European Journal of Psychology of Education (2025) 40:105
https://doi.org/10.1007/s10212-025-00997-9

The longitudinal relationship between social network site use and learning engagement among Chinese adolescents: the roles of self-concept clarity and perceived social support

Jingjing Chen[1] · **Xiao Wang**[2] · **Yansong Wang**[3]

Received: 18 September 2024 / Revised: 19 July 2025 / Accepted: 10 August 2025

Abstract
This study investigated 318 Chinese adolescents (174 males, mean age 15.87 ± 1.9 years) through two measurement waves conducted six months apart. By constructing a cross-lagged panel model and a moderated mediation model, the research examined the longitudinal mediating role of self-concept clarity in the relationship between social network site (SNS) use and adolescents' learning engagement, as well as the moderating effect of perceived social support on this mediation process. The analysis revealed the following findings: (1) SNS use at Time 1 can significantly negatively predict learning engagement at Time 2 after controlling for gender, age, and learning engagement at Time 1; (2) Self-concept clarity played a longitudinal mediating role in the effect of SNS use on adolescents' learning engagement; (3) Perceived social support significantly moderated the relationship between SNS use and self-concept clarity. Specifically, in the low-perceived social support group, SNS use had a significant negative predictive effect on self-concept clarity, whereas this relationship was not significant in the high-perceived social support group. However, further analysis revealed that the moderated mediation effect was not significant. These results contributed to understanding the underlying mechanisms by which SNS use affects adolescents' academic performance and offered insights for guiding healthy SNS use among adolescents.

Keywords Social network site use · Learning engagement · Self-concept clarity · Perceived social support · Adolescents

✉ Jingjing Chen
chenjingjing007@126.com

[1] Department of Sociology, Faculty of Humanities and Social Sciences, Nanjing Forestry University, Nanjing 210037, China

[2] College of Emergency Management, Nanjing Technology University, Nanjing 211816, China

[3] School of Medicine, Nanjing University of Chinese Medicine, Nanjing 210023, China

Published online: 20 September 2025

Introduction

As of 2024, Facebook remains the world's most popular social network site (SNS), with over 3 billion users (Statista, 2024). In China, the most widely used social networking platforms—WeChat and QQ—boast a usage rate of 97% as of 2023 (China Internet Network Information Center, 2024). Adolescents have been a significant segment of the SNS user base. Surveys revealed that in most developed countries, over 90% of adolescents spend more than 4 h per day on SNSs (Ortiz-Ospina & Roser, 2024). In China, nearly 80% of adolescents engage in chat interactions on SNSs daily (China Internet Network Information Center, 2022). These trends have drawn growing scholarly attention to the potential effects of SNS use on adolescents' academic performance.

In fact, in the early days of Facebook's widespread adoption among college students, there was significant public attention due to surveys reporting a negative correlation between Facebook use and academic performance (Pasek & Hargittai, 2009). Since then, numerous studies across various countries have been conducted to explore this relationship; however, the results have been inconsistent (e.g., Greenhow et al., 2015; Junco & Cotten, 2012; Pasek & Hargittai, 2009). This inconsistency can be attributed to several factors. On the one hand, the impact mechanism of SNS use on academic performance is complex, involving multiple influencing pathways and being subject to specific contextual factors (Wohn & LaRose, 2014). On the other hand, a fundamental requirement for one variable to cause another is that the cause must precede the effect in time (Cole & Maxwell, 2003). However, previous research has predominantly employed cross-sectional designs, leading to ambiguous conclusions (Astatke et al., 2023; Huang, 2018). In this context, this study adopted a longitudinal research design to examine the internal influence mechanism of SNS use on adolescents' learning engagement through a survey of Chinese adolescents.

SNS use and learning engagement

Learning engagement typically refers to students' enthusiastic and immersed state during learning processes (Furrer & Skinner, 2003). Scholars generally consider it a complex, multidimensional construct, with the most influential being Fredricks et al.'s (2004) three-dimensional model comprising: behavioral engagement (observable behaviors such as effort, concentration, and persistence), emotional engagement (positive affect like interest and enjoyment), and cognitive engagement (mental processes including deep learning strategies and self-regulation). As research progresses, scholars have further expanded the conceptualization by proposing agentic engagement, students' proactive participation in teaching by offering suggestions and expressing needs (Reeve & Jang, 2022), and social engagement, emphasizing collaborative interactions and interpersonal participation in learning (Sá, 2023).

Despite these conceptual expansions, this study adopts Skinner et al.'s (2009) two-dimensional engagement model focusing on behavioral and emotional dimensions. The rationale is threefold: First, the proliferation of engagement dimensions has created conceptual confusion, particularly regarding the substantial overlap between behavioral and cognitive engagement, which compromises measurement clarity and cross-study comparability (Fredricks et al., 2016). Second, Skinner et al. (2009) explicitly stated that their model does not attempt to encompass all possible engagement forms, but rather concentrates on core

classroom behavioral and emotional participation variables emphasized in Fredricks et al.'s (2004) review, featuring solid theoretical grounding and clear structural delineation. Third, extensive empirical studies have recently validated this two-dimensional model's stability and predictive validity across contexts, providing robust theoretical support for the current research (e.g., Aza et al., 2023; Yin et al., 2023).

