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Article

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Abstract: For almost a decade, Twitter use and its impact on students' academic performance have been explored by many researchers. Despite growing scholarly interest, studies have been mostly quantitative in nature. The findings of previous studies are conflicting; thus, an in-depth study is needed to determine how and what impacts college students' academic performance (i.e., GPA) when they spend time on Twitter. The purpose of this study was to understand the effects of Twitter use on college students' academic performance. The present study shows that individual analysis techniques, such as quantitative or qualitative tools, are not enough to understand the underlying relationship. Therefore, a mixed-method approach (i.e., correlation and discourse analysis) was used to analyze the research data. Undergraduate students responded ($N = 498$) to a set of items along with some open-ended questions ($n = 121$). The results of this study indicate that how students use Twitter matters more than the amount of time they spend using it for their studies.

Keywords: academic achievement; mixed-methods; social media; Twitter

1. Introduction

Twitter is one of the most used social networking applications (Aharony 2010; Amiruzzaman 2019; Amiruzzaman and Amiruzzaman 2021; Calderón et al. 2020; Junco et al. 2013; Tang and Hew 2017). People of different ages are using Twitter in their day-to-day lives (Kausar et al. 2021; Lasorsa et al. 2012). Additionally, it has become a popular social outlet for undergraduate and graduate students (David et al. 2018; Bista 2015; Sewell 2013). Authors of earlier studies mentioned that Twitter helps to broadcast and share information via the internet (Martínez-Rojas et al. 2018; Aharony 2010; Junco et al. 2011, 2013). Every day, millions of people are using Twitter to communicate and share information (Aslam 2017; Coad 2017; Mao 2014; Parra et al. 2016). As a social media platform, Twitter has different effects on university students' learning, social interactions, and sleep duration (Singh 2020). Some researchers have found that using social media or social networking sites helps students to do better in their college studies (Malik et al. 2019; Junco et al. 2011, 2013; Lin et al. 2013; Mao 2014). However, other researchers think that students are spending a lot of time using social networking sites because their social life is centered around online and social media. Because of this, the use of social media may affect their academic performance negatively (Alnjadat et al. 2019; Flanigan and Babchuk 2015; Kirschner and Karpinski 2010). For example, Kirschner and Karpinski (2010) wanted to see how many college students use Facebook and how the use of Facebook influences their academic performance. Their results indicated that Facebook users have a lower mean grade point averages (GPA) than nonusers, due to fewer hours of studying per week than Facebook nonusers. Similarly, Flanigan and Babchuk (2015) view technology as a distraction for students. These researchers took a closer look at Facebook and Twitter. Students' learning and achievement were the basis of this research. Conflicting findings in the existing literature have led us to believe that there may be factors affecting students'

GPAs other than the amount of time they spend on social media platforms, such as Twitter. The present study tries to understand the relationship between Twitter use and students' academic achievement in-depth, rather than just depending on survey answers or ratings of their preferences.

The purpose of this study was to understand how college students' use of Twitter (i.e., a social networking site) is affecting their academics (i.e., GPA). Furthermore, it examined how students' views on Twitter and their academic performance are related. The next section discusses the theoretical framework to better understand how social learning theory applies to social networking applications, such as Twitter.

In this study, the following research questions were investigated:

1. What is the effect of students' use of Twitter as a social networking site (SNS) on their grades?
2. How do students justify their use of Twitter for their academics?
3. How do students' justifications explain the statistical effect on their grades?

Therefore, it is important to investigate how this social networking application is affecting students' learning and what students think about this application for their academics. In addition, we examine how students' views on a social networking application and their academic thinking affect their academic performance. The purpose of this study is to explore students' views on Twitter use and how time spent on Twitter affects their GPA. This study examined social aspects, such as using Twitter to communicate with peers and instructors to help students in their studies.

Theoretical Framework

The theoretical framework of this study is based on Bandura's (1969) social learning theory and Vygotsky's (1978a) social cultural theory. Vygotsky (1978a) states " . . . human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (p. 34). Hence, students must communicate with each other, in turn, which helps them to learn from each other (Coad 2017; Lin et al. 2013; Tu 2000). Vygotsky also mentioned that people learn from each other through communication and interactions (Vygotsky 1978b). To emphasize the importance of communication and interaction, Bandura (1969) stated that "learning is bi-directional". People learn by teaching and sharing with others. The fundamental idea of this study was that social networking applications, such as Twitter and Facebook, affect students' learning. However, a few studies about the use of social networking applications among college students have revealed that when students spend too much time on a social networking application, their academic performance decreases (Astatke et al. 2021; Kirschner and Karpinski 2010; Pedersen et al. 2018). However, it did not explore social aspects, for example, social learning, how students' views affect their use of social media, and how it affects them.

2. Literature Review

Technology is evolving very fast, as are the technological habits of young people. New technologies are coming to light every day and the new generation of students is able to learn them and adapt to new developments very fast. It makes sense that students growing up in this technology-rich environment are referred to as the Net Generation (Flanigan and Babchuk 2015). Further reading gives this technology-rich generation the title "Homo Zappiens" (Kirschner and Karpinski 2010). Whatever this generation is referred to as, the reality is that technology is a very present part of their world. There is a discussion about the advantages and disadvantages of this environment for students. There is continued work analyzing the consequences of technology. While the use of technology may be faster and more convenient, questions arise about whether it is hindering students' skill sets as they mature. For example, Kirschner and Karpinski (2010) wanted to see how many college students use Facebook and how the use of Facebook impacts their academic performance. Their results indicated that Facebook users have a lower mean GPA than nonusers, due to fewer hours spent studying per week than Facebook nonusers. The evidence being

published continues to lean toward the idea that lower GPAs are associated with the use of social media.

Some researchers have hypothesized about students' multitasking skills. Multitasking was defined by Karpinski et al. (2013) as "the simultaneous/concurrent execution of two or more cognitive or information processing activities" (p. 1183). Rouis (2012) predicted that students who had multitasking skills were better at managing their time and effort for their schoolwork. Kirschner and Karpinski (2010) took a deeper look at multitasking and the assumption that these students were able to work effectively and efficiently. They found that a high level of work (in terms of effectiveness and efficiency) was not being produced while multitasking. Subsequently, Lau (2017) found that people were making assumptions about multitasking skills, but discovered a lack of skill sets in these students. Tasks were not being completed or were frequently broken up over a period of time, leaving the work inadequately done. This leaves room for improvement in their levels of focus.

There was no proof that technology, specifically social media access, was advantageous for students. What was being considered as the development or lack of development of students' skills? An advantage of using social media could be what Bekalu et al. (2019) discovered about students' emotional well-being. Rouis (2012) and subsequently Friedman et al. (2022) revealed that social media gave students more connections with people (e.g., parents, professors/teachers, friends, etc.) in a positive manner, which in turn caused students to care more about their academic performance. The premise was that if students felt connected to friends and family, they would then have the motivation and desire to do well in school. Social media could serve as a medium for students' social connections or as a social outlet.

Naqshbandi et al. (2017) looked at the personality traits of social media (i.e., Facebook) users. Personality factors were considered an important component of molding students' academic performance. Students who were shy or who were considered extroverted had different types of responses or purposes for social media. People may use this type of media to disseminate information while others use it as a means to socialize. These factors are also considered as the research results were given. Students' responses have become part of the work of researchers. This helps in understanding more components of how social media affects students' academic performance.

Researchers have mixed opinions about technology (Bekalu et al. 2019; Meier et al. 2016; Rouis 2012). For example, Imlawi et al. (2015) viewed technology as a distraction to students. These researchers specifically looked at Facebook and Twitter. Students' learning and achievement were the basis of this research. Some parents were concerned that the distraction of technology would affect students' academic performance. There was a constant pull to stay connected socially. The exposure and temptation might be due to emotions students cannot control, which may be leading to exposures that were not productive. Findings regarding this topic have determined that even though college students have continuous access to technology, they may not have the skills to best use it as students or professionals. This includes the self-discipline to be aware of the appropriate times to use social media. As stated, students often comment that they cannot help themselves but check their devices often, and this occurs during instruction and homework time.

