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A systematic review of factors influencing student interest in online homework

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Abstract

Online homework has been emerging with the popularity of online learning. The significance of online homework has been recognised, especially during the outbreak of COVID-19. Although it is regarded as one homework format, studies explicitly targeted at online homework are limited till now, particularly in student interest. As interest is defined as the driver of student learning, it is important to explore the factors influencing student interest in online homework to promote this technology use. Thus, a systematic review of the literature was conducted to identify studies on student interest in online homework with the guide of PRISMA. Based on 23 selected studies, this study unveiled the included studies' characteristics and the informed factors influencing student interest in the online homework system or the homework assigned or completed online. The findings of this study showed that background variables, adult guidance and monitoring, and the role of students in the process impact student interest in online homework. As online homework is delivered via technology, other factors, such as content design, the ability of technology use and homework submission methods, are also associated with student interest in online homework. Relevant educational implications are elaborated. Further studies and limitations are also included in this study.

Keywords: Online learning, Online homework, Student interest

Introduction

Homework, regarded as a supportive method for students to consolidate their learning, is usually assigned by teachers and done by students outside of school (Cooper, 2001; Magalhães et al., 2020). As a teaching and learning component (Williams, 2012), online homework is a homework format delivered with the support of technology. It is a facilitating tool for student learning with the emergence of technology. Interest is an enduring predisposition to engage with particular objects or activities (Hidi & Renninger,

2006). Identified as a key component in learning (Schiefele, 1996), interest has a significant impact on homework completion and student achievement (Cooper et al., 1998; Du et al., 2016; Suárez et al., 2019; Sun et al., 2019; Xu, 2008, 2012, 2021).

Studies on homework interest, especially paper-and-pencil homework, as perceived by students in college, middle school and primary school have attracted sufficient attention in recent decades (Knekta et al., 2020; Krapp, 2005; Sellami et al., 2017; Xu, 2008, 2020, 2021). However, student interest in online homework has been less investigated. Specifically, research on factors influencing student interest in online homework is less and incomplete. Given the ubiquity of technology in today's classrooms and the advantages of online homework for student learning, the current study aims to investigate factors influencing student interest in online homework via a systematic review.

Factors affecting student interest in homework

As an important educational tool, homework is an indispensable part of student learning (Cooper et al., 2006; Hagger et al., 2015). The significance, value, and positiveness of homework for students to consolidate, master, and further explore the instructed learning are largely demonstrated (Halcrow & Dunnigan, 2012; Xu, 2020). Nevertheless, research has also pointed out that homework is ineffective per se. Most students still take it as a routine and mundane activity they must complete in their daily lives. Their attitudes towards homework also tend to be negative (Warton, 2001; Xu, 2008, 2020).

Interest is a source driving students' learning (Chan et al., 2018). To better facilitate learning, educators should seek ways to foster student interest. Homework is an important part of learning consolidation, hence student interest in homework also should be highlighted. Herein, student interest in homework refers to students' preference to complete sustained academic assignments imposed by educators in the context of school and home (Hidi & Renninger, 2006; Krapp, 1999; Xu, 2008). Past research and theories indicate that various variables impact interest (Ainley, 2006; Eccles & Wigfield, 2002; Hidi & Renninger, 2006; Renninger & Hidi, 2002; Sansone, 2000). Factors, including affective components, cognitive components, adult monitoring, and background variables, are suggested to influence homework interest as perceived by students (Xu, 2008).

Relevant theoretical models are developed mainly from various aspects including teachers, students, and parents to investigate student interest in homework (Cooper, 2001; Corno, 1996; Epstein & Van Voorhis, 2001; Warton, 2001; Xu, 2008, 2012, 2016, 2018, 2020, 2021). Three categories of variables have been concluded to affect student interest in homework, including background variables, adult guidance and monitoring, and the role of students in the homework process (Xu, 2008). Herein, background variables refer to gender, ability, grade level, economic background, etc. Adult guidance and monitoring

include family help and teacher feedback. The role of students in the process involves cognitive, conative, and affective aspects.

Studies on student interest in online homework

Current technological advances promise the possibility of multiple modality facilitators and learning modes to guarantee the delivery of learning in and after class. Online homework paves its way to echo the mushrooming technological popularity in an educational context. Its emergence satisfies the demand for online learning and becomes a part of learning consolidation. The outbreak of COVID-19 has made online homework pertinent in continuing successful teaching and learning (Cadaret & Yates, 2018; Lim et al., 2013; Richards-Babb et al., 2015).

