

Review Article

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The Impact of Digital Skills on University Students' Motivation: A Systematic Review

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Abstract

Background/purpose. In the context of the digital era, students' motivation and engagement have become increasingly influenced by their level of digital skills. This systematic review was conducted to explore how digital competencies impact motivation in e-learning environments, particularly in educational settings. The purpose of the study was to synthesize empirical findings on the relationship between digital skills and students' motivation.

Materials/methods. The review followed the PRISMA checklist to ensure a rigorous and transparent methodology. A total of 80 articles published between 2014 and 2024 were initially identified from reputable academic databases and widely used scholarly sources. Strict inclusion and exclusion criteria were applied to focus on peer-reviewed empirical studies examining the effect of digital skills on student motivation. Eleven studies were ultimately included in the final analysis.

Results. The analysis revealed a significant positive relationship between digital skills and student motivation. The reviewed studies consistently highlighted that students with higher digital competence demonstrated greater engagement, autonomy, and persistence in digital learning environments.

Conclusion. Digital skills are a transformative factor in enhancing motivation and improving the quality of learning experiences. This review confirms the need to integrate digital skills development into educational practices to foster more effective and engaging e-learning environments.

1. Introduction

In the era of digital transformation, information and communication technologies for education have become essential within university settings. This shift requires students to develop digital skills not only to interact, learn, communicate, and solve problems, but also to succeed in an ever-evolving academic and professional world where autonomy, adaptability, and proficiency with digital tools have become indispensable (Redecker & Punie, 2017).

Within this context, recent studies have shown that students who are capable of searching for, reusing, collaborating on, and filtering online information tend to develop a strong sense of self-efficacy and show greater involvement in their studies (Y. Kim & Frick, 2023; Van Deursen, 2024). Beyond their intrinsic value, these skills can significantly impact motivation, cognitive engagement, and persistence in higher education (Hamzaoui et al., 2024).

To illustrate the positive connection between digital skills and student engagement, Ng (2012) demonstrated that students who are proficient in various digital tools actively take ownership of their learning. Similarly, Hatlevik and Christophersen (2013) found that higher levels of digital competence are associated with an enhanced perception of self-efficacy and increased engagement in different university activities.

Hence, this systematic review investigates the influence of digital skills on the students' motivation by associating these competences with the variables that indicate the levels of learners' engagement and involvement. The aim is to gain a deeper understanding of the relationship between digital skills, intrinsic motivation, and different aspects of students' performance. The study aims to answer the following questions:

- Research Question 1: What are the latest studies on the application of digital skills to enhance student motivation and engagement within educational environments?
- Research Question 2: What sources and types of data are used to evaluate the impact of digital skills on students' motivation?
- Research Question 3: What are the most influential factors of digital skills affecting students' motivation and engagement in their learning?
- Research Question 4: Which are the most suitable methods and approaches for the analysis of digital skills and the relationship between these skills and motivation?

The aim of this systematic review is to provide an overview of the most recent research on digital skills with an impact on students' motivation and learning. We also examine the determinants and constraints of students' success and failure at various stages of their academic careers.

This systematic review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methods (Moher et al., 2009). Information was taken and evaluated from the scientific peer-reviewed literature spanning the period 2014-2024. Therefore, the present paper offers a grounded reference for further empirical work on digital skills in relation to student motivation and academic performance.

The organization of this study is as follows: First, we start with the research methodology, followed by the PRISMA guidelines. Then, the results and discussion section presents the main findings, but everything bearing on the risk of bias is simply recognized as such without further sustained elaboration. The following section concludes the paper and discusses the implications.

2. Literature Review

2.1. Digital Competencies in Higher Education

Over the past decade, digital competencies have become recognized as a crucial set of skills for students operating within increasingly digitized academic environments. According to the European Commission's DigComp framework (Vuorikari et al., 2016), digital competence encompasses not only technical proficiency but also the ability to communicate, solve problems, critically evaluate information, and create content within digital contexts. In the realm of higher education, these competencies are essential not only for accessing online educational resources but also for fostering student autonomy and knowledge construction (Christine, 2017).

Numerous studies have sought to assess university students' mastery of digital skills. For instance, Ng (2012) identified three complementary dimensions: technical, cognitive, and socio-affective competencies. However, findings indicate that although students generally feel comfortable with the functional use of technology, their ability to effectively employ digital tools for academic purposes varies significantly depending on context, resource availability, and the extent of pedagogical integration (Hatlevik et al., 2015).

2.2. Academic Motivation

Motivation plays a central role in students' engagement and success within academic settings. According to self-determination theory, motivation can manifest in different forms: intrinsic motivation, where an activity is pursued for personal interest or enjoyment; extrinsic motivation, driven by external rewards or pressures; and amotivation, where individuals lack any intention to act (Deci & Ryan, 2000).

In educational contexts, Viau (1995) identifies three key factors influencing motivation: perceived competence, task value, and perceived control over learning conditions. Within higher education, motivation is shaped by a complex interplay of individual, institutional, and pedagogical factors. Students' growing autonomy confronts them with digital learning environments whose impact on motivation largely depends on how these environments are pedagogically integrated (García Botero et al., 2019).