Flanigan and Babchuk (2015) interviewed students and found that students did not feel confident in their computer use skills. The students had enough knowledge to get around technologically, socially, or for leisure, but did not know how to use programs sufficiently nor did they have strategies to stay off a device at inappropriate times. They lacked an understanding of how to gain a technologically savvy skill set; often they could not manage their time wisely and still learn how to use technology for their schoolwork or their jobs. For example, the students might not have known when to stop and take a break from the computer. Programs were being used within classrooms, but students were not being taught the basics. The basics could include keyboarding, shortcuts, correct grammar or sentence structure, and/or appropriate communication etiquette. Students wanted to be taught how and when to use technology advantageously. They wanted to know what was

expected because of they had a limited working knowledge of its usage. They also wanted to be held accountable by their instructors.

Roblyer et al. (2010) studied higher-education faculty members and students. At that time, there was a delay in the use of technology for instruction. Professors were reluctant to use technology as a teaching tool because some of them did not know how to use the latest technologies. Technology was generally used as a form of communication, as in emails. Again, the advances in technology were slow to be used by some people since they were not willing to learn or did not know how to apply it to the newer generations of students. This gap meant that the students were on their own to figure things out. This might be a shortcoming in their educational experience.

Another article by Moghavvemi et al. (2018) reported on the usefulness of technology in an academic setting. YouTube was found to be an effective tool. The use of this type of media could be helpful to enhance learning environments. It could be used to further the lesson on a subject. This type of technology could also be presented in a way to capture the learners' attention. It should be noted when these research articles were published. In the eight years of the research data, the use of technology has shifted in education. New programs have been integrated to heighten the engagement of students. Review games, such as Kahoot and Quizlet, have been useful. Presentation tools, such as Prezi, have become popular.

In a later study, Lau (2017) found that whether students used technology for academic purposes was not a significant predictor of their GPA. The study further reported that students using technology for non-academic activities and social media multitasking was a factor in students having lower GPAs. As stated earlier, the rate of technological advancements has paved the way for this evolving community. Built upon this study is the research conducted by Liu et al. (2017). Liu et al. (2017) concluded that there was a negative correlation between students' academic performance and their use of social network sites. This article concluded that there is a strong relationship between social media use and lower GPAs for females and college students. The impact of students with poor academic performance spending more time on social media was noted.

Interviewing students is an excellent way to get a better understanding of how technology affects students. In a study, Flanigan and Babchuk (2015) spoke with 10 undergraduate students and wanted to hear their perceptions of social media use. The students stated that social media was tempting to a fault. The students understood that their time was not well spent when they participated in social media activities. They could comprehend that it took away from their study time and quality work time. Students commented that they were willing to put in the additional time to be productive in their college studies so that they could also be active in the social community. Many students stated that they would retain more information if they were not active social media participants.

In a recent study, Tafesse (2020) proposed that how students engage on social networking sites is a determining factor in their academic performance. Social networking sites are a new source of information (Ansari and Khan 2020) on which young people, mostly college students, spend a lot of time absorbing a variety of types of information. However, constant connectivity with social networking sites could be harmful to students (Whelan et al. 2020), especially since they may be overloaded with information, negatively impacting their academic performance. The contradictory findings of existing studies have led us to conclude that perhaps an individual quantitative or qualitative study is not enough to understand the phenomena, and a mixed-methods study could provide a better understanding (see Table 1). Thus, the above literature supports the need for this study.

Table 1. Summary of the literature in favor and against the use of Twitter for students.

Advantages of Using Social Media	Disadvantages of Using Social Media
Students' psychological and emotional well-being, such as self-esteem and satisfaction with life (Bekalu et al. 2019)	Have a lower mean GPA than nonusers, due to fewer hours of studying per week than Facebook nonusers (Kirschner and Karpinski 2010; Pedersen et al. 2018)
Gave students more connections with people (e.g., parents, professors/teachers, friends, etc.) in a positive manner, which led students to care more about their academic performance (Rouis 2012)	Lack of multitasking (two or more processing activities at the same time); cannot perform tasks while using social media (Kirschner and Karpinski 2010)
Have enough knowledge to get around technologically, socially, or for leisure (Flanigan and Babchuk 2015)	Viewed as a distraction to students since it uses up their time for studying (Imlawi et al. 2015)
Could be helpful to enhance learning environments by allowing them to see different solutions to academic problems (Moghavvemi et al. 2018)	Did not know how to use programs sufficiently and did not have strategies to stay off a device when inappropriate (Flanigan and Babchuk 2015)
Students view Twitter as an opportunity for learning, networking, and personal branding (Friedman et al. 2022)	Excessive usage of SNS, inappropriate use of SNS, and usage of SNS for recreational activities other than those for educational purposes harmed students' academic achievement (Astatke et al. 2021)
Twitter was utilized in teaching and learning (Calderón et al. 2020; Tang and Hew 2017)	Institutional uses of Twitter are not living up to their potential as an educational or communication medium (Kimmons et al. 2017)

The rest of this paper is organized as follows: (1) the method section describes the data collection and data analysis procedures; (2) the results section follows the method section and presents the analyzed results; and (3) the discussion and conclusion section summarizes the paper and presents the implications. The purpose of the study was to determine how college students spending time on Twitter affects their GPA. In addition, the intention was to see how students justify their use of Twitter and how their justification is related to their academic performance.

3. Rationale for Mixed-Methods Design

Authors of previous studies tried to relate social networking applications and students' academic performance either based on statistical relationships or based on students' opinions (Junco et al. 2011, 2013; Parra et al. 2016). Quantitative research studies helped to investigate the relation between students' academic performance and the use of social networking applications (Junco et al. 2013; Kirschner and Karpinski 2010; Lian et al. 2018). Similarly, qualitative research studies helped to understand students' views about social networking (Ozer et al. 2014). However, there have not been studies that try to incorporate the use of social networking applications and students' academics, as well as their views about social networking applications. Both quantitative and qualitative data must be collected, analyzed, and integrated to understand the phenomenon better (Fetters et al. 2013; Srivastava and Chandra 2018). Therefore, a mixed-methods research study is used; that way, the research method can guide us to combine a statistical analysis and students' views to portray a clear picture of what might be happening. A mixed-methods research study will try to combine students' views on the use of social networking applications and their self-reported grade point average (GPA) and see if the phenomenon can be explained better.

4. Method

A concurrent-convergent design was used for this proposed study (see Figure 1). The concurrent-convergent design is a commonly used methodology in mixed-methods research. In this type of design, both quantitative and qualitative data collection processes take place at the same time (Creswell and Miller 2000). One of the advantages of this type of design is that it allows researchers to pay equal attention to quantitative and qualitative data, which later helps to integrate the research data and results for final findings (Guetterman et al. 2015). In this study, both quantitative and qualitative data were collected from the sample population. For the quantitative data collection, close-ended questions were used, and for the qualitative data collection, open-ended questions were used to capture participants' opinions/views on Twitter use in academia (Venkatesh et al. 2016).
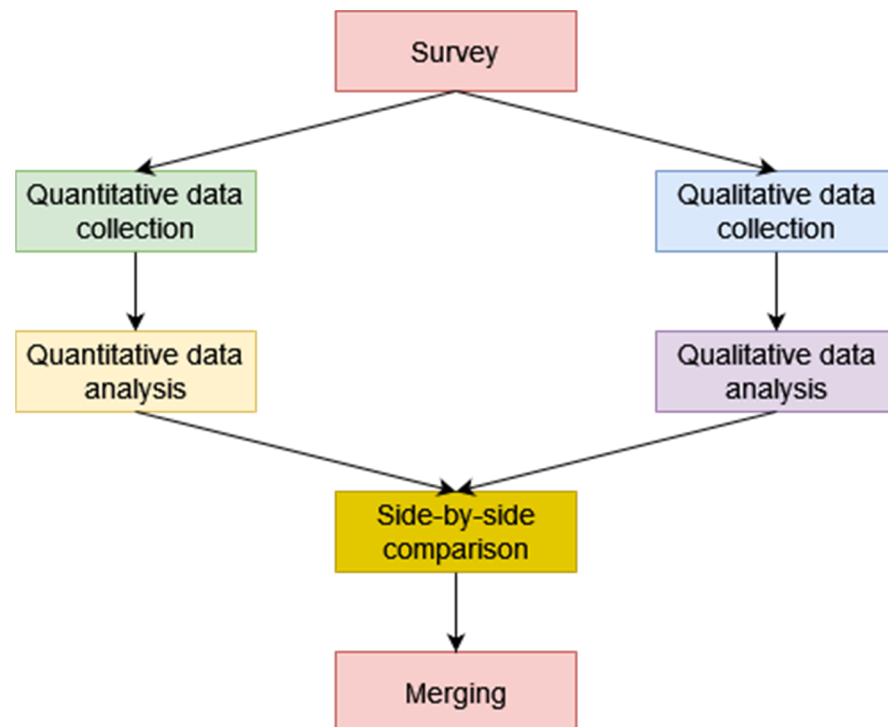

Figure 1. Design diagram of the research study.