Evidence has shown that online homework promises many benefits for students (Cadaret & Yates, 2018; Murphy et al., 2019; Richards-Babb et al., 2015; Wiggins & van der Hoff, 2021; Yushau & Khan, 2014). The highlights of instant and individualised feedback provided by online homework offer the opportunity for students to correct their errors and encourage them to practice exercises to consolidate their acquisition (Halcrow & Dunnigan, 2012; Nutan & Demps, 2014; Rodriguez et al., 2016; Salame & Hanna, 2020). What is more, online homework also supports students to achieve the mastery of coursework (Lunsford & Pendergrass, 2016; Magalhães et al., 2020; Murphy et al., 2019), and succeed in higher academic achievement (Chang et al., 2014; Fan et al., 2017; Magalhães et al., 2020).

The Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003), is considered a useful and comprehensive model about technology adoption. Based on this model, many variables have been applied to demonstrate the technology acceptance by students (Barnett et al., 2015; Khechine et al., 2020; Venkatesh et al., 2012). Specifically, Khechine et al. (2020) have demonstrated that the intrinsic value construct is critical in predicting the acceptance and use of technology. Herein, the intrinsic value construct is regarded as "a desirable phenomenon to maintain users' engagement and self-motivation to use a system" (Khechine et al., 2020, p. 2307). It contains two dimensions — enjoyment and interest. The findings indicate that interest is related to behavioural intention and user behaviour. Informed findings also show that the interest construct affects users' adoption and acceptance of online homework (Aksenova et al., 2015; Kurt, 2021; Maxwell et al., 2018; Wheeler & Blanchar, 2019).

Existing literature reports unequivocally the benefits of online homework for student learning. Online homework's implementation is still not widespread, however (Cao & Song, 2020). Many students report reluctance, unwillingness and rejection to use online homework (Elmehdi, 2013; Rentler & Apple, 2020). In other words, certain students are uninterested in online homework. Still, evidence of what factors influence student interest

in online homework to promote this technology for learning is scattered. Given the increased use of technology in the current education system, the advocacy of interest-driven life-long learning theory, and the significance of online homework in learning consolidation for students, it is necessary and important to systematise research findings regarding factors influencing student interest in online homework.

Hence, based on the eligibility and exclusion criteria, the study aims to synthesise selected articles to answer the specific research questions through an in-depth analysis. Particularly, the analysis of the factors influencing student interest in online homework is based on the model of student interest in homework concluded by Xu (2008). This is a novel trial to conduct a systematic review concerning this topic based on this model. The research questions of this study are as follows:

RQ1: What are the characteristics of the included studies?

RQ2: What factors influence student interest in online homework of the included studies?

Materials and methods

The present systematic review focuses on the outline of the characteristics of the included studies, and the discovery of the informed factors influencing student interest in online homework. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) are used to guide this study to conduct the review. Terms such as "online homework", "online homework system", and "homework assigned or completed via online" are used in this study to describe the usage of online homework in student learning.

Search strategy and selection criteria

Based on preplanned eligibility criteria, a systematic literature review is conducted to allocate all empirical evidence to investigate the proposed questions. Inclusion and exclusion criteria were applied in this study to provide reliable findings. Review articles, book chapters, and conference abstracts were excluded. Only journal publications in the English language which were peer-reviewed were considered for this review. The inclusion criteria were as follows: (1) the study should concern online homework, (2) the study needs to report the relationship between variables and student interest in online homework, and (3) the study should be conducted in the recent decade, ranging from 2012 to 2021. Four databases were searched, namely ScienceDirect, Education Resources Information Center (ERIC), Scopus, and Google Scholar, to find the targeted studies. The keywords used for the searches were "online homework" and "student interest". The searches were conducted between October 20th, 2020 and October 20th, 2021.

For the Science Direct database, advanced search was used with the terms "online homework and student interest", then "title, abstract, keywords" was keyed on "online homework". The option of research articles was selected later. As for ERIC, the term

Table 1 Search results and final articles selected from per database

Database	Science Direct	ERIC	Scopus	Google Scholar
Result	33	33	101	301
Article Selected	3	2	10	10

"online homework", as well as "peer-reviewed only" and "full text available on ERIC", was selected for searching journal articles. For the Scopus database, after searching "title, abstract, keywords" with the terms "online homework", the term "student interest" was searched as a follow-up. Finally, for Google Scholar, the tool "advanced search" was used and "online homework" was keyed into "with all the words", "student interest" was in "with the exact phrase", and "anywhere in the article" was selected in "where my words occur". Table 1 shows the search results and papers obtained from the targeted databases.

