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Second screen use motivations of higher education students during online education

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ABSTRACT

This study aimed to determine whether higher education students used a second screen during remote learning, identify the reasons for such usage, and assess their impact on academic performance. A mixed-methods design was employed, comprising 471 students (survey) and 10 students (semi-structured interviews) from a state university with distance education experience. The findings revealed that the majority of participants utilized a second screen, with smartphones being the preferred secondary device and laptops serving as the primary tool. Students who used a second screen for in-class activities showed high motivation and maintained an average GPA of three or higher. Those who used it for extracurricular activities exhibited low motivation, and an average GPA below 3. Students using a second screen for both in-class and extracurricular activities experienced interruptions in communication with instructors. The results underscore the significance of technological tools in distance education, emphasizing second-screen usage, motivation, and effects on academic achievement. Limitations include reliance on self-reported data, a cross-sectional design preventing causal inferences, and a qualitative sample size that may not fully capture the impact of second-screen use on learning outcomes. Further research involving larger populations is necessary to better understand and develop instructional technologies and second-screen use in education.

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Second screen; media multitasking; online education; motivation; higher education

Introduction

Many higher education institutions worldwide use distance education systems for various reasons. While distance education has been used across various educational levels for diverse purposes for years, the Covid-19 pandemic has necessitated countries to adopt it more extensively. Thus, distance education has emerged as a crucial component of global higher education, especially during crises, such as pandemics (UNESCO, 2023) and natural disasters. Consequently, all universities in Turkey have swiftly implemented online learning, with approximately seven million higher education students participating in distance education for five academic semesters, albeit with interruptions due to the pandemic and the 2023 earthquake (YÖK, 2023).

Distance education involves physical separation between learners and instructors, who rely on communication technology to interact with and exchange information (Abou Hashish et al., 2022). Caner (2012) noted that distance education offers novel methods for teaching and learning in higher education. Technological advancements and the widespread use of these technologies

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in society have accelerated and created opportunities for societies to train higher-education students through distance education (Mencet & Gabdyssalyk, 2023).

Research on higher-education students who have participated in distance learning has demonstrated that they generally perceive it favorably, primarily because of their temporal and spatial flexibility (Forson & Vuopala, 2019). Distance learning was also evaluated as a positive process by some students because it gave them the opportunity to study and interact with their teachers simultaneously (Elnikova et al., 2020). While some students view distance learning positively in terms of flexibility and sustainability, others do not approach distance learning because of the lack of a healthy learning process and interaction (Bozkuş-Genc, 2022).

Research on the use and importance of online communication technologies in distance education, the effects of which vary in the field of education, remains as relevant today as in the past (Aktaruzzaman & Plunkett, 2023; Nurkhamidah & Itsnaini, 2020; Robins & Webster, 2002; Williamson et al., 2020). Moreover, the rapid introduction of online learning technologies on campuses since the 2000s (Coates, 2006) and the gradual development of Internet networks around the world have increased the opportunities for universities to provide distance-based education (Volery & Lord, 2000). The distance education system, which prioritizes alterations in the method of delivering teaching and learning activities to students rather than the subject matter itself, necessitates students' active engagement.

When the available literature is examined, it is seen that some studies (Allo, 2020; Paudel, 2021; Syauqi et al., 2020) have revealed that online learning is good, useful and has positive contributions, and that it has aspects that affect learner success (Volery & Lord, 2000). In the context of tools used in distance education, some studies have been conducted on the effectiveness of online tools (Şanlıalp-Zeyrek et al., 2022), smartphones, and smartphone applications (Devi, 2020; Mella-Norambuena et al., 2021; Stotz & Lee, 2018).

An emerging trend in online education involves the use of secondary devices, such as smartphones or tablets, alongside primary devices to enhance students' learning experience. The integration of secondary devices with primary screens, increasingly prevalent in digital and interactive media contexts, which is referred to as the use of a "second screen" (Pagno et al., 2015) or "media multitasking" (Drody et al., 2023), has grown in significance as digital devices have become progressively embedded in the learning environment within online educational settings. According to research conducted in the United States, almost all 18-year-olds (93%) possess a smartphone and devote approximately 8 hours each day to interacting with screen media, which often entails engaging with multiple screens or media at the same time (Rideout et al., 2022).

Multitasking is common among students in online education and often involves multiple screens. This practice positively or negatively impacts learning outcomes, depending on its use. Effective multitasking can enhance efficiency by providing additional resources or aiding note-taking, leading to a deeper understanding of course material (Srna et al., 2018). In contrast, unproductive multitasking, such as browsing unrelated websites or using social media, disrupts learning and harms comprehension and performance. Research on media multitasking and academic achievement (May & Elder, 2018; Mayer & Moreno, 2003) has highlighted its negative effects on cognitive and academic measures. Further studies (Demirbilek & Talan, 2018; Felisoni & Godoi, 2018; Fried, 2008) show that students often multitask during lectures using electronic devices, engaging in non-academic activities that distract both themselves and nearby peers, reducing academic success. However, Lui and Wong (2012) suggested that frequent media multitaskers may develop better multisensory integration, indicating that these individuals might not always suffer from cognitive drawbacks. Overall, while media multitasking can hinder certain academic aspects, it may also enhance specific cognitive skills in certain contexts.

The use of second screens in education has garnered attention for enhancing learning through access to resources, such as videos, articles, and definitions. Research (Hirsh-Pasek et al., 2015; Lee et al., 2018; Shin et al., 2015) shows that second screens provide complementary information, encourage collaboration, promote peer learning, enhance information processing, and boost student

engagement via chat applications, forums, and collaborative documents. For example, peer learning is supported through messaging apps and online study groups, where students can seek help, access resources, participate in real-time polls, or engage in simulations while following the main lecture on a primary screen. Additionally, multimedia content and educational games can make learning more engaging and improve comprehension, catering to diverse learning styles (Dey & Panda, 2024). However, challenges include potential distractions that may hinder comprehension and increase cognitive load, possibly causing anxiety and reducing competence (Jeong & Hwang, 2016; Shin et al., 2015). Non-academic activities on second screens, such as social media or gaming, can also negatively affect academic progress. By balancing these advantages and drawbacks, educators can use second-screen technology to create more interactive and collaborative learning environments to enhance student engagement and participation in online classrooms, transforming traditional learning into dynamic, engaging activities suitable for the digital age.

While the extent of second screen use during online activities remains unclear, the limited research conducted thus far suggests that a significant proportion of individuals engage in this behavior. Necka et al. (2016) reported that a substantial percentage of participants used a second screen during online activities, with prevalence rates ranging from 8 to 20%. Previous research (Drody et al., 2022) has utilized compliance checks to indirectly evaluate second screen usage during online examinations. These studies indicate that second screen use is common in online testing environments; however, additional analysis across larger datasets is required to gain a more comprehensive understanding of this behavior.

Upon analyzing the current literature, recent research has predominantly focused on second screen usage or media multitasking in the domain of media and communication, particularly through the examination of second screen applications by Kannas et al. (2023) and the investigation of the connection between anxiety levels and second screen use by Malka et al. (2023). Furthermore, a study conducted by Cheng et al. (2023) investigated the relationship between the use of second screens and trust in alternative media sources. Several studies, such as those conducted by Macrì (2016) and Medina et al. (2015), have explored the advantages of utilizing second screens, whereas others, including Cauwenberge et al. (2014) and Emmerich et al. (2014), have investigated their potential downsides. Similarly, İmren and Tekman (2019) conducted a study in the Turkish context to investigate the relationship between second screen use behavior, sustained attention, and working memory.