This study focused on all college students as a population. However, it is not possible to collect data from all college students. Therefore, for sampling, this study only focused on students (e.g., undergraduate, graduate, and professional) from one university. Students were invited via social media and email to voluntarily participate in the study. The methodology is described in Figure 2 in algorithmic form.

Algorithm: Mixed-method study to understand the relationship between Twitter use and students' academic performance.

Collect data using a survey of closed-ended and open-ended questions

Quantitative analysis

Analyze close-ended or Likert scale-based data using

Qualitative analysis

Analyze open-ended questions answers using discourse analysis

Mixed-method

Combine both quantitative and qualitative data

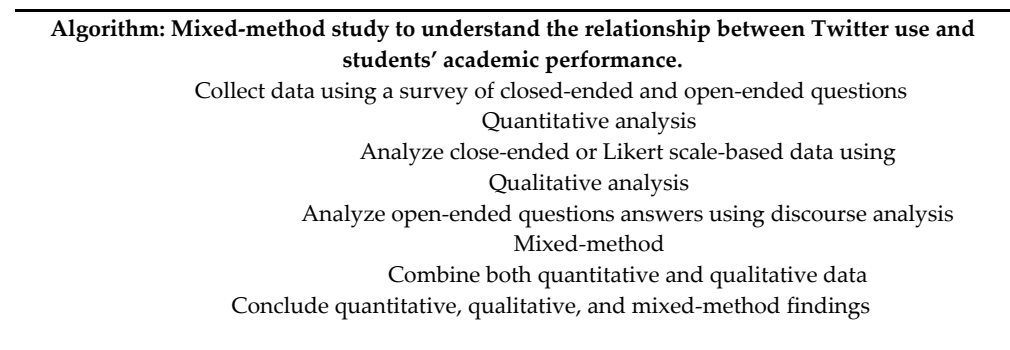Conclude quantitative, qualitative, and mixed-method findings

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Figure 2. The algorithm that guided this study.

5. Data Collection

Participants were invited via email, which provided the purpose of the study, directions to complete the survey, the survey web link, the investigators' contact information, and the Institutional Review Board (IRB) approval number. In addition, in the email invitation, it was mentioned that no identification information about the participants would be collected. The first half of the survey instrument was mainly Likert scale-based, in which most answers were provided using predefined ratings. Likert scales provide variability and ease for participants (Miller et al. 2003). It is important that participants feel comfortable while taking the survey. If they feel comfortable, then that helps to increase the rate of participation (Fowler 2002). The second half of the survey instrument consisted of open-ended questions, in which participants were able to enter their opinions or views to answer those questions. Open-ended questions are helpful to capture participants' views (Rudolph et al. 2007). In this study, open-ended questions were used to understand the use of Twitter among students and how they manage their time for their studies while they are using it.

6. The Quantitative Phase of the Study

6.1. Measures

A pilot study was conducted to validate the questionnaire. During the pilot study, there were 31 participants providing feedback, which helped us to improve the questions (i.e., make them clear, more precise, and remove redundant and irrelevant questions). In this study, based on the themes that emerged from the literature, we developed two scales (i.e., engagement and opinion), and these two scales were used to explore their use of Twitter and their opinions about it (see Figure 1). The engagement questions asked students how much time they spend on Twitter. The opinion questions asked students how they view using Twitter during their academic studies.

Three questions helped to understand how students are using Twitter to have deliberate conversations, debate or have discussions, and participate in special interest groups. Likewise, three questions helped to measure students' opinions about Twitter for their studies, such as group work, social interactions, and collaboration/sharing tools. All items on the scales were 5-point Likert scales.

The first scale, Twitter and Academic Engagement (TAE), has three aspects: (i) Twitter for deliberate conversation, (ii) Twitter for debate/discussion, and (iii) Twitter for special interest groups (SIGs). The second scale, Twitter and Students' Opinion (TSO) had three aspects: (i) Twitter for group work, (ii) Twitter for social interactions, and (iii) Twitter for collaboration/sharing (see Table 2). Samples of questionnaires for both scales are shown in Table 3.

Table 2. Scales and aspects of this study.

Scales	Aspects
Twitter and Students' Engagement (TSE)	Twitter for deliberate conversation Twitter for debate/discussion Twitter for special interest groups (SIGs)
Twitter and Students' Opinion (TSO)	Twitter for group work Twitter for social interaction Twitter for collaboration/sharing

Table 3. Scales and items of this study.

Scales	Items
Twitter and Students' Academic Engagement (TSE)	Approximately how often do you spend using Twitter per day? Approximately how often do you post/send tweets in a day? Approximately how often do you send retweets/replies in a day?
Twitter and Students Opinion (TSO)	Do you agree that Twitter is helpful for groupwork? Do you agree that Twitter is an outlet for social interaction? Do you agree that Twitter is helpful for academic collaboration?

For the TAE scale, there were three items on Twitter and students' engagement (*n* = 3 items, see Table 3). All items used a 5-point Likert scale indicating how often participants use their Twitter while participating in deliberate conversation, debated/discussiond, and special interest groups (SIGs) (Very Rarely = 1, Rarely = 2, Sometimes = 3, Often = 4, and Very Often = 5). For the TSO scale, there were three items on Twitter and students' opinions (n = 3 items, see Table 3). All items used a 5-point Likert scale indicating how participants' opinions impact their Twitter use while attending school-related activities or during leisure time (Strongly Disagree = 1, Disagree = 2, Neutral/Mixed Feeling = 3, Agree = 4, and Strongly Agree = 5).

6.2. Participants

Participant data (*N* = 498) were collected from undergraduates (*n* = 310; 62.25%) enrolled in bachelor's programs, graduates (*n* = 184; 37.02%) enrolled in either master's or Ph.D. programs, and professionals (*n* = 4; 0.0073%) enrolled in J.D (Law), Ed.S, or in certificate programs at a large, public university in the Midwest United States (U.S.) using a survey-hosting website. Students' ages ranged from 18 to 66 (*M* = 24.26, *SD* = 7.210). More specifically, 53.01% were between the ages of 18 to 25 (*n* = 264), 29.71%, were between the ages of 26 to 35 (*n* = 148), 15.06% were between the ages of 36 to 44 (*n* = 75), 1.40% were between the ages of 45 to 54 (*n* = 7), and 0.80% were between the ages of 55 to 66 (*n* = 4). There were 329 females (66.20%), 163 (32.80%) males, and 6 (1.00%) others. For ethnicity/race (*N* = 498), the largest proportion of students was White (*n* = 418; 83.94%) followed by Black (*n* = 29; 5.82%), Asian American (*n* = 42; 8.43%), and Latin American (*n* = 9; 1.81%). Finally, the majority of the respondents were Social Science majors (*n* = 192; 38.4%), followed by "Other" (*n* = 168; 33.8%), Natural Sciences (*n* = 50; 10.1%), Humanities (*n* = 38; 7.6%), Engineering (*n* = 33; 6.6%), and Business (*n* = 17; 3.5%).