Previous research on the relationship between SNS use and learning engagement can be broadly categorized into three perspectives. The first perspective emphasizes the potential positive effects of SNS use, proposing that social platforms help build social connections, expand opportunities for interpersonal interaction, and facilitate the sharing of knowledge and information (Koranteng et al., 2019). This externally developed social capital may, in turn, enhance peer interaction within the classroom and promote learning engagement (Ellison et al., 2011). However, empirical support for this perspective remains limited. In contrast, the second perspective underscores the negative consequences of SNS use, a view increasingly supported by empirical evidence. Studies have shown that SNSs are predominantly used for social rather than academic purposes (Kirschner, 2015; Tsai & Liu, 2015). Excessive use can lead to sleep deprivation, reduced attention, and decreased study time, ultimately undermining learning engagement (Li et al., 2019; Tafesse, 2020; Xanidis & Brignell, 2016). Finally, the third perspective suggests that there is no significant relationship between SNS use and learning engagement; instead, the association may depend on specific contexts and the manner in which SNSs are used (Park et al., 2022; Zamani & Talebi, 2018).

It should be noted that the studies above primarily focused on college students, and research on the impact of SNS use on adolescents' academic performance still needs to be made available (Astatke et al., 2023). Compared to college students, adolescents are subject to more supervision and discipline from schools and parents when using electronic devices (Lakshmana et al., 2017; Qin & Wang, 2022). This difference in the online environment may make the findings of previous studies not applicable to adolescents. Additionally, while past studies have explored the causal relationship between SNS use and learning engagement, they have predominantly used cross-sectional designs, which is a significant reason for the unclear conclusion of this relationship (Huang, 2018). Based on the above, this study employed a longitudinal research design to examine the effects of SNS use on adolescents'learning engagement, and proposed *Hypothesis 1*: SNS use would negatively predict adolescents' learning engagement.

Mediating effect of self-concept clarity

While previous research exploring the mechanisms through which SNS use affects learning engagement has primarily focused on mediating effects of social capital accumulation or cognitive resource allocation (e.g., Ellison et al., 2011; Tafesse, 2020), this perspective may overlook a critical psychological pathway: the influence of SNS use on adolescents' self-concept development. In daily life, adolescents frequently engage in self-presentation on SNSs by sharing updates, curating their profiles, and receiving peer feedback (Jong & Drummond, 2016; Park et al., 2022). At the same time, they are exposed to others' posts, compare themselves to peers, and form self-evaluations based on these interactions (Vogel et al., 2014). These interactions suggest that SNS use may play a crucial role in shaping adolescents' self-concept. Therefore, this study shifts the focus from cognitive mechanisms to a self-concept development perspective, examining whether and how SNS use affects learning engagement via changes in self-concept clarity.

Self-concept clarity refers to the extent to which individuals possess a clearly defined, internally consistent, and stable sense of self (Campbell, 1990). A growing body of theoretical and empirical work suggests that SNS use may influence the development and stability of self-concept clarity. Two primary theoretical frameworks help elucidate this relationship. First, the fragmentation hypothesis (Valkenburg & Peter, 2011) posits that individuals on SNSs often engage in online identity exploration, which may increase the complexity and inconsistency of their self-representations. Over time, this process may hinder the integration of self-aspects and lead to a decrease in self-concept clarity. Second, according to social comparison theory, adolescents are frequently exposed to curated content on SNSs that highlights others' achievements, physical appearance, or social status (Jarman et al., 2021). This can lead to upward social comparisons, resulting in feelings of inferiority and self-doubt, which may undermine the stability and clarity of one's self-concept (Zhang et al., 2024). Empirical evidence supports both views, with several studies showing that more frequent SNS use is associated with lower self-concept clarity (Davis, 2013; Israelashvili et al., 2012; Niu et al., 2015).

Low self-concept clarity, in turn, has been linked to diminished learning engagement. For instance, students with unstable self-concepts are more likely to adopt self-handicapping strategies (such as procrastinating before exams) to manipulate others' perceptions of their abilities and to avoid attributing failure to their incompetence (Gadbois & Sturgeon, 2011). Moreover, research has shown that individuals with low self-concept clarity exhibit weaker self-control, spending less time on repetitive tasks and struggling to maintain focus during sustained learning activities (Jiang et al., 2023).

Based on the above, this study proposed *Hypothesis 2*: Self-concept clarity would mediate the relationship between SNS use and learning engagement. SNS use negatively predicts self-concept clarity, while self-concept clarity positively predicts learning engagement.

Moderating effect of perceived social support

Inconsistent findings on the relationship between SNS use and learning engagement have prompted numerous scholars to explore the moderating variables in the relationship (e.g., Arora et al., 2018; Çimen & Yılmaz, 2017). Ecological techno-microsystems theory posits that electronic use impacts psychological development similarly to other microsystems, such as family and school, with the effects moderated by other microsystems (Johnson & Puplampu, 2008). Based on this viewpoint, this study examined the moderating role of perceived social support from teachers, peers, and parents in the relationship between SNS use and learning engagement.