Selection process and data extraction

The PRISMA guideline (Moher et al., 2009) was followed for the data abstraction. Based on the above-mentioned inclusion and exclusion criteria, the targeted articles were extracted from four databases at first. Two authors first screened the titles and abstracts, then independently assessed, analysed, extracted, and conducted the eligibility phase. In case of uncertainty or disagreement between the two authors, a third researcher refereed the discrepancies. Via the discussion, a mutual agreement was reached with the cooperation of the three authors. With the selected articles, duplication was checked then. Finally, the total number of studies was included with the combination of the articles chosen from the four databases. After analysing in detail, the following data are extracted: participants, course, methodology, types of online homework, and study findings.

Concerning online homework, data are reported with online homework platforms (systems or tools or applications) or types of homework assigned or completed online that are mentioned in the included studies. As a format of homework delivery, online homework, specified with the advancement of technology to assist student learning, is endowed with the characteristics of paper-and-pencil homework. Additionally, student interest in online homework is defined as students' preference to engage in completing homework online for a sustainable and stable period in this study.

Hence, the factors influencing student interest in online homework are reported by three categories based on the conclusion by Xu (2008) in this study. The categories include background variables, adult guidance and monitoring, and the role of students in the homework process. Other factors are also concluded and summarised as well.

Results

The database searches resulted in 468 records altogether. After the document type search in each database, 301 studies remained. The reason for exclusion is that four full texts were not research articles (in Science Direct), two were not journal articles (in ERIC), 43 were not published journal articles (in Scopus), and 118 were not journal articles (in Google Scholar). Later, 172 articles were excluded by title and abstract screening because these articles were not about online homework, nor homework assigned or completed online. Subsequently, after considering the inclusion and exclusion criteria in each database, 25 articles were found to comply with the criteria related to student interest. Later, after checking the duplication, two articles were deleted. Finally, 23 individual studies were included in the final review. Figure 1 outlines the flow of the process among four databases of the systematic review.

In this systematic review, the publication dates of the 23 studies are from 2012 to 2021. Among these studies, the number of publications recorded at the peak is in 2018 (as shown in Figure 2). This study aims to explore the characteristics of the selected studies and then unveil the factors influencing student interest in online homework. Accordingly, in the following sections, the main characteristics of the retrieved studies are illustrated, including participants, course domain, study design, types of online homework, and factors affecting student interest.