7. The Qualitative Phase of the Study

7.1. Participants and Data Collection

The online survey included a few open-ended questions. Specifically, the second measure was designed to capture students' opinions/views on the use of Twitter. Not all participants answered the open-ended questions with complete sentences. Overall, almost one-fourth (*n* = 121) of the total sample participants answered the open-ended questions with complete sentences. Others mainly used a few words to complete the open-ended questions. One of the questions of open-ended questions was "Do you think that Twitter helps you to stay connected with your classmates and/or instructors/professors?—Maybe/Not Sure (Please Explain Below)". This question received the most attention from students, and they answered this question with complete sentences. The participants were 92 females and 29 males and ranged in age between 18 and 44 years.

7.2. Mixed-Methods Phase

The purpose of mixed-methods for this study was to understand the meaning of the quantitative findings with the help of qualitative data. A side-by-side comparison was used to integrate the qualitative and quantitative data (see Table 5); integration data using the mixed-method help to draw a better conclusion (Bergman 2008). Both quantitative and qualitative data were placed in a single table to see the relation between students' views

about the use of Twitter for their studies and their current GPA. The tabular view (i.e., a joint display) helped to determine how students' views and GPAs are related (see Table 3). Holding negative views and using Twitter were negatively correlated. In contrast, holding positive views and having a higher GPA were positively correlated. Some students have shown neutral views towards the use of Twitter, and it appeared that their GPA and use of Twitter did not have any relationship. Finally, the quality of inference was maintained by ensuring the validity, reliability, and trustworthiness of the research data in the quantitative, qualitative, and mixed-method sections, respectively.

8. Data Analysis

Answers from close-ended questions were the source of quantitative data, which were analyzed using quantitative methods (e.g., correlation). Quantitative analysis also included a validity test of the instrument and a reliability analysis of the quantitative results. The *validity test* is to check whether the results are accurate (Chapelle 1998) and the reliability test is to check whether the results are consistent (Stratford 1989). Answers from open-ended questions were analyzed using a discourse analysis as part of the qualitative analysis. A *discourse analysis* is used to study the structures or functions of underlying themes from participants' responses (O'Halloran et al. 2018; Van Dijk 2006). This approach is often referred to as a views-based analysis. In this study, college students' views about the use of Twitter for their studies were analyzed using the discourse analysis. In the qualitative analysis phase, coding and theme development took place; themes helped to identify larger categories of data. The further refinement of those themes (i.e., secondary theme development) helped to capture participant students' views about the use of Twitter.

9. The Quantitative and Qualitative Phase

First, a data cleanup was performed to make sure errors from incorrect data were corrected, for example, some students misspelled their major or college names. In addition, re-coding was performed for those variables, which needed to be recoded before conducting the quantitative analysis (e.g., ANOVA, correlation analysis). Additionally, the data were checked for outliers. Extreme values or *outliers* can be found when the values fall outside the normal range of values. Outliers could lead to a Type I or a Type II error (Lomax and Hahs-Vaughn 2012). To determine outliers, the Mahalanobis distance and Cook's distance tests are used, in which values of more than one are considered outliers. In this study, Cook's distance was used to find the outliers. None of the Cook's distance values were more than one. Therefore, we had correctly assumed there were no outliers.

The assumptions of the ANOVA were as follows: independence, normality, and homoscedasticity. In addition, using the Kolmogorov–Smirnov (K–S) test, the normality assumption was tested. The analysis indicated that $p > 0.05$ for the K–S test; therefore, the normality assumption was met. Moreover, a Q–Q plot and histogram analysis were performed to confirm the normality (in which the data were indeed normally distributed). The assumption was that independence was assumed, as the data were collected via an online survey and most likely participants could not influence each other. Levene's test was used to confirm the homoscedasticity; therefore, the homoscedasticity assumption was met since it showed that the variances in the independent variables were equal (Shukor 2016). The ANOVA test on the quantitative data indicated there was no significant difference among the groups, such as male, female, and others; as well as among undergraduate, graduate, and professional students.

Second, as part of the quantitative analysis, the descriptive statistical analysis results were checked to understand the data and its distribution. The quantitative analysis also included the validity test of the instrument and a reliability analysis of the quantitative results. For the quantitative analysis, the Statistical Package for the Social Sciences (SPSS) software was used. The SPSS helped to re-code the data as well (e.g., male = 0, female = 1, and other = 3).

Third, answers from open-ended questions were analyzed using a discourse analysis as part of the qualitative analysis. Qualitative data were visually inspected to find any spelling or grammar mistakes from participants (because misspelling could trigger a misclassification of qualitative themes). Separate notes were taken on any spelling- and grammar-related errors. Coding and theme development took place during the qualitative analysis, which was used to combine the quantitative and qualitative data. In other words, the thematic analysis is considered one of the methods of identifying and analyzing data to find the main themes (Braun et al. 2016; Braun and Clarke 2006). There were several steps for the thematic analysis: (1) the researchers read the participants' answers to get familiar with the content; (2) the raw data was coded in units; (3) we sought common themes or similar meanings; (4) we reviewed and examined all potential themes and logical relationships; (5) we defined and named themes; and (6) we wrote up the report. For the qualitative data analysis, FreeQDA was used.

10. Mixed Phase

Finally, both the quantitative and qualitative data were merged to make inferences. Leech et al. (2011) presented one of the techniques of data integration in the mixed-methods study and wrote that it "integrat[ed] both qualitative and quantitative data into either a coherent whole" (p. 18). In this phase, a side-by-side tabular view was used to accomplish the mixing of quantitative and qualitative data (see Table 5).

10.1. Quality Measure

Quality measures of mixed-method research start with a statement of purpose (Sale and Brazil 2004; Venkatesh et al. 2013), and research questions as well. In addition, the applicability of the findings can be helpful to explain the reliability of mixed-methods research (MMR) (Onwuegbuzie and Johnson 2006). Creswell and Clark (2018) mentioned that in MMR, researchers should consider validity and reliability separately; however, they should check whether the quantitative and qualitative validities agree with each other. More specifically, both the quantitative and qualitative data should support each other to confirm validity and reliability.

10.2. Validity

As for quantitative validity, the following validities were checked during the study:

(1) Content validity—facets of a concept. For example, not feeling like eating or not wanting to do anything may indicate depression. The content validity was tested during the pilot study. Based on the pilot study participants, the items of the survey were updated. All questions were checked to make sure there were no questions with double meanings and all questions were related to the purpose of the survey.

(2) Criterion validity—instruments have been developed to measure usefulness as the indicators of specific behaviors. For example, one's driving test score indicates one's driving ability. The instruments were developed and tested before (i.e., pilot study) the final administration. Participants of the pilot study helped to modify the instruments by providing explicit feedback and suggestions.

(3) Construct validity—how well a measure is related to previous theory or research. The instrument was developed by analyzing the existing literature. First, a theoretical framework was developed. Second, the framework and previous literature helped to develop the scales.

10.3. Trustworthiness

In this study, we used peer debriefings, integrity checks, multiple sources of data, and weakness minimization. The following paragraphs describe each step briefly.

10.4. Peer Debriefings

A peer observed the data analysis process and provided important feedback as well. Creswell and Miller (2000) explained the peer debriefing procedure and wrote: "A peer review or debriefing is the review of the data and research process by someone familiar with the research or the phenomenon being explored" (p. 129). Therefore, the primary responsibility of the peer was to make sure all interpretations are based on the data. The peer independently analyzed the data and compared it with the primary researcher. This peer-briefing procedure helped to maintain the quality of the interpretations and inferences of the research data.

10.5. Integrity Check

The integrity check was one of the major tests of validity and trustworthiness. Before drawing any conclusion, the mixing table was checked to make sure both the quantitative and qualitative data confirm the findings. In addition, all inferences were drawn from the analysis, and personal biases were kept aside. A secondary analyst conducted the analysis and verified all the findings to confirm the integrity of the analysis as well.

10.6. Multiple Sources of Data

Researchers need to incorporate multiple sources of data before they conclude. As Onwuegbuzie and Johnson (2006) said: " . . . while inferences are made in concurrent designs on both sources of data in an integrated manner, in parallel mixed designs, each data source leads to its own set of inferences" (p. 53). The finding of the quantitative analysis was confirmed by the findings of the qualitative analysis. For example, those students who have indicated a higher GPA have shown cautious views towards Twitter. They have expressed concerns about the excessive use of Twitter among students. In addition, students who have shown positive views towards Twitter also indicated that they limited their use of Twitter.

