learning settings. It emphasizes the need to put into practice efficient adaptation techniques and offer necessary assistance. It also underlines how important it is for organizations and students to get ready for this change in advance so that everything goes more smoothly and effectively for everyone involved in online learning.

Directly correlating with dropout rates are system, information, and service qualities. Factors encompassing platform usability, lecturer attributes, system quality, information provision, and technical support distinctly influence the acceptance of e-learning (Naciri et al., 2021). Machado-da-Silva et al. (2014) highlighted that perceived information quality positively influences system use, with Information quality, service quality, and system quality sequentially shaping satisfaction and use. A

strategic allocation of resources to foster engaging content, robust online learning platforms, internet infrastructure, and a positive online education image is pivotal for educators (Tao et al., 2018). Acknowledging potential limitations, the authors additionally recognize that learners may sometimes be impeded in capitalizing on available resources due to computer knowledge gaps and technological challenges (Chakraborty & Muyia Nafukho, 2014).

Virtual Learning Environment (VLE) suitability and having a user-friendly and skilled technical infrastructure support team can help students adapt to online learning tools, making them essential requirements for student success.

Learner motivation emerges as a pivotal determinant of success in online programs. The evolution of student motivation from program commencement to culmination underscores its dynamic nature (Buck, 2016). The sensation of disconnectedness and remoteness in online learning might increase student's dropout rate, which might decrease their motivation to learn. Highly motivated learners are more likely to succeed in online learning than learners with low motivation (Amoozegar et al., 2022).

Negative student satisfaction and achievement are robust predictors of attrition. Unsatisfied students usually spend less time studying and have a higher rate of withdrawal, which underscores the impact of course satisfaction, study motivation, consistent study patterns, and tutorial attendance on academic outcomes (Behr et al., 2020). Learners are less likely to drop out when they are satisfied with the courses and when they are relevant to their own lives (Choi & Kim, 2018). Furthermore, research on e-learning emphasizes that student satisfaction with and utilization of the system result in overall benefits for distance learning and significantly contribute to student retention, thereby reducing dropout rates (Machado-da-Silva et al., 2014).

In the positive section screen fatigue and concentration issues and students feeling isolated are some of the important factors that can cause student dropout (de Oliveira et al., 2021).

Support-related factors play an important role in enhancing online higher education retention rates. The personality and expertise of the teacher have been identified as significant factors contributing to student dropout rates in online education (Prabowo et al., 2022). Research underscores that instructors' digital literacy skills and their belief in the online education system influence student motivation and course continuation (Bağrıacık Yılmaz & Karataş, 2022). Additionally, effective faculty feedback, particularly in terms of timeliness and usefulness, plays a vital role in student engagement and retention (Lockma & Schirm, 2020).

Also, insufficient academic support for students has been identified as a significant dropout factor in online education, encompassing elements like orientation to online instruction, faculty-student interaction quality, and fostering a sense of community (Lockma & Schirm, 2020). The absence of effective support mechanisms, coupled with technical difficulties and lack of tutor assistance, can lead to student frustration, and potentially hinder their persistence (Rajabalee & Santally, 2021). Furthermore, while financial aid and scholarships hold importance, comprehensive academic support is essential for maintaining student motivation and commitment throughout their online courses (Li et al., 2022; Luburić et al., 2021).

Strengths, limitations and future research directions

This systematic review's strength lies in its comprehensive approach, covering 11 years of research to understand dropout in online higher education thoroughly. The review explores a wide range of factors contributing to dropout, including demographics, course-related aspects, technology, motivation, and support, offering a holistic understanding of this complex issue. Methodological rigor is evident through strict inclusion criteria, ensuring the quality of studies included and enhancing the reliability of findings. The review's interdisciplinary nature, considering technological, pedagogical, psychological, and support aspects, contributes to a nuanced comprehension of online education dropout.

Notably, the articles under review employed diverse methodologies to predict dropout, including machine learning approaches, factor analyses of schools and open institutions, and studies investigating dropout in face-to-face education. This methodological diversity introduces potential variability in findings and interpretations.

