How active/passive social network usage relates to academic performance among high school students in Taiwan

Wen Cheng[1] · Pham Ngoc Thien Nguyen[2,3] · Nhan Duc Nguyen[3,4]

Abstract

This study aimed to explore the effects of active social network usage (ASNU) and passive social network usage (PSNU) on academic performance. Using a survey sample of 621 high school students in Taiwan, the results showed that PSNU did not associate with learning results, whereas ASNU may have its function on students' learning. Specifically, ASNU interacted with PSNU to predict high school students' academic performance. Moreover, ASNU undermined the academic performance of those with high PSNU, but not of those with low or medium PSNU. Additionally, for individuals with high PSNU and high ASNU, their performance mostly suffered. The results supported the work–life conflict theory, revealing that excessive social network sites (SNS) use, especially ASNU, might distract students from studying and, therefore, negatively impact their learning performance. The findings may contribute to the clinical and educational fields regarding adolescents' SNS-using behaviors and psychological development.

Keywords Active Social Network usage · Passive Social Network usage · Academic performance · Adolescents

✉ Pham Ngoc Thien Nguyen
npnthien@agu.edu.vn

[1] Center for Teacher Education, Institute of Education, & International Graduate Program of Education and Human Development, National Sun Yat-sen University, Kaohsiung, Taiwan (R.O.C.)

[2] An Giang University, Vietnam National University Ho Chi Minh City, Ho Chi Minh City, Vietnam

[3] International Graduate Program of Education and Human Development, National Sun Yat-sen University, Kaohsiung, Taiwan (R.O.C.)

[4] The University of Texas at San Antonio, San Antonio, USA

🖄 Springer

1 Introduction

In hypermedia environments, previous research highlights a number of important factors that support academic performance and identifies some that have a negative impact on learning outcomes (e.g., Aslan, 2021; Palmer & Holt, 2009; Wei & Chou, 2020). The support factors included self-regulation, which relates to self-generated thoughts, emotions, and actions that are intended and cyclically adjusted in order to achieve personal targets (Zimmerman, 2000), and self-directed, with more active participation in learning tasks such as reviewing online learning contents, doing the assigned work, and preparing and examining learning milestones (Geng et al., 2019). Adversely, time management was a factor that contributed to poor academic performance (Alwagait et al., 2015; Karpinski et al., 2013).

Indeed, adolescents' usage of social media platforms has soared in the last few years, and it now pervades their daily social lives. Social network sites (SNS) usage has been widely classified into active and passive facets (Burke et al., 2010; Thorisdottir et al., 2019; Verduyn et al., 2015, 2017). Active social network usage (ASNU) includes both text interactions (sending instant messages and commenting) and non-text interactions (sending emotions, likes, and tagging photos) with friends on SNS (Burke et al., 2010; Valkenburg et al., 2021; Zhang et al., 2020). Passive social network usage (PSNU) refers to surfing, scrolling, reposting links, and seeing material from others (Thorisdottir et al., 2019). The rapid growth of youths' social media use has garnered academic attention in order to better understand its consequences. ASNU and PSNU have been linked to different outcomes in terms of users' mental health (Chen et al., 2016; Frison & Eggermont, 2016a, 2017; Zhang et al., 2020). Most studies have shown that ASNU enhances positive outcomes, such as social connectedness (Deters & Mehl, 2013) and increased wellbeing (Burke et al., 2010). On the contrary, PSNU was more likely to be linked with negative psychological outcomes, including depression (Escobar-Viera et al., 2018; Frison & Eggermont, 2016a; Krasnova et al., 2013; Tandoc et al., 2015), decreased wellbeing (Chen et al., 2016; Kross et al., 2013; Wang et al., 2017), and negative emotions (Burke et al., 2010; Lup et al., 2015).

Additionally, the association between academic achievement and the usage of SNS platforms has received considerable research attention over the last decade. Research has discovered various associations between social networking usage and learning outcomes, including a negative relationship (Alwagait et al., 2015; Tafesse, 2020), a positive relationship (Liu et al., 2017), and the benefits and drawbacks of using SNS in educational contexts (Greenhow & Askari, 2017). Liu et al. (2017) conducted a meta-analysis study and revealed that SNS use was not always associated with lower academic performance. Specifically, research indicated active and passive behaviors had both supporting and opposing results in learning outcomes (e.g., Junco, 2012, 2015; Mazman & Usluel, 2010). The inconsistent findings related to online media usage (ASNU and PSNU) may be explained by the work–life interface theories, including work–life enrichment[1] and work–life conflict[2] frameworks. This

---

[1] The original term used by Greenhaus and Powell (2006) is work-family enrichment.

[2] The original term used by Greenhaus and Beutell (1985) is work-family conflict.

study also aimed to investigate how ASNU and PSNU interact in predicting learning performance according to the work–life interface theories.

Furthermore, most studies on SNS usage and learning outcomes have been conducted with undergraduates (e.g., Alwagait et al., 2015; Karpinski et al., 2013); however, SNS usage is also prevalent among high school students, and its impact on students' learning and school performance is an important concern in the Internet age. Thus, to fill the participants' gaps and to investigate in which circumstances ASNU/ PSNU enhance or hamper academic performance, in our study, we aim to investigate impacts of both ASNU and PSNU on high school students' academic performance, especially the interaction effect of ASNU and PSNU on academic performance.

1.1 Work–life enrichment and work–life conflict

In this age of technology-driven human connection, work and life are becoming entwined rather than functioning as separate sides (Nam, 2013). Work–life issues have long been concerns for those who care about their job-life satisfaction and its relationship to with overall life satisfaction (Guest, 2002). The work–life interface, which was first mentioned by Greenhaus and Beutell (1985), is referred to as the interaction between work and non-work domains (De Simone et al., 2014; Weale et al., 2019). Work may interfere with non-work domains, or non-work domains may interfere with work domains (Gordon & Hood, 2021). Work–life interfere is divided into two categories: work–life enrichment and work–life conflict (Greenhaus & Beutell, 1985; Greenhaus & Powell, 2006; Mao et al., 2015).