10.7. Weakness Minimization

The quantitative data was indicating some relationship between Twitter use and students' GPA. However, the qualitative data helped to explain the phenomenon better (see Table 3). Similarly, the quantitative data helped to focus on related qualitative data. Therefore, both types of data helped to minimize the shortcomings of one another.

11. Results

11.1. Quantitative Findings

The analyzed results indicated that students' GPAs ranged from 0.00 to 4.00 (i.e., a few of them just started studying in college and most of them have a good GPA). The mean GPA was $M = 3.636$ ($SD = 0.471$). In addition, 53% of students have demonstrated positive views towards Twitter. Among them, 71% were female, 25% were male, and 4% were others. There was a negative correlation between Twitter time and GPA ($r = -0.525$, $p < 0.01$), and the result was statistically significant (see Table 4). On the other hand, there was a positive correlation between study time and GPA ($r = 0.121$, $p < 0.01$), and the result was statistically significant as well. Again, there was a positive correlation between the TSE scale and GPA ($r = 0.38$, $p < 0.05$) as well as the TSO scale and GPA ($r = 0.21$, $p < 0.05$), and both results were statistically significant (see Table 4). The internal consistency reliabilities for the TSE and TSO scales were $\alpha = 0.559$ and $\alpha = 0.678$, respectively. In addition, the inter-correlation between items was consistent as well.

Table 4. Correlation between students (*n* = 498) academic performance (i.e., GPA) and other variables and scales.

	Study Time	Twitter Time	TSE	TSO	GPA
Study Time	–	−0.32	0.18	0.02	0.12 **
Twitter Time		–	0.09	0.15	−0.52 **
TSE			–	0.08	0.38 *
TSO				–	0.21 *
GPA					–

** $p < 0.01$, * $p < 0.05$.

11.2. Qualitative Findings

During the qualitative data analysis, it was observed from the data that those who have shown a positive attitude towards Twitter use in academia are currently using Twitter for their academics. For example, most of the students, among the Twitter users, indicated that they use Twitter to read online articles, review comments and posts, and participate in blogging. For example, one of the participants said: " ... sometime[s] some Professors from other universities post their explanation for some topic so it helps to understand some tough topics". To explain the benefit of Twitter use in academia, one of the participants mentioned: "[Twitter] made me aware of what [is] going on in the world". A few participants mentioned that they have used Twitter since high school; one of them said: "In high school, we would have discussions on Twitter which was easy because all of us could post without having to have another account. Making accounts for school sucks because it [is] another password you have to remember. It also has the element of convenience".

Some students have expressed negative opinions about Twitter for their academics. For example, one of the students mentioned: "Twitter kills my time ... I hate it, but cannot stop using it ... haha ... I am [an] addict to it". When asked if Twitter is helpful for academic collaboration, then the same student said: "Seriously!!! I did not know [that] people use Twitter for school ... .darn!! I wish some told [me] that before ... no wonder [why] I am struggling ... " Another student mentioned: "[I had] no idea Twitter is good", and further added: "I only use it to follow celebrities and funny people ... ".

Based on the participants' opinions, six major themes were developed. The six major themes were: knowledgeable, possible learning, balanced-fair, lack of knowledge, not sure yet, and not interested. For example, if a participant showed positive views about Twitter's use in academics, then the response was categorized as "knowledgeable, possible learning, and balanced-fair" and negative views or opinions were categorized as "lack of knowledge, not sure yet, and not interested". The careful analysis of words and tone of the answers of participants helped to develop the primary themes. For example, if the participant used the words "at times" or "it depends", then the answer was labeled as a "possible" theme. To further narrow down the major themes into smaller categories, three major themes were developed. The three emerging themes based on the discourse analysis were "using it, maybe, and no interest".

Finally, the themes were checked again to see if there were any differences based on groups (i.e., undergraduate, graduate, and professional, and gender—male, female, and other). To accomplish this, the guidelines from Lindsay (2019) were followed. According to Lindsay (2019), there are five different types of qualitative comparisons of groups, including: (a) healthy comparison; (b) no intervention or treatment; (c) comparing two or more health conditions or groups; (d) comparing different aspects of a health condition or phenomenon; and (e) multiple perspectives of the same phenomenon. In this study, we focused on the fifth type—multiple perspectives of the same phenomenon, since students shared their opinions regarding Twitter. The obtained results indicated that there were no significant differences among the groups.

11.3. Merged Findings

However, in merging the qualitative data (i.e., in-depth interviews and open-ended questions) with the quantitative data (i.e., a survey containing close-ended questions), both answers were combined, and found common themes regarding Twitter and students' academic performance. Furthermore, a meta-inference was used to combine both quantitative and qualitative findings. A meta-inference helps to draw overall conclusions, explanations, and or understanding through integrations of both qualitative and quantitative findings (Tashakkori and Teddlie 2008). In this stage, instead of looking at evidence from a quantitative analysis or a qualitative analysis individually, inferences were made by considering both analyses' results together. It was noticed that participants with a positive attitude toward Twitter had a high average GPA ($M = 3.6$, $SD = 0.28$, ranging from 3.3 to 4.0, $n = 24$). A second group was identified during the qualitative analysis (i.e., participants who are not using Twitter but have negative views about the use of Twitter for their studies).

The students who knew how to use Twitter showed positive views towards it and had a higher GPA, compared to those who did not know how to use Twitter for academic purposes. On the other hand, those who did not show positive views towards Twitter were not using it or did not know how to use it for academic purposes. The side-by-side merging of the quantitative and qualitative data based on participants' pseudo identification numbers helped to see which types of views were related to higher or lower academic performances (see Table 5). Without the merging of the qualitative and quantitative analyses' results, the individual results alone would have led to different interpretations, which would have been incomplete and inaccurate.

Table 5. Merging table (side-by-side comparison).

Participant ID	GPA	Twitter Time	Study Time	Primary Theme	Secondary Theme
1	3.1	0	4	Lack of knowledge	No interest
2	3.6	1	5	Possible	Maybe
3	3.5	2	4	Balanced	Maybe
4	2.7	0	2	Lack of knowledge	No interest
5	3	0	3	Lack of knowledge	No interest
6	3.4	1	3	Possible	No interest
7	3.3	2	0	Possible	No interest
8	3.4	1	3	Possible	No interest
9	3.7	4	6	Possible	Using it

The triangulation of mixing qualitative and quantitative data helped to gain a better understanding from a larger sample of the survey as well as a small selection of participants for open-ended interviews, because if examined individually, the quantitative and qualitative data could have led to different findings. However, the mixed-methods approach helped to reveal the true or more complex relationship between Twitter use and students' academics. The quantitative results would have led us to believe that the relationship between Twitter use and students' academic performance is straightforward. This would mean that the use of Twitter is bad for students. Similarly, the qualitative results would have implied that not all students see Twitter as a helpful tool for their academics. The mixed-method results help us to see how the results of the quantitative and qualitative methods are intertwined.

12. Discussion

The purpose of this study was to learn how the use of Twitter (i.e., a social networking site) influences college students' academic performance (i.e., GPA). Additionally, we examined how their perceptions of Twitter and their academic performance are associated. Evidence obtained from this study indicated that students who had positive opinions/views on the use of Twitter for academia suggested using Twitter for academia.

Similar findings were reported by Rouis (2012) and Friedman et al. (2022). Furthermore, students who knew how to use Twitter for academics had better GPAs than those who did not know how to use it. Perhaps this was because of their experience and knowledge about social networking applications. They seemed to have better knowledge about Twitter and its applications. Therefore, students did not see Twitter as a distraction, which did not agree with the findings from Imlawi et al. (2015). Knowledge is the key to success; this is proven to be true in this study as well. This supports the discussion brought up by Ansari and Khan (2020): the authors noted that social networking sites are new sources of information from which students can absorb information. Not having enough knowledge may prevent other students from using it for academia and may impact their academic performance negatively. For example, Kirschner and Karpinski (2010) found that students who use Facebook have a lower mean GPA than nonusers, due to fewer hours spent studying per week compared to the students who did not use Facebook. However, this information from this study would not have come out without the help of a mixed-methods approach. Mixing the results of quantitative and qualitative methods helped us to uncover an in-depth understanding, which could not have been obtained using quantitative or qualitative results individually (Fetters et al. 2013; Srivastava and Chandra 2018).

