

Digital Distraction, Engagement, and Academic Performance: A Moderated Mediation Model in Higher Education

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Abstract

In the digital age, university students are increasingly exposed to an attention economy in which digital platforms continuously compete for their cognitive resources. Although digital distraction has become a common issue in higher education, its underlying mechanisms affecting academic performance remain insufficiently explored. This study investigates the relationship between digital distraction and academic performance by examining the mediating role of student engagement and the moderating role of self-control. A quantitative research design was adopted, and data were collected from 268 university students through structured questionnaires. Structural equation modeling (SEM) was used to test the proposed hypotheses. The findings reveal that digital distraction has a significant negative effect on academic performance. Student engagement partially mediates this relationship, indicating that digital distraction reduces students' cognitive and behavioral involvement in learning, which subsequently lowers academic achievement. In addition, self-control moderates the relationship, as students with stronger self-regulation experience weaker negative effects, although the buffering impact is relatively limited. This study contributes to the literature by integrating mediation and moderation into a single analytical framework and highlighting student engagement as a key explanatory mechanism. It also reconceptualizes digital distraction as a structural issue shaped by the attention economy rather than merely an individual problem. The findings provide practical implications for educators and institutions in promoting engagement and attention management in digitally intensive learning environments.

Keywords: Digital Distraction , Academic Performance, Student Engagement, Self-Control, University Students, Higher Education

Introduction

The digitization age is making university students to be engulfed with different types of technology such as smart phones, social media networks, and online learning systems. Although the technologies allow an access to information and learning materials like never

before, they are also bringing about new challenges especially in the form of digital disruption. Digital distraction is the interrupting of the learning process by a digital device or web-based materials, e.g., social media notifications, messaging apps, and non-academic browsing. Since more time is devoted to the use of digital media by the students, there have been concerns over the possible effects of digital media on academic performance.

Recent researches have emphasized the fact that digital distraction is currently becoming a widespread problem in higher education. Multitasking is a common behavior among students, including looking at social media or answering messages in the middle of a lecture or a study session and can harm their attention, cognitive processing, and learning effectiveness. The cognitive load theory explains that too much external stimulator can overload the cognitive resources of students so that they cannot effectively process academic information. In turn, digital distraction is becoming a highly significant aspect of the academic performance of students.

Having empirical research on the relationship between digital distraction and academic performance has yielded mixed results. Certain studies indicate that high occurrences of digital interruptions are linked with poor academic performance, lack of concentration, and poor learning performance. Nevertheless, other facts reveal that the effect of digital technology can be based on the usage occasion which implies that the correlation could be indirect and transmitted through other variables. This divergence indicates the necessity to have a closer look at the mechanisms underlying the impact of digital distraction on academic performance.

Student engagement as one such key mechanism can be defined as the extent to which students interact with learning processes in terms of their cognitive, emotional and behavioral engagement. The involvement of students has been widely cited to be one of the factors that predict academic success. Students tend to concentrate on tasks when they are engaged, put effort in them and even continue with their studies despite academic difficulties. Nonetheless, digital distraction can lessen the engagement since it can move the focus on other activities other than learning, thus undermining student participation in academic work. Hence, the level of student engagement can serve as an intervening variable in digital distraction-academic performance.

Coupled with mediating processes, individual differences are also important in the determination of the reaction of students to digital distraction. This is especially applicable in the way of self-control as the capacity to control oneself in terms of behaviour, attention and impulses. High-self-controlling students are in a better position to handle distractions and stick to their academic activities, and individuals with low-self control might be more susceptible to digital interference. In that way, self-control can be an intermediate that balances the connection between digital distraction and academic performance and affects the character and the direction of that relationship.

Even though the body of literature on digital distraction is expanding, several research gaps remain. First, much of the existing work focuses on the direct association between digital distraction and academic performance—for example, Lepp et al. (2015) and Junco (2012) report negative correlations between media use and grades—yet these studies rarely test the

psychological mechanisms that explain why such effects occur, leaving the mediating role of student engagement largely untested. Second, although student engagement (Fredricks et al., 2004) and self-control (Tangney et al., 2004) have each been examined as separate predictors of academic outcomes, very few studies integrate a mediating and a moderating variable within a single analytical model, so the conditions under which digital distraction is more or less harmful remain unclear. Third, much of the available evidence predates the rapid shift to online and hybrid learning, and empirical work spanning diverse higher-education contexts—particularly in developing regions where digital usage patterns and learning conditions differ markedly—is still scarce. Addressing these gaps matters because, without an integrated, mechanism-based model, educators and institutions lack clear guidance on whether to target distraction itself, the engagement it erodes, or the self-regulatory capacities that may buffer it.