According to research on the interface between work and life, Greenhaus and Powell (2006) suggested a new theory, namely work–life enrichment. Work–life enrichment is defined as "… the extent to which experiences in one role improve the quality of life in another role" (Greenhaus & Powell, 2006, p. 73). In other words, Greenhaus and Powell (2006) believed that if people receive extensive resources from one role, the positive effect in that role will be enhanced, which facilitates their functioning in the other role. Enrichment is a term used to describe the positive aspects of the work–life interface (Carlson et al., 2006; Greenhaus & Powell, 2006; Shockley & Singla, 2011). Individuals' agency activities, defined as a person's unique ability to set specific goals, appear to define a critical driver of work–life enrichment (Pedersen & Jeppesen, 2012). Work–life enrichment has also been shown to improve an individual's mental health (Grzywacz & Bass, 2003), household behavior (Grzywacz & Marks, 2000), and occupational satisfaction (Hermann et al., 2020).

However, in situations where people cannot balance work and life outside of work, the second term, "work–life conflict", is used. Work–life conflict refers to a type of multi-role conflict wherein obligations arising from the work and life contexts are in some ways unharmonious (Greenhaus & Beutell, 1985). In other words, ineffectiveness in one role is hampered by experience in the other due to incompatible role pressures arising from the work and life domains (Greenhaus et al., 2006). In contrast to work–life enrichment, work–life conflict is generally linked to negative outcomes (Bauwens et al., 2020; Mao et al., 2015).

In this study, "work" refers to academic performance, while "life", which refers to non-work activities, may encompass all SNS usages, including ASNU and PSNU.

Following the work–life enrichment, we assumed that ASNU and PSNU may link with positive learning performance; whereas ASNU and PSNU may link with negative learning performance based on the work–life conflict.

1.2 ASNU and academic performance

It is believed that the potential of SNS usage may facilitate academic learning based on work–life enrichment (Agyenim-Boateng & Amankwaa, 2016; Alalwan, 2022; Greenhaus & Powell, 2006; Moorthy et al., 2019). Students' practical learning assistance seeking, group work, and other self-directed learning actions within SNS reflected this belief (Greenhow & Askari, 2017; Park et al., 2014). In light of research on learning and SNS usage in higher education, undergraduates benefited from their active online behaviors, including conversation, teamwork, information and resource communicating, and increased discussion with friends about learning material and examination (DiVall & Kirwin, 2012; Mazman & Usluel, 2010). In other words, ASNU can help maintain the interaction outside the classroom for educational purposes (Mazman & Usluel, 2010), and therefore, enhance their learning performance. Additionally, students' interactions with instructors or peers via social media may be beneficial to learning (Alalwan, 2022), and students can actively use SNS for educational purposes, such as sharing lessons contents, working on assignments with their friends, and organizing study groups (Lampe et al., 2011). Therefore, some researchers have recommended that universities and educational institutions actively take part in students' usage of social media for educational purposes (Park et al., 2014; Pekpazar et al., 2021).

On the other hand, according to work–life conflict theory, ASNU may have the potential detrimental effects on students' outcomes. SNS activities requiring significant cognitive resources, such as status updates or talking, may result in cognitive overload and multitasking mistakes (Junco & Cotten, 2012). Particularly, frequently texting via the Facebook platform while doing schoolwork or online searching undermined learning results (Junco, 2012; Junco & Cotten, 2012).

In sum, based on the above findings, we assumed that active SNS behaviors may relate to positive or negative learning performance depending on the using purpose and individuals' self-regulation of their usage following work–life enrichment or work–life conflict, respectively.

1.3 PSNU and academic performance

The extant literature has shown that PSNU is linked with other behavioral issues in adolescents (Buja et al., 2018) and has impacts on students' academic performance (Junco, 2015; Karpinski et al., 2013). PSNU was found to stimulate positive learning performance (Agyenim-Boateng & Amankwaa, 2016; Junco, 2012). Besides ASNU using such as posting news or chatting with others (Zhang et al., 2020), the majority of users' activities on a social networking site consist of viewing photos, videos, personal information, and news via the community's network platform, which is considered as PSNU (Thorisdottir et al., 2019; Zhang et al., 2020). Some PSNU activities, including seeking social information and checking friends' updates on their social

media, were related to emotional support, refresh the mind, release some tension, which are advantages for learning outcomes (Agyenim-Boateng & Amankwaa, 2016; Junco, 2012). According to the findings of Junco (2012), the passive online behavior is not detrimental to academic outcomes if the time spent on the site was little. In other words, when users can manage their time effectively, based on work–life enrichment, PSNU may enhance learning performance.

Similar to ASNU, PSNU may also negatively relate to learning outcomes, according to the work–life conflict theory. The blurring of formal learning and extracurricular activities can pose challenges to the educational process (Halverson, 2011). For instance, students who spent a lot of time on social media instead of schoolwork had relatively lower learning outcomes (Junco & Cotten, 2012). Moreover, PSNU was shown to have a positive association with depression mood (Frison & Eggermont, 2016a), which was believed to be intertwined with poor school performance (Wong et al., 2017).

Although PSNU has the potential to support teaching and learning, research on the effects of PSNU on students' academic performance stays inconsistent. Evidently, PSNU provided both opportunities and obstacles to students. Efforts should be made to maximize benefits and minimize harm. Thus, we aimed to investigate how PSNU functions on learning outcomes.

1.4 The interaction between ASNU and PSNU on academic performance

Consistent with research regarding two aspects of SNS—ASNU and PSNU (e.g., Joseph, 2021; Sharifian et al., 2022; Zhang et al., 2020), we hypothesized that ASNU may, together with PSNU, predict learning outcomes following work–life enrichment or work–life conflict. That is, the two behaviors seem to facilitate learning performance based on work-life enrichment theory, while ASNU and PSNU appear to jeopardize students' performance according to work–life conflict theory.

Drawing on the work–life enrichment model, ASNU, when accompanied by PSNU, may increase learning outcomes. Social media platforms enable students to participate in online group discussions (i.e., ASNU) and check the views of their classmates or other peers on a certain concern issues even in their comfort rooms (i.e., PSNU), therefore, facilitating teaching-learning activities and contributing to their understanding of class learning (Asiedu, 2017; Fakokunde, 2020; Yu et al., 2010). The positive effects of social media use on students' academic performance may come from the opportunities provided for both individuals actively communicating with lecturers and classmates regarding class materials, and chatting with friends about learning, and for individuals passively exploring contents related to their course learning and information from others' posts (Agyenim-Boateng & Amankwaa, 2016; Helou, 2014).