2.3. The Relationship Between Digital Competencies and Motivation

Recent research has begun to explore the connection between digital competencies and academic motivation. Several studies suggest that students who perceive themselves as digitally competent develop stronger feelings of self-efficacy and engagement, thereby enhancing intrinsic motivation (Tang & Chaw, 2016). Effective use of digital tools is thus seen as a means to strengthen autonomy and mastery, two key dimensions of motivation according to Deci and Ryan's theory (Deci & Ryan, 2000).

Nevertheless, this relationship is neither linear nor uniformly positive. Kaarakainen et al. (2018) emphasize that inadequate digital skills may lead to frustration, anxiety, or disengagement, particularly when students face complex digital systems. Additionally, disparities in access to technology and pedagogical support can exacerbate motivational gaps, especially among students from disadvantaged backgrounds (Means et al., 2009).

2.4. Limitations of Existing Research

Despite growing interest in digital competencies, current research remains limited by predominantly descriptive approaches, a tendency to homogenize student profiles, and minimal use of mixed methods. A deeper understanding of the impact of digital skills on motivation requires contextualized studies that consider the diversity and complexity of student trajectories.

Information was taken and evaluated from the scientific peer-reviewed literature spanning the period 2014-2024. Therefore, the present paper offers a grounded reference for further empirical work on digital skills in relation to student motivation and academic performance.

There are several critical reasons why this systematic review is important. First, at a time when educational settings are more than ever embedded within digital technology, it is important to assess how digital competences can influence student motivation in order to lead to efficient and targeted interventions. Through systematically reviewing the current literature on this subject, this review synthesizes the most pertinent papers, identifying gaps in the studies and recommendations for future research. Moreover, the findings of this study are crucial for a further comprehension of the links between students' motivation and how this relationship affects students' engagement and academic achievement.

3. Methodology

3.1. Research Design

A systematic review was conducted to analyze existing studies on the impact of digital competencies on the motivation of university students. Starting from the hypothesis that a diversity of approaches and findings characterizes this research area, our focus was placed on the richness of contributions, the plurality of motivation concepts, and the variety of methodologies employed to investigate the relationship between digital skills and academic engagement.

In this context, the scope of investigation was intentionally broadened to include all publications addressing digital technology use in higher education. This choice aimed to move beyond a purely motivational perspective and to gain a more comprehensive understanding of the pedagogical effects of digital technology.

The adopted approach is based on a systematic review supported by an extensive literature search, following the stages outlined by Arksey and O'Malley (2005), which include the formulation of the research question, the identification of relevant studies, the selection of studies, the extraction of data, and finally the synthesis and interpretation of results.

3.2. Data Sources

In this investigation, we carried out a systematic review in the e-learning area, focusing on the role of digital skills on students' motivation and learning. We employed the Scopus database as our main source of literature since it is quite extensive and includes a large number of indexed publications. A research timeline from 2014 to 2024 was set to reflect the latest findings of digital skills and their inclusion in university curricula.

The choice of the research period, from 2014 to 2024, is based on several essential factors. First, this period is temporally significant, spanning more than a decade marked by the increasing integration of digital skills into academic curricula. It also reflects the dynamic emergence of digital technologies and their impact on learning and teaching, especially in higher education. In addition, over this period, recognition has been given to major developments within what might be termed "digital education", namely the rise of "Digital Skills" modules as part of the academic and personal development of students. Lastly, the choice of this time frame provides access to recent data, which would then contribute to deeper analysis and revised interpretation of research outcomes so that the results reflect the contemporary university students and actual needs.

We used "OR" and "AND NOT" as Boolean operators to combine the keywords in order to find the appropriate studies. This was then applied to "articles, abstracts, and keywords" contained in the database consulted. The search terms, which originate from our main research area, were "Digital Skills," "Motivation," "student," "university," and "higher education". The aim of this phase was to

obtain as many references related to the subjects of our study as possible. The query used in the research database is detailed in Table 1.

Table 1. Databases and Search Strings for the Literature Review on Scopus

Database	Keywords used
Scopus	"digital literacy" OR "new literacies" OR "digital competency" OR "digital competences" OR "digital competencies" OR "digital skills" OR "IT skills" OR "ICT skills" AND NOT article title with "educator" AND NOT article title with "teacher"

By using multiple synonyms and related expressions, this selection of keywords allows for the coverage of a wide range of research addressing digital skills either directly or indirectly.

Moreover, the exclusion of articles with "educator" or "teacher" in the title helps to refocus this study specifically on students rather than on teachers or trainers. Indeed, although numerous, studies concerning the digital skills of educators are not directly relevant for analyzing the impact of digital competencies on students' motivation.

3.3. Selection Process

For the successful completion of this study, we had to take a few steps to conduct this research: First, setting the inclusion criteria and excluding criteria; then, selecting papers of interest by their titles and abstracts. The final step consisted of a detailed examination of the full texts to identify the studies that would be included in this literature review. This systematic review was performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009).