To address these gaps, this study examines how digital distraction affects the academic performance of university students through the mediating role of student engagement and the moderating role of self-control. Drawing on survey data and a quantitative approach, it offers a more in-depth understanding of the mechanisms through which digital distraction shapes academic outcomes. In doing so, the study makes three contributions: it integrates mediation and moderation within a single analytical model rather than testing direct effects in isolation; it identifies student engagement as the key explanatory mechanism linking distraction to performance; and it reframes digital distraction as a structural feature of the attention economy rather than a purely individual shortcoming. These contributions carry both theoretical and practical implications for higher-education institutions seeking to manage digitally intensive learning environments.

Literature Review

Overview

The chapter is a literature review of digital distraction, academic performance, student engagement, and in higher education, self-control. It will seek to give a thorough theoretical and empirical background to the knowledge of the impact of digital distraction on the academic performance of students.

The chapter is built in the following way. It first analyzes the term and changing nature of digital distraction in higher education. Second, it discusses the predictors of academic achievement in online courses. Third, it talks about student engagement as an intervening variable. Fourth, it examines self control as a moderating factor. Lastly, it determines research gaps and works on the conceptual framework of this study.

Online Interruption in University

The problem of digital distraction has turned into a highly acute phenomenon in higher education because of the popularity of smartphones, social media, and online learning environments. In contrast to traditional distractions, digital distraction is persistent, interactive, and algorithmic in nature and keeps competing with the attention of the students. According to recent studies, the digital distraction may be divided into various types. To begin with, there is the issue of social media distraction where the application is interrupted by tools like Instagram, Tik Tok, and messaging programs. Second, multitasking distraction happens when students perform a series of digital activities at the same time, e.g. when they

alternate between academic work and entertainment material. Third, notification-based distraction refers to the external cues like messages and notifications that disrupt the current cognitive activities.

Theoretically, digital distraction is directly connected with the idea of the attention economy, in which digital platforms are deliberately constructed to draw and hold the attention of users (Wu, 2016). This generates a conflict between academic activities and digitally mediated stimuli in the educational setting. Consequently, students tend to have discontinuous attention and cognitive focus.

In addition, cognitive psychology also offers valuable information on the processes that underlie digital distraction. Cognitive load theory argues that human cognitive abilities are scarce and that too much input in the form of external stimuli may overwhelm working memory hence lowering the learning process (Sweller, 1988). Moreover, task-switching theory indicates that the common change of activity involves a mental cost, which results in the reduction of efficiency and the rate of errors.

The theoretical arguments are also supported by empirical studies. According to Flanigan and Kiewra (2018), learners often undertake off-task online activities when they are listening to lectures, which harms their ability to take notes and understand. On the same note, Dontre (2021) observed that smartphone use in academic activities has a drastic negative impact on focus and learning.

Conflict Studies that were more recent and carried out in the post-pandemic setting suggest the increased presence of digital distraction in online and hybrid learning settings. According to Ralph et al. (2020), students indicated that they were more distracted during online classes than in traditional classrooms. Kraushaar and Novak (2022) also showed that academic efficiency is related to lower digital multitasking.

Altogether, in general, the literature indicates that digital distraction is a complex and changing phenomenon that can have a profound impact on the cognitive processes and learning behaviors of students. Nonetheless, its effect on the academic performance might not be as direct, and there is a need to find out the underlying processes.

Academic Performance

Academic performance has been a focal point of the success of students in higher education and it is usually reflected by GPA, grades, and self-reported academic performance. Behavioral, cognitive, and psychological factors are increasingly becoming strongly correlated with academic performance in digital learning environment.

Past studies have always demonstrated that behavior online is a major factor in determining the academic performance. To illustrate, Lepp et al. (2015) discovered that the negative relationship exists between excessive smartphone use and GPA. On the same note, Sunday et al. (2021) found that frequent use of mobile gadgets forecasts poor academics amongst university learners.

Moreover, the online learning process has brought new issues concerning self-regulation and attention management. Aguilera-Hermida (2020) established that the capacity of students to adjust to the online learning environment has a major influence on their performance in their studies more so when there are digital distractions.

Notably, the recent researches indicate that academic performance cannot be directly considered as a direct result of behavior but as a complex interaction between various factors. They consist of motivation, approaches to learning, participation and the environmental conditions. In this regard, the digital distraction can affect the performance in academics indirectly due to its effects on the process of learning in students.