Previous research has explored second screen usage primarily in television and media contexts; however, its role in educational settings, particularly in higher education, remains underexamined. The literature review revealed a substantial gap in the understanding of how higher-education students utilize second screens during distance learning. Specifically, existing studies do not provide a comprehensive analysis of the motivations underlying students' second screen use during online education or the effects of these motivations on academic outcomes and student-instructor interactions. Additionally, there is limited research on the types of devices that students employ as primary and secondary screens as well as the distinct purposes for utilizing a second screen. This gap highlights the need for further investigation of the relationship between second screen use and learning outcomes in online education. To address these gaps, the present study examined second screen usage among university students in online learning environments, focusing on the types of devices utilized, motivations for employing a second screen, and how these factors impact engagement, academic performance, and student-instructor interactions. By distinguishing between academic and non-academic uses of second screens, this study provides nuanced insights into how media multitasking may support or hinder learning outcomes. The findings have practical implications for educators and institutions, offering strategies to enhance online learning environments by balancing the benefits and potential distractions of second screen use to improve student engagement and academic performance. In summary, this study aimed to address the following research questions:

RQ1: What are the primary motivations and patterns of second screen use among university students during online education?

RQ2: How does second screen use for academic or non-academic activities affect students' course performance and interaction with instructors in distance education?

Method

Design

This study employed a mixed-methods research design to investigate the motivations for second screen use among higher-education students. Specifically, this study utilized an exploratory sequential mixed-methods design that integrates quantitative and qualitative approaches to provide a comprehensive understanding (Creswell, 2014).

To quantitatively assess motivation for second screen use, researchers developed a Second Screen Use Motivation Scale, as no validated scale exists. The scale comprised 26 items on a 5-point Likert scale, encompassing technology utilization patterns, secondary device behaviors, and motivations for using an additional screen during online learning. The survey was electronically distributed to a diverse sample of higher education students from various faculties, selected through convenience sampling.

Semi-structured interviews were conducted with ten volunteer participants selected based on survey responses to represent diverse usage patterns. The interview protocol included open-ended questions regarding motivation and contextual factors, encompassing experiences during online learning, types of second screens utilized, and perceived academic or social value.

Descriptive and inferential statistics were employed to analyze the quantitative data, illuminating trends, and relationships between motivation and demographics. Thematic analysis, conducted by two independent coders, was used to identify recurring themes in the qualitative data. Finally, quantitative and qualitative findings were integrated to provide a comprehensive understanding of second screen use motivations, with quantitative patterns compared to qualitative themes for triangulation and validation, offering a multifaceted perspective that balances broad trends with personal demographics.

Participants and research setting

The participants for this study comprised students enrolled at a large Turkish state university, situated in a city on the southwestern coast of the Mediterranean. Under typical circumstances, the university predominantly offers face-to-face courses, with limited exceptions. However, due to external factors such as the COVID-19 pandemic and earthquakes in 2023, students experienced a transition to distance and online education during these periods. With an overall student population of approximately 65,000, a sample size of 382 was initially deemed sufficient (Tutar & Erdem, 2020). To ensure broad representation, participants were randomly selected from a range of fields, resulting in a final sample of 471 students chosen through convenience sampling. The study sample consisted of 296 females and 175 males, with an age range of 18–23. Additionally, ten participants were selected for semi-structured interviews using convenience sampling to obtain deeper insights into their second screen usage patterns and motivations. Detailed demographic information, including gender, grade level, and field of study, is provided in Table 1 to further contextualize the participant population.

Research setting

Understanding the online learning environment of participants is crucial for this research, as it highlights how course structure and technology impact second screen usage and motivations. This study, conducted in a comprehensive distance education setting, involved higher-education students

Table 1. The demographics of the participants.

Variables	Group	f	%
Gender	Male	175	37
	Female	296	63
Grade	1	182	38,7
	2	86	18,3
	3	110	23,4
	4	93	19,6
Fields	Social Sciences	321	68,15
	Science	92	19,53
	Health Sciences	57	12,10

using various online learning modalities and technological platforms. Participants from diverse academic disciplines shared a range of perspectives on second screen use in university learning.

Educational content was delivered via Microsoft Teams, primarily through synchronous learning activities and occasionally supplemented by asynchronous components. Synchronous courses include live videoconferencing sessions for real-time lectures, discussions, and interactions with instructors and peers. Asynchronous courses featured pre-recorded video lectures, PowerPoint documents, and discussion forums, allowing students to access content and participate at their convenience, thus maintaining curriculum continuity.

Digital platforms such as Microsoft Teams have facilitated participants' distance education experiences. Synchronous sessions utilized videoconferencing, whereas recorded lectures and forums supported asynchronous engagement. Microsoft Teams also enabled group projects and interactions beyond scheduled class times. Course assessments included both synchronous and asynchronous elements with real-time oral examinations, tests, and assignments submitted via Microsoft Teams, offering flexibility in demonstrating course comprehension. This integration of technological tools supports various learning modalities and enhances student engagement.

Data gathering instruments

This study employed a scale (Second Screen Use Motivation Scale) and semi-structured interviews as primary data collection instruments to investigate the motivations of higher-education students for second screen use. The scale was developed following an extensive review of recent literature on second screen use and media multitasking, ensuring alignment with the objectives of the study.

The scale development process commenced with a comprehensive literature review and conceptual analysis to generate an initial pool of 46 items designed to assess motivations for second screen use during online courses. This preliminary pool was evaluated by experts in educational psychology and digital learning who assessed each item's content validity, clarity, and relevance. The items were subsequently refined based on expert feedback, resulting in the final selection of 26 items.

To validate the scale's structure, exploratory and confirmatory factor analyses were conducted to identify the core motivational dimensions of second screen use. Additionally, Cronbach's alpha coefficient was calculated to evaluate the internal consistency of the scale, ensuring reliability in measuring the motivational constructs. This final instrument, refined through expert review and factor analysis, was completed using a statistical software.

The second screen use motivation scale comprises two sections. The first section collected demographic information through 10 questions, whereas the second section consisted of 16 items divided into two subscales. All items in the second section were evaluated on a 3-point Likert scale, ranging from strongly disagree (1) to strongly agree (3), to reduce response complexity and facilitate more direct, unbiased responses from participants.

The demographic questions in this study were designed to elicit background information regarding participants' familiarity with the definition of the second screen concept, gender, and fields of students. Demographic questions also encompassed the participants' ownership and primary

utilization of communication devices, particularly during online courses and examinations. Furthermore, participants were queried about their use of a second screen during these activities and, if applicable, about the specific devices employed both in regular online course sessions and during examinations.

The second section of the scale consisted of 16 items divided into two subscales: ''second screen use habits'' and ''motivation to utilize a second screen'' during online courses. The ''habits'' subscale encompasses a range of second screen activities, including using a second screen to research course topics, communicate with instructors or classmates, participate in lessons, and engage in non-academic activities such as social media, gaming, or shopping. The ''motivations'' subscale examines reasons for using a second screen, including enhancing engagement, alleviating boredom, and understanding the potential impacts on focus, attention, and learning.