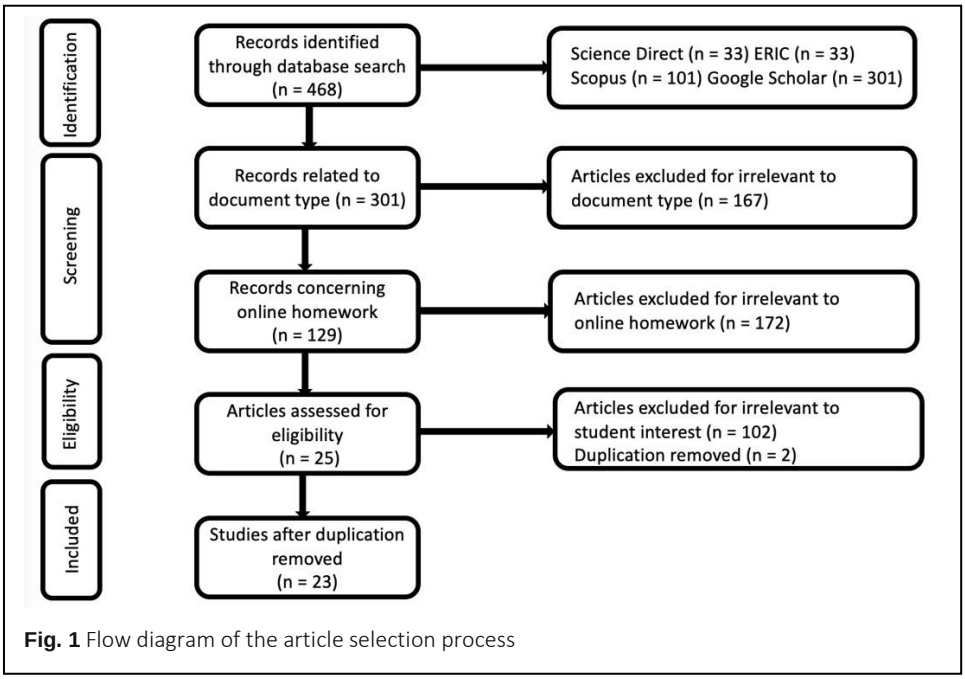

Fig. 1 Flow diagram of the article selection process

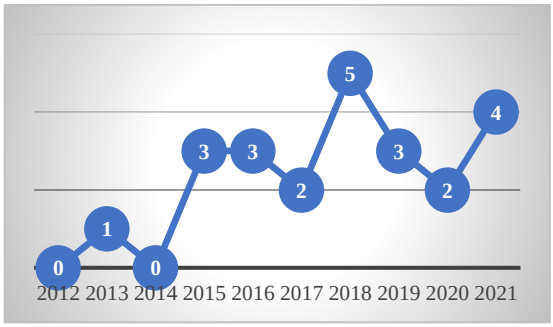

Fig. 2 Number of publications per year of the included studies

Participants

The selected studies in this review are conducted in different countries. Most of the studies originate from the United States (n = 12), followed by China (n = 3), Malaysia (n = 2), England (n = 1), Turkey (n = 1), Germany (n = 1), and three studies are not clearly specified.

The participants are composed of teachers and students. Most studies are conducted with college or university students (n = 14), followed by middle or secondary school students (n = 5). Three studies involve teachers and students as participants (Amiryousefi, 2016; Mzoughi, 2015; Zhu, 2017). While the study conducted by Mohamad et al. (2020) includes postgraduate students.

Except for seven studies, 16 articles provide information about sample sizes, ranging from 36 (Tsai et al., 2021) to 2,597 (Keith et al., 2021). Five categories of sample size are found as well, including less than 50 (n = 2), between 50 and 100 (n = 4), between 100 and 200 (n = 2), more than 200 (n = 7), and more than 1,000 (n =1). Most participants are of the same nationality, except for two studies. A study by McCollum et al., (2019) invited participants from Western Canada and Central US, respectively. While the study conducted by Hart et al. (2017) investigated 85 college students, in which approximately 87% of students were white, 7% were Black or African American, 2% were Asian, 4% were other, and 17% were Hispanic/Latino.

Course domain and study design

Conventionally, academic disciplines can be divided into humanities and sciences based on Wikipedia. In the selected studies, most are focused on sciences (n = 17), followed by humanities (n = 2). Regarding sciences, four articles are focused on STEM-related courses (science, technology, engineering, and mathematics). Then, the following are calculus (n = 3), accounting (n = 2), psychology (n = 2), and physics (n = 2). Subsequently, one article contributes to chemistry, microeconomics, artificial intelligence of things (AIOT) practical course, and career development. Besides, two studies are focused on humanities,

English and history, respectively. Meanwhile, four studies target more than one course (Gong et al., 2021; Keith et al., 2021; Mohamad et al., 2020; Purinton & Burke, 2018) (as shown in Table 2).

Table 2 Participants, course domain, study design of the included studies

First Author	Year	Participants	Courses	Study Design
Baris, M. F.	2013	10th Grade Students	Career Development Course	Survey, Questionnaire
Mzoughi, T.	2015	College Students & Teachers	Physics	Survey
Settlage, D. M.	2015	College Students	Microeconomics	Survey
Camp, J. M.	2015	College Students	Accounting	Survey
Powers, K. L.	2016	College Students	Introductory Psychology	Pre/post-test
Amiryousefi, M.	2016	College Students & Teachers	English	Semi-Structured Interview, Questionnaire
Scott, C. E.	2016	Undergraduate Students	Calculus	Survey
Hart, S. A.	2017	College Students	Calculus II Course	Experiment
Zhu, T.	2017	College Students & Teachers	History of Modern Design	Questionnaire; Survey
Maxwell, P.	2018	College Students	Accounting	Survey
Basnet, R. B.	2018	College Students	Computer Science	Survey
Albelbisi, N. A.	2018	Secondary School Students	Mathematics	Survey, Questionnaires
Mahaffey, A. L.	2018	Undergraduate Students	Human Physiology	Survey
Purinton, E. F.	2018	Undergraduate Students	Accounting & MBA Marketing	Survey
Kulhanek, A.	2019	College Students	Engineering Design	Action Research
Wheeler, S. R.	2019	High School Students	Advanced Physics	Mixed-method
McCollum, B.	2019	College Students	Organic Chemistry	Qualitative, Survey
Mohamad, M.	2020	Distant Post Graduate Students	Psycholinguistics & Language Teaching	Questionnaire
Ramirez, G.	2020	College Students	Psychological Intervention	Experiment
Keith, N. H.	2021	Grade 8-11 Students	English, Social Studies, Math, and Science	Survey & Self-Report
Chamberlain, D.	2021	College Students	Calculus	Survey
Tsai, C. C.	2021	Senior High School Students	AIOT Implementation Course	Questionnaires & Qualitative Interviews
Gong, J.	2021	College Students	Chinese Culture & Data Structure	Field Experiment, Factorial Design

The most frequently used research methodology is the quantitative approach (n = 17) in the selected studies, followed by qualitative approach (n = 2), mixed method (n = 2), action research (n = 1), and case study (n = 1). The common research designs used by studies in this review are survey (n = 14) and experimental (n = 5), while four studies do not specify the study design.