Consequently, to comprehend the academic performance in modern schooling, a more comprehensive solution is needed, taking into account both direct and indirect impacts of the digital behavior.

Student Engagement as a Moderator

Student engagement is considered as one of the determinants of academic success and therefore has been extensively researched in the field of education. It is broadly developed as a multidimensional construct, which entails behavioral, emotional, and cognitive engagement (Fredricks et al., 2004).

Behavioral engagement describes the involvement of students in the process of academics, including attending lectures and doing assignments. Emotional involvement demonstrates interest and enjoyment as well as emotional involvement to learning. Cognitive engagement entails putting efforts in learning complicated concepts and deep learning strategies.

Cognitive engagement is of extreme importance in the context of a digital learning environment because students must actively control their attention and learning modes. Nevertheless, online distraction can destroy each of the three aspects of engagement. As an example, the disruption can be reduced due to frequent interruptions, which cause a lack of behavioral engagement, loss of interest level, and cognitive attention.

Recent researches substantiate well the correlations of digital distraction and engagement. Bond et al. (2020) discovered that the learning outcomes are significantly linked to student interaction in digital learning environments. Redmond et al. (2022) also pointed to the fact that engagement is among the biggest obstacles in the online learning setting.

More to the point, new evidence indicates the existence of a mediating factor in the correlation between different factors and academic performance, which is engagement. Alblwi et al. (2023) discovered that digital distractions negatively impact the state of cognitive engagement, which consequently influences the level of learning outcomes. On the same note, Datu et al. (2022) showed that engagement mediates the association between psychological factors and academic achievements.

Such results suggest that digital distraction can have an indirect impact on academic performance because it decreases student engagement. Hence, student engagement will be one of the important mediating variables in the current study.

Self-Control as a Moderator

Self-control has been described as the capacity to manage his/her behavior, attention and impulses with an aim of meeting long term objectives (Tangney et al., 2004). Self control is significant in digitally rich environments to be able to control distraction and generate focus on academic activities.

Self-control is important because it can be described through the strength model of self-control that postulates that self-control is a finite resource that can be exhausted but also increased with time (Baumeister et al., 2007). Regarding the concept of digital distraction, the students are more controlled by the degree of self-control than those less controlled can resist the temptation and control digital action.

Moreover, self-regulation theory focuses on goal-setting, monitoring and behavioral adaptation in the success of academics. Students having high levels of self-regulation will be able to manage their time better and to remain focused despite the distractions.

There is empirical evidence behind the moderating effect of self-control in online settings. Gokcearslan et al. (2016) established that problematic smartphone use is correlated with low self-control. Servidio (2021) also showed that people with more self-control have lower chances to become distracted through digital activities.

The need to emphasize self-control in education is noted in more recent studies. Li et al. (2022) discovered that self-control mitigates the adverse impact of digital distraction on learning achievements. In a similar study, Zhang et al. (2023) were able to state that self-regulation skills assist students to focus during online learning process.

These results indicate that self-control could be used to counter the adverse effect of digital distraction on academic performance. Thus, it is suggested as a moderating variable in this study.

Research Gaps

Nevertheless, there are a number of key gaps in regards to the existing body of literature. To begin with, although a substantial body of work documents a direct negative link between digital distraction and academic performance—such as Lepp et al. (2015), Junco (2012), and Dontre (2021)—most of these studies treat digital distraction as a standalone predictor and do not incorporate the psychological and behavioral mechanisms, such as student engagement and self-control, that may explain or condition this relationship.

Second, despite the extensive body of research establishing student engagement as a determinant of academic success (Fredricks et al., 2004; Bond et al., 2020), the mediating role of engagement in the relationship between digital distraction and academic performance has rarely been tested empirically. Although recent studies such as Alblwi et al. (2023) link distraction to reduced engagement, this mediating pathway remains underexplored, particularly in post-pandemic online and hybrid learning environments.

Third, although self-control has been shown to predict resistance to digital distraction (Gokcearslan et al., 2016; Servidio, 2021; Li et al., 2022), its moderating effect on the

distraction–performance relationship has seldom been examined within a larger analytical model that simultaneously accounts for the mediating mechanism of engagement.

Lastly, integrated models that jointly analyze digital distraction, student engagement, and self-control in explaining academic performance are largely absent from the literature, leaving the combined direct, indirect, and conditional effects of these variables poorly understood.