The professor-researcher and the doctoral students, members of the Innovation and Research Laboratory in Teaching / Teaching Professions, screened 80 titles and abstracts, as duplicate titles were removed. All discrepancies were resolved by discussion to reach consensus, thereby enabling an extensive and impartial review of the literature to be conducted. The title and the abstract of all included articles were then screened. This iterative process of review improved the rigor and dependability of the selection. Eventually, the full-text articles were reviewed independently for inclusion or exclusion in the study.

3.4. Eligibility Criteria

This study emphasized the effect of digital skills on students' motivation and engagement in distance learning contexts. This study, however, focused on the impact of digital skills on students' motivation and academic achievement, and the factors that encourage or discourage a student in this regard. For this purpose, we selected the articles that satisfied the predefined criteria. For these reasons, studies that did not meet these criteria were excluded from our systematic review after having removed the duplicates.

Table 2. Lists of Inclusion and Exclusion Criteria

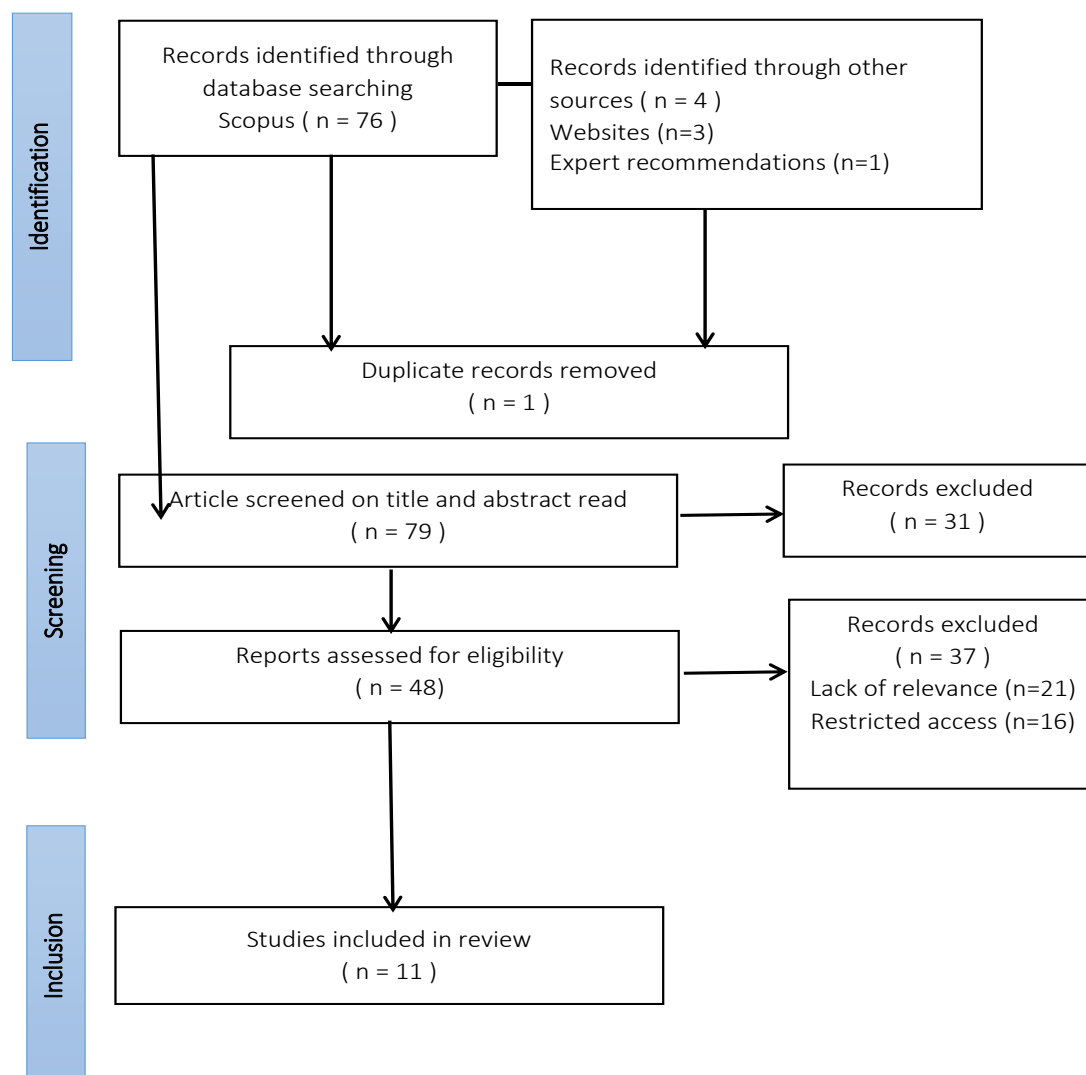
Inclusion Criteria	Exclusion Criteria
1. A journal article published in any language between 2014 and 2024.	1. Articles published outside the defined time period.
2. Articles related to the field of digital skills and student motivation.	2. The subject does not concern the relationship between digital skills and student motivation