Types of online homework

As shown in Table 3, the most frequently used online homework are systems (n = 6), including the blackboard course management system, WEPS, the online homework correcting system, Kattis, MyiMaths, and OWLv2. Then, online homework platforms are also targeted (n = 6), including WebAssign, Xronos, MOOC platform, gamification platform, and an online homework platform. Besides, articles also contribute to online homework applications (n = 2) and tools (n = 2). Specifically, the online homework tool used by Mzoughi (2015) in the study was developed by the author himself.

In addition, studies (n = 7) are also focused on homework assigned online. The ways of homework assigned are frequently in the form of quizzes (n = 2) and online video and chat (n = 2). Additionally, one article contributes to online resources, animation games, and online activities.

Informed factors influencing student interest in online homework

Student interest in homework is impacted by three categories concluded by Xu (2008), including background variables, adult monitoring and guidance, and the role of students in the process. As a format of homework, factors influencing student interest in online homework are analysed based on the aforementioned categories. Additionally, studies targeted at online homework and homework assigned or completed online are examined.

Selected studies concerning online homework

Among the selected studies, student interest in online homework (n = 16) is mainly associated with the following factors. The role of students in the process is identified frequently (n = 11), followed by adult monitoring and guidance (n = 1), background variables (n = 1), and other factors (n = 3).

In terms of the role of students in the process, many selected studies have reported the influence of the usefulness of online homework on student interest (n = 7). Mzoughi (2015) indicated that students were interested in the self-developed online tool because they could learn more. Scott et al. (2016) emphasised that online homework (WebAssign) was a critical motivating factor contributing to enhancing student performance. Hence, students

Table 3 Types of online homework and study findings

First Author	Type	Study Findings
Baris, M. F.	E-portfolio application	The application was interesting and students had low-grade anxiety when using the system.
Mzoughi, T.	Online tools	Students were able to learn material of the course via using the online tools which triggers their interest in completing homework online.
Settlage, D. M.	Aplia	Students' attitudes towards Aplia affected their performance and their sentiment towards Aplia.
Camp, J. M.	Online quizzes	Students found quizzes were helpful for them to prepare for their exams. Hence, they preferred the online homework format to the traditional style. Besides, the alternative quiz styles increased students' confidence in learning as well.
Powers, K. L.	Blackboard course management system	Although students reported difficulties or displeasure when using the system, about half of the students indicated that they were interested in using the system. Because the system was better fit with students' work schedules.
Amiryousefi, M.	Online resources	Homework design should be based on the needs and interests of students. Besides, students should gain the right to resort to online resources and self-access centres.
Scott, C. E.	WebAssign	Based on the surveys, the usage of the online homework system can motivate students to learn and increase their performance. This format also increased students' subject interests and enhance their problem-solving skills.
Hart, S. A.	WEPS	Students would engage with the online system when they found the system was significant for their study.
Zhu, T.	The online homework correcting system	Students' interest in the online homework correcting system was associated with the course content. Specifically, different situations, personal experiences, and feedback about the content were accounted for their interest.
Maxwell, P.	An online homework platform	Students' interest in the online homework platform was increasing when they believed the platform fitted their learning styles.
Basnet, R. B.	Kattis	Students' levels of satisfaction, confirmation of expectations, and the perceived usefulness of the system were related to their continuance intentions to use Kattis.
Albelbisi, N. A.	MyiMaths	There were significant relationships between performance expectancy, effort expectancy, and student attitude towards using the tool. Besides, a positive relationship between student attitudes and their actual use (interest) of online homework was demonstrated as well.
Mahaffey, A. L.	Animation games	The use of animation, as well as games, can trigger students' interest in their course assignments and exams.