For the qualitative component, a set of nine semi-structured, open-ended interview questions were developed to examine students' academic motivation and performance in relation to second screen use during online education. The questions were designed to investigate participants' experiences with second screen utilization, focusing on the types of devices employed, the frequency and purpose of second screen use during online courses, and their impact on the overall educational experience. Participants were asked about the frequency of second screen use, its efficacy, its effects on interactions with the instructor, and its influence on their motivation to learn. Furthermore, the questions explored whether second screen use affected course flow and dynamics. Educational psychology and digital learning experts reviewed the questions to ensure their validity, clarity, and relevance. Each interview was conducted face-to-face, lasted approximately 10–15 min, and was subsequently transcribed and alphanumerically anonymized (P) to protect participant confidentiality.

Validity and reliability

Exploratory factor analysis was applied to evaluate the construct validity of the second screen use motivation scale. Exploratory factor analysis (EFA) is a multivariate statistical technique that aims to distill fewer latent structures from a myriad of interconnected variables (Henson & Roberts, 2006). The primary objective of this method is to determine the number of factors or dimensions formed by grouping related items; in essence, it can be considered an endeavor to uncover the structure of the scale. In this study, the principal component analysis technique, which is widely used in the literature, was utilized as the factor extraction method, and the varimax method was applied as the rotation method.

The outcomes of the EFA conducted for the second screen use motivation scale indicated that the two items were grouped together as separate factors. Because of the minimal difference in their factor loadings (less than 0.10), these two items were removed from the scale. The subsequent EFA was conducted using the remaining items and yielded a 2-factor structure. Table 2 illustrates the EFA and reliability analyses of the final scale.

As shown in Table 2, the results of the EFA conducted on the scale for second screen use motivation in distance education indicated that the Kaiser-Meyer-Olkin (KMO) value was 0.866, indicating that the sample size was appropriate. Furthermore, the analysis revealed that the factor loadings for Factor 1 were between 0.467 - 0.85 and for Factor 2 between 0.540-0.773. Given that all factor loadings were high, it can be inferred that both factors reliably measured constructs.

In terms of clarity, out-of-class activity was referred to as Factor 1 and included activities such as communicating with individuals beyond the classroom, engaging in gaming, following social media accounts, checking e-mails, seeking entertainment or alleviating boredom, shopping online or examining products, and conducting work that generates income. Meanwhile, ''in-class activity'' was referred to as Factor 2 and encompassed activities such as researching the subject matter of the course, interacting with the instructor, engaging in the course, collaborating with classmates, and completing homework assignments.

Table 2. EFA and reliability results.

Items	Out-of-class	In class	r
5	0,712		0,611
6	0,785		0,711
7	0,85		0,735
8	0,586		0,539
9	0,87		0,773
10	0,797		0,717
12	0,467		0,432
1		0,722	0,634
2		0,639	0,553
3		0,773	0,705
4		0,573	0,583
11		0,54	0,531
13		0,701	0,471
15		0,661	0,439
Statistic	KM0 = 0.866 & Bartlett Test: $\chi^2_{(91)} = 3044.275$, $p < .001$)		
Eigenvalues	5,356	2,275	
Variance Explained	31,037	23,471	54,508
Reliability	0,870	0,819	0,872

r: Item-total correlation value

Cronbach's alpha coefficient was used to assess the reliability and validity of the scale. The scale demonstrated an overall reliability of 0.872, with the sub-dimension of extracurricular (out-of-class) motivation reaching a reliability of 0.87. Additionally, the sub-dimension of intracurricular (in-class) motivation had a reliability of 0.819. These results indicate that the second screen use motivation scale in distance education is both valid and reliable.

The Second Screen Motivation Scale was initially developed with 16 items and subsequently reduced to 14 items following the EFA, resulting in a two-factor structure comprising out-of-class (Factor 1) and in-class activities (Factor 2). The construct validity of the two-factor structure obtained through EFA was subsequently evaluated using Confirmatory Factor Analysis (CFA). This method is a multivariate statistical approach that determines the extent to which the observed data fit the proposed factor structure, with acceptable values indicating good fit. The CFA results and relevant fit indices are presented in Table 3.

The t-values obtained in the CFA fell outside the range of ±1.96, which represents the critical t-value at $p < .05$ significance level, indicating that the factor loading of the corresponding item on its associated factor is considered statistically significant. The results of the CFA demonstrated that the t-values of the items related to both out-of-class motivation and in-class motivation factors were

Table 3. CFA analysis: t values for items.

Factor	Items	t-value
Out of class	5	16,23*
	6	18,13*
	7	20,93*
	8	12,52*
	9	22,63*
	10	19,5*
	12	9,18*
In-Class	1	16,68*
	2	14,44*
	3	19,04*
	4	16,1*
	11	14,36*
	13	9,68*
	15	8,65*

*t > 1.96 or $p < .05$

statistically significant. Consequently, it was not necessary to eliminate items from the two-factor structure derived from the EFA based on the outcomes of the CFA.

To develop a model that demonstrates both the magnitude and direction of each observed variable's relationship with the latent factors, standardized factor loadings were calculated. This process is essential for ensuring that the measurement model accurately represents the underlying theoretical framework. The model presented in Figure 1 illustrates the standardized factor loadings derived from the CFA results.

The standardized factor loadings presented in Figure 1 demonstrate the robustness of the Second Screen Motivation Scale. The loadings for the in-class motivation factor range from 0.41–0.79, indicating moderate to strong associations between the observed variables and their underlying latent construct. Similarly, the extracurricular motivation factor exhibited loadings ranging from 0.42–0.86,