The "digital compensation" theory suggests that online social interactions can compensate for a lack of social support in real life. Specifically, individuals who lack social support in their offline lives are more likely to seek entertainment, make new friends, or find social compensation in virtual spaces (McKenna & Bargh, 1999). However, this motivation often leads to problematic Internet use, such as Internet addiction (Benvenuti et al., 2024; Jin et al., 2015; Wang & Wang, 2013). In other words, individuals with insufficient offline social support are more likely to spend extended periods on SNSs, which can encroach on time that would otherwise be dedicated to studying, negatively affecting academic performance and reducing learning engagement. Conversely, research indicates that when individuals have substantial offline social support, SNSs can serve as functional tools, helping

to build and maintain social capital and enhance online social support (Cauberghe et al., 2021), which may, in turn, improve learning engagement.

Therefore, this study proposed *Hypothesis 3*: When offline social support is high, SNS use would positively predict learning engagement, whereas when offline social support is low, SNS use would negatively predict learning engagement.

On the other hand, offline social support may affect how individuals present themselves on SNSs, which in turn affects self-concept clarity. According to Valkenburg et al. (2006), individuals who have a lot of offline social support are more likely to use online social platforms to maintain their current relationships rather than make new ones, while individuals who have little offline social support are more likely to seek new connections through online interactions. Studies have shown that social networks based on familiar relationships encourage individuals to present their real-life selves and receive supportive feedback in the form of likes and comments (Ivcevic & Ambady, 2013). This can help strengthen self-concept and enhance self-concept clarity (Drogos, 2015). Conversely, if online friends are primarily strangers, such social spaces may encourage individuals to experiment with different roles or engage in virtual self-presentation, thereby impairing self-concept clarity (Zhang et al., 2016).

Based on the above, this study proposed *Hypothesis 4*: For adolescents with high levels of offline social support, SNS use would enhance self-concept clarity, which in turn will improve learning engagement. Conversely, for adolescents with low levels of offline social support, SNS use would diminish self-concept clarity and consequently reduce learning engagement.

The present study

In summary, this study used a six-month longitudinal design with students from two middle schools in China to investigate the effects of SNS use on learning engagement. Given that SNSs provide opportunities for social interaction and self-presentation closely related to self-concept development, the study aimed to explore whether SNS use affects adolescents' learning engagement by influencing their self-concept clarity. Additionally, the study assessed the moderating role of adolescents' perceived offline social support in this relationship, where self-concept clarity serves as a mediator. This research sought to enrich and expand existing findings in this field and offer practical insights into how SNSs can be effectively leveraged to support adolescents' academic development.

Methods

Participants

We randomly selected one middle school from Nanjing in the eastern region of China and one from Yunnan in the western region. From each school, 1–2 classes were randomly chosen from each grade level, ranging from the first year of junior high to the third year of senior high, for a six-month longitudinal study.

The first round of data collection was conducted in November 2022. The questionnaire assessed SNS use intensity, self-concept clarity, perceived social support, and learning engagement. A total of 360 students from 8 classes were contacted, and we received 360 valid responses (174 males and 186 females). The second round of data collection

took place in May 2023, and the questionnaires covered self-concept clarity and learning engagement. Due to absences and transfers, 16 participants were lost, resulting in a dropout rate of 4.4%. After quality screening of both sets of questionnaires—removing 26 questionnaires with excessive missing data or inconsistent responses—the final sample comprised 318 participants (152 boys and 166 girls), aged 12 to 20 years (mean age: 15.87 ± 1.9 years), with a response rate of 90.9%.

The final sample included 28 students from the first year of junior high (14 boys and 14 girls), 43 from the second year (21 boys and 22 girls), 39 from the third year (20 boys and 19 girls), 79 from the first year of senior high (33 boys and 46 girls), 46 from the second year (24 boys and 22 girls), and 83 from the third year (40 boys and 43 girls).

Measurements

SNS use intensity

SNS use intensity was assessed using a scale adapted from the Facebook Use Intensity Scale developed by Ellison, Steinfield, and Lampe (2007). The scale measures the extent and level of engagement with SNSs. Six items from the original Facebook scale were retained, with "Facebook" replaced by "social networking sites" (e.g., "Using social networking sites is a part of my daily routine"). Responses were rated on a 5-point Likert scale, where 1 indicates "Strongly Disagree" and 5 indicates "Strongly Agree." Higher scores indicated greater SNS use intensity. In this study, the Cronbach's α coefficient for this scale was 0.76 (Time 1).

Self-concept clarity

Self-concept clarity was measured using the scale developed by Campbell et al. (1996), which reflects the stability, consistency, and clarity of an individual's self-perception. This scale consisted of 12 items, such as "Overall, I have a clear sense of who I am and what I am like." Responses were rated on a 5-point Likert scale, where 1 indicates "Strongly Disagree" and 5 indicates "Strongly Agree." Higher scores indicated greater self-concept clarity. The Cronbach's α coefficients for this scale were 0.70 (Time 1) and 0.69 (Time 2) in the two assessments.