- | | |
|---|---|
| <p>3. Studies analyzing the impact of digital skills on student motivation or engagement.</p> <p>4. All types of studies (Qualitative, Quantitative, or Mixed Methods).</p> <p>5. Types of references: Journal article, research article, conference paper, review, book chapter, data paper.</p> <p>6. An article must present empirical results based on rigorous methods of digital skills analysis.</p> | <p>3. Studies focusing on e-learning without a direct link to digital skills or student motivation.</p> <p>4. Absence of empirical analysis or rigorous methodology in the study.</p> <p>5. The references do not include journal articles, research articles, conference papers, reviews, book chapters, or data papers.</p> <p>6. An article must not present empirical results based on rigorous methods of digital skills analysis.</p> |
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3.5. Study Selection

This preliminary systematic review adhered to the PRISMA flow diagram for our searching and selection criteria. This will provide a reference for future studies in this field and can be helpful to incorporate studies from various origins. The PRISMA procedure consists of a three-stage method to eliminate irrelevant documents. These steps include identification, screening, and inclusion, making this approach an essential tool for conducting systematic literature reviews (Billion & Mauritsius, 2023). See Figure 1 below for a visual representation of the PRISMA diagram.

Figure 1. PRISMA Flow Diagram



3.6. Data Collection Process

The extraction form we used in order to collect the data of each study selected was similar to the one used by Magaji et al (2024) and contained the following criteria: bibliographic information (title, authors, publication year), study aim and purpose, study design and methods (study type, sampling, tools used), sample characteristics (sample size, age, gender, context), main findings, and potential biases or study limitations.

This type of form facilitates a comparison between the different studies and strengthens the methodological rigor of the systematic review. In order to extract the information from the eligible studies, we compared the extracted data and resolved discrepancies through discussion. Subsequently, the extracted data were entered into a Word document, with a further verification to ensure their accuracy. For each included study, we recorded the following aspects:

Table 3. Study References, Overview of Indicators, Methods, and Research Results

Study References	Overview of Research Indicators	Methods and Results
- Title of the article	- CiteScore	- Analytical methods used
- Authors' names	- Number of citations	- Selection or filtering of features
- Journal name		- Performance of applied models or analysis methods
- Year of publication		- Behavioral characteristics analyzed to assess student motivation
- Keywords		- Description of research findings
- Research database		- Inclusion and exclusion criteria of selected studies

4. Results

4.1. Descriptive Results

The PRISMA diagram clearly illustrates the selection process of the studies used in the systematic review. It follows a logical structure organized into three main stages: Identification, Screening, and Inclusion, making it possible to understand how the articles were filtered and selected.

In the identification phase, a total of 80 articles were identified through different sources. Among these, 76 were retrieved from the Scopus database, 4 articles were from other sources, 3 articles were obtained from different databases and 1 article was proposed by an expert. As the content analysis continues, one duplicate article was excluded, revealing quality control of duplicates to reduce selection bias.

During the screening stage, 79 articles were examined based on their titles and abstracts. At this stage, 31 articles were excluded due to a lack of relevance, meaning they did not meet the review's criteria. 48 articles were then assessed in full for eligibility. After detailed examination, 37 articles were excluded, 21 articles were identified as irrelevant, and 16 were excluded due to restricted access. This stage helped to retain the most appropriate and accessible studies.

Finally, in the last phase of inclusion, 11 studies were selected for inclusion in the systematic review. The 11 articles were imported into the bibliographic management software Zotero. This final result reflects a rigorous selection process, ensuring the credibility and quality of the data used. To

further improve the diagram, it would be interesting to add details on other possible exclusion criteria, such as study methodology or data quality.