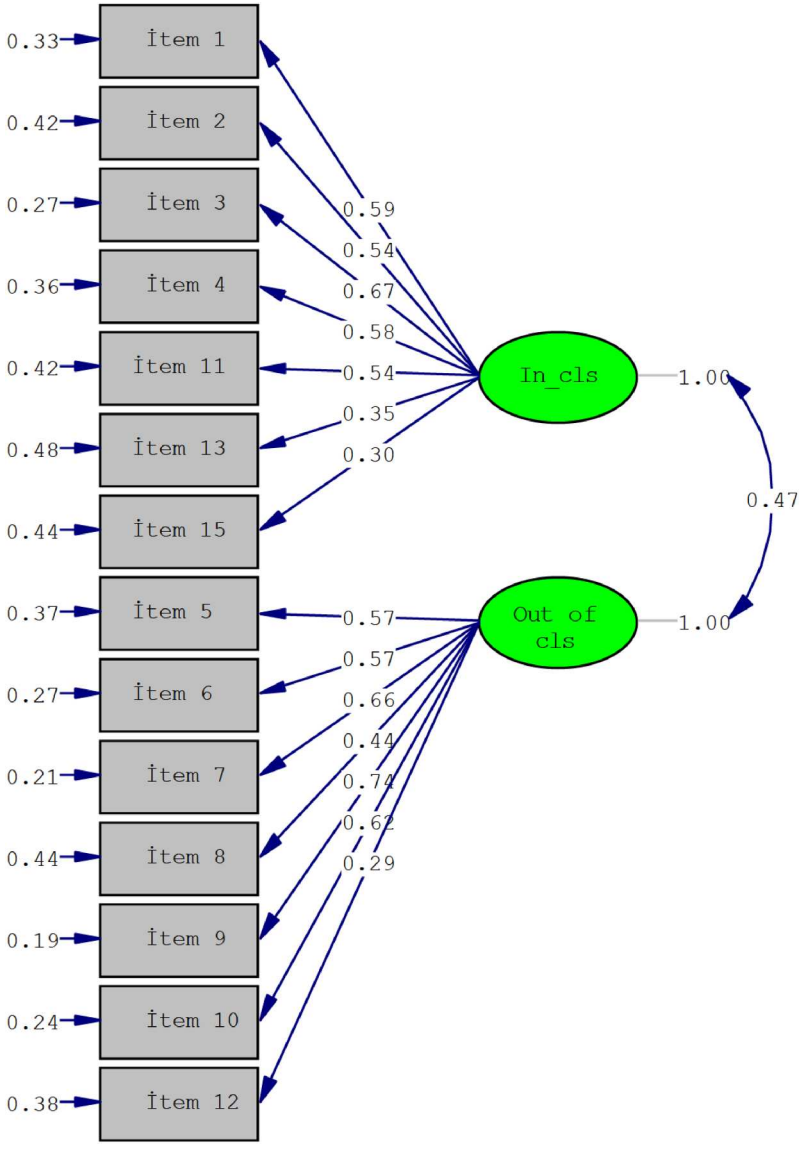


Figure 1. Standard factor loadings. Chi-Square = 314.57, df = 76, *P*-value = 0.00000, RMSEA = 0.093.

Table 4. Model fit index.

Index	Perfect Fit	Good Fit*	Findings	Result
X^2/sd	0–3	3–5	4.14	Good fit
RMSEA	.00 ≤ RMSEA ≤ .05	.05 ≤ RMSEA ≤ .10	0.093	Good fit
CFI	.95 ≤ CFI ≤ 1.00	.90 ≤ CFI ≤ .95	0.93	Good fit
NFI	.95 ≤ NFI ≤ 1.00	.90 ≤ NFI ≤ .95	0.92	Good fit
GFI	.90 ≤ GFI ≤ 1.00	.85 ≤ GFI ≤ .90	0.88	Good fit
IFI	.95 ≤ IFI ≤ 1.00	.90 ≤ IFI ≤ .95	0.93	Good fit
SRMR	.00 ≤ SRMR ≤ .05	.05 ≤ SRMR ≤ .10	0.084	Good fit

*(Schumacker & Lomax, 2015)

reflecting a comparably strong relationship with its respective items. These findings suggest that both motivation factors are adequately represented by their corresponding observed variables, thus reinforcing the construct validity of the scale and supporting its reliability in measuring second screen use motivation across diverse contexts.

Another crucial criterion for CFA is model-data fit, which serves as an indicator of construct validity. The analysis of the model data fit results is presented in Table 4.

Based on the model-data fit indices, the confirmatory factor analysis results indicated an acceptable fit for the factor structure of the second screen motivation scale, which comprised 14 items and two factors as determined by exploratory factor analysis (EFA). ($\chi^2 = 314.57$, df = 76, $\chi 2/sd = 4.14$; RMSEA = .093, CFI = .93, NFI = .92, IFI = .93, GFI = .88, SRMR = .084). That is, the analysis showed that all the fit indices examined demonstrated a good fit and that the scale accurately captured the latent constructs of second screen use motivation, providing a reliable foundation for further analysis.

To ensure the trustworthiness of the qualitative data, several strategies have been implemented to enhance credibility, transferability, dependability, and confirmability. Credibility was enhanced through triangulation, which involved comparing findings from semi-structured interviews with quantitative survey results to provide a more comprehensive understanding of students' motivations for using a second screen. Member checking was also employed, which allowed the participants to review their interview transcripts to ensure an accurate representation of their responses. Transferability was addressed by providing detailed descriptions of the research context, including participant demographics, online learning environments, and second screen usage patterns, enabling other researchers to assess the applicability of the findings to similar educational settings. Dependability was ensured by maintaining an audit trail documenting each phase of the research process, from data collection to theme development, which supports transparency and future replication. Confirmability was achieved through reflexivity and peer debriefing. The researchers maintained a reflexive journal to document reflections and potential biases, thus minimizing subjective interpretations. Peer debriefing allowed external researchers to review the coding and thematic analysis, ensuring objectivity and impartiality. Collectively, these strategies reinforce the credibility, transferability, dependability, and confirmability of the data, providing a reliable understanding of students' second screen use motivation in distance education.

Data analysis

Quantitative data analysis

Quantitative data were analyzed using a combination of descriptive and inferential statistical methods to provide a comprehensive understanding of second screen use motivations and their relationships with demographic factors. Descriptive statistics, including means, standard deviations, and frequencies, were calculated to summarize trends in second screen use, usage patterns, and demographic characteristics.

For inferential analysis, multiple statistical techniques were employed to investigate the relationships and differences between key variables. Independent samples t-tests were conducted to compare motivations and usage patterns between students who utilized a second screen for in-

class versus out-of-class activities, as well as during distance education courses and examinations. To evaluate differences in motivation across students' academic class levels, one-way analysis of variance (ANOVA) was performed. ANOVA utilized the F-statistic to determine whether significant differences existed among the means of the academic class levels.

Additionally, chi-square tests of independence were used to examine associations between categorical variables, such as second screen knowledge, usage patterns, device preferences, and gender. This integrated approach of descriptive and inferential analyses facilitated a nuanced understanding of second screen use, highlighting significant patterns and relationships in the data, while elucidating the interplay between motivational and demographic factors.

Qualitative data analysis

To analyze the qualitative data from semi-structured interviews, a rigorous thematic analysis approach was employed, following the framework of Braun and Clarke (2006). The analysis involved several structured phases to ensure reliability and depth in identifying students' motivations for second screen use. In the initial data familiarization and segmentation phase, researchers transcribed the interviews verbatim, reviewed them for accuracy, and segmented the transcripts into meaningful units related to second screen use, such as motivation, usage context, and perceived impact. During the coding stage, researchers independently applied inductive coding to identify recurring themes such as academic support, distraction, social engagement, and enhanced focus. Discrepancies were resolved through group discussions to ensure consistency in code definitions. In the theme-development phase, the related codes were grouped into broader categories, including academic enhancement, social connection, entertainment, and self-regulation, which were refined for applicability and internal consistency. Themes were further reviewed and refined to ensure that they accurately captured the data, with sub-themes emerging to distinguish, for example, in-class activities from out-of-class activities. Finally, the qualitative findings were integrated with the quantitative results to cross-validate the themes and enhance the validity of the study. This systematic approach ensured methodologically rigorous and reliable interpretation of the qualitative data, thereby providing a comprehensive understanding of students' second screen use motivations.

Ethical concerns

This study was approved by the university's Social and Human Sciences Scientific Research and Publication Ethics Committee. All procedures performed in this study involving human participants were in accordance with the ethical standards and the Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all the participants included in the study.

Results

In response to the first research question, which examines the extent of use, types of devices, and reasons for usage, with a focus on the broad themes of "why" and "how" students use second screens, results concerning the participants' demographic information and relevant variables were presented. The participants were provided with the definition of the second screen at the outset of the scale and asked whether they possessed prior knowledge of the second screen in accordance with this definition. The analysis showed that although approximately half (51%) of the participants acknowledged being acquainted with the concept of the second screen, nearly an equal proportion (49%) declared that they were unacquainted with it. Upon conducting a more in-depth analysis of the use of a second screen in distance education, the findings indicated that out of the 471 participants, 271 made use of a second screen during their distance learning experience.