Perceived social support

The Perceived Social Support Scale (MSPSS), developed by Zimet et al. (1988) and revised by Jiang (1999), was used to assess the level of social support perceived from teachers, peers, and family. The scale included 12 items, such as "There are people (teachers, classmates, family) who are there for me when I encounter problems." Responses were rated on a 5-point Likert scale, where 1 indicates "Strongly Disagree" and 5 indicates "Strongly Agree." Higher scores indicated higher levels of perceived social support. In this study, the Cronbach's α coefficient for this scale was 0.87 (Time 1).

Learning engagement

A short version of the Learning Engagement Scale, developed by Skinner et al. (2009), was used to measure students' learning engagement. The scale includes six items that measure

two dimensions: behavioral engagement and emotional engagement (Reeve & Lee, 2014). Minor modifications were made to the original item wording to assess students' learning engagement on the previous day (e.g., "I put my best effort into learning in the classroom over the past day."). Responses were rated on a 5-point Likert scale, where 1 indicates "Strongly Disagree" and 5 indicates "Strongly Agree." Higher scores indicated greater engagement. The Cronbach's α values for this scale were 0.81 (Time 1) and 0.83 (Time 2), demonstrating good internal consistency in both survey waves.

Procedure and data analysis

This study first contacted two secondary schools located in eastern and western China and introduced the research objectives and procedures to school administrators and teachers. After obtaining informed consent from the schools, students, and their parents, two waves of offline survey data collection were conducted in November 2022 (two months after the start of the fall semester) and May 2023 (two months after the start of the spring semester). The surveys were administered by professionally trained social work students with relevant experience. On-site instructions were provided, and questionnaires were collected in a standardized manner. Each session took approximately 20 min. Student identification numbers and other personal information were collected to enable accurate matching between the two waves.

Data entry, descriptive statistics, and correlation analyses were conducted using SPSS 27.0. Longitudinal mediation analysis was performed in AMOS 23.0, and moderated mediation effects were tested using the PROCESS macro developed by Hayes. Missing values were handled using mean imputation. The significance of mediation effects was assessed using the bootstrap method (Wen & Ye, 2014), generating 5000 resamples with replacement to compute standard errors and bias-corrected 95% confidence intervals (CIs). An effect was considered significant if the CI did not include zero. To control for potential confounding variables, gender and age were included as covariates in all main analyses, based on prior findings that both factors significantly influence self-concept clarity and learning engagement (Geng et al., 2022; Kessels et al., 2018; Lodi-Smith & Roberts, 2010; Mahatmya et al., 2012).

In terms of research design, this study employed the half-longitudinal design proposed by Cole and Maxwell (2003) to examine the longitudinal mediation effect of self-concept clarity. This design involves repeated measurement of both the mediator (M) and the outcome (Y) across two time points, while the predictor (X) is measured at least at Time 1. By accounting for temporal precedence and controlling for the autoregressive effects of M and Y, the model effectively reduces the risk of spurious mediation caused by variable stability, thereby improving causal inference compared to traditional cross-sectional mediation models. Specifically, the mediator at Time 2 (M_2) is regressed on the mediator and predictor at Time 1 (M_1 and X_1), while the outcome at Time 2 (Y_2) is regressed on the outcome and mediator at Time 1 (Y_1 and M_1). Path a reflects the effect of X_1 on M_2 controlling for M_1, and path b reflects the effect of M_1 on Y_2 controlling for Y_1. The product ab represents the estimated longitudinal mediation effect of X on Y via M.

Building upon this robust framework, the study further adopted the First-order Autoregressive Cross-lagged Panel Model (FALCLPM) proposed by Fang et al. (2021) to more comprehensively examine dynamic relationships among variables. In addition to autoregressive and cross-lagged paths, the FALCLPM includes a direct path from X_1 to Y_2 (path c′) in the outcome equation, allowing for simultaneous testing of direct and indirect effects

and enhancing the rigor of causal inference. Following measurement optimization strategies from Zeng et al. (2025) and Saticı et al. (2024), the present study measured the predictor X only at Time 1, while both the mediator M and the outcome Y were assessed at Time 1 and Time 2. The final model was specified as follows:

$$M_2 = \beta_1 M_1 + aX_1 + e_1 \tag{1}$$

$$Y_2 = \beta_2 Y_1 bM_1 + c\prime X_1 + e_2 \tag{2}$$

As the moderator variable in this study, perceived social support was measured at only one time point, following the theoretical assumption that social support networks are relatively stable over time (Newcomb, 1990; Sarason et al., 1986).

Analysis results

Common method bias test

Since the variables of SNS intensity, perceived social support, self-concept clarity, and learning engagement were all self-reported in this study, we employed Harman's single-factor test to assess common method bias. The results indicated that, at both Time 1 (T1) and Time 2 (T2), the number of factors with eigenvalues greater than 1 was 8. The variance explained by the first factor was 18.77% at T1 and 18.02% at T2, both below the 40% threshold (Zhou & Long, 2004). Therefore, it can be inferred that common method bias did not severely affect the results of this study, allowing for further analysis.

Descriptive statistics and correlation analysis

Descriptive statistics and correlation analysis results for each variable are presented in Table 1. There were moderate correlations between self-concept clarity and learning engagement at T1 and their respective variables at T2, with correlation coefficients ranging between 0.45 and 0.50. SNS use at T1 was significantly negatively correlated with self-concept clarity at both measurement points (T1: $r = -0.26$, $p < 0.01$; T2: $r = -0.18$, $p < 0.01$) and with learning engagement at both measurement points (T1: $r = -0.13$, $p < 0.05$; T2: $r = -0.15$, $p < 0.05$). Additionally, SNS use at T1 was significantly negatively correlated with perceived social support at T1 ($r = -0.32$, $p < 0.05$).