On the other hand, ASNU together with PSNU may decrease learning outcomes according to the work–life conflict theory. It was discovered that the level of social media addiction positively related to the amount of time spent on social media (Çimke & Cerit, 2021). Computer-based activities involve more multitasking, less concentrated behavior, and more time spent online, which may result in schoolwork underperformed (Judd, 2014; Kirschner & Karpinski, 2010). Indeed, spending too

much time on social networking sites in daily routines or being addicted to SNS was found to distract students from educational activities, causing lower academic performance (Asiedu, 2017; Moon & Illingworth, 2005).

ASNU and PSNU, which are two subsets of SNS usage, have distinct implications for social media usage and learning outcomes. The effect of ASNU on learning outcomes may not be the same among people with different levels of (i.e., low and high) PSNU. The two facets of SNS usage (ASNU and PSNU) together predict learning outcomes because the two behaviors are intertwined and cannot be distinguished solely. In order to shed light on these interrelationships, we believe studying these two types of SNS behaviors together can help us gain a relatively complete picture of how SNS behaviors function on high school students' learning. Specifically, according to work–life enrichment, the effects of ASNU and PSNU may together support individuals' learning; whereas these effects may hamper students' learning performance based on work–life conflict. Therefore, it was hypothesized in the study that ASNU and PSNU may interact to predict learning performance.

1.5 Overview of the study

ASNU and PSNU have shown both positive and negative effects on learning outcomes. Explanation of these inconsistent findings rarely capture both types of SNS behaviors as well as their interaction together on learning performance. In addition, how and when active and passive social media use associate with learners' performance has yet to be investigated, to the best of our knowledge. Since ASNU and PSNU are two nonexclusive aspects of SNS usage, we postulated that there may be different functions of both SNS usages on learning performance. The current study sought to determine whether active and passive social media usage may result in a negative learning outcome based on work–life conflict or can benefit to school learning based on work–life enrichment. Following are the hypotheses (Fig. 1):

Hypothesis 1 According to work–life enrichment, social network usages, including ASNU, PSNU, and their interactions, appear to ***positively*** predict academic performance. Specifically, those with the high ASNU and high PSNU may benefit from using SNS, and thus have a better academic performance.
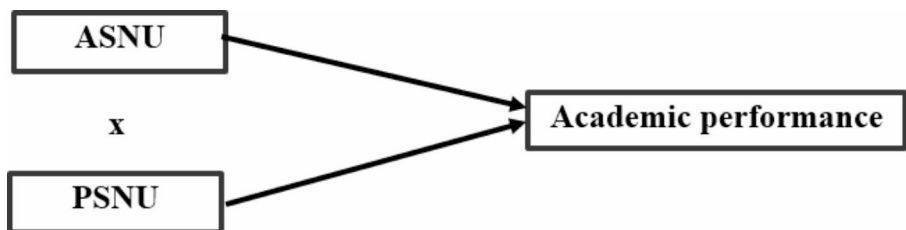

Fig. 1 The conceptual model
Note. ASNU=Active social network usage, PSNU=Passive social network usage

Hypothesis 2 According to work–life conflict, social network usages, including ASNU, PSNU, and their interactions, appear to ***negatively*** predict academic performance. Specifically, those with the high ASNU as well as high PSNU may spend more time and efforts on SNS, and thus would suffer mostly in their academic performance.

2 Methods

2.1 Participants and procedures

In the current study, 621 participants who are Taiwanese high school students ranging from grade 10 to 12 (54.3% female, 0.8% missing data for gender) completed the pencil and paper self-reported questionnaires including active and passive SNS usage and learning performance. The data were collected from September and October 2021.

2.2 Measurements

Active and Passive Social Network Usage. Active/Passive SNS usage was assessed using a 9-item scale developed by (Chen et al., 2016; Frison & Eggermont, 2016b; Wang et al., 2017). In terms of PSNU, six items asked participants to rate their agreement on how often they engaged in SNS passively such as "How often (on average) do you look through your friends' social networking sites homepage?" and "How often (on average) do you look through the homepage of those (e.g., friends of yours) you don't know?". In terms of ASNU, three items asked participants to rate their agreement on how often they engaged in SNS actively such as "How frequently do you update your status?" and "How frequently do you comment on your friends' wall?". These items was rated on a 5-point scale ranging from 1 (*never*), 2 (*rarely*), 3 (*occasionally*), 4 (*quite often*), 5 (*almost every time I log on*) was used. In the current study, the Cronbach's α of ASNU and PSNU were 0.78 and 0.79, respectively.

Learning Performance. Learning performance was measured using a question which asked respondents to report their grade point average (GPA) in the last semester, four distinct categories were embedded to answer and re-coded as: 1 (*below the last quarter*), 2: (*the third quarter*), 3 (*the second quarter*), 4 (*the first quarter*).

2.3 Data analysis

To test the theoretical model with the moderating role effect of PSNU on the relationship between ASNU and learning performance, Model 1 in SPSS PROCESS (Hayes, 2013) was used. Moreover, SPSS 20 was utilized to calculate means, standard deviation (*SD*), min, max among continuous study variables.

Table 1 Correlations between the Continuous Study Variables

	Mean	SD	Min	Max	1	2	3
1. ASNU	2.09	0.72	1.00	5.00	—		
2. PSNU	2.69	0.71	1.00	4.83	0.54***	—	
3. Learning performance	2.66	0.98	1.00	4.00	−0.09*	−0.06	—

Note. ASNU=Active social network usage, PSNU=Passive social network usage

* $p<.050$. *** $p<.001$

Table 2 PSNU as a Moderating Effect on the Relationship between ASNU and Learning Performance

	b	se_b	β	t	p	Sr^2	
ASNU	-0.089	0.067	-0.066	-1.333	=0.183	0.003	$R^2=0.016*$
PSNU	-0.031	0.066	-0.023	-0.470	=0.639	0.000	*Adj.* $R^2=0.011$
ASNUxPSNU	-0.131	0.063	-0.086	-2.079	=0.038	0.007	

Note. ASNU=Active social network usage, PSNU=Passive social network usage

Dependent variable: Learning Performance

* $p<.050$

3 Results

Descriptive statistics and correlations between the study variables display in Table 1. ASNU was positively associated with PSNU ($r=.54, p<.001$) and negatively associated with learning performance ($r−.09, p=.023$). However, PSNU was not associated with learing performance ($r=−.06, p=.159$).