The implications of this review extend to both research and practice, benefiting stakeholders such as educators, students, and course designers. It equips them with a comprehensive view of factors affecting student success and dropout, empowering them to design online courses that foster engagement, performance, and satisfaction. Beyond practical application, the review serves as a valuable resource, particularly for newcomers to the field, by providing insights into student characteristics, course design, technology integration, motivation, and support mechanisms that influence online learning outcomes.

The systematic nature of this review enhances its rigor; however, several limitations warrant consideration. The scope of this paper necessitated a thematic synthesis, offering a broad overview of the collected data. Given additional more time and resources could be deepened and potentially investigated further. A thorough search was conducted of the library databases; however, unpublished, and grey literature was not included in the search strategy, which may have limited the final articles selected.

This review's potential limitations extend to its search methodology. While a common practice, the focus on English-language studies could have inadvertently omitted relevant research conducted in other languages. Moreover, the database selection process might have inadvertently excluded certain studies due to time and resource availability constraints.

Notably, the articles under review employed diverse methodologies to predict dropout, including machine learning approaches, factor analyses of schools and open institutions, and studies investigating dropout in face-to-face education. This methodological diversity introduces potential variability in findings and interpretations.

Due to a lack of information concerning certain dropout factors associated with online tools, we were only able to address some critical factors in our discussion.

Furthermore, while this review encompasses a comprehensive analysis of existing literature, identifying relevant interventions and their quantitative effectiveness remains a critical avenue for future exploration. The need for more studies focusing on intervention outcomes, employing robust quantitative methods, and encompassing larger sample sizes, is apparent.

Future research should focus on designing and implementing interventions and assessing their quantitative impact on student retention. This could involve randomized controlled trials (RCTs), quasi-experimental designs, or robust statistical analyses to provide concrete evidence of the efficacy of various interventions. Additionally, conducting longitudinal studies that track students over an extended period can provide valuable insights into how various factors evolve and interact over time. This could help uncover dynamic trends and inform the development of timely interventions.

Conclusion

The education landscape has undergone a transformative evolution with the advent of technology, revolutionizing learning opportunities and accessibility, primarily fueled by the global proliferation of the Internet. Online learning, a novel educational approach, has gained significant traction across higher education, offering learners an alternative pathway to knowledge acquisition. Nonetheless, this method presents inherent challenges and impediments, of which the quality of online course design, layout, and content emerges as a pivotal concern.

This systematic literature review was properly conducted in pursuit of a comprehensive understanding of the multi-faceted reasons behind students' decisions to discontinue their online education journeys. The overarching objective was to unravel the intricate web of factors influencing dropout rates and to present a holistic overview to educators, administrators, and policymakers. The synthesis of current research has unveiled a nuanced narrative, categorizing these dropout factors into five major dimensions: demographic factors, course-related factors, technology-related factors, motivational factors, and support-related factors.

By presenting these categories and the associated subcategories, each comprising a diverse array of attributes, this study offers a valuable repository of insights for researchers and educators alike. The culmination of our analysis underscores key themes influencing student dropout in online higher education. Notably, elements such as the quality of online course design, academic preparedness, student satisfaction and achievement, learner motivation, system functionality, information provision, and service quality emerge as pivotal factors contributing to negative perceptions of dropout. Similarly, students' online studying activities, teacher attributes, expertise, and academic support, along with students' skills and their interaction with system information and service quality, form a constellation of influences linked to dropout tendencies.

However, diverse challenges and limitations emerged from the student perspective. Health concerns and anxiety, financial difficulties, issues related to internet connectivity, technological challenges, screen fatigue, concentration problems, feelings of isolation, lack of support, and the burden of academic workload and time constraints were identified as the most prominent constraints affecting students' experience in online learning. These insights illuminate the multi-faceted nature of dropout in the online higher education landscape, paving the way for tailored interventions and strategies that address the factors contributing to negative perceptions and the constraints students face in their pursuit of online education.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s41239-024-00450-9>.

Additional file 1: Table S1. Overview of articles. **Table S2.** Quality assessment of studies. **Table S3.** General characteristics. **Table S4.** Online dropout factors.

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Availability of data and materials

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Code availability

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Declarations

Competing interests

Amir Mohammad Rahmani, Wim Groot and Hamed Rahmani declare that they have no conflicts of interest that are relevant to the contents of this review.

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