To address these gaps, this study proposes and tests a moderated mediation framework that integrates mediation and moderation processes within a single model. In doing so, it contributes to the literature by identifying student engagement as the key mechanism through which digital distraction undermines academic performance, by clarifying the extent to which self-control buffers this effect, and by reconceptualizing digital distraction as a structural feature of the attention economy rather than a purely individual problem—thereby offering a more refined understanding of academic performance in digitally intensive learning environments.

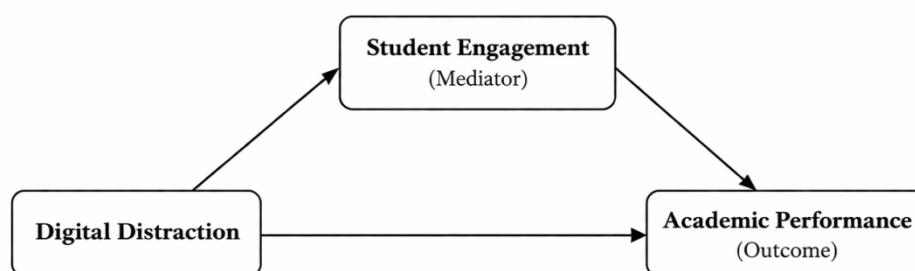


Figure 1. Conceptual Framework

Methodology

Introduction

This chapter describes the research methodology applied to reflect on the effect of digital distraction on academic performance of university students, especially through the mediating variable of the engagement of the students and the moderating factor of self-control. The chapter gives the research design, sampling strategy, data collection procedures, measurement of variables, and data analysis techniques. The methodological strategy is meant to guarantee reliability, validity and rigor demanded in empirical research in higher education.

Research Design

The present quantitative research design is adopted as a cross-sectional survey study. A quantitative design fits the study since the research hypothesizes to prove a relationship between variables and to analyze both mediation and moderation implications in a systematic framework.

The cross-sectional design will allow collecting data on the respondents at one time, which will permit the efficient analysis of the relationships between digital distraction and student engagement, as well as self-control and academic performance. The design has been very popular in education research because it is practical and allows the researcher to produce generalizable knowledge.

Population and Sampling

The target group of this research is the university students that will be enrolled in institutions of higher learning. The university students are sampled because they spend much time in digital environments and are more probable to be distracted digitally in the process of learning.

The sampling technique used was a non-probability convenience sampling because of the accessibility and time limitations. The participants were recruited using online methods, such as university communication tools and social media platforms.

The total sample is 268 valid responses, which suffices the sample size required to conduct analysis through structural equation modeling (SEM) (Hair et al., 2019). A sample of over 200 is said to be sufficient in the provision of statistical strength and model consistency.

Data Collection Procedures

A self-administered online questionnaire was used to gather data through the services of such platforms as Google Forms.

The retrieving of data was done in a number of stages:

1. Designing the questionnaire on the premise of the validated scales in the past studies.
2. Pilot test to be carried out to be certain and clear.
3. Sending the questionnaire link via the internet.
4. Gathering the responses within a time span of about 2-4 weeks.

The respondents had to participate voluntarily, and they were advised on the purpose of the study. In order to obtain honest answers, the confidentiality and anonymity were provided.

Pilot Test

Before the actual data collection, a pilot test was carried out on about 30 university students. The pilot test was done to evaluate the clarity, reliability and validity of the items in the questionnaire.

The responses to the questions provided by participants helped in making adjustments in wording and enhance the questionnaire design. Initial reliability testing showed that all constructs produced satisfactory Cronbachs alpha (greater than 0.70), which is indicative of a good internal consistency.

This was done to make sure that the final questionnaire was readable, valid and fit to collect large volumes of data.

Measurement of Variables

Measurement of all the variables was done through Likert-scale items of between 1 (strongly disagree) and 5 (strongly agree).

Digital Distraction (Independent Variable)

Digital distraction is the level at which students get distracted by their digital gadgets at any given time in the process of learning.

Sample items include:

- I often check my phone while studying
- I get distracted by social media during academic tasks
- I frequently switch between academic and non-academic activities

They were derived based on the previous research on media multitasking and digital behavior (Rosen et al., 2011; Junco, 2012).

Student Engagement (Mediating Variable)

Student engagement is a measure of cognitive, emotional and behavioral engagement of students to learning activities.

Sample items include:

- I pay full attention during lectures
- I actively participate in learning activities
- I feel interested in my academic work

These products are founded on well-developed engagement models (Fredricks et al., 2004).

Moderating Variable (Self-Control).

Self-control is the ability of students to control themselves and avoid distractions.