The results of this study indicate that positive opinions about Twitter are also related to having knowledge about how to use it, and ultimately are related to students' academic performances; similar findings were documented by Moghavvemi et al. (2018). Hence, knowledge of Twitter seems to be a helpful tool for peer communication, collaboration, and academic performance. Bekalu et al. (2019) also promoted this decisively. This means that students can communicate with their classmates and learn how to work together on their class assignments in order to improve their academic performance. This finding supports Vygotsky's and Bandura's social learning theory. In other words, collaboration and peer communication are important factors for students' academic success. Rouis (2012) and Friedman et al. (2022) indicated that students had more connections with people (e.g., family, friends, professors, etc.) from social media. It improved their emotional well-being in a positive manner since they care more about their academic performance. Hence, it would be a good idea to provide training to students and show them how to use Twitter for academic purposes. For example, Flanigan and Babchuk (2015) reported that students did not feel confident in their computer use skills, even though students have enough knowledge to get around technologically, socially, or for leisure. However, they did not know how to use programs sufficiently nor did they have strategies to stay off a device when inappropriate. Perhaps college administrators could provide training or workshops to students about how to use social media applications for academic purposes. A similar recommendation was made by Roblyer et al. (2010) and Calderón et al. (2020). Additionally, college administrators should encourage professors by providing some incentives if they learn and use new technologies in their classrooms. Otherwise, some of them may be reluctant to use technology as a teaching tool since they may be afraid of using the latest technologies (Tang and Hew 2017). Additionally, by having Twitter training, students will learn how to use it for their academic work as well as how to communicate with their classmates and instructors. In the future, a study can be conducted to train students and see if their perspectives change after training. In addition, a study could try to uncover if any other variables may be influencing students' academic performance aside from the use of Twitter. Similarly, a longitudinal study could be helpful to explore how social media applications, such as Twitter, impact students' learning and academic performance.

13. Implications and Future Research Directions

The results of this study found that a positive relationship exists between the use of Twitter and undergraduate students' academic performance. However, a negative relationship exists between students' academic performance and their perceptions of Twitter use for their studies. The implications of this study are stated for undergraduate student users,

collegiate faculty members, administrators, and future researchers, which are presented in the next sections below.

13.1. Implications for Undergraduate Student Users

The evidence from this study suggests that students who thought that their academic performance should be a priority and that they should put less focus on Twitter during their studies often had better GPAs compared to students who showed less interest in their academic performance. This statement remains consistent with the existing literature (Michikyan et al. 2015; Moghavvemi et al. 2018; Ozer et al. 2014). In addition, the authors found a positive relationship between students' academic performance and Twitter use. The evidence of this study suggests that students who prioritize tasks and manage their time and focus on their studies have better academic performances. Using Twitter during leisure time or study breaks positively affects their GPAs. This finding supports the findings of a few previous studies, such as Astatke et al. (2021). Thus, when students use Twitter for academic communication, they can benefit from it, which helps them improve their GPA. In sum, a small amount of time using Twitter does not hamper students' academic performances.

13.2. Implications for Collegiate Faculty and Administrators

The findings of this study have implications for collegiate faculty members and administrators. The results found here suggested that Twitter could be helpful for students' studies, more specifically, when they use Twitter to communicate with their classmates and instructors. This finding was aligned with the findings of Friedman et al. (2022), in which researchers reported that students viewed Twitter as a good learning and networking tool. Perhaps when feasible, faculty members and administrators should remind students to use Twitter wisely, for thoughtful conversation or as an information-sharing medium. Studies that have investigated the use of Twitter suggested that it helps to follow specific users, discussions, and special interest groups (SIGs) in real-time. A SIG means a community within a large society that shares some interests with certain content or in a certain area. For example, a SIG can be a math club in which the members like to use applications of mathematical concepts. In such circumstances, faculty members and administrators could post relevant information in discussion posts or SIGs for students to discuss and expand their knowledge. Perhaps this could be the efficient and most supportive way for students to communicate with each other.

Based on the findings of this study, it is also suggested that Twitter can be a good tool to develop networks and communicate with other professionals. A few studies indicated that Twitter can be used to advance professional development (Calderón et al. 2020; Carpenter and Krutka 2015; Davis 2015; Tang and Hew 2017). For example, college faculty members and administrators could use Twitter to post survey links and gather students' quick responses, since most Twitter users check their accounts for updates at least a few times each day (Vis 2013). Twitter can serve as a fast information sharing and reporting platform (Friedman et al. 2022).

13.3. Implications for Research

Previous research seemed to investigate the relationship between students' use of Twitter and their academic achievement (e.g., Junco 2012; Karpinski et al. 2013). A few studies found that there was a negative correlation between the time students spent using Twitter and their academic performance (Junco 2012; Kirschner and Karpinski 2010; Liu et al. 2017; Pedersen et al. 2018). Evidence from this study showed that it is not only the time students spend on Twitter, but rather how they spend that affects their academic performance. The findings reveal that researchers who focus on Twitter use and students' studies should explore different directions, such as how students are learning and how technological tools aid the learning process. Evidence from this study indicates that students who know how to use Twitter for academic purposes, such as for communicating

with peers and instructors, have benefited from it. Therefore, the relationship between students' academic performance and time spent on Twitter is not straightforward. Different types of statistical analysis may help to reveal other influencing factors, which were not considered in this study due to its scope.

In the future, researchers could use different statistical tools, such as multiple regression, to evaluate the scales from different points of view. However, researchers should keep in mind that different statistical tools may have specific limitations. For example, some statistical tools (e.g., Chi-square) work best with large sample sizes, whereas some other statistical tools, e.g., RMSEA, do not depend on sample size.

14. Limitations and Future Research Directions

Due to the design of this study, there are some limitations. The results may have a lower generalizability across all states in the U.S. Because the findings of this study are based on a four-year research-based university, the findings in two-year community colleges and teaching-based universities may vary. In the future, researchers should try to collect data from more than one university and include both two-year and four-year teaching- and research-based universities. It will be also beneficial to collect data from more than one state to understand if there is any effect on local and geographical locations. Additionally, the voluntary response sample is a limitation in that there is no way to corroborate self-reported information. Unfortunately, this is often the nature of Internet-based survey research. Additionally, Internet-based studies may suffer from self-report bias, because the answers of the participants may vary based on the time of the day and their emotional level. Perhaps a longitudinal study could be a potential solution for this.

In this study, a major portion of the participants were undergraduate students. The ANOVA analysis revealed that there were no significant differences among the groups. However, the uneven size of the groups may have impacted the ANOVA results. This limitation also limits the ability to generalize this study. Perhaps a future study should focus on increasing the participation of different student groups and explore if there are any significant differences among groups.

15. Conclusions

The analyzed results helped obtain the answers to the research questions. First, the results suggested that there is a negative effect on students' academic performance as they use Twitter. Second, it appears that not many students know how to use Twitter for academic purposes. Those who knew how to use Twitter were able to use it for improving their academic performance. In addition, evidence from this study suggests that students should be careful about how they want to spend their time, because excessive use of Twitter could take away from their study time and may affect them negatively in their studies. Third, it seemed that students who had positive opinions about Twitter knew how to use it for academic purposes. It is noteworthy to mention that it is not the amount of time students spend on Twitter that is related to their academic performance, but rather how they use it that matters the most. If students spend their time on Twitter to communicate with peers and instructors or collaborate with others, then Twitter time will be beneficial for their academic performance.

Perhaps, if students learn how to use Twitter, then they may use it more often for their academics. Most students who use Twitter are using it for different reasons, such as political news, gossip blogs, and entertainment. Students must learn how to use it for their academic studies; this will help them to use it to improve their academic performance. Collegiate faculty members and administrators could help students to learn how they can use social media applications, such as Twitter, to communicate with their peers and instructors. They can help students to see how they can maximize the use of Twitter as an academic communication platform to enhance their learning and interactions with their classmates. A future study could try to help students to learn about Twitter and its applications for academia, and then see whether the training helps students.