The relationship between SNS use, self-concept clarity, and learning engagement

First, controlling for gender, age, and T1 learning engagement, a regression analysis was conducted to examine the impact of T1 SNS use on T2 learning engagement. The results indicated that T1 SNS use significantly negatively predicted T2 learning engagement ($\beta = -0.11$, $p < 0.05$, 95% CI $[-0.20, -0.01]$). Consequently, Hypothesis 1 of this study was supported.

Further analysis using a cross-lagged panel model (Fang et al., 2021) explored the causal relationships between SNS use, self-concept clarity, and learning engagement. Gender and age were controlled for in the analysis (paths for these variables are not shown in the model for simplification). After removing non-significant paths, the model

Table 1 Pearson correlation coefficients of variables ($n = 318$)

	M	SD	1	2	3	4	5	6	7	8
1. T1 SNS Use	2.76	0.78	1							
2. T1 Self-concept Clarity	2.86	0.46	−0.26**	1						
3. T2 Self-concept Clarity	2.92	0.49	−0.18**	0.46**	1					
4. T1 Learning Engagement	2.94	0.63	−0.13*	0.16**	0.22**	1				
5. T2 Learning Engagement	2.88	0.67	−0.15*	0.23**	0.19*	0.50**	1			
6. T1 Perceived Social Support	3.34	0.58	−0.32*	0.36**	0.25**	0.47**	0.34**	1		
7. Gender	1.62	0.49	−0.06	−0.06	−0.07	0.07	0.11	−0.02	1	
8. Age	15.92	1.88	0.05	0.05	0.04	0.01	0.05	0.10	0.04	1

Gender were dummy variables, male = 1, female = 2; T1 = Time 1, T2 = Time 2; $^{*}p < 0.05$, $^{**}p < 0.01$

demonstrated a good fit ($\chi^2 = 26.46/18 = 2.21$, CFI = 0.93, TLI = 0.93, GFI = 0.98, RMESA = 0.05). As shown in Fig. 1, after controlling for T1 self-concept clarity, T1 SNS use significantly predicted T2 self-concept clarity ($\beta = -0.11$, $p < 0.05$, 95% CI [−0.22, −0.01]). After controlling for T1 learning engagement, T1 self-concept clarity significantly predicted T2 learning engagement ($\beta = 0.17$, $p < 0.01$, 95% CI [0.05, 0.29]), which indicated that both the earlier and later segments of the longitudinal mediation pathway were significant, suggesting that self-concept clarity mediates the relationship between SNS use and learning engagement.

To further clarify the causal direction between variables, we added the path from T1 learning engagement to T2 self-concept clarity. The fit indices for the new model were as follows: $\chi^2(17) = 21.862$, CFI = 0.95, TLI = 0.90, GFI = 0.98, RMSEA = 0.06. Compared to the original model ($\chi^2(18) = 26.46$), the chi-square difference test showed $\Delta\chi^2(1) = 4.598$, $p = 0.032$. Since $p < 0.05$, the new model demonstrated a significantly better fit than the original model. In the new model, except for a slight increase in the autoregressive coefficient for self-concept clarity (from 0.42 to 0.44, $p < 0.001$, 95% CI [0.318, 0.556]), the magnitudes of all the substantive paths remained unchanged. The path coefficient from T1 learning engagement to T2 self-concept clarity was $\beta = 0.112$, $p = 0.030$, 95% CI [0.013, 0.214].

In addition, the direct effect of T1 SNS use on T2 learning engagement was found to be non-significant ($\beta = -0.05$, $p > 0.05$, 95% CI [−0.15, 0.05]). Using the Bootstrap method with 5000 samples and a 95% confidence interval, the longitudinal mediation effect of self-concept clarity was found to be −0.02, $p < 0.05$, 95% CI [−0.05, −0.01], supporting Hypothesis 2.

Moderating effect of perceived social support

To examine whether perceived offline social support moderates the mediating effect of SNS use on learning engagement via self-concept clarity, we employed Model 8 of the