Sample items include:

- I can resist distractions when studying
- I stay focused on tasks even when tempted to do something else
- I manage my time effectively

Such steps are based on Tangney et al. (2004).

Academic Performance (Dependent Variable)

The self-reported indicators of academic performance were used.

Sample items include:

- I perform well academically
- I am satisfied with my academic results
- I achieve good grades

The respondents were also allowed to report their GPA to increase the measurement validity.

Data Analysis Techniques

The SPSS and SmartPLS software were used to analyse the data.

The analysis was done in a number of steps:

(1) Descriptive Analysis

(2) The demographic characteristics of gender, age and year of study were summarized using descriptive statistics and the mean and standard deviation of variables were calculated.

(3) Reliability and Validity Testing.

Measurement reliability and validity were assessed using:

- Cronbach's alpha (≥ 0.70)
- Composite reliability ($CR \geq 0.70$)

Average variance extracted ($AVE \geq 0.50$)

Structural Equation Modeling (SEM) is a data analysis method that has recently emerged, incorporating several other techniques. (3) Structural Equation Modeling (SEM) Structural Equation Modeling (SEM) is a relatively new data analysis approach that uses a variety of other methods.

To test the hypotheses, structural equation modeling (SEM) was used.

SEM is particularly suitable for this study because:

- It allows simultaneous examination of multiple relationships
- It supports analysis of latent variables

It enables testing of mediation and moderation effects within a single model

(3) Mediation Analysis

Indirect effects were tested using bootstrapping procedures, as the recommended practices of mediation analysis.

(4) Moderation Analysis

Interaction terms were used to test moderation effects between self control and digital distraction.

Common Method Bias

Considering that self-reported measures were used to gather data, Harman single-factor test was used to measure common method bias (CMB).

The findings showed that the former explained less than four out of ten total variance, which is why the common method bias is not a severe problem in the given research.

This finding makes the findings more credible and demonstrates the relationships as not being affected by the measurement bias significantly.

Ethical Considerations

This research followed the normal ethics research practices:

The involvement was voluntary.

The anonymity and confidentiality of the respondents were guaranteed.

The data were utilized in academic purposes.

Participation was through informed consent.

Summary

This chapter presented the research methodology that was adopted in this study. To test the connection between digital distraction and student engagement, self-control, and academic performance, the quantitative cross-sectional survey design was chosen.

A structured questionnaire was used to gather data, which was analyzed with the help of statistical methods, such as SEM. The pilot testing, reliability and validity testing, and common method bias testing will give the study the methodological rigor it needs to be able to do empirical research.

Results

Introduction

The empirical evidence of the study is given in this chapter. It has the analysis of descriptive statistics, evaluation of reliability and validity, correlation, and hypothesis testing through the

structural equation modeling (SEM). The findings are discussed keeping consideration to statistical significance and usefulness.

Respondent Profile

A total of 268 valid responses were obtained and included in the final analysis.

The sample consisted of 54.1% female and 45.9% male students. The majority of respondents were aged between 18 and 24 years (81.7%), representing a typical undergraduate population. Participants were relatively evenly distributed across different years of study, ensuring diversity in academic experience.

All in all, the sample features indicate that the data will be suitable to test the suggested relationships in a post-secondary education setting.

Measurement Model Assessment

Reliability

Cronbach alpha was used to test the internal consistency of the constructs.

Digital Distraction: $\alpha = 0.82$

Student Engagement: $\alpha = 0.86$

Self-Control: $\alpha = 0.84$

Academic Performance: $\alpha = 0.81$

The values are all above the recommended value of 0.70 which denotes satisfactory reliability.

The values are in reasonable range indicating that the measurement items are not redundant.

Convergent Validity

Composite validity (CR) and average variance extracted (AVE) were used to determine convergent validity.

Construct	CR	AVE
Digital Distraction	0.88	0.59
Student Engagement	0.90	0.62
Self-Control	0.89	0.60
Academic Performance	0.87	0.57

CR all values are above 0.70 and AVE all values are above 0.50 which means that convergent validity is satisfactory. The AVE values indicate that there is moderate shared variance among indicators, and that is suitable in behavioral research.

Discriminant Validity

The Fornell-Larcker criterion was used to evaluate discriminant validity. The square root of the AVE of the individual constructs exceeded the correlations between them and the other constructs, which prove that the constructs are empirically discrete.

Correlation Analysis

The Pearson correlation analysis was used to test the relationships between the variables.