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References

Aharony, Noa. 2010. Twitter use in libraries: An exploratory analysis. *Journal of Web Librarianship* 4: 333–50. [CrossRef]

Alnjadat, Rafi, Malek M. Hmaidi, Thamer E. Samha, Mhd M. Kilani, and Ahmed M. Hasswan. 2019. Gender variations in social media usage and academic performance among the students of University of Sharjah. *Journal of Taibah University Medical Sciences* 14: 390–94. [CrossRef]

Amiruzzaman, Md. 2019. *Assessing the Psychometric Properties of Newly Developed Behavior and Attitude Twitter Scales: A Validity and Reliability Study*. Kent: Kent State University.

Amiruzzaman, Stefanie, and Md Amiruzzaman. 2021. Students' academic performance multitasking and digital social-networking using Twitter. Paper presented at 2021 IEEE International Conference on Cyber Science and Technology Congress (CyberSciTech), Athabasca, AB, Canada, October 25–28; pp. 863–66.

Ansari, Jamal Abdul Nasir, and Nawab Ali Khan. 2020. Exploring the role of social media in collaborative learning the new domain of learning. *Smart Learning Environments* 7: 1–16. [CrossRef]

Aslam, Salman. 2017. Twitter by the Numbers: Stats, Demographics & Fun Facts. Available online: https://www.omnicoreagency.com/twitter-statistics/ (accessed on 3 July 2017).

Astatke, Melese, Cathy Weng, and Sufen Chen. 2021. A literature review of the effects of social networking sites on secondary school students' academic achievement. *Interactive Learning Environments* 1–17. [CrossRef]

Bandura, Albert. 1969. Social-learning theory of identificatory processes. In *Handbook of Socialization Theory and Research*. Chicago: Rand McNally & Company, pp. 213–62.

Bekalu, Mesfin. A., Rachel F. McCloud, and K. Viswanath. 2019. Association of social media use with social well-being, positive mental health, and self-rated health: Disentangling routine use from emotional connection to use. *Health Education & Behavior* 46: 69S–80S.

Bergman, Manfred Max, ed. 2008. 7 quality of inferences in mixed-methods research: Calling for an integrative framework. In *Advances in Mixed-methods Research*. London: SAGE Publications Ltd., pp. 101–19. [CrossRef]

Bista, Krishna. 2015. Is Twitter an effective pedagogical tool in higher education? Perspectives of education graduate students. *Journal of the Scholarship of Teaching and Learning* 15: 83–102. [CrossRef]

Braun, Virginia, and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3: 77–101. [CrossRef]

Braun, Virginia, Victoria Clarke, and Paul Weate. 2016. Using thematic analysis in sport and exercise research. In *Routledge Handbook of Qualitative Research in Sport and Exercise*. London: Taylor & Francis, pp. 191–205.

Calderón, Antonio, Lourdes Meroño, and Ann MacPhail. 2020. A student-centred digital technology approach: The relationship between intrinsic motivation, learning climate and academic achievement of physical education pre-service teachers. *European Physical Education Review* 26: 241–62. [CrossRef]

Carpenter, Jeffrey P., and Daniel G. Krutka. 2015. Engagement through microblogging: Educator professional development via Twitter. *Professional Development in Education* 41: 707–28. [CrossRef]

Chapelle, Carol A. 1998. Construct definition and validity inquiry in SLA research. In *Interfaces between Second Language Acquisition and Language Testing Research*. Ames: Iowa State University, pp. 32–70.

Coad, David T. 2017. "That's my face to the whole field!": Graduate students' professional identity-building through Twitter at a writing studies conference. *Computers and Composition* 45: 51–66. [CrossRef]

Creswell, John W., and Dana L. Miller. 2000. Determining validity in qualitative inquiry. *Theory into Practice* 39: 124–30. [CrossRef]

Creswell, John W., and Vicki L. Plano Clark. 2018. *Designing and Conducting Mixed-Methods Research*, 3rd ed. London: Sage Publications.

David, Jessica L., Matthew D. Powless, Jacqueline E. Hyman, DeJon M. Purnell, Jesse A. Steinfeldt, and Shelbi Fisher. 2018. College student athletes and social media: The psychological impacts of Twitter use. *International Journal of Sport Communication* 11: 163–86. [CrossRef]

Davis, Kerry. 2015. Teachers' perceptions of Twitter for professional development. *Disability and Rehabilitation* 37: 1551–58. [CrossRef]

Fetters, Michael D., Leslie A. Curry, and John W. Creswell. 2013. Achieving integration in mixed-methods designs—Principles and practices. *Health Services Research* 48: 2134–56. [CrossRef] [PubMed]

Flanigan, Abraham E., and Wayne A. Babchuk. 2015. Social media as academic quicksand: A phenomenological study of student experiences in and out of the classroom. *Learning and Individual Differences* 44: 40–45. [CrossRef]

Fowler, Floyd J., Jr. 2002. *Survey Research Methods*, 3rd ed. Thousand Oaks: Sage Publications.

Friedman, Brett J., Irene Chen, Kwesi Asantey, Stacy Loeb, Simon P. Kim, Rena D. Malik, Patrick Karabon, Tracy Wunderlich-Barillas, and Thenappan Chandrasekar. 2022. Twitter engagement of medical students applying to urology residency during COVID-19: A mixed-methods study. *Urology* 165: 120–27. [CrossRef]

Guetterman, Timothy C., Michael D. Fetters, and John W. Creswell. 2015. Integrating quantitative and qualitative results in health science mixed-methods research through joint displays. *The Annals of Family Medicine* 13: 554–61. [CrossRef]

Imlawi, Jehad, Dawn Gregg, and Jahangir Karimi. 2015. Student engagement in course-based social networks: The impact of instructor credibility and use of communication. *Computers & Education* 88: 84–96.

Junco, Reynol. 2012. The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. *Computers & Education* 58: 162–71.

Junco, Reynol, C. Michael Elavsky, and Greg Heiberger. 2013. Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success. *British Journal of Educational Technology* 44: 273–87. [CrossRef]

Junco, Reynol, Greg Heiberger, and Eric Loken. 2011. The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning* 27: 119–32. [CrossRef]

Karpinski, Aryn C., Paul A. Kirschner, Ipek Ozer, Jennifer A. Mellott, and Pius Ochwo. 2013. An exploration of social networking site use, multitasking, and academic performance among United States and European university students. *Computers in Human Behavior* 29: 1182–92. [CrossRef]

Kausar, Mohammad Abu, Arockiasamy Soosaimanickam, and Mohammad Nasar. 2021. Public sentiment analysis on Twitter data during COVID-19 outbreak. *International Journal of Advanced Computer Science and Applications* 12: 415–422. [CrossRef]

Kimmons, Royce, George Veletsianos, and Scott Woodward. 2017. Institutional uses of Twitter in US higher education. *Innovative Higher Education* 42: 97–111. [CrossRef]

Kirschner, Paul A., and Aryn C. Karpinski. 2010. Facebook® and academic performance. *Computers in Human Behavior* 26: 1237–45. [CrossRef]

Lasorsa, Dominic L., Seth C. Lewis, and Avery E. Holton. 2012. Normalizing Twitter: Journalism practice in an emerging communication space. *Journalism Studies* 13: 19–36. [CrossRef]

Lau, Wilfred W. 2017. Effects of social media usage and social media multitasking on the academic performance of university students. *Computers in Human Behavior* 68: 286–91. [CrossRef]

Leech, Nancy L., Anthony J. Onwuegbuzie, and Julie P. Combs. 2011. Writing publishable mixed research articles: Guidelines for emerging scholars in the health sciences and beyond. *International Journal of Multiple Research Approaches* 5: 7–24. [CrossRef]

Lian, Shuai-lei, Xiao-jun Sun, Zong-kui Zhou, Cui-ying Fan, Geng-feng Niu, and Qing-qi Liu. 2018. Social networking site addiction and undergraduate students' irrational procrastination: The mediating role of social networking site fatigue and the moderating role of effortfulcontrol. *PLoS ONE* 13: e0208162. [CrossRef]

Lin, Meng-Fen Grace, Ellen S. Hoffman, and Claire Borengasser. 2013. Is social media too social for class? A case study of Twitter use. *TechTrends* 57: 39. [CrossRef]

Lindsay, Sally. 2019. Five approaches to qualitative comparison groups in health research: A scoping review. *Qualitative Health Research* 29: 455–68. [CrossRef] [PubMed]

Liu, Dong, Paul A. Kirschner, and Aryn C. Karpinski. 2017. A meta-analysis of the relationship of academic performance and Social Network Site use among adolescents and young adults. *Computers in Human Behavior* 77: 148–57. [CrossRef]

Lomax, Richard G., and Debbie L. Hahs-Vaughn. 2012. *Statistical Concepts: A Second Course*, 4th ed. London: Routledge.