Testing the interaction effect of ASNU X PSNU on learning performance. A regressed model including mean centering of ASNU, PSNU, and interaction term between mean centering of ASNU and PSNU was used to predict the high school students' self-reported learning performance. The total regression model was significant, $F(3, 599)=3.190, p=.023, R^2=0.02$, as well as the interaction of ASNU x PSNU, $b = -0.13, SE=0.06, p=.038$ (see Table 2).

In order to determine how the interaction of ASNU and PSNU functions on learning performance, the post hoc analyses were conducted. We examined whether ASNU could predict learning performance at different levels of PSNU. It was found that, for the students with low and medium levels of PSNU, their ASNU was not related to their learning performance, $b=0.14, SE=0.08, p=.954; b=−0.09, SE=0.06, p=.183$, respectively. However, for the students with a high level of PSNU, their ASNU significatly negatively perdicted learning performance was, $b=−0.18, SE=0.07, p=.011$ (Fig. 2).

In addition, we also exmined whether PSNU could predict learning performance at different levels of ANSU. However, PSNU did not predict learning performance at any level of ASNU. Please see Fig. 3 for the details.

Overall, PSNU did not significantly relate to high school students' school learning performance; whereas ASNU significantly negatively predicted school learning performance but not for those students with low and medium PSNU, only for those with high PSNU. In sum, only students with both high ASNU and high PSNU suffered most in their school performance. The findings supported work–life conflict
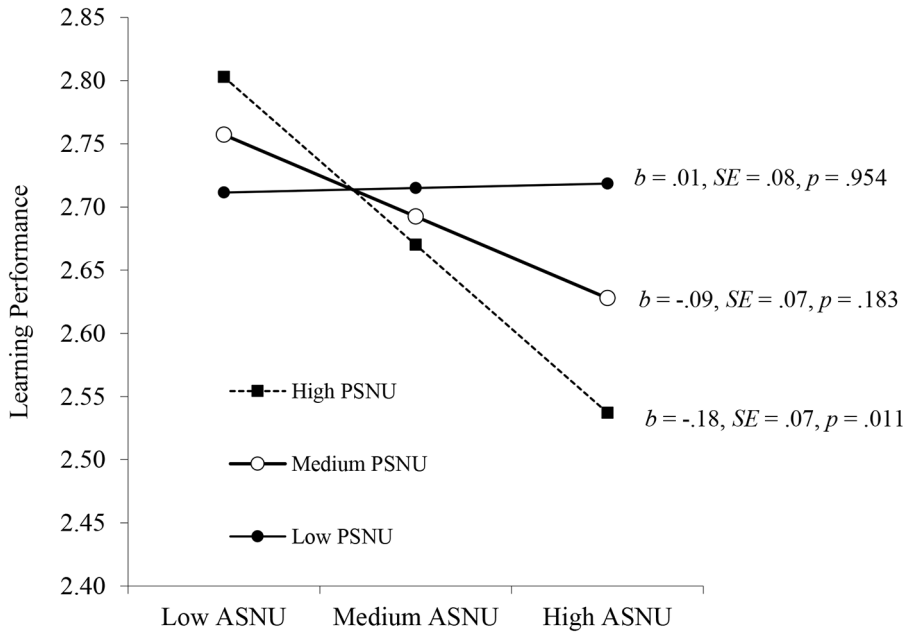
Fig. 2 The Associations between ASNU and Learning Performance among Different Levels of PSNU
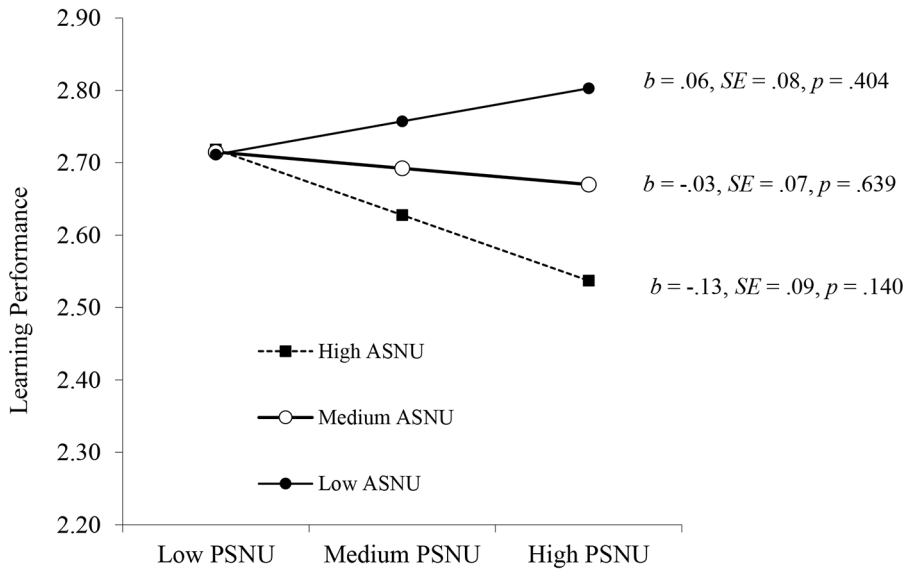*Note*. ASNU=Active social network usage, PSNU=Passive social network usage

Fig. 3 The Associations between PSNU and Learning Performance among Different Levels of ASNU
Note. ASNU=Active social network usage, PSNU=Passive social network usage

(*Hypothesis 2* was supported), but not work–life enrichment (*Hypothesis 1* was not supported).