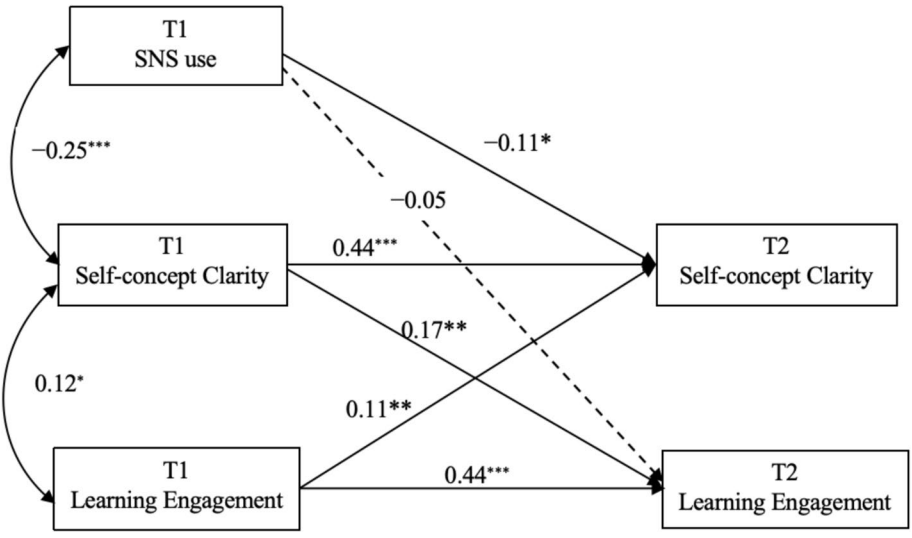

Fig. 1 The analysis result of cross-lagged panel model. Dashed lines represent non-significant coefficients, $n = 318$

PROCESS macro, incorporating T1 SNS use, T1 self-concept clarity, T1 perceived social support, and T2 learning engagement.

The results (see Table 2) indicated that the interaction between T1 SNS use and T1 perceived social support did not significantly predict T2 learning engagement ($\beta = -0.05$, $p > 0.05$, 95% CI [−0.14, 0. 04]), indicating that perceived social support did not moderate the direct effect of SNS use on learning engagement. Therefore, Hypothesis 3 was not supported.

However, this interaction term significantly predicted T1 self-concept clarity ($\beta = 0.10$, $p < 0.05$, 95% CI[0.01, 0. 19]), suggesting that perceived social support moderated the relationship between SNS use and self-concept clarity. Following the principle of one standard deviation above and below the mean, perceived social support was categorized into high and low groups to illustrate the moderation effect (see Fig. 2). Simple slope analyses revealed that for adolescents with high levels of perceived social support ($n = 52$), SNS use did not significantly predict self-concept clarity ($\beta_{simple} = -0.06$, $p > 0.05$, 95% CI [−0.21, 0. 09]). In contrast, among those with low perceived social support ($n = 46$), SNS use significantly and negatively predicted self-concept clarity ($\beta_{simple} = -0.26$, $p < 0.05$, 95% CI [−0.41, −0. 12]). These findings provide support for the first part of Hypothesis 4, indicating that perceived social support significantly buffers the negative impact of SNS use on adolescents' self-concept clarity.

Despite this significant moderation in the first stage of the mediation model, the conditional indirect effects at different levels of perceived social support were not statistically significant. Specifically, the indirect effect for the low perceived social support group was − 0.038 (95% CI [− 0.088, 0.002]), and for the high perceived social support group was − 0.009 (95% CI [− 0.056, 0.013]). The index of moderated mediation was 0.014 (95% CI [− 0.005, 0.036]), with the confidence interval including zero, indicating a non-significant moderated mediation effect overall.

Additionally, the path from T1 self-concept clarity to T2 learning engagement was significant ($\beta = 0.14$, 95% CI [0.02, 0.27]), suggesting that higher self-concept clarity is positively associated with subsequent learning engagement.

In summary, while data supported the moderating effect of perceived social support on the relationship between SNS use and self-concept clarity, this moderation did not translate into a significant conditional indirect effect on learning engagement.

Discussion

This study conducted a six-month longitudinal investigation among Chinese middle school students to address three key questions: (1) Does SNS use negatively impact adolescents' learning engagement? (2) Does SNS use affect adolescents' learning engagement indirectly through its impact on self-concept clarity? (3) Does perceived social support moderate the relationship between SNS use and learning engagement through self-concept clarity as a mediator? By exploring these questions, the study aimed to clarify the impact of SNS use on adolescents' academic performance and its underlying mechanisms, thereby enriching the theoretical understanding of social media's effects on adolescents and providing useful information for educators, parents, and policymakers.

The correlation analysis revealed significant negative correlations between SNS use and both T1 and T2 learning engagement. Additionally, T1 SNS use significantly predicted

Table 2 A moderated mediation model ($n = 318$)

Regression model		Goodness-of-fit index			Regression coefficient				
DV	IV	R	R^2	F	B	t	p	LLCI	ULCI
T1 self-concept clarity		0.43	0.19	8.92***					
	T1 SNS Use				−0.16	−2.79	0.01	−0.28	−0.05
	T1 Perceived Social Support				0.26	4.09	0.01	0.13	0.39
	T1SNS Use × T1 Perceived Social Support				0.10	2.24	0.03	0.01	0.19
	T1 Learning Engagement				−0.01	−0.04	0.90	−0.13	0.12
	Gender				−0.11	−0.99	0.32	−0.33	0.11
	Age				−0.01	−0.01	0.99	−0.06	0.06
T2 learning engagement		0.56	0.32	15.38***					
	T1 SNS Use				−0.05	−0.76	0.45	−0.17	0.07
	T1 Self-concept Clarity				0.14	2.17	0.03	0.02	0.27
	T1 Perceived Social Support				0.08	1.12	0.26	−0.06	0.21
	T1SNS Use × T1 Perceived Social Support				−0.05	−1.15	0.25	−0.14	0.04
	T1 Learning Engagement				0.49	7.60	0.01	0.36	0.62
	Gender				0.16	1.47	0.14	−0.06	0.39
	Age				0.01	0.24	0.81	−0.05	0.07

All of the model's variables were standardized before being added to the regression equation.