Malik, Aqdas, Cassandra Heyman-Schrum, and Aditya Johri. 2019. Use of Twitter across educational settings: A review of the literature. *International Journal of Educational Technology in Higher Education* 16: 1–22. [CrossRef]

Mao, Jin. 2014. Social media for learning: A mixed-methods study on high school students' technology affordances and perspectives. *Computers in Human Behavior* 33: 213–23. [CrossRef]

Martínez-Rojas, Maria, Maria del Carmen Pardo-Ferreira, and Juan Carlos Rubio-Romero. 2018. Twitter as a tool for the management and analysis of emergency situations: A systematic literature review. *International Journal of Information Management* 43: 196–208. [CrossRef]

Meier, Adrian, Leonard Reinecke, and Christine E. Meltzer. 2016. "Facebocrastination"? Predictors of using Facebook for procrastination and its effects on students' well-being. *Computers in Human Behavior* 64: 65–76.

Michikyan, Minas, Subrahmanyam Kaveri, and Dennis Jessica. 2015. Facebook use and academic performance among college students: A mixed-methods study with a multi-ethnic sample. *Computers in Human Behavior* 45: 265–72. [CrossRef]

Miller, Redonda G., Bimal H. Ashar, and Kelly J. Getz. 2003. Evaluation of an audience response system for the continuing education of health professionals. *Journal of Continuing Education in the Health Professions* 23: 109–15. [CrossRef]

Moghavvemi, Sedigheh, Ainin Sulaiman, Noor Ismawati Jaafar, and Nafisa Kasem. 2018. Social media as a complementary learning tool for teaching and learning: The case of YouTube. *The International Journal of Management Education* 16: 37–42.

Naqshbandi, M. Muzamil, Sulaiman Ainin, Noor Ismawati Jaafar, and Nor Liyana Mohd Shuib. 2017. To Facebook or to Face Book? An investigation of how academic performance of different personalities is affected through the intervention of Facebook usage. *Computers in Human Behavior* 75: 167–76. [CrossRef]

O'Halloran, Kay L., Sabine Tan, Duc-Son Pham, John Bateman, and Andrew Vande Moere. 2018. A digital mixed-methods research design: Integrating multimodal analysis with data mining and information visualization for big data analytics. *Journal of Mixed-Methods Research* 12: 11–30. [CrossRef]

Onwuegbuzie, Anthony J., and R. Burke Johnson. 2006. The validity issue in mixed research. *Research in the Schools* 13: 48–63.

Ozer, Ipek, Aryn C. Karpinski, and Paul A. Kirschner. 2014. A cross-cultural qualitative examination of social-networking sites and academic performance. *Procedia-Social and Behavioral Sciences* 112: 873–81. [CrossRef]

Parra, Denis, Christoph Trattner, Diego Gómez, Matias Hurtado, Xidao Wen, and Yu-Ru Lin. 2016. Twitter in academic events: A study of temporal usage, communication, sentimental and topical patterns in 16 computer science conferences. *Computer Communications* 73: 301–14. [CrossRef]

Pedersen, Willy, Viggo Vestel, and Anders Bakken. 2018. At risk for radicalization and jihadism? A population-based study of Norwegian adolescents. *Cooperation and Conflict* 53: 61–83. [CrossRef]

Roblyer, Margaret D., Michelle McDaniel, Marsena Webb, James Herman, and James Vince Witty. 2010. Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. *The Internet and Higher Education* 13: 134–40. [CrossRef]

Rouis, Sana. 2012. Impact of cognitive absorption on Facebook on students' achievement. *Cyberpsychology, Behavior, and Social Networking* 15: 296–303. [CrossRef]

Rudolph, Jenny W., Robert Simon, Peter Rivard, Ronald L. Dufresne, and Daniel B. Raemer. 2007. Debriefing with good views: Combining rigorous feedback with genuine inquiry. *Anesthesiology Clinics* 25: 361–76. [CrossRef]

Sale, Joanna E., and Kevin Brazil. 2004. A strategy to identify critical appraisal criteria for primary mixed-method studies. *Quality and Quantity* 38: 351–65. [CrossRef]

Sewell, Robin R. 2013. Who is following us? Data mining a library's Twitter followers. *Library Hi Tech* 31: 160–70. [CrossRef]

Shukor, Mohd Yunus. 2016. Bartlett and the Levene's tests of homoscedasticity of the modified Gompertz model used in fitting of Burkholderia sp. strain Neni-11 growth on acrylamide. *Bioremediation Science and Technology Research* 4: 18–19. [CrossRef]

Singh, Lenandlar. 2020. A systematic review of higher education academics' use of microblogging for professional development: Case of Twitter. *Open Education Studies* 2: 66–81. [CrossRef]

Srivastava, Shirish C., and Shalini Chandra. 2018. Social presence in virtual world collaboration: An uncertainty reduction perspective using a mixed-methods approach. *MIS Quarterly* 42: 779–804. [CrossRef]

Stratford, Paul. 1989. Reliability: Consistency or differentiating among subjects? *Physical Therapy* 69: 299–300. [CrossRef]

Tafesse, Wondwesen. 2020. The effect of social networking site use on college students' academic performance: The mediating role of student engagement. *Education and Information Technologies* 25: 4747–63. [CrossRef]

Tang, Ying, and Khe Foon Hew. 2017. Using Twitter for education: Beneficial or simply a waste of time? *Computers & Education* 106: 97–118.

Tashakkori, Abbas, and Charles Teddlie. 2008. Quality of inferences in mixed-methods research: Calling for an integrative framework. *Advances in Mixed-Methods Research* 53: 101–19.

Tu, Chih-Hsiung. 2000. On-line learning migration: From social learning theory to social presence theory in a CMC environment. *Journal of Network and Computer Applications* 23: 27–37. [CrossRef]

Van Dijk, Teun A. 2006. Ideology and discourse analysis. *Journal of Political Ideologies* 11: 115–40. [CrossRef]

Venkatesh, Viswanath, Susan A. Brown, and Hillol Bala. 2013. Bridging the qualitative-quantitative divide: Guidelines for conducting mixed-methods research in information systems. *MIS Quarterly* 37: 21–54. [CrossRef]

Venkatesh, Viswanath, Sue A. Brown, and Yulia W. Sullivan. 2016. Guidelines for conducting mixed-methods research: An extension and illustration. *Journal of the Association for Information Systems* 17: 435–95. [CrossRef]

Vis, Farida. 2013. Twitter as a reporting tool for breaking news: Journalists tweeting the 2011 UK riots. *Digital Journalism* 1: 27–47. [CrossRef]

Vygotsky, Lev. 1978a. Interaction between learning and development. *Readings on the Development of Children* 23: 34–41.

Vygotsky, Lev Semenovich. 1978b. *Mind in Society: Development of Higher Psychological Processes*. Edited by Michael Cole, Vera John-Steiner, Sylvia Scribner and Ellen Souberman. Cambridge: Harvard University Press.

Whelan, Eoin, AKM Najmul Islam, and Stoney Brooks. 2020. Applying the SOBC paradigm to explain how social media overload affects academic performance. *Computers & Education* 143: 103692.