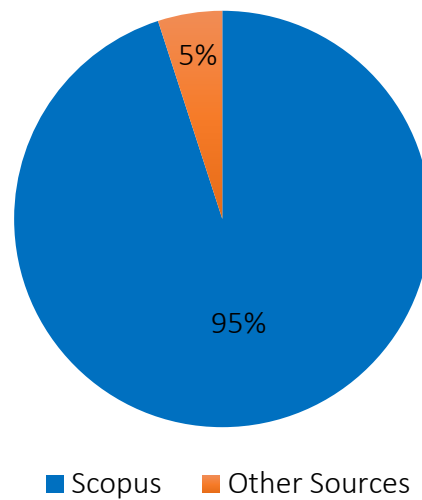


Figure 2. Percentage of Articles from the Scopus Database and Other Sources

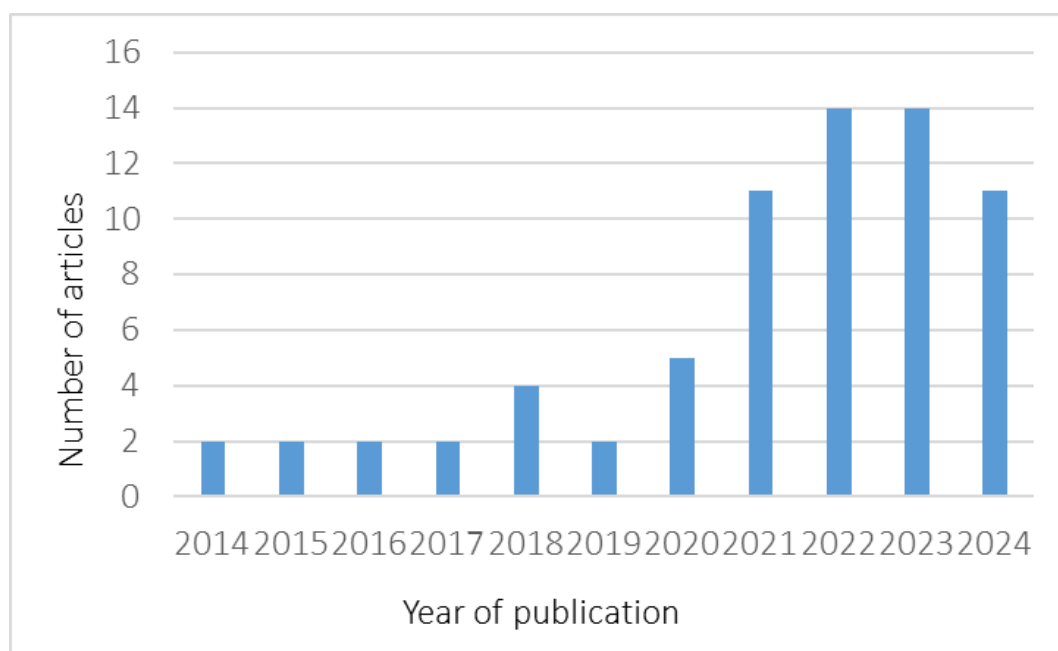


Figure 3. Number of Articles Included in the Systematic Review by Year of Publication

Our inclusion criteria restrict us to the last ten years of research. It is worth mentioning that most of the articles were published between 2020 and 2024. Once again, an increase in the number of articles has been detected that are included for further in-depth review, from 2020 onwards, indicating a recent growing interest in this topic.

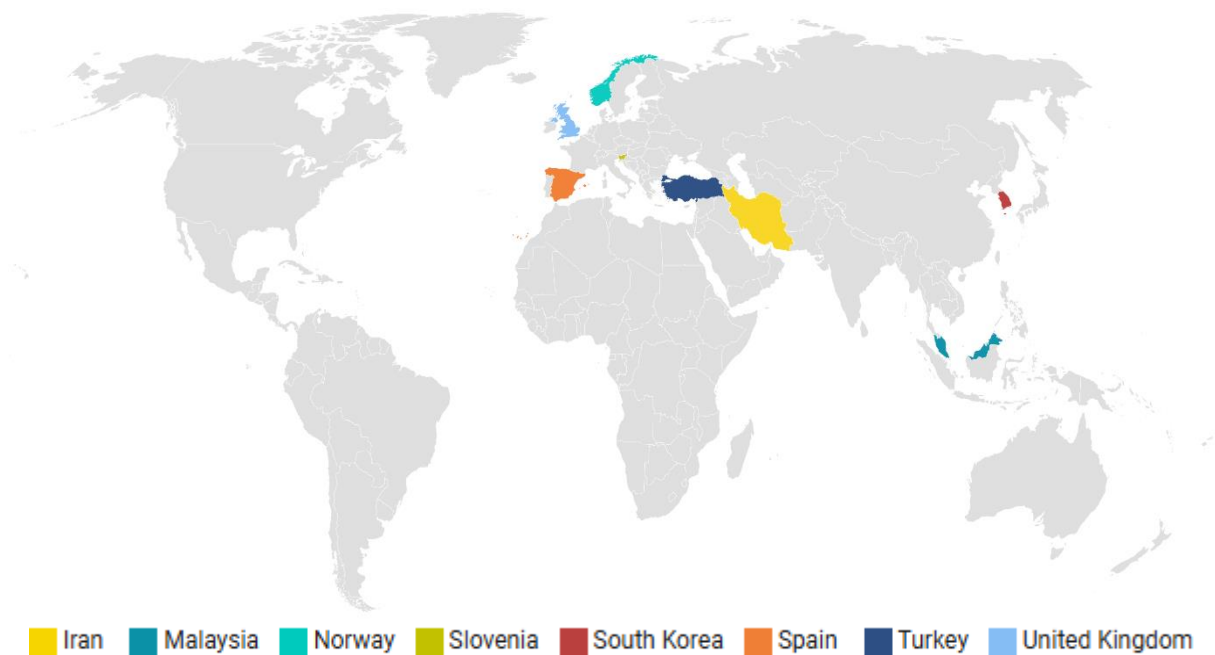


Figure 4. Geographical Color Map: 11 Research Articles Selected and Referenced in Our Global Review Analysis

By examining the 11 articles sourced from the database and other sources, it is clear that the majority of research on the impact of digital skills on student motivation originates from Spain and South Korea. Research from other databases is not included in this summary. Figure 4 provides a global overview of research in this field.

4.2. Data Extraction and Synthesis of studies

Data from the included studies were extracted by all authors and categorized according to the authors, year of publication, study objectives, research methods, study findings, the digital competencies assessed and their impact on student motivation, as well as the main contributions (see the table below). This process enabled us to compare similarities and differences among the various studies reviewed.