Table 5. Awareness and utilization of second screen among students in online education.

Variables	Group	f	%
Knowledge of the second screen definition	No	231	49,1
	Yes	240	50,9
Use of second screen during the class activities	No	200	42,6
	Yes	271	57,4
Using a second screen during the exams in distance education	No	302	64
	Yes	169	36

According to the data, most participants (57.4%) utilized a second screen during their online courses, while only 36% reported doing so specifically during examinations during their distance learning experience.

Table 5 displays the numerical information pertaining to the participants' awareness and utilization of the second screen in online education.

Data analysis was performed to assess whether participants employed the second screen for in-class or out-of-class tasks. The descriptive statistics related to this issue are listed in Table 6.

As illustrated in Table 6, a statistically significant difference was observed in the students' scores regarding their utilization of a second screen during online courses. Specifically, students who employed a second screen demonstrated higher mean scores in general activities ($t = -6.826$, $p < .05$), in-class activities ($t = -6.333$, $p < .05$), and out-of-class activities ($t = -5.145$, $p < .05$) than those who did not.

This study also utilized a one-way analysis of variance (ANOVA) to examine second screen use patterns among higher education students across various grade levels in different contexts, with the objective of determining whether these behaviors differ and how academic progression or engagement with online education influences second screen use. Table 7 presents the one-way ANOVA results.

As demonstrated in Table 7, the utilization of second screen remained consistent among students across different grade levels, encompassing in-class activities, out-of-class purposes, and total motivation. Although minor differences in mean scores were observed, such as elevated out-of-class usage in the 2nd grade, these variations were not statistically significant ($p > .05$). This finding suggests that higher education students' second screen use does not exhibit significant change as they progress academically, indicating comparable levels of engagement in both the classroom and extracurricular contexts.

Table 6. Comparison of demographics, the second screen use and other sub-dimension.

Variable	N	In-class M ± SD	Out of class M ± SD	Motivation Total M ± SD
Knowing the definition of second screen				
No	231	14 ± 4	11,8 ± 4,3	25,8 ± 7,2
Yes	240	14,3 ± 3,9	11,7 ± 4,1	26 ± 6,6
t		−0,873	0,112	−0,433
p		0,383	0,911	0,665
Use of second screen in courses during the distance education				
No	200	12,9 ± 3,9	10,6 ± 3,9	23,5 ± 7
Yes	271	15,1 ± 3,7	12,6 ± 4,1	27,7 ± 6,2
t		−6,333	−5,145	−6,826
p		,000	,000	,000
Use of the second screen in exam during distance education				
No	302	13,9 ± 4,1	11,1 ± 4	25 ± 6,9
Yes	169	14,6 ± 3,6	12,9 ± 4,2	27,6 ± 6,6
t		−2,078	−4,61	−3,974
p		0,038	,000	,000

t: Independent samples t-test statistics

Table 7. The ANOVA results concerning second screen use across different grade levels.

	Class	*N*	*M*	*SD*	Sum of Squares	*df*	Mean square	F	*p*
In-class	1st grade	182	14,09	4,03	4,94	3	1,64	,10	,95
	2nd grade	86	14,25	3,98	7339,78	466	15,75		
	3rd grade	110	14,00	4,17	7344,73	469			
	4th grade	93	14,27	3,55					
	Total	471	14,14	3,95					
Out-class	1st grade	182	11,30	4,29	63,28	3	21,09	1,22	,30
	2nd grade	86	12,17	4,48	8046,02	466	17,26		
	3rd grade	110	11,97	3,97	8109,31	469			
	4th grade	93	12,02	3,74					
	Total	471	11,76	4,15					
Motivation Total	1st grade	182	25,40	7,11	83,46	3	27,82	,58	,62
	2nd grade	86	26,43	7,48	22196,03	466	47,63		
	3rd grade	110	25,98	6,82	22279,49	469			
	4th grade	93	26,29	5,93					
	Total	471	25,90	6,89					

Additionally, chi-square tests of independence were conducted to examine the relationships among categorical variables, including gender, second screen knowledge, and second screen use during courses and exams. Thus, data on the use of second screen among higher education students in terms of gender were analyzed, and the findings are presented in Table 8.

With respect to gender, 56.3% of the male and 47.6% of the female students demonstrated familiarity with the definition of the second screen. Furthermore, 55.7% of males and 58.4% of females reported using a second screen during class activities, while 37.9% of males and 34.8% of females used it during exams. It is noteworthy that no statistically significant difference in familiarity or usage rates of the second screen between genders was observed for either class activities or examinations ($p > .05$).

To determine the types of devices that higher education students typically use as their primary and secondary screens, as well as the frequency with which they employ them, chi-square calculations were performed for some variables. Table 9 presents the findings related to gender and types of devices used for second-screen activities in distance learning.

The data indicated that 43.7% of male participants utilized smartphones as a secondary screen in distance education with a high frequency, 25.9% utilized them at a lower frequency, and 30.5% did not utilize them at all. Among the female participants, 56.1% utilized smartphones with high frequency, 19.9% utilized them at a lower frequency, and 24% did not. A statistically significant association was observed between gender and the frequency of smartphone use in distance education ($p < .05$). Bonferroni correction for multiple comparisons revealed that females utilized smartphones significantly more frequently than males did. However, the proportion of participants who infrequently or never utilized smartphones was comparable across genders.

The data indicated that higher education students infrequently utilized tablets as a second screen during distance learning. Among male participants, only 5.7% reported frequent tablet use, 12.6% utilized them less frequently, and 81.6% did not use them at all. Female participants exhibited a

Table 8. Comparative analysis of demographic and second screen-related factors with respect to gender.

Variable	Group	Male f (%)	Female f (%)	*p*
Knowledge of the second screen definition	No	76 (43,7)	155 (52,4)	0,069
	Yes	98 (56,3)	141 (47,6)	
Use of second screen during the class activities	No	77 (44,3)	123 (41,6)	0,568
	Yes	97 (55,7)	173 (58,4)	
Using a second screen during the exams in distance education	No	108(62,1)	193 (65,2)	0,494
	Yes	66(37,9)	103 (34,8)	

p:Chi-square analysis significance value

Table 9. Analysis of gender differences in second screen devices used for online learning.

Devices used as second screen	Group	Male f (%)	Female f (%)	*p*
Smartphone	Newer	53 (30,5)a	71 (24)a	**0,034**
	Less	45 (25,9)a	59 (19,9)a	
	Frequent	76 (43,7)a	166 (56,1)b	
Tablet	Newer	142 (81,6)	225 (76)	0,096
	Less	22 (12,6)	36 (12,2)	
	Frequent	10 (5,7)	35 (11,8)	
Laptop	Newer	60 (34,5)	83 (28)	0,067
	Less	32 (18,4)	41 (13,9)	
	Frequent	82 (47,1)	172 (58,1)	
Desktop	Newer	113 (64,9)a	247 (83,4)b	**,000**
	Less	23 (13,2)a	22 (7,4)b	
	Frequent	38 (21,8)a	27 (9,1)b	

p: Chi-square analysis significance value; a, b: Bonferroni correction results indicating the difference

similar pattern, with 11.8% utilizing tablets frequently, 12.2% utilizing them less frequently, and 76% not utilizing them. These findings revealed no statistically significant association between gender and tablet utilization frequency in distance education ($p > .05$).