4 Discussion

As social media has played a crucial role in students' schooling (Buja et al., 2018), the learning process and learning performance should take into account the role of SNS use. Additionally, the extant literature on SNS use has mostly neglected the relationship among ASNU, PSNU, and their interaction and learning process. Moreover, the inconsistent findings related to the relationship have not been explained clearly. Hence, in the present study, the associations between two types of SNS behaviors, their interactions, and academic performance among high school students were examined.

Using a cross-sectional design, we discovered that PSNU was not associated with learning performance, whereas ASNU actually undermined academic performance but only when students also had high PSNU. Some passive online behaviors per se (such as keeping up with friends' status updates and viewing online peers' posts) have little impact on students' learning activities. However, it appears that ASNU significantly negatively predicted learning performance when PSNU was high. The results revealed that only students with both high ASNU and high PSNU suffered significantly in their learning outcomes.

The finding that active social media use is negatively associated with academic performance is in line with previous studies (e.g., Greenhaus & Beutell, 1985; Junco, 2012; Junco & Cotten, 2012). Based on the idea of work–life conflict, behavior such as ASNU is linked with a negative outcome if it distracts students from their learning activities. When discussing work–life conflict, Greenhaus and Beutell (1985) suggested that if individuals are unable to adjust their behavior to meet the expectations of various roles, then they are likely to experience role conflict, which may also be related to poor self-regulation. Self-regulation, an ability to regulate behavioral impulses effectively, is associated with the likelihood of obtaining good results in high school (Cambron et al., 2017). Instead of learning, students with poor self-regulation may be easily attracted to SNS use (e.g., chatting online, updating SNS status, and checking posts). Thus, they might be unable to handle various course requirements, such as doing assignments, participating in learning activities, and interacting with peers and teachers, which all consume their time, energy, and concentration.

Our next finding was that students with high ASNU and high PSNU had the worst learning performances, which was also not surprising. Based on work–life conflict, time spent on tasks within one role is generally unable to be devoted to tasks within another (Greenhaus & Beutell, 1985). In the current case, when students spent time and energy on both active and passive SNS use, they might not have enough inner resources for learning activities. Consequently, their learning performance was negatively impacted. The current finding is consistent with previous research on the same issues (e.g., Çimke & Cerit, 2021; Judd, 2014; Kirschner & Karpinski, 2010). Our research may provide new insights into the role of social media in the learning process.

Previous studies have revealed an inconsistent relationship between SNS use and academic performance, indicating that SNS use either might be harmful (Alwagait et al., 2015; Tafesse, 2020), beneficial (Liu et al., 2017), or even have no relation (Greenhow & Askari, 2017) to academic performance. The possible reason might be that the active and passive SNS-using behaviors were not distinguished from each other and were combined together to show the mixed results. However, when ASNU and PSNU are considered separately as two predictors of learning outcomes, it may shed some light on a potential way to explain the inconsistent findings from previous studies. In the current study, it was found that PSNU had no effect on learning, but ASNU may. Specifically, ASNU predicted learning performance only when PSNU was high. That is, although SNS use may negatively impact learning performance based on the work–life conflict theory, negative effects may not always occur. Their school performance is likely to suffer only when individuals have both high ASNU and high PSNU.

5 Conclusions and limitations

In summary, we believe that the current study makes two contributions to the relevant field of SNS and academic performance. First, the work–life theories, including work–life enrichment and work–life conflict, are popular in economic domains or occupational-related fields with employees as participants (e.g., Fu & Shaffer, 2001; Hauser et al., 2018; Pedersen & Jeppesen, 2012) but are seldom considered in educational phenomena, to the best of our knowledge. The current study revealed that, based on work–life conflict, SNS behaviors, such as ASNU and PSNU, generally may not facilitate learning but instead may distract students from learning, especially when individuals' use SNS that is not intended for learning purposes. Discussions with peers and teachers about lessons or sharing learning resources through social media seem to benefit students' learning process as well as their learning results. However, when using SNS not intended for learning purposes, students' excessive active and passive SNS use may harm their learning.

Second, SNS use may be multidimensional as well as a single variable (Joseph, 2021; Sharifian et al., 2022; Zhang et al., 2020). Unlike studies where the associations among ASNU/PSNU and wellbeing, depression, or negative emotions have been well-investigated (e.g., Ding et al., 2017; Frison & Eggermont, 2016a; Wang et al., 2018, 2019), little research has focused on how ASNU and PSNU related to students' learning. The current study helps to fill this void, where ASNU, PSNU, and their interaction are treated as different predictors of learning performance.

The study enriches our understanding of how high school students' learning relates to their social media activities. In particular, we found that social media usage was related to poor learning performance only for those with high ASNU and high PSNU. In other words, when students recorded both highly active SNS use (including frequently sharing posts or status updates and chatting with friends) and highly passive use of SNS (such as checking others' updates constantly), their school performance often suffered, which supports the work–life conflict theory (Greenhaus & Beutell, 1985; Junco & Cotten, 2012). Interventions should be designed to prevent high

ASNU and PSNU use among high school students. Regulators and policymakers can implement relevant policies or interventions regarding students' SNS use while being cautious with students' active and passive SNS use. Furthermore, parents and teachers may consider setting time limits for students on social media for entertainment purposes and instead attract students to more academic activities, including posting or sharing learning quizzes and organizing educational discussions.

Despite the implications of this study, some limitations should be noted. First, we relied on self-reported data. Although self-reports have been believed to be reliable for assessing individual subjective experiences, recall bias and inaccurate estimates may be present. Second, the ASNU and PSNU were measured for general SNS usage without distinguishing between academic and non-academic usage. Third, the current study is correlational (i.e., one-time survey data were used). Causation cannot be determined due to the correlational design when investigating the hypothesized relationship between ASNU, PSNU, and academic performance. To enhance the robustness of the findings, future exploration (such as longitudinal studies and experimental-designed studies) should be applied to investigate how SNS use may (or may not) be related to learning performance.

Data availability The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Competing interest Authors have no competing interests to declare.

Ethics approval and consent to participate This research was supported by the National Science and Technology Council, Taiwan. Grant number is MOST 110-2410-H-110 -041-SS2. Data collection followed human subject principles. The student participations were voluntary; objectives of the research were disclosed and the consents were granted before the survey started.