Table 4. Summary of studies included in the review

Authors & Year	Study Objectives	Methodology	Digital Skills Assessed	Impact on Student Motivation	Key Contributions
(H. J. Kim et al., 2018)	Examine the impact of students' prior digital experiences, particularly family influence, on their digital competence, university attitudes, and academic engagement.	Quantitative approach; online survey with 381 university students; data analysis via Partial Least Squares Structural Equation Modeling (PLS-SEM).	Perceived digital skills, attitudes toward technology, and learning agility.	Prior digital experiences influence perceived skills and attitudes, impacting student engagement.	Prior family digital experience and personal effort enhance academic engagement through learning agility.

(Guillén-Gámez et al., 2020)	Explore actual use of digital skills in training future teachers, analyzing the correlation between the use of Web 2.0 tools, perceived skill level, age, and motivation.	Quantitative, quasi-experimental ex post facto study; questionnaire with 108 future teachers; statistical analysis with Pearson correlation.	Use of Web 2.0 tools, LMS platforms (Moodle), online research, and digital presentations.	Positive correlation between digital skills and motivation; no correlation with age.	Future teachers show moderate-to-low digital tool use despite high perceived competence; there is a need for better training and motivation to integrate ICT.
(Tian & Park, 2022)	Investigate whether students' personal characteristics influence digital literacy and learning approaches; assess role of Self-Determination Theory (SDT) as a mediator.	Quantitative approach; Structural Equation Modeling (SEM); survey with 639 students from three types of universities in China; Likert scales.	Digital literacy, learning approaches (deep vs. surface), autonomy, competence, social relatedness.	Deep learning approach and intrinsic motivation significantly enhance digital literacy and autonomy.	Autonomy and social relatedness are key factors for digital literacy development, competence less influential.
(Rogers, 2014)	Explore the impact of Digital Technologies (DTs) on youth motivation during academic and professional transitions.	Qualitative approach: literature review and theoretical analysis based on three major motivation theories.	Digital skills linked to academic and professional transitions, autonomous learning.	Digital technologies can influence motivation but depend on pedagogical integration and self-regulation.	Highlights importance of self-determined motivation and critiques views that see technology as a mere "amplifier" of motivation.
(Zhao et al., 2021)	Analyze current research on digital competence in higher education between 2015-2021, including definitions, evaluation dimensions, research goals, methodologies, and findings.	Systematic literature review; qualitative methodology; analysis of articles from Web of Science and Scopus.	Mastery of digital tools, online collaboration and communication, digital content creation, data protection, problem-solving.	Well-developed digital competence enhances student engagement and autonomous learning; perceptions vary based on personal/academic experiences.	Emphasizes the need for pedagogical strategies to strengthen digital skills and the role of institutions in promoting digital learning.

(Lilian, 2022)	Examine the relationship between motivational belief strategies and digital literacy in digital learning among university students.	Quantitative method; questionnaire administered to 583 students; data analyzed using SmartPLS 3.0.	Digital literacy, technical, cognitive, and socio-emotional skills.	Positive correlation between motivational beliefs and digital competence; intrinsic motivation influences engagement.	Highlights key role of motivational beliefs in enhancing digital competence and success in digital learning.
(Usán Supervía & Castellanos Vega, 2024)	Determine the influence of an educational innovation project using active methodologies and digital tools on student motivation and digital competence.	Quantitative, experimental study with pre- and post-tests; 102 first-year primary education students; instruments: Educational Motivation Scale (EME) and Digital Competence Questionnaire (CCD); statistical analysis with SPSS v29.0.	Future teachers' digital competencies: technological literacy, communication and collaboration, information research and processing, digital citizenship, creativity and innovation.	Innovation program "PracTICS" significantly improved academic motivation and digital competence, and a positive relationship between intrinsic motivation and digital skills.	Demonstrates that digital tools and active methodologies enhance student engagement and professional digital competence preparation.
(Fink et al., 2023)	Validate differences in digital competences between university and professional higher education students in Slovenia; assess impact on academic engagement.	Quantitative methodology; T-tests, ANOVA, linear regression, Chi-square tests; questionnaire with 223 participants.	Student engagement, effective use of online learning platforms, perception and attitude toward e-learning, digital readiness, digital skill development, infrastructure.	Digital readiness and positive perception of e-learning significantly influence student engagement.	Professional experience contributes more to digital skill development than personal exposure to digital technologies.
(Heidari et al., 2021)	Examine the relationship between students' digital skills and academic engagement, exploring the mediating role of Digital Informal Learning (DIL) during the COVID-19 pandemic.	Quantitative, correlational descriptive model; SEM analysis; sample of 308 students from Shiraz University in Iran.	Students' digital competence (technical, cognitive, ethical skills), informal digital learning.	Informal digital learning positively mediates between digital competence and academic engagement; high digital competence increases motivation in digital environments.	Highlights the need for universities to enhance digital skills and provide adapted platforms, especially during crises like COVID-19.
(Zabala et al., 2018)	Analyze digital competencies, access to digital	Exploratory empirical study using mixed methods	Knowledge of Internet access requirements,	97% of students use digital services due to ease of use; lack of	Highlights medium-high digital