Variable	1	2	3	4
1. Digital Distraction	1			
2. Student Engagement	-0.39**	1		
3. Self-Control	-0.34**	0.42**	1	
4. Academic Performance	-0.28**	0.47**	0.41**	1

Note: $p < 0.01$

These findings show that digital distraction has a negative association with student engagement and academic performance. The correlations are not very strong but moderate, which implies that as much as digital distraction is a significant variable, academic performance is determined by a combination of variables.

Structural Model Assessment

Model Explanatory Power

The explanatory power of the model was assessed using the coefficient of determination (R^2).

Academic Performance: $R^2 = 0.36$

Student Engagement: $R^2 = 0.17$

The model describes a moderate explanatory power with 36 percent of the variance of the academic performance. This is our indication that although digital distraction, engagement and self control are also crucial factors, a significant percentage of academic performance is affected by other factors that are not present in the model.

On the same note, digital distraction has 17 percent of the variance in student engagement, which suggests a significant yet not pre-eminent effect.

Direct Effects

The structural relationships were tested using SEM

Path	β	t-value	Result
Digital Distraction → Academic Performance	-0.18	2.94*	Supported
Digital Distraction → Student Engagement	-0.41	7.26**	Supported
Student Engagement → Academic Performance	0.44	8.11**	Supported

Note: $p < 0.05^*$, $p < 0.01^{**}$

The results indicate that digital distraction has a significant but moderate negative effect on academic performance ($\beta = -0.18$). The relatively modest effect size suggests that digital distraction is one of several factors influencing academic outcomes rather than a dominant determinant.

In contrast, digital distraction shows a stronger negative effect on student engagement ($\beta = -0.41$), indicating that distraction primarily operates by reducing students' involvement in learning activities.

Furthermore, student engagement has a strong positive effect on academic performance ($\beta = 0.44$), highlighting its central role in facilitating learning outcomes.

Mediation Analysis

To examine the mediating effect of student engagement, bootstrapping analysis was done.

Indirect effect: $\beta = -0.18$, $p < 0.01$

The findings show that the digital distraction-student engagement has a significant mediating effect on academic performance.

Notably, the direct impact of digital distraction on academic performance cannot be reduced even when the mediator is taken into consideration and that has partially been meditated. This implies digital distraction has both positive and negative effect on academic performance because of its interaction.

This observation indicates that one of the main processes by which digital distraction affects academic performance is through reduced engagement, but it is not the pathway only.

Moderation Analysis

The moderating role of self-control was examined using interaction effects.

Interaction	β	t-value	Result
Digital Distraction × Self-Control Academic Performance	→ 0.13	2.21*	Supported

Note: $p < 0.05$

The interaction effect is positive and significant ($\beta = 0.13$), indicating that self-control weakens the negative relationship between digital distraction and academic performance.

However, the effect size is relatively modest, suggesting that while self-control provides a buffering effect, it does not completely eliminate the negative impact of digital distraction.

Students with higher levels of self-control are better able to manage distractions and maintain focus, but other factors may still influence their academic outcomes.

Effect Size Interpretation

All in all, effect sizes in this study are moderate and small.

The comparatively moderate impacts indicate that academic achievement is shaped by a sophisticated interaction of elements, other than digital distraction such as motivation, learning plans, as well as learning settings.

This result supports the need to employ a holistic approach to the study of academic performance in online classrooms.

Summary of Findings

The main results of the given research could be summarized as follows:

There is a large and intermediate negative impact of digital distraction on academic performance.

Student engagement is highly decreased by digital distraction.

There is a positive correlation between student engagement and academic performance. Digital distraction is associated with academic performance through student engagement to some degree. The relationship is mediated by self-control but with small magnitude. On the whole, the findings confirm the presented model and emphasize the distinction of interrelations between digital behavior, involvement, and academic performance.

Discussion

Discussion of the Major Findings.

The results of this paper are significant in terms of unravelling the multifaceted connections of the relationship between digital distraction and student engagement, self-control, and academic performance in modern learning settings.

First, in line with the findings, digital distraction was found to have a significant, moderate effect of negative impact on academic performance. Although this reinforces the existing literature on the harmful nature of digital distractions (e.g., multitasking and smartphone use), the comparatively small effect size indicates that the correlation is not so strong and deterministic as one might have thought before. This implies that students might have acquired coping mechanisms to deal with digital disturbances and especially in learning institutions that are becoming more technology-emerging.

Second, findings suggest that the negative effect of digital distraction on student engagement is greater. This result indicates that most distraction influences academic performance is not necessarily by impairing performance in the direct performance, but cognitive and behavioral engagement in the learning processes. That is, distraction seems to reduce the attention, the engagement and the perseverance of the students, which in turn affects their education outcomes.