References

Agyenim-Boateng, R., & Amankwaa, A. (2016). The impact of Social Media on Student Academic Life in Higher Education. *Global Journals of Human-Social Science Linguistics and Education*, *16*(4).

Alalwan, N. (2022). Actual use of social media for engagement to enhance students' learning. *Educ Inf Technol*, *27*, 9767–9789. https://doi.org/10.1007/s10639-022-11014-7.

Alwagait, E., Shahzad, B., & Alim, S. (2015). Impact of social media usage on students academic performance in Saudi Arabia. *Computers in Human Behavior*, *51*, 1092–1097. https://doi.org/10.1016/j.chb.2014.09.028.

Asiedu, N. (2017). *Influence of social networking sites on students' academic and social lives: The ghanaian perspective*. Library Philosophy and Practice.

Aslan, A. (2021). Problem- based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction. *Computers & Education*, *171*, 104237. https://doi.org/10.1016/j.compedu.2021.104237.

Bauwens, R., Muylaert, J., Clarysse, E., Audenaert, M., & Decramer, A. (2020). Teachers' acceptance and use of digital learning environments after hours: Implications for work-life balance and the role of integration preference. *Computers in Human Behavior*, *112*, 106479. https://doi.org/10.1016/j.chb.2020.106479.

Buja, A., Gallimberti, L., Chindamo, S., Lion, C., Terraneo, A., Rivera, M., & Baldo, V. (2018). Problematic social networking site usage and substance use by young adolescents. *Bmc Pediatrics*, *18*(1), 367. https://doi.org/10.1186/s12887-018-1316-3.

Burke, M., Marlow, C. A., & Lento, T. M. (2010). Social network activity and social well-being. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*.

Cambron, C., Kosterman, R., Catalano, R. F., Guttmannova, K., Herrenkohl, T. I., Hill, K. G., & Hawkins, J. D. (2017). The role of self-regulation in academic and behavioral Paths to a High School Diploma. *Journal of Developmental and Life-Course Criminology*, *3*(3), 304–325. https://doi.org/10.1007/s40865-017-0066-5.

Carlson, D., Kacmar, K., Wayne, J., & Grzywacz, J. (2006). Measuring the positive side of the work-family interface: Development and validation of a work-family Enrichment Scale. *Journal of Vocational Behavior*, *68*, 131–164. https://doi.org/10.1016/j.jvb.2005.02.002.

Chen, W., Fan, C. Y., Liu, Q. X., Zhou, Z. K., & Xie, X. C. (2016). Passive social network site use and subjective well-being: A moderated mediation model. *Computers in Human Behavior*, *64*, 507–514. https://doi.org/10.1016/j.chb.2016.04.038.

Çimke, S., & Cerit, E. (2021). Social media addiction, cyberbullying and cyber victimization of university students. *Archives of Psychiatric Nursing*, *35*(5), 499–503. https://doi.org/10.1016/j.apnu.2021.07.004.

De Simone, S., Lampis, J., Lasio, D., Serri, F., Cicotto, G., & Putzu, D. (2014). Influences of work-family interface on job and life satisfaction. *Applied Research in Quality of Life*, *9*(4), 831–861. https://doi.org/10.1007/s11482-013-9272-4.

Deters, F., & Mehl, M. R. (2013). Does posting Facebook Status updates increase or decrease loneliness? An online social networking experiment. *Social Psychological and Personality Science*, *4*(5), 579–586. https://doi.org/10.1177/1948550612469233.

Ding, Q., Zhang, Y. X., Wei, H., Huang, F., & Zhou, Z. K. (2017). Passive social network site use and subjective well-being among chinese university students: A moderated mediation model of envy and gender. *Personality and Individual Differences*, *113*, 142–146. https://doi.org/10.1016/j.paid.2017.03.027.

DiVall, M. V., & Kirwin, J. L. (2012). Using Facebook to facilitate course-related discussion between students and faculty members. *American Journal of Pharmaceutical Education*, *76*(2), 32. https://doi.org/10.5688/ajpe76232.

Escobar-Viera, C. G., Shensa, A., Bowman, N. D., Sidani, J. E., Knight, J., James, A. E., & Primack, B. A. (2018). Passive and active Social Media Use and depressive symptoms among United States adults. *Cyberpsychol Behav Soc Netw*, *21*(7), 437–443. https://doi.org/10.1089/cyber.2017.0668.

Fakokunde, J. (2020). Influence of Social Media on Students' academic performance as perceived by Undergraduate Students. *Journal of Education in Black Sea Region*, *6*, 41–51. https://doi.org/10.31578/jebs.v6i1.218.

Frison, E., & Eggermont, S. (2016a). Exploring the relationships between different types of Facebook use, perceived online social support, and adolescents' depressed mood. *Social Science Computer Review*, *34*(2), 153–171. https://doi.org/10.1177/0894439314567449.

Frison, E., & Eggermont, S. (2016b). Harder, better, faster, stronger: Negative comparison on Facebook and Adolescents' life satisfaction are reciprocally related. *Cyberpsychology Behavior and Social Networking*, *19*(3), 158–164.

Frison, E., & Eggermont, S. (2017). Browsing, posting, and liking on Instagram: The reciprocal Relationships between different types of Instagram Use and Adolescents' depressed Mood. *Cyberpsychology Behavior and Social Networking*, *20*, 603–609. https://doi.org/10.1089/cyber.2017.0156.

Fu, C. K., & Shaffer, M. A. (2001). The tug of work and family: Direct and indirect domain-specific determinants of work-family conflict. *Personnel Review*, *30*, 502–522.

Geng, S., Law, K., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International journal of educational technology in higher education*, *16*. https://doi.org/10.1186/s41239-019-0147-0.

Gordon, J. R., & Hood, E. (2021). Organization-based self-esteem and work-life outcomes. *Personnel Review*, *50*(1), 21–46. https://doi.org/10.1108/pr-09-2019-0484.

Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. *The Academy of Management Review*, *10*(1), 76–88. https://doi.org/10.2307/258214.