DV dependent variable, *IV* independent variables, *LLCI* lower limit confidence interval, *ULCI* upper limit confidence interval

***$p < 0.001$

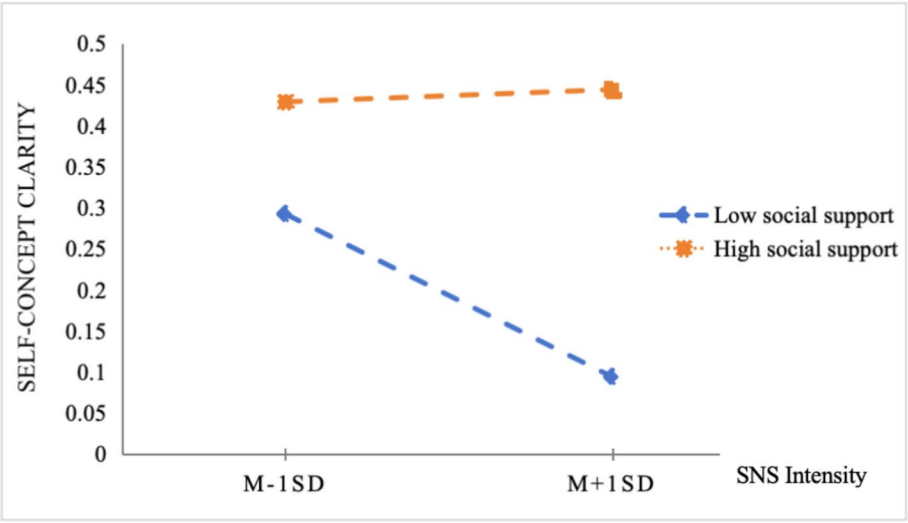

Fig. 2 Moderating effect of perceived social support on the relationship between SNS use and learning engagement

lower learning engagement at T2, which supporting Hypothesis 1. However, subsequent analyses using the cross-lagged panel model and the moderated mediation model showed that T1 SNS use did not have a significant direct effect on T2 learning engagement six months later. This suggested that for adolescents with strict control over electronic device use (Qin & Wang, 2022), the situation where excessive SNS use negatively impacts learning engagement (e.g., Junco, 2015) is less common. The negative impact of SNS use on learning engagement often occurs indirectly through other psychological traits or variables. Exploring the mediating mechanisms involved can help better understand the impact of SNS use on adolescent learning engagement.

The analysis of the cross-lagged panel model revealed that SNS use at T1 negatively predicts self-concept clarity at T2 (controlling for T1 self-concept clarity), and self-concept clarity at T1 negatively predicts learning engagement at T2 (controlling for T1 learning engagement). These findings suggest that self-concept clarity plays a significant mediating role in the relationship between SNS use and learning engagement, which supporting Hypothesis 2. The negative effect of T1 SNS use on T2 self-concept clarity supports the fragmentation hypothesis (Valkenburg & Peter, 2011) and aligns with prior studies (e.g., Davis, 2013; Israelashvili et al., 2012). According to self-perception theory (Bem, 1972), self-evaluation is shaped by interactions with others. SNS platforms, especially those popular among Chinese adolescents like Kwai and TikTok, provide opportunities for self-presentation and feedback. However, the anonymity of these platforms allows adolescents to present idealized or alternate identities, leading to a fragmented self-concept and reduced self-concept clarity (Zhang et al., 2016). On the other hand, consistent with prior research (Findley, 2013; Thomas & Gadbois, 2007), this study confirms that T1 self-concept clarity positively predicts adolescents' T2 learning engagement. Previous research indicates that students with clearer self-concepts tend to exhibit stronger learning engagement because they are typically better at setting clear goals (Liang, 2020) and adopting deeper learning strategies (Gadbois & Sturgeon, 2011). According to Self-Determination Theory (Ryan &

Deci, 2000), this phenomenon may arise from the fact that when students set goals aligned with their self-concept, this alignment satisfies their basic psychological need for autonomy, which in turn enhances intrinsic motivation and boosts cognitive engagement and task persistence in learning activities.

Previous research has pointed out that most studies on self-concept clarity have been conducted with college student samples, which may lead to a ceiling effect in academic performance assessments (Findley, 2013). College students typically exhibit stable and high levels of academic performance, leaving little room for variability, which limits the ability to detect the influence of psychological traits like self-concept clarity. In contrast, examining this relationship in middle school students, who are still undergoing significant cognitive, emotional, and academic development, offers more nuanced insights into how self-concept clarity affects academic performance. This study confirmed that the relationship between self-concept clarity and learning engagement also applies to middle school students. In addition, as the path coefficient from T1 learning engagement to T2 self-concept clarity was significant, this study further revealed a bidirectional relationship between self-concept clarity and learning engagement. According to expectancy-value theory (Eccles, 2009), when students experience success in learning, external recognition and positive feedback regarding their abilities can enhance their academic self-concept.