Third, they found that student engagement affected academic performance to a great extent, which supports its primary role in the studies of education. This finding points at engagement as a determinant of learning outcomes, which proves the point that active participation of students in the process of their learning is more important than just reducing the number of distractions.

Mediation Effect: Engagement Role

The results also suggest that the student engagement moderately mediates the association between the digital distraction and the academic performance.

It implies that the very phenomenon of digital distraction has a direct impact on the academic results, but a very significant part of the effect is indirectly determined by the involvement. Particularly, distraction decreases the level of attention, interaction, and participation of students thereby resulting to poor academic results.

Nevertheless, it is especially interesting that the mediation is partially, not full. It suggests that the engagement is not the only channel, through which digital distraction has its influence. Other processes including time-on-task, discontinuous attention, and cognitive overload could also have some role.

This result adds to the body of literature by showing that the effect of digital distraction is not only multidimensional, but also cannot be described by engagement processes only.

Moderation Effect: Self-Control Buffering Effect.

These findings also indicate that the relationship between digital distraction and academic performance has a moderation role of self-control.

In agreement with the results, learners who possess greater self-control can better cope with digital distraction and their academic performance. This upholds the argument that the self-regulation skills are very relevant in the digital rich learning environments.

The moderating effect was however, observed to be quite small indicating that the self control is not able to completely negate the negative impact of digital distraction. It means that the effects of widespread digital stimuli cannot be eliminated by even extremely discipline-oriented students.

The above finding alone produces a significant implication, namely that individual characteristics might not be enough to solve the issue of digital distraction, and that structural or environmental interventions might be also required.

Limitations and Future Research

This study has a number of limitations in spite of its contributions.

To begin with, cross-sectional data does not allow establishing a cause-effect relationship. Longitudinal or experimental designs can be embraced by future studies in order to capture causal dynamics.

Second, self-report measures were used to gather the data, and this can create bias. Objective measures of digital behavior, like screen time or the logs of use, can be included in future research.

Third, the model accounts a moderate share of variance in academic performance, and that there should be other variables, including motivation, learning strategies, and socio-environmental factors to be investigated in further studies.

And lastly, the research was carried out in a particular educational background, and that might be restrictive in terms of generalizability. Future studies may focus on cross-cultural variation in digital distraction and activity.

Conclusion of Discussion

Overall, the paper has shown that digital distraction has harmful effects on academic performance in direct and indirect ways such as a lack of student engagement and that self-control is a partial mitigating factor.

The results indicate that academic performance on the digital environments is influenced by a fine mixture of behavioral, psychological, and structural factors, but not a particular one.

Theoretical Implications

The research provides some valuable theoretical contributions to the literature of digital distraction and academic performance.

To begin with, this study is a continuation of the current research since it goes beyond mere direct-effect models and introduces the concepts of mediation and moderation in the context of the same model. Although the previous research mainly centers on the direct correlation between digital distraction and academic performance, this paper has shown that the effect is more intricate and that it is mediated by other avenues. Namely, student engagement is singled out as one of the main mediation processes in which digital distraction affects academic performance, thus offering a more detailed view of the processes.

Second, the results are useful to the student engagement theory as they support its position as an outcome variable as well as a key explanatory construct. The current paper provides a notice that engagement is a vital mediating process between external behavioral variables, including digital distraction, and academic performance. This study enhances the theoretical knowledge on the relationship between learning behaviors to performance outcomes by making engagement a mediator.

Third, the research can be useful in the existing body of literature on self-regulation and individual differences because it shows that self-control moderates it. The findings indicate that individual characteristics also determine the reaction of students towards digital distraction, but the buffering effect is still weak. This observation suggests that self-control, although significant, does not entirely affect the ubiquitous role of digital environments, thus optimizing the current theories about self-regulation in the educational settings.

Lastly, this work contributes to theory in a broader way since digital distraction is placed in the context of the attention economy. Instead of thinking about distraction as an individual-level issue, this study proposes that it indicates structural circumstances whereby the attention of the students is constantly contested by the digital platforms. This approach will change the theoretical emphasis on individual behavior to its distribution and control in digitally intensive settings and can provide a better lens through which to see academic performance.