Greenhaus, J. H., & Powell, G. N. (2006). When Work and Family are Allies: A theory of Work-Family Enrichment. *The Academy of Management Review*, *31*(1), 72–92. http://www.jstor.org/stable/20159186.

Greenhaus, J., Allen, T., & Spector, P. (2006). Health Consequences of work–family conflict: The Dark side of the work–family interface. *Employee health, coping and methodologies* (5 vol., pp. 61–98). Elsevier Science/JAI Press. https://doi.org/10.1016/S1479-3555(05)05002-X.

Greenhow, C., & Askari, E. (2017). Learning and teaching with social network sites: A decade of research in K-12 related education. *Educ Inf Technol*, *22*(2), 623–645. https://doi.org/10.1007/s10639-015-9446-9.

Grzywacz, J. G., & Bass, B. L. (2003). Work, Family, and Mental Health: Testing different models of work-family fit. *Journal of Marriage and Family*, *65*, 248–261.

Grzywacz, J. G., & Marks, N. F. (2000). Family, Work, Work-Family spillover, and Problem drinking during midlife. *Journal of Marriage and Family*, *62*(2), 336–348. http://www.jstor.org/stable/1566743.

Guest, D. (2002). Perspectives on the study of work-life balance. *Social Science Information*, *41*, 255–279. https://doi.org/10.1177/0539018402041002005.

Halverson, E. (2011). Do social networking technologies have a place in formal learning environments? *On the Horizon*, *19*, 62–67. https://doi.org/10.1108/10748121111107717.

Hauser, A., Weisweiler, S., & Frey, D. (2018). Does the Motivational Orientation Matter? A Regulatory Focus Perspective on Work-Life Enrichment and work-life conflict. *International Journal of Stress Management*, *25*(4), 357–376. https://doi.org/10.1037/str0000074.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guilford Press.

Helou, A. M. (2014). The influence of social networking sites on students' academic performance in Malaysia. *International Journal of Electronic Commerce Studies*, *5*, 247–254.

Hermann, M. A., Haskins, N., Neale-McFall, C., Ziomek-Daigle, J., & Eckart, E. (2020). Counselor Educator mothers: Work-Life Enrichment and Occupational satisfaction. *Adultspan Journal*, *19*(2), 77–93. https://doi.org/10.1002/adsp.12097.

Joseph, J. (2021). Facebook, Social Comparison, and Subjective Well-Being: An Examination of the Interaction Between Active and Passive Facebook Use on Subjective Well-Being. In (pp. 1201–1217). https://doi.org/10.4018/978-1-7998-8544-3.ch066.

Judd, T. (2014). Making sense of multitasking: The role of Facebook. *Computers & Education*, *70*, 194–202. https://doi.org/10.1016/j.compedu.2013.08.013.

Junco, R. (2012). Too much face and not enough books: The relationship between multiple indices of Facebook use and academic performance. *Computers in Human Behavior*, *28*(1), 187–198. https://doi.org/10.1016/j.chb.2011.08.026.

Junco, R. (2015). Student class standing, Facebook use, and academic performance. *Journal of Applied Developmental Psychology*, *36*, 18–29. https://doi.org/10.1016/j.appdev.2014.11.001.

Junco, R., & Cotten, S. R. (2012). No A 4 U: The relationship between multitasking and academic performance. *Computers & Education*, *59*(2), 505–514. https://doi.org/10.1016/j.compedu.2011.12.023.

Karpinski, A. C., Kirschner, P. A., Ozer, I., Mellott, J. A., & Ochwo, P. (2013). An exploration of social networking site use, multitasking, and academic performance among United States and european university students. *Computers in Human Behavior*, *29*(3), 1182–1192. https://doi.org/10.1016/j.chb.2012.10.011.

Kirschner, P. A., & Karpinski, A. C. (2010). Facebook® and academic performance. *Computers in Human Behavior*, *26*(6), 1237–1245. https://doi.org/10.1016/j.chb.2010.03.024.

Krasnova, H., Wenninger, H., Widjaja, T., & Buxmann, P. (2013). *Envy on Facebook: A Hidden Threat to Users' Life Satisfaction?*.

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N., & Ybarra, O. (2013). Facebook use predicts declines in subjective well-being in young adults. *PLoS One*, *8*(8), e69841. https://doi.org/10.1371/journal.pone.0069841.

Lampe, C., Wohn, D. Y., Vitak, J., Ellison, N. B., & Wash, R. (2011). Student use of Facebook for organizing collaborative classroom activities. *International Journal of Computer-Supported Collaborative Learning*, *6*(3), 329–347. https://doi.org/10.1007/s11412-011-9115-y.

Liu, D., Kirschner, P. A., & Karpinski, A. C. (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*, 148–157. https://doi.org/10.1016/j.chb.2017.08.039.

Lup, K., Trub, L., & Rosenthal, L. (2015). Instagram #Instasad? Exploring Associations among Instagram Use, depressive symptoms, negative Social Comparison, and Strangers followed. *Cyberpsychology Behavior and Social Networking*, *18*, 247–252. https://doi.org/10.1089/cyber.2014.0560.

Mao, Y., Kwan, H. K., Chiu, R., & Zhang, X. (2015). The impact of mentorship quality on mentors' personal learning and work–family interface. *Asia Pacific Journal of Human Resources*, *54*, https://doi.org/10.1111/1744-7941.12069.

Mazman, S. G., & Usluel, Y. K. (2010). Modeling educational usage of Facebook. *Computers & Education*, *55*(2), 444–453. https://doi.org/10.1016/j.compedu.2010.02.008.

Moon, S. M., & Illingworth, A. J. (2005). Exploring the dynamic nature of procrastination: A latent growth curve analysis of academic procrastination. *Personality and Individual Differences*, *38*, 297–309.

Moorthy, K., T'Ing, L. C., Wei, K. M., Mei, Z., Yee, P. T., Wern, C. Y. J., K. L., & Xin, Y. M. (2019). Is facebook useful for learning? A study in private universities in Malaysia. *Computers & Education*, *130*, 94–104. https://doi.org/10.1016/j.compedu.2018.12.002.

Nam, T. (2013). Technology Use and Work-Life Balance. *Applied Research in Quality of Life*, *9*, https://doi.org/10.1007/s11482-013-9283-1.