Purinton, E. F.	Online video	The fun exercise design can motivate students' interest and engagement in the course.
Kulhanek, A.	Gamification platform	Students were interested in the platform because they felt it was interesting and useful to their learning. Besides, students also felt support from the platform, which made them feel successful in their coursework.
Wheeler, S. R.	WebAssign	Male students were interested in the homework because they had context choice, while females were for their perceptions of difficulty levels when doing homework. Providing homework choices and enhancing contextual interest could increase students' interests.
McCollum, B.	OWLv2	Students' interest in the system for learning can be triggered by exchanging and negotiating ideas with their faculty.
Mohamad, M.	Online quizzes	The fully prepared and more relaxed environment for students learning resulted in their preference to online quizzes.
Ramirez, G.	Online video	After receiving the online web-based assignment, students showed more significant interest in using the targeted resources. The identities, concrete concerns, and social belonging needs of the first-generation students at minority-serving institutions should be addressed.
Keith, N. H	Online activities	Though there was no relationship between home Internet access, GPA, or performance on the AST, students who had broadband home Internet access became more interested in completing homework online.
Chamberlain, D.	Xronos	Students regarded the challenges provided by the system as a reason for them to learn the material. It seemed challenges enhanced their interest in the course.
Tsai, C. C.	Turtle Graphics	Small-scale online learning courses aroused students' interest and enhanced their learning participation. The "perceived ease of use" and "perceived usefulness" positively affected "behavioral intention" in using online digital teaching materials. Students' learning engagement also impacted their actual intention towards learning.
Gong, J.	XuetangX	It was likely that students would submit homework and receive higher homework grades if they were given a monetary incentive. The monetary incentives can counteract students' engagement decay and help them cultivate persistent learning habits.

showed increasing interest in the subject. Hart et al. (2017) pointed out that when students found online homework useful, they would engage in the system. Maxwell et al. (2018) stressed that if students believed the online homework platform would be compatible with their learning style, they would try it. At the same time, Basnet et al. (2018) emphasised that when students perceived the usefulness of Kattis, they would continuously use the system.

Similarly, Albelbisi and Yusop (2018) pointed out that performance expectancy was the best factor for predicting student attitude towards the use of online homework. At the same time, student attitude impacted the actual use of online homework, defined as personal interests or personal evaluation of the system. Hence, there was a positive relationship between performance expectancy and student interest in online homework. In addition, Kulhane et al. (2019) identified that students were inclined to learn the content delivered by the gamification platform because of the interesting and useful content.

Moreover, in terms of the role of students in the process, studies (n = 4) have also found that students' experience impacts their interest in online homework. When students experience a positive feeling, students may become interested in using online homework. Baris and Tosun (2013) pointed out that students showed high interest in online homework because the application was interesting and they experienced low-grade anxiety. Via the introduction of Aplia as a homework management tool to students who majored in microeconomics, Settlage and Settlage (2015) reported that student sentiment regarding Aplia was high. The result also showed that students who held favourable views towards Aplia, performed better. Conversely, students with unfavourable opinions of Aplia did not perform as well as others.

Additionally, students' negative feelings do not distinguish their interest in online homework. Powers et al. (2016) indicated that students still became interested in doing online homework because of learning freedom. However, they perceived difficulties or displeasure in doing homework online via the blackboard course management system. The authors also recommended that it was helpful to design homework based on students' needs and interests and resort to using online resources and self-access centres. What is more, when students experience the novelty of online homework, they also may show interest in online homework. Zhu (2017) found that the student interest was associated with the course content, novel experience, and feedback provided by the system.

For background variables (n = 1), student interest has been identified as related to gender in the studies. Wheeler and Blanchard (2019) emphasised that males would choose homework context based on their interest. On the contrary, females would perceive the difficulty level of the homework. But, if the physic homework can be modified more contextually interesting, it can enhance student interest so as to increase academic achievement for both males and females.

For monitoring and guidance (n = 1), the role of teachers has been found to affect student interest in the selected studies. Via the analysis of interviews, surveys, and student-written reflections, McCollum et al. (2019) identified the difficulties students encountered when doing the international online collaborative assignments. Specifically, the authors stressed that exchanging and negotiating ideas with faculty could stimulate student interest in using the system.

In addition, other factors also have been discovered to impact student interest. Via the investigation of the use of an online homework system called Xronos among students, Chamberlain et al. (2021) indicated that the use of animations, games, and the functionality of the system piqued student interest in completing course assignments. Gong et al. (2021) signified a monetary incentive was likely to influence students to use XuetangX and gain higher homework grades. While Tsai et al. (2021) reported that small-scale online learning via the original Turtle Graphics homework was demonstrated to arouse student interest in doing the assignment.

Selected studies concerning homework assigned or completed online

For studies on homework assigned or completed online (n = 7), factors influencing students' interest in online homework, are also categorised based on the conclusion by Xu (2008). The variable of the role of students in the process (n = 3) was also recorded as the most frequently mentioned among the selected studies, followed by background variables (n = 2), and other factors (n = 2).