The results of the moderated mediation model revealed that T1 perceived social support did not significantly moderate the relationship between T1 SNS use and T2 learning engagement, thus not supporting Hypothesis 3. This suggests that while adolescents with limited offline social support may be more motivated to seek online interactions (McKenna & Bargh, 1999), school-related constraints (Qin & Wang, 2022) prevent them from becoming overly immersed in SNS use, thereby mitigating its potential negative impact on learning engagement. Similarly, for adolescents with strong offline social support, although they may also gain social support online (Meng et al., 2016), the relatively low relevance of online interactions to academic pursuits (Kirschner, 2015) means that online social capital does not enhance their learning engagement.

The analysis also indicated that T1 perceived social support significantly moderated the relationship between T1 SNS use and T1 self-concept clarity. Specifically, among adolescents with lower levels of perceived social support, SNS use significantly and negatively predicted self-concept clarity. In contrast, this relationship was non-significant among those with higher levels of perceived social support. These findings are consistent with prior research suggesting that individuals who lack adequate offline social support tend to seek interpersonal connection and affirmation through online platforms (Shillair et al., 2015). However, the anonymous and impersonal nature of many online environments may encourage users to present identities that differ from their real selves, which can lead to self-concept fragmentation and decreased clarity (Valkenburg & Peter, 2011).

Existing literature offers mixed findings regarding the role of high offline social support in the association between SNS use and self-concept clarity. On one hand, some studies suggest that individuals with high offline social support are more likely to use SNSs to maintain existing real-life relationships (Ivcevic & Ambady, 2013; Meng et al., 2016). In these contexts, where online interactions are rooted in authentic social ties, individuals may be more likely to engage in authentic self-presentation and receive emotional support through positive feedback such as likes and comments, which can enhance self-concept clarity (Wang et al., 2022). On the other hand, other studies argue that adolescents with ample offline support may already have a stable self-identity, and frequent self-exploration on SNSs in this context may actually hinder identity development (Huang, Wang, & Jing, 2024). This study finds that high levels of offline social support serve as a protective factor,

buffering the potential negative effects of SNS use on adolescents' self-concept development. This supports the buffering hypothesis of social support (Miloseva et al., 2017), which suggests that perceived offline resources can provide emotional reassurance and cognitive support, helping individuals withstand the negative impact of online experiences on self-perception. This highlights the cognitive protective function of offline social support.

Notably, this protection demonstrates clear boundaries. Specifically, the moderating role of perceived social support is evident only at the cognitive level (self-concept clarity) and does not extend to behavioral outcomes such as learning engagement. The moderated mediation effect was not significant, indicating that while social support can mitigate the negative cognitive effects of SNS use, this effect does not effectively translate into improved academic behavior. This may be due to the relatively weak influence of self-concept clarity on learning engagement ($\beta = 0.14$), falling short of the threshold needed for cognitive changes to drive behavioral outcomes. Additionally, adolescents' self-concept measured at Time 1 may have recovered by Time 2, especially among those with a strong growth mindset (Burnette et al., 2019). These individuals may reduce the harm of upward social comparison (Jarman et al., 2021) by reframing their ability beliefs and enhancing self-efficacy, resulting in minimal impact on learning engagement.

Previous research on the causal relationships between SNS use, self-concept clarity, and learning engagement has focused mainly on college students and used cross-sectional designs. This study extends the existing literature by employing a longitudinal approach to investigate these relationships in adolescents. Furthermore, whereas prior studies have often examined the influence of SNS use on learning from the perspective of social capital accumulation or cognitive resource allocation (e.g., Park et al., 2022; Tafesse, 2020), the present study emphasizes the role of self-concept formation and its implications for academic performance. By examining self-concept clarity as a mediator from a self-awareness development perspective, this research highlights the combined importance of online social interactions and offline support from family and school in shaping adolescents' self-concept and promoting their learning engagement.

Limitations and future research

This study has several limitations that should be considered. First, the study focused exclusively on Chinese adolescents, so the generalizability of the findings to other populations remains to be determined. Future research should expand the sample size and include participants from diverse cultural backgrounds to verify the stability and replicability of the conclusions.

Second, this study only measured the intensity of SNS use among adolescents. However, existing research suggests that specific activities on SNS (such as authentic self-presentation or virtual self-presentation) are crucial internal mechanisms through which SNS use affects individuals' self-concept and academic performance (Zhao, 2017). Additionally, different motivations for using SNS may also lead to varying psychological and academic outcomes (Šporčić & Glavak-Tkalić, 2018). Future research should investigate the specific activities adolescents engage in on SNS and their motivations for using SNS, which would provide a more detailed and precise understanding of how SNS use impacts adolescents' academic performance.

Third, while this study acknowledges the potential role of social comparison processes in the relationship between SNS use and self-concept clarity, as discussed in the

introduction (e.g., Jarman et al., 2021; Zhang et al., 2024), its current design did not directly measure or disentangle the specific mechanisms through which social comparison operates. Future research could explicitly integrate measures of social comparison (e.g., upward/downward comparisons, comparison frequency, and comparison orientation) to clarify its mediating or moderating role in this complex relationship. This would provide a more nuanced understanding of how SNS use influences changes in self-perception.

Lastly, although offline social support significantly buffered the negative impact of SNS use on self-concept clarity, this moderating