	services, and motivations affecting e-service use among technology career students at Universidad Distrital Francisco José de Caldas.	(quantitative and qualitative) to analyze digital skills, access, and motivation.	browser and search engine use, online form completion, digital transaction security.	trust, interest, and knowledge limits broader adoption.	competence in information search and form usage, but medium-low for secure environment recognition; stresses the need for strengthening digital confidence and security training.
(Koyuncu, 2011)	Analyze the key role of digital skills in individuals' social, educational, and professional lives; shifting importance from business management to education.	(Methodology not specified in provided text.)	Digital competence (technical access, awareness, motivation, digital capability).	Young students show higher motivation for digital empowerment than older individuals.	Highlights students' greater awareness of digital technology usage, influencing their academic performance and societal engagement.

As the above table demonstrates, we conducted a systematic review of 11 selected research articles on the impact of digital skills on university students' motivation, covering the period from 2014 to 2024. Four specific research questions guided this review, and the results were presented to provide a comprehensive overview of the current state of knowledge in this field.

Research Question 1: What are the latest studies on the application of digital skills to enhance students’ motivation and engagement in educational environments?

Recent research has begun to examine the role of digital skills in relation to student motivation, combining behavioral engagement and technology use. According to the quantitative study of Lilian (2022), the results show that there was a significant relationship between motivational strategies and digital literacy, demonstrating a strong connection between self-motivation and the development of digital skills. Similarly, Usán Supervía & Castellanos Vega (2024) proposed an experimental study with active-learning and digital tool-based teaching that highlights significant increase in motivation and digital skills. Additionally, the study by Tian & Park (2022) argues that digital awareness, motivation, and access to the tools are effective in student involvement and academic achievement. In brief, these studies indicate a growing interest in integrative frameworks that intertwine digital skills, motivational devices, and the use of technologies to enhance the engagement and performance of university students.

Research Question 2: What are the sources and types of data used to evaluate the impact of digital skills on student motivation?

In investigations of the influence of digital competence on the motivational profile of university students, different sources and types of data are employed. For example, in the study of Tian & Park (2022), the data were obtained from a sample of 639 students from different types of universities, and the SEM equation modelling was implemented. Moreover, in Guillén-Gámez et al. (2020), a quasi-experimental ex post facto design was used to examine the relationship between the perceived level of digital competence and motivation, through a questionnaire administered to 108 students of education. Lastly, Heidari et al. (2021) used a descriptive correlational model among 308 students selected from Shiraz University in Iran to test the effects of digital skills on academic

engagement. These diverse studies demonstrate the range of approaches and information sources to understand the effect of digital skills on student motivation.

Research Question 3: What are the most influential factors of digital skills on students' motivation and engagement in learning?

The research question of what factors influence digital skills of university students contributing to motivation has been investigated in many studies. In Lilian (2022), the emphasis was placed on the motivational beliefs regarding self-motivation to improve digital literacy and their effect on students' academic engagement. Autonomy and social relatedness emerged as two main factors that had a positive impact on digital literacy and student motivation in the study by Tian & Park (2022). It is noteworthy that Usán Supervía & Castellanos Vega (2024) point out the contribution of active-based methodologies of learning and digital tools to enhance students' academic motivation and digital skills, with a positive relationship between intrinsic motivation to learn and the mastery of digital tools. Finally, the study conducted by Heidari et al. (2021) confirms the relevance of informal digital learning in relation to the academic engagement of students. Collectively, these studies have brought to light a wide range of factors shaping university students' motivation, such as self-motivation, autonomous learning, social needs and the employment of educational technologies.

Research Question 4: What are the most effective approaches and methods for analyzing the relationship between digital skills and students' motivation?

Several studies have highlighted different methodologies used to evaluate the impact of digital skills on university students' motivation. In the study by Lilian (2022), a quantitative method based on a questionnaire administered to 583 students was employed, with data analysis conducted using SmartPLS 3.0, a technique for identifying relationships between motivation and digital literacy. Similarly, in the study by Tian & Park (2022), structural equation modeling (SEM) was used to examine the impact of autonomy and deep learning approaches on motivation and digital literacy.

Furthermore, the study by Usán Supervía & Castellanos Vega (2024) adopted an experimental approach with pre-test and post-test measures, demonstrating the effectiveness of digital tools and active pedagogies in strengthening student motivation. Finally, in the study by Heidari et al. (2021), a correlational analysis was conducted to evaluate the mediating role of informal digital learning in students' academic engagement.

These studies illustrate the diversity and effectiveness of methodologies used to measure the impact of digital skills on students' motivation, combining advanced quantitative approaches, experimental studies, and rigorous statistical analyses.