In terms of the role of students in the process (n = 3), Camp et al. (2015) indicated that students who experienced confidence in the material showed their preference for the alternative quiz styles compared to traditional ones. Purinton and Burke (2018) demonstrated that students frequently interacted and engaged in the exercise in the form of online video and online chat because of the fun of the assignment. Mohamad et al. (2020) suggested that students would like to carry out online quizzes when they were fully prepared and in a more relaxed environment.

In terms of background variables (n = 2), Keith et al. (2021) stressed the significance of economics due to its promise of broadband home Internet access. The participants from lower economic families were reluctant to accept the homework. Moreover, the authors also suggested that even though there was no relationship between home Internet access and students' GPA or performance on the SAT, the rural students whose families can support them to access broadband Internet would be interested in completing homework and school. Ramirez et al. (2020) stressed that first-generation and continuing-generation-to-college students became more interested in using targeted resources after receiving online homework. The authors pointed out that online homework as an intervention was associated with students' stories. Hence, the authors argued that the concerns of the first-

generation students at minority-serving institutions were about identity and social belonging needs, which should be addressed.

For other factors, Amiryousefi (2016) emphasised that current homework assignments were insufficiently interesting, leading to dissatisfied learning outcomes. Most students did not complete the assignment based on their teachers' requirements. Hence, the author stressed that homework design should be in accordance with students' needs and interests. Moreover, students should obtain the opportunities to access online resources, and self-access centres. In the study by Mahaffey (2018), students were interested in doing online homework due to the use of animations and games provided by homework assigned online. Hence, homework design is also accountable for enhancing student interest in online homework.

Discussion

In terms of the characteristics of the selected studies, the extant literature unveils that college students are the predominant population of the studies included in this review, especially in the recent five years. To stress, there are only four studies focused on secondary school students among the studies included hereof (Albelbisi & Yusop, 2018; Keith et al., 2021; Tsai et al., 2021; Wheeler & Blanchard, 2019). It may indicate that the investigation on the use of online homework among elementary, middle, and high school is insufficient.

For the course domain of the informed studies, studies on sciences herein attract particular focus. This result may account for the relevance of areas of knowledge in modern society. Or, the types of homework design are more feasible to be implemented by the system with the support of technology (Magalhães et al., 2020). Surveys, self-reports, questionnaires, and qualitative interviews are frequently used in most studies. Though these instruments have prevailed currently in collecting data, some uncontrollable influences still affect the results, such as dishonest responses as well as biased answers. What is more, among the selected studies, research focused on the online homework system (application, platform and tool) is twice more than on homework assigned or completed online in the current review. This may indicate that the researchers are inclined to investigate the online homework system, compared with homework assigned or completed via online.

For factors influencing student interest in online homework, regardless of types of homework, the role of student in the process is frequently reported to influence student interest (n = 15), followed by background variables (n = 2), adult monitoring and guidance (n = 2), and other factors (n = 4). Inevitably, studies from the student aspect have obtained sufficient attention. Particularly, feeling-related and value-related aspects are associated with personal interest. Additionally, owing to the technical characteristics of online

homework, factors including content design, submission ways, and online interaction also can evoke student interest.

Studies show that feelings of positiveness (Settlage & Settlage, 2015); novelty (Zhu, 2017), low-grade anxiety (Baris & Tosun, 2013), confidence (Camp et al., 2015), fun (Purinton & Burke, 2018), and relaxation (Mohamad et al., 2020) can trigger interest. Particularly, even though there are difficulties or displeasure in doing online homework, the authors suggested that online coursework offered students the flexibility of completing their studies at their convenience. Accordingly, students with the responsibility and intention to pursue learning independently may like the flexibility of working online and show interest in other hybrid coursework (Powers et al., 2016).

Relevant studies also stress that the increase in student performance is frequently identified to impact student interest in online homework (Albelbisi & Yusop, 2018; Basnet et al., 2018; Hart et al., 2017; Kulhanek et al., 2019; Scott et al., 2016). In addition, the possibility of learning more (Mzoughi, 2015) and compatibility with learning style (Maxwell et al., 2018) are also indicated to impact student interest.

Despite the majority of studies emphasising the benefits of online homework, some conclusions indicate that students are inclined to do paper-and-pencil homework. Mzoughi (2015) pointed out that students still longed for traditional homework because the online tool cannot interact with professors and lecture assistants face-to-face. Similarly, Powers et al. (2016) also claimed that 41% of informants expressed their agreement and preference for the traditional lecture and homework.

Last but not least, some studies also mentioned the barriers students encountered when using online homework. According to Powers et al. (2016), technical difficulties are worsening, leading to a sharp decline in hybrid course participation among students. Particularly, the added features were incompatible with student learning style, making students confused and reluctant to accept the coursework. This finding is consistent with McCollum et al. (2019). The authors also found that students described their difficulties in using technology. Conversely, Tsai et al. (2021) suggested that students who were highly receptive to learning technology had a higher intention of learning via technology.