The study examined participants' use of laptops as a second screen during distance education and yielded diverse responses. Among male respondents, 47.1% reported frequent laptop usage, 18.4% utilized them less frequently, and 34.5% did not employ them at all. Among the female respondents, 58.1% frequently utilized laptops, 13.9% employed them less frequently, and 28% did not. No statistically significant relationship was observed between gender and laptop usage frequency in distance education ($p > .05$).

Participants were queried regarding their use of desktop computers as a second screen during distance education, revealing varying levels of usage. Among the male respondents, 21.8% reported frequent use, 13.2% reported less frequent use, and 64.9% reported no use. In contrast, 9.1% of the female respondents reported frequent use, 7.4% reported less frequent use, and 83.4% reported no use. Statistical analysis revealed a significant relationship between gender and desktop computer use as a second screen ($p < .05$). Bonferroni correction indicated that male respondents were significantly more likely to use desktop computers frequently or rarely as a second screen than female respondents, whereas female respondents were significantly more likely to never use desktop computers than male respondents.

This study also explored the pairing of different devices as a second screen in distance learning with the gender variable, and the findings are presented in Table 10.

As presented in Table 10, 19.5% of male participants frequently utilized both smartphones and desktop computers as second screen during distance education, 17.2% employed this combination less frequently, and 63.2% never utilized it. Among the female participants, 11.1% reported frequent utilization of both devices, 11.5% employed them less frequently, and 77.4% did not utilize this combination. A statistically significant relationship was observed between gender and the frequency of utilizing both smartphones and desktop computers ($p < .05$). The Bonferroni correction revealed that male participants were significantly more likely to utilize both devices frequently than female participants, while female participants were significantly more likely than male participants to never employ this combination during distance education.

The investigation revealed that 51.1% of male participants frequently utilized a combination of smartphones and laptops as second screen during distance education, 14.9% employed them less frequently, and 33.9% reported no usage of this combination. Among the female participants, 54.4% frequently employed smartphones and laptops, 17.6% utilized them less frequently, and 28% reported no usage. No statistically significant association was observed between gender and the frequency of smartphone and laptop usage during distance education ($p = .05$).

Table 10. Analysis of gender differences in secondary device use for online learning.

Devices used as second screen	Group	Male f (%)	Female f (%)	*p*
Smartphone and Desktop	Newer	110 (63,2)a	229 (77,4)b	**0,004**
	Less	30 (17,2)a	34 (11,5)a	
	Frequent	34 (19,5)a	33 (11,1)b	
Smartphone and laptop	Newer	59 (33,9)	83 (28)	0,383
	Less	26 (14,9)	52 (17,6)	
	Frequent	89 (51,1)	161 (54,4)	
Smartphone and tablet	Newer	142 (81,6)a	207 (69,9)b	**0,005**
	Less	22 (12,6)a	44 (14,9)a	
	Frequent	10 (5,7)a	45 (15,2)b	
Tablet and desktop computer	Newer	150 (86,2)	261 (88,2)	0,817
	Less	14 (8)	21 (7,1)	
	Frequent	10 (5,7)	14 (4,7)	
Tablet and Laptop	Newer	143 (82,2)	246 (83,1)	0,898
	Less	16 (9,2)	28 (9,5)	
	Frequent	15 (8,6)	22 (7,4)	
Desktop and laptop	Newer	143 (82,2)	259 (87,5)	0,26
	Less	16 (9,2)	21 (7,1)	
	Frequent	15 (8,6)	16 (5,4)	

p: Chi-square analysis significance value; a, b: Bonferroni correction results indicating the difference

The study revealed that 5.7% of male participants frequently utilized smartphones and tablets, 12.6% utilized them less frequently, and 81.6% never used them during distance education. Among the female participants, 15.2% frequently utilized smartphones and tablets, 14.9% utilized them less frequently, and 69.9% reported never utilizing them. A statistically significant relationship was observed between gender and the frequency of smartphone and tablet use during distance education ($p < .05$). Bonferroni correction indicated that females were more likely than males to frequently utilize both devices, whereas a greater proportion of males reported never utilizing them.

The analysis revealed that 8.6% of male respondents frequently used a combination of tablets and desktop computers, 9.2% utilized them less frequently, and 82.2% reported never utilizing this combination during distance education. Among the female respondents, 7.4% frequently utilized both devices, 9.5% utilized them less frequently, and 83.1% never utilized them. The results indicated no statistically significant relationship between gender and the frequency of utilizing a tablet and desktop computer combination during distance education ($p > .05$).

This study examined the utilization of desktop computers and laptops in conjunction with gender-based differences. Among the male participants, 8.6% reported frequent utilization of this combination, 9.2% utilized it less frequently, and 82.2% never utilized it during distance education. Among the female participants, 5.4% reported frequent utilization, 7.1% utilized it less frequently, and 87.5% never utilized it. These findings revealed no statistically significant relationship between gender and the frequency of utilizing a desktop computer and laptop combination during distance education ($p > .05$).

Table 11 presents the descriptive statistics for second screen use in distance education, describing both in-class and out-of-class activities along with combined scores.

As demonstrated in Table 11, the overall motivation scores for utilizing the second screen in distance education ranged from 14 to 42, with a mean score of 25.9. In-class motivation scores varied between 7 and 21, with an average of 14.14, whereas out-of-class motivation scores similarly ranged from 7 to 21, with a mean of 11.76.

Table 11. Descriptive statistics of scale and subscale scores.

Factors	Smallest	Biggest	M	SD	Skewness	Kurtosis
In-Class Activity	7	21	14,14	3,96	−0,277	−0,902
Out of class Activity	7	21	11,76	4,16	0,59	−0,697
Total	14	42	25,90	6,89	0,145	−0,477

The second research question investigated the impact of second screen use for academic or non-academic purposes on students' course performance and interaction with instructors in distance education. Statistical analysis revealed no significant differences in students' scores across various activities, including class activities such as researching course content, interacting with instructors, engaging in the course, collaborating with peers, completing assignments, and extracurricular activities such as communicating outside the classroom, gaming, engaging with social media, checking emails, seeking entertainment or mitigating boredom, online shopping, and conducting income-generating work. Additionally, there was no statistically significant difference in relation to general activities and understanding the definition of the second screen, with a *p*-value greater than 0.05.

Qualitative analysis of participant interviews revealed significant insights into students' second screen use in online education, identifying 13 key themes: frequency, efficacy, interactions with instructors and peers, motivation, educational impact, distraction, social engagement, focus, academic enhancement, social connection, entertainment, and self-regulation.

This study explored the relationship between participants' GPA and their use of a second screen. Table 12 presents the demographic characteristics and grade point averages (GPA) of the participants who participated in the interviews.

Based on the findings of the qualitative analysis, it was observed that students with higher GPA scores generally used their second screen for in-class activities and exhibited increased motivation for their courses during distance education. However, further analysis revealed that students used second screens differently inside and outside of class. In class, usage was mainly non-academic. P5 stated, "*During class, I sometimes accessed social media on my smartphone … It was not related to the lesson most of the time*." P10 highlighted the convenience of online searches, "*When the lecturer asked something, I could quickly find an answer on Google rather than dealing with the book*."