Palmer, S. R., & Holt, D. M. (2009). Examining student satisfaction with wholly online learning. *Journal of Computer Assisted Learning*, *25*(2), 101–113. https://doi.org/10.1111/j.1365-2729.2008.00294.x.

Park, S. Y., Cha, S. B., Lim, K., & Jung, S. (2014). The relationship between university student learning outcomes and participation in social network services, social acceptance and attitude towards school life. *British Journal of Educational Technology*, *45*, https://doi.org/10.1111/bjet.12013.

Pedersen, V. B., & Jeppesen, H. J. (2012). Contagious flexibility? A study on whether schedule flexibility facilitates work-life enrichment. *Scandinavian Journal of Psychology*, *53*(4), 347–359. https://doi.org/10.1111/j.1467-9450.2012.00949.x.

Pekpazar, A., Kaya Aydın, G., Aydın, U., Beyhan, H., & Arı, E. (2021). Role of Instagram Addiction on Academic performance among turkish University students: Mediating Effect of Procrastination. *Computers and Education Open*, *2*, 100049. https://doi.org/10.1016/j.caeo.2021.100049.

Sharifian, N., Zaheed, A. B., & Zahodne, L. B. (2022). The role of Envy in linking active and Passive Social Media use to memory functioning. *Psychol Pop Media Cult*, *11*(1), 80–89. https://doi.org/10.1037/ppm0000318.

Shockley, K., & Singla, N. (2011). Reconsidering work—family interactions and satisfaction: A Meta-analysis. *Journal of Management - J MANAGE*, *37*, 861–886. https://doi.org/10.1177/0149206310394864.

Tafesse, W. (2020). The effect of social networking site use on college students' academic performance: The mediating role of student engagement. *Educ Inf Technol*, *25*(6), 4747–4763. https://doi.org/10.1007/s10639-020-10162-y.

Tandoc, E., Ferrucci, P., & Duffy, M. (2015). Facebook use, envy, and depression among college students: Is facebooking depressing? *Computers in Human Behavior*, *43*, 139–146. https://doi.org/10.1016/j.chb.2014.10.053.

Thorisdottir, I., Sigurvinsdottir, R., Asgeirsdottir, B., Allegrante, J., & Sigfusdottir, I. (2019). Active and Passive Social Media Use and symptoms of anxiety and depressed Mood among icelandic adolescents. *Cyberpsychology Behavior and Social Networking*, *22*, https://doi.org/10.1089/cyber.2019.0079.

Valkenburg, P. M., van Driel, I. I., & Beyens, I. (2021). The associations of active and passive social media use with well-being: A critical scoping review. *New Media & Society*, *24*(2), 530–549. https://doi.org/10.1177/14614448211065425.

Verduyn, P., Lee, D., Park, J., Shablack, H., Orvell, A., Bayer, J., & Kross, E. (2015). Passive Facebook usage undermines Affective Well-Being: Experimental and longitudinal evidence. *Journal of Experimental Psychology General*. https://doi.org/10.1037/xge0000057.

Verduyn, P., Ybarra, O., Résibois, M., Jonides, J., & Kross, E. (2017). Do Social Network Sites enhance or undermine subjective Well-Being? A critical review. *Social Issues and Policy Review*, *11*, 274–302. https://doi.org/10.1111/sipr.12033.

Wang, J. L., Gaskin, J., Rost, D., & Gentile, D. (2018). The reciprocal relationship between Passive Social networking site (SNS) usage and users' subjective well-being. *Social Science Computer Review*, *36*, 511–522. https://doi.org/10.1177/0894439317721981.

Wang, H. Z., Yang, T. T., Gaskin, J., & Wang, J. L. (2019). The longitudinal association between passive social networking site usage and depressive symptoms: The mediating role of envy and moderating role of life satisfaction. *Journal of Social and Clinical Psychology*, *38*(3), 181–199. https://doi.org/10.1521/jscp.2019.38.3.181.

Wang, Gaskin, J., Rost, D. H., & Gentile, D. A. (2017). The reciprocal relationship between passive social networking site (SNS) usage and users' subjective well-being. *Social Science Computer Review*, *36*(5), 511–522.

Weale, V., Wells, Y., & Oakman, J. (2019). The work-life interface: A critical factor between work stressors and job satisfaction. *Personnel Review*, *48*, https://doi.org/10.1108/PR-09-2016-0226.

Wei, H. C., & Chou, C. (2020). Online learning performance and satisfaction: Do perceptions and readiness matter? *Distance Education*, *41*(1), 48–69. https://doi.org/10.1080/01587919.2020.1724768.

Wen Cheng[1], Pham Ngoc Thien Nguyen[2], and Nhan Duc Nguyen[3].

Wong, M. D., Strom, D., Guerrero, L. R., Chung, P. J., Lopez, D., Arellano, K., & Dudovitz, R. N. (2017). The role of Social-Emotional and Social Network factors in the relationship between academic achievement and risky behaviors. *Academic Pediatrics*, *17*(6), 633–641. https://doi.org/10.1016/j.acap.2017.04.009.

Yu, A. Y., Tian, S. W., Vogel, D., & Kwok, C. W., R (2010). Can learning be virtually boosted? An investigation of online social networking impacts. *Computers & Education*, *55*(4), 1494–1503. https://doi.org/10.1016/j.compedu.2010.06.015.

Zhang, X. X., Rost, D. H., Wang, J. L., & Reynolds, K. J. (2020). Active and Passive Social networking Sites usage and negative emotions: A reciprocal relationship? *Journal of Social and Clinical Psychology*, *39*(3), 195–213. https://doi.org/10.1521/jscp.2020.39.3.195.

Zimmerman, B. J. (2000). Chapter 2 - Attaining Self-Regulation: A Social Cognitive Perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7.

1Center for Teacher Education, Institute of Education, & International Graduate Program of Education and Human Development, National Sun Yat-sen University, Kaohsiung, Taiwan (R.O.C.).

3International Graduate Program of Education and Human Development, National Sun Yat-sen University, Kaohsiung, Taiwan (R.O.C.); The University of Texas at San Antonio, USA.