Educational implications

The articles reviewed stressed the impact of the role of students in the process on student interest in online homework. Positive feelings and better performance expectancy may boost student interest in doing online homework. This finding may help instructors manage the homework process. For example, the assignment of novel, funny and interesting homework is likely to assist students in learning with interest. Since the feasibility and possibility of academic improvement or success may evoke student interest in doing online homework (Basnet et al., 2018; Kulhanek et al., 2019), it indicates that educators may help

students set reachable learning purposes so as to enhance their interest as well. Meanwhile, educators can design relaxing and low-grade anxious learning contexts to alight student interest.

It is important to note that some challenges should be tackled when using online homework. The decrease in the interpersonal reaction is regarded to be one issue that some students refuse to use online homework. Instructors, therefore, should actively take advantage of the technology to communicate with students whenever and wherever, if necessary. Another problem that should be solved is technical difficulties. It suggests that some relevant stakeholders may consider simplifying the operation of online homework as well as offering sufficient support to students. Besides, educators also should provide instructions to students to help them appropriately use the technology and master the skills.

Limitations and further studies

In the current study, four databases are included in the search. However, most of the selected studies are conducted via surveys. Though this research design is cost-effective, reliable, and versatile, it lacks inflexibility and potential depth. Informants may offer dishonest answers or biased opinions as well. Hence, it is possible that some factors influencing student interest in online homework may be left unanswered or ignored. More robust research designs, such as standardised validated measures, are recommended to be applied in future studies. Besides, the present study does not control the quality of the papers reviewed. Some important aspects of the investigation may fail to inform, such as the demographic information of the participants, and validate measures concerning student interest in online homework. For other factors influencing student interest, for example, content design and submission methods, more studies are still needed to take on further investigation.

In addition, online homework is a kind of homework assigned or completed with the support of technology. The burgeoning of this homework delivery format promises the usage of technology to help students benefit from the techniques for learning. On the other hand, the success of online homework also relies on the support of technology, to some extent. Technical difficulties may also include barriers to students grasping online homework. In this case, studies on student interest in online homework also ought to consider in terms of technology. Further studies on this aspect require more attention.

Lastly, papers included in this review are less focused on humanities, but on sciences. Perhaps, it is because the designs of exercises as well as the relevant feedback provided by online homework seem easier to develop in science subjects. The exploration on other domains deserves to be conducted more in the future. Likewise, regarding the limited studies targeted at the middle school level, taking further research to bridge this gap is recommended.

Conclusions

The current study aims to systematise the characteristics of the included studies as well as the factors influencing student interest in online homework. The findings herein are likely to benefit academicians and researchers to comprehend the knowledge from the literature and learn the research gaps that could be further investigated. Specifically, determining what factors influencing student interest in online homework can enrich learning quality and facilitate pedagogical and instructional uses of this technology. Therefore, educators can take advantages of the findings to effectively promote the use of online homework among students for teaching and learning.

Regarding the first research question, results show that the majority of studies are college students from different countries with a wide range of participants, different duration of intervention, and various course domains. The main research methodology is the quantitative approach and the common research design is survey. Online homework systems are frequently employed to be investigated in the study. For the second research question, results show that the role of students in the process is the frequently-mentioned factor affecting student interest in online homework. When students cognitively perceive the use of online homework to enhance their academic performance or assist their learning, student interest in online homework will be greater. What is more, different feelings that students experience in doing online homework affect their interest in the tasks. Besides gender and economic conditions, adult guidance and monitoring, factors such as content design and submission methods impact student interest in online homework.

In conclusion, via systematic review, the current study roughly outlines the characteristic of the retrieved studies and highlights the extant factors influencing student interest in online homework. It unveils that the role of students in the process is pertinent to impact interest in online homework among students in most studies. Interesting homework content (animation, video and gamification homework) and convenient functions (instant feedback and online resource access) are also emphasised to trigger student interest. Additionally, relevant educational implications are elaborated. Further studies as well as limitations of this study are also presented.

Abbreviations

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis; COVID-19: Coronavirus disease of 2019; UTAUT: Unified Theory of Acceptance and Use of Technology; ERIC: Education Resources Information Center.

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Authors' contributions

Liu Chen was the main author of the paper who conducted the data collection, and wrote the majority part of the paper. Su Luan Wong revised and edited the manuscript. Shwu Pyng How finalised the manuscript. All authors offered crucial ideas in conceptualising the research.

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