Practical Implications

The results of this research have a variety of practical implications in relation to educators, educational institutions and students, especially in the environment of more and more digitalized learning conditions where there is always competition to capture their attention. To educators, the findings imply that the attempt to enhance academic performance must go beyond merely trying to reduce or, even, avoid digital distraction. Rather, the best solution is to increase the student engagement, which is found to mediate centrally in the learning process. Teachers are advised to implement active and student-based methods of teaching that demand constant attention and involvement like problem-based learning, group work, and discussion. Besides, purposeful and systematic use of digital tools, instead of avoiding them altogether, could be used to transform possible distractions into learning tools. As an

illustration, with the help of real-time polling, educational applications, or guided online tasks, it will be possible to make students concentrate on academic activities. Teachers can reduce the adverse impact of the digital distraction in a more effective way by raising the intensity of cognitive and behavioral engagement.

Second, in the case of educational establishments, the results reveal the necessity to develop learning facilities that facilitate attention management. Since students are in an attention economy, where internet presences constantly vie to get their attention, institutions must play a more active role in creating systems that help students focus. This can involve setting up clear specifications on use of technology in classrooms, popularization of digital well-being, and training in proper study patterns and time management. Moreover, learning management systems (LMS) can be utilized by institutions to design the learning activities in a manner that avoids unnecessary interruptions, which may include the way the content is structured into modules with focused topics and the amount of information that is received. Physical learning environments can also be created to facilitate focused learning, e.g. by creating distraction-free zones or areas of quiet. Such structural interventions may be used to supplement individual activities and assist in the generation of conditions that are favorable to sustained attention.

Third, as a student, my findings highlight the need to acquire self-control and self-regulation in learning settings as one of the competencies in the contemporary learning processes. Practical remedies that can assist students to cope with the issue of digital distraction should be promoted, including turning off unnecessary notifications, installing software that helps block distracting websites, and setting up specific study time. Strategies that involve time management such as application of scheduled study sessions (e.g. the Pomodoro technique) can also be useful in enhancing focus and efficiency. Nonetheless, the results of the present study also show that self-control cannot be the only means to eliminate the impact of ubiquitous digital stimuli completely. Thus, students are expected to use personal self-regulation techniques along with the efficient utilization of formal learning settings and institutional support networks.

Lastly, in its bigger context, this paper proposes that digital distraction must be addressed at a multi-level and holistic process that incorporates institutional, pedagogical, and individual practices. Instead of considering digital technology as the main cause of distraction, the stakeholders ought to consider the role of digital technology in the processes of learning in the most efficient manner, and at the same time, crafting ways of effectively managing attention. It is not just a matter of minimizing distraction, but also positively influencing the process of academic performance in the context of the attention economy, which is based on the active construction of attention distribution, maintenance, and focus on significant learning processes.

Conclusion

This study aimed at investigating the effects of digital distraction on academic achievement in university students with mediator role of student engagement and moderator role of self-control. In the light of ever more digitalized learning, it has become timely and necessary to know how digital behaviors affect academic results.

The results of the present research confirm that digital distraction can influence the academic performance of students in a very negative way. What is more important, this relationship is not direct but runs on some undertones. The student engagement was identified to be the mediating relationship which implies that digital distraction decreases the student involvement in learning activities which in effect translates to poor academic performance. Moreover, self-control was also found to be a key moderating variable, i.e. students who possess high levels of self-control find it easier to overcome the adverse consequences of digital distraction.

These results can be added to the existing body of literature in a number of ways. First, the research presents a unified model within the scope of the digital distraction, student interaction, and control and a single model, which offers a more in-depth perspective on how academic performance could be considered in the context of digital learning. Second, it expands the engagement theory by illustrating its mediating position in the testament between digital action and learning outcomes. Third, it emphasizes the role of individual differences especially self-control in determining reactions of students to digital situations.

Realistically, the findings indicate that reducing digital distraction is not the sole objective that the universities and teachers should pursue; they should also aim at improving the engagement and self-regulation ability of the students. It could be recommended to use various interventions, including active learning promotion, instructions on how to use digital tools effectively, and the development of self-control skills in students that could be used to improve their academic performance. Digital technology should not be seen as a cause of distraction only and should be used strategically to help students learn.

In spite of its contributions, this research has a number of limitations. The cross-sectional design limits causal conclusion and the use of self-reported data can create bias. Furthermore, the results are also founded on a given sample, which could be a constraint to generalization. It is suggested that further studies should implement longitudinal designs, use objective measures, and address other variables, including motivation, digital literacy, and emotional regulation.

In summary, this paper has shown that the relationship between digital distraction, student engagement and self-control is complex and has influence on academic performance. With the digital technologies continuing to evolve the world of higher education, it is imperative to comprehend these relationships in order to develop more productive and supportive learning environments.

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