The frequency of second-screen use varied among the participants. Some, like P3, used it frequently to counter boredom in theoretical lessons: "*I used my second screen in every theoretical lesson when I get bored*." Others, such as P2, used it moderately or occasionally during brief disengagements: "*I use my smartphone as a second screen once or twice if I get very bored*."

The effectiveness of the second screen was mixed. Some students found it academically beneficial, particularly in terms of quick access to information. P6 stated, "*The second screen enables rapid information retrieval … I could quickly find an answer on Google*." However, other studies have noted a dual impact. P1 mentioned, "*Even if I used it for lesson-related purposes, I often used it for unrelated activities, which negatively affected me*."

Participants often noted that the second screen hindered their interactions with the instructors. P8 mentioned communication breakdowns: "*When lecturers asked something, if I was busy with the second screen, I didn't understand what they said*." Others have observed that second screens sometimes promote peer interactions by engaging with instructors. P3 stated, "*I was afraid to ask the lecturer, so I used my second screen and asked my friends*," highlighting how easy access to peer support can reduce direct educator engagement.

Table 12. Demographic of interview participants and their academic performance metrics.

Participant	Gender	GPA
P1	Female	2,47
P2	Female	3,12
P3	Female	2.50
P4	Female	3,33
P5	Male	3,34
P6	Male	3,02
P7	Male	2,82
P8	Male	2,64
P9	Female	2,60
P10	Male	3,29

The second screen influenced the students' learning motivation both positively and negatively. P9 found them motivating for academic use, stating, "*Using the second screen during the lesson positively affected my learning motivation because I was researching the lesson*." However, participants also noted decreased motivation when distracted by social interactions, as P4 explained, "*When my friends text me … my motivation to learn the lesson could decrease*."

Second screen use had diverse effects on educational experience. P7 noted its drawbacks as "*While the lecturer was explaining something, I was on social media … Sometimes I didn't even realize that the class was over*." Distraction emerged as a significant theme with several students noting that the second screen disrupted their lesson engagement. P6 stated, "*Using the second screen disconnected me from the lesson and scattered my focus*." P7 added, "*Holding my phone during class inevitably leads me to social media, causing me to lose touch with the teacher and my friends*." Although limited, some instances show second screens that modestly enhance focus, particularly in research contexts. P10 noted, "*When I used a second screen, my learning motivation was positively affected because I was doing research about the lesson*." Nonetheless, the data predominantly suggest divided attention, indicating that second screens are more frequently a distraction than a focus aid.

Occasionally, the second screen was seen as beneficial for additional research and understanding. P6 noted, "*Using the second screen for lesson-related research … increases the lesson's efficiency*." However, P8 highlighted negative effects, stating, "*Using the second screen affects my interaction with the teacher*." Therefore, while second screens can enhance academic activities, they often disrupt engagement.

The second screen for entertainment was frequently used during the class. For instance, P3 noted, "*While the lecturer was explaining something, I was on social media …* " This highlights the allure of second screens, with students such as P5 confessing, "*I was either googling something or checking messages*."

Most students struggled with self-regulating second screen use despite attempts to control it. P5 stated, "*I was interested in for a minute or two. I would turn it off and go back to the class, so it didn't distract me*." Conversely, P1 noted an increase in usage over time: "*As the lesson lasts longer, I sometimes use my smartphone as a second screen*." This indicates that self-regulation strategies are often inadequate to meet the continuous demands of online learning.

Based on the analysis of qualitative data, it was observed that students utilized second screens to research course topics, which facilitated the clarification of ambiguous concepts and enhanced the efficacy of the lesson without requiring interruption by the instructor. For these students, the second screen functioned as a tool for real-time, self-directed learning. However, some participants also noted that online class monotony and external stimuli led them to rely on the second screen, which affected their motivation and focus. This shift indicates a tendency for the second screen to become distractions when engagement with a lesson diminishes. Additionally, the data revealed that some participants used their devices for non-academic purposes such as social media and messaging. Although not classified as leisure activities, these pursuits nonetheless diverted their attention from the lecture, illustrating how even incidental non-academic second screening can impede concentration. In numerous instances, second-screen use had direct negative effects on attentiveness: students frequently missed questions posed by the instructor, leading to observable signs of distraction that hindered their engagement and interaction. Overall, the qualitative data analysis illustrates both productive multitasking, where students employ a second screen to support learning, and distract multitasking, where attention is diverted from lesson content. It can be inferred that productive multitasking appears beneficial, whereas distracting multitasking can hinder performance, underscoring the importance of promoting mindful second screen use. These findings highlight the necessity of strategies that balance productive and distracting second screen use to enhance online learning and academic engagement. Future research should investigate methods to promote self-regulation and optimize the academic advantages of second screens in virtual learning environments.

Discussion

This study reveals a multifaceted relationship between second screen use and several factors, including concept familiarity, usage patterns, device preferences, gender differences, and their impact on academic performance and motivation in distance education. By integrating both quantitative and qualitative data, the findings underscore the prevalence and varied nature of second screen use among students. While nearly half of the participants were unfamiliar with the concept of the second screen, 57.4% reported utilizing it during online courses and 36% employed it during examinations. These findings highlight the widespread integration of second screens in an online learning setting.

The frequency of second screen use demonstrated a positive correlation with higher scores in in-class, out-of-class, and general learning activities, suggesting that its use may enhance academic engagement. This correlation was consistent across genders, with both male and female students exhibiting similar rates of second screen use during lessons and examinations. However, gender differences emerged in device preferences: females utilized smartphones more frequently, while males preferred desktops, a statistically significant difference. These results support the growing role of second screens in distance education, driven by both academic and nonacademic motivations.

Qualitative data provided deeper insights into how the second screen was utilized. Many students reported using second screens for academic purposes, such as researching lecture topics, which facilitated self-directed learning without disrupting the class. For these students, the second screen functioned as a tool for enhancing comprehension. However, others acknowledged that external distractions, coupled with online class monotony, led them to rely on second screen for non-academic activities, reducing their motivation and focus. This shift from productive to distracting multitasking highlights the dual nature of second screen use, which can support learning; it can also become a source of distraction when engagement with the lesson diminishes.

This study further distinguished between productive and distracting multitasking. Students using second screens for academic purposes, such as clarifying course content, exhibited increased engagement, whereas those distracted by non-academic activities, such as social media, experienced reduced focus. Gender-based device preferences add nuance to these findings, with females favoring smartphones and males opting for desktops, reflecting previous research on gendered technology use. These device preferences may be influenced by the functional demands of each device in an online learning environment.

Notably, while both academic and non-academic second screen use were prevalent, they did not significantly affect the academic performance scores. This observation suggests that the impact of the second screen on academic outcomes is not determined by the devices themselves, but by students' intentions and self-regulation. Students with higher GPAs tended to utilize second screens for academic purposes, which supported their learning, whereas those with lower GPAs were more likely to engage in non-academic use, leading to decreased motivation. Therefore, the role of second screen use in academic success appears contingent upon students' goals and self-discipline, with productive multitasking fostering motivation and distracting multitasking reducing the focus.

Further analysis of multitasking behaviors revealed no significant differences in overall performance scores between academic and non-academic second screen use, reinforcing the notion that the purpose of second screen use, rather than its mere presence, is critical. Qualitative data also supported this finding, demonstrating that productive multitasking, such as using a second screen for content clarification; enhanced engagement; and distracting multitasking, such as social media use, diverted attention, and hindered performance.

Regarding motivation and academic performance, students with higher GPAs were more likely to utilize second screens for in-class activities, whereas those with lower GPAs engaged in more extracurricular use, which correlated with reduced motivation. Both high – and low-performing students reported communication difficulties with instructors when using a second screen for non-academic purposes, highlighting the potential for distractions to impede student-instructor interactions. These

challenges underscore the importance of promoting productive second screen use while mitigating its potential to distract.

The data further indicate that second screen use can impact student-instructor interactions. Numerous participants reported communication difficulties regardless of whether their device use was academic or non-academic. This finding points to the need for improvements in distance education settings, where instructors may consider strategies to encourage productive second screen use while minimizing distractions that hinder engagement.

The study's implicit findings align with Yeşilyurt's (2023; Yeşilyurt & Karaduman, 2024) conclusions, which suggest that contemporary higher education students are well equipped with technological devices such as smartphones, laptops, tablets, desktop computers, and Internet tools. Consequently, Nurkhamidah and Itsnaini's (2020) argument that technology deprivation may lead to difficulties in teaching distance education cannot be substantiated within the present study. Moreover, the widespread availability of contemporary technology and numerous applications that can be utilized on these devices present students with plethora of options for engaging with a second screen during class. While some students utilized these options in conjunction with the course, others used them for extracurricular activities. The motivational preferences of students for utilizing their second screen have a significant impact on their performance in the course.

Schindler et al. (2017) identified a phase in which students may become addicted to technology. This addiction could be beneficial for utilizing a second screen. Indeed, our findings indicate that students use their second screen during distance education. Moreover, it is speculated that lack of control in the home environment may also contribute to this phenomenon. Students tended to utilize their second screen for both course-related and independent purposes.

According to Abou Hashish et al. (2022), in the context of distance education, students and teachers are physically and temporally isolated from one another and communication between them is facilitated through technological means. Our study found that not all students used second screen technologies to communicate with their teachers during the lessons. However, we discovered that those who engaged in such communication demonstrated a high level of motivation towards the lesson.

Furthermore, according to Sun and Chen (2016), the efficacy of online instruction is contingent on the rapid progression of technology. Nevertheless, in our opinion, the mere advancement of technology at a rapid pace is insufficient to ensure the success of online teaching. Instead, it is more closely linked to the extent to which students utilize this technology during lessons.

Owing to the prevalence of technology, it has been observed that certain students engage in extracurricular activities on their second screen during distance education courses. While the reasons for this behavior may appear to be students' own choices, the abundance of technology can also be considered a contributing factor. Furthermore, whether this behavior is purely the result of students' decisions is worthy of further study, as it encompasses both psychological and sociological dimensions.

Webster and Hackley (1997) discovered that students' attitudes and control over technology affect their learning outcomes. Despite the passage of years, Webster and Hackley's findings remain the same. The present study revealed that students who utilized their second screen for class-related activities demonstrated enhanced motivation and increased academic engagement. Conversely, students who employed their second screen for non-academic pursuits during instructional periods exhibited diminished motivation and engagement. However, communication with the course instructor was disrupted in both cases, regardless of whether the second screen was used for in-class or extracurricular activity.

Additionally, the outcomes of this study are in line with those of earlier studies that explored different forms of media multitasking in educational settings, such as text messaging (Clayson & Haley, 2013), social media use (Lau, 2017), mobile phone use (Kuznekoff & Titsworth, 2013), and laptop use (Fried, 2008; Gaudreau et al., 2014; Sana et al., 2013). These studies have consistently shown that media multitasking or second screen usage among students is associated with decreased academic performance, including poorer learning results, lower course grades, and lower test scores.

Despite these insights, this study had several limitations. Primarily, reliance on self-reported data may introduce biases, such as social desirability and recall inaccuracies, particularly regarding second screen activities. The sample, while diverse, was confined to students at a single state university, potentially limiting its generalizability to other educational contexts and levels. The cross-sectional design also constrains the ability to infer causal relationships between second screen use, academic performance, and motivation. Furthermore, while qualitative data enriched the findings, a more extensive qualitative sample or observational data could enhance the understanding of real-time engagement with second screens. These limitations indicate promising avenues for future research, particularly regarding how multitasking affects learning across various academic environments.

In conclusion, while second screen use demonstrates the potential to support self-directed learning and engagement, it also presents risks of distraction, particularly in online environments, where students may readily alternate between academic and non-academic tasks. This study underscores the significance of cultivating productive multitasking habits and intentional second screen use to maximize the educational benefits of technology, while minimizing distractions. Institutions and educators should consider developing guidelines to promote purposeful secondary device use, thereby assisting students in leveraging technology to enhance their learning outcomes.

Conclusion

This study investigated second screen use among higher education students engaged in distance education. Although many participants were initially unaware of their second screen usage, most employed such devices during online courses, with smartphones and laptops being the predominant choices. A gender difference in device preferences was observed, with females being more likely to use smartphones and tablets, whereas males tended to prefer smartphones and desktops. This difference may reflect varied usage patterns, where females might be inclined towards more portable, versatile devices, such as tablets, for multitasking in diverse contexts, whereas males may prioritize desktop setups for a more stable and functional experience, particularly for academic tasks. However, further research is required to explore these gendered preferences in detail.

Motivations for second screen use varied, with academic purposes (research, collaboration, and interaction with instructors) correlating with increased motivation and academic performance, whereas nonacademic activities (social media and entertainment) were associated with decreased motivation and performance.

The study concludes that second screens have the potential to enhance academic engagement when utilized appropriately; however, they may also serve as a source of distraction. Further research is necessary to explore the psychological and sociological implications of second screen use in educational contexts.

Suggestions for further studies

Future research should investigate the effects of increased awareness of second screen use on student behavior and academic performance as well as conduct longitudinal or experimental studies to assess its long-term effects. Additionally, studies on strategies to manage second screen use, such as blocking distracting websites, could enhance student focus. Further exploration of gender differences in second screen preferences is needed to inform the development of inclusive educational technologies.

Theoretical and practical implications

This study offers a refined perspective on technology acceptance models by emphasizing the utilization of second screens and their consequences on learning and participation. This can pave the way for the formulation of more comprehensive models that consider both intentional and automatic

technology usage behaviors. Additionally, this study contributes to multitasking theories by elucidating the effects of second screen use on learning, positing that the nature of second screen activities influences student motivation, and offers insights for more comprehensive models of engagement. Educators and policymakers should incorporate guidelines for second screen use into curricula and consider secure online assessment methods to address academic dishonesty. Furthermore, adaptive learning technologies can personalize education based on second screen behaviors, potentially improving learning outcomes and mitigating distractions.

Additionally, this study underscores the significance of creating learning environments that balance technological engagement. Institutions should implement support systems, such as training on the productive use of second screens and tools that assist students in limiting distractions. This approach encourages the strategic use of technology to enhance learning rather than impeding it.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Author contributions

Conceptualization, A.Y., and M.C.; Literature Review, A.Y. and M.C.; Methodology, M.C.; Data collection, A.Y.; Data analysis; A.Y.; Writing—original draft preparation, A.Y.; Writing—review and editing, M.C. Both authors have read and approved the final version of the manuscript.

Data availability statement

The dataset of the present study is available from the corresponding author upon reasonable request.

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