5. Discussion

Findings from this systematic review support the notion of the relationship between digital skills and the academic motivation of university students. The results align well with the findings of Deci and Ryan (2000), who proclaimed that autonomy and perceived competence (two major aspects of digital competencies) are important elements for intrinsic motivation. In particular, the investigation by Tian and Park (2022) stressed the mediating role of these psychological needs with respect to digital learning, supporting that digital literacy is comprised not only of technical skills but also motivational and socio-affective elements.

Furthermore, data also reveal that including digital instruments in active teaching methodologies promotes strong mastery as well as student involvement (Usán Supervía & Castellanos Vega, 2024). These results are consistent with published research of Zhao et al. (2021), with the focus on the deliberate and critical use of educational technologies.

However, some discrepancies should be noted. For example, while Guillén-Gámez et al. (2020) found no correlation between age and digital motivation, earlier studies of Livingstone & Helsper (2007) revealed generational differences in the use and mastery of technologies. This disparity underscores the importance of institutional and cultural contexts, as well as students' prior experiences (H. J. Kim et al., 2018).

This systematic review offers several original contributions. Firstly, it provides an updated, interdisciplinary synthesis of a rapidly expanding field, drawing on studies from diverse geographic regions (Europe, Asia, the Middle East). Secondly, it highlights the growing role of informal digital learning as a mediator of academic motivation (Heidari et al., 2021).

The study also sheds light on the diversity of methodologies used to assess the impact of digital competencies, ranging from experimental designs to advanced correlational analyses. This methodological diversity strengthens the robustness of the findings while underscoring the complexity of the relationship studied.

Despite the rigor of the selection process, certain limitations must be acknowledged. Firstly, the included studies are predominantly in English and originate from specific cultural contexts (Spain, South Korea, China, Iran), which may limit the generalizability of results to other university environments, particularly in Africa or Latin America. Secondly, most studies employ quantitative methods, often relying on self-administered questionnaires, which may introduce social desirability biases or subjective perceptions.

Furthermore, few studies analyze the differentiated impact of types of digital competencies (technical, cognitive, socio-emotional), or the long-term effects on motivation and academic success. These gaps represent promising avenues for future research.

Regarding the Risk of Bias in studies, this research was conducted using rigorous methods to reduce the risk of bias. In line with the PRISMA 2020 guidelines, a systematic and structured review of the current body of knowledge on the contribution of digital competencies to the motivation of higher education students was conducted. This organized and systematic method, utilizing the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist, led to a transparent, reproducible, and orderly article-selection process.

The search was meticulously performed utilizing well-known databases with precise search terms to retrieve acceptable and unacceptable articles. A total of 80 articles at the initial search level were identified, 11 of which followed inclusion criteria and underwent detailed examination. The high quality of this selection and conformity to clear criteria should minimize bias in the study results. Nevertheless, despite the fact that this study does not describe particular biases, the authors do recognize this limitation and indicate that this is worthy of continual critical evaluation.

6. Conclusion

The systematic review we conducted on the impact of digital competencies on university students' motivation provides clear answers to the research questions posed at the outset. The results highlight a positive and significant relationship between the mastery of digital skills and several dimensions of motivation, including engagement, perseverance, autonomy, and academic success. They also reveal that students who have developed strong digital competencies exhibit greater self-confidence, improved self-regulation abilities, and a more favorable attitude toward integrating technologies into their learning processes.

Regarding assessment methods, our review shows that studies primarily rely on self-report questionnaires, performance tests, and behavioral observations, while emphasizing the need for more standardized tools adapted to diverse cultural and institutional contexts. Moreover, factors

influencing this relationship—such as the socio-educational environment, the quality of pedagogical support, and access to digital tools—deserve particular attention when designing educational policies.

Beyond mapping the existing literature, our study offers several contributions. It provides an up-to-date synthesis of research in a rapidly evolving field while identifying methodological and theoretical gaps that need to be addressed. It also highlights the most effective pedagogical strategies to enhance digital competencies, such as project-based learning, flipped classrooms, and the gradual integration of digital tools into curricula.

In terms of recommendations, we encourage higher education institutions to design targeted digital skills training programs, promote reflective technology use, and support educators in adapting their teaching practices. Strengthening technological infrastructure is crucial, but so is providing human support to ensure equitable and sustainable digital adoption for all students.

In sum, this systematic review underscores that the digital transformation of higher education can only succeed by combining technical skills, innovative pedagogical approaches, and a nuanced understanding of students' motivational drivers. It thus paves the way for future empirical and contextualized research capable of effectively supporting ongoing educational transitions.

7. Suggestion

Based on the findings, several recommendations can be proposed. Higher education institutions are encouraged to: integrate targeted digital skills training from the first year of university studies; promote active pedagogies that engage technologies critically and creatively; support ongoing professional development for educators in the use of digital tools linked to motivational approaches; and establish mentoring programs to assist students in their informal digital learning.

Finally, future research would benefit from: a more nuanced analysis of disciplinary differences in the effect of digital skills on motivation; the use of mixed methods (quantitative and qualitative) to deepen the understanding of the underlying mechanisms; and the investigation of digital competencies' impact in peripheral or disadvantaged contexts to better address issues of inclusion and digital equity.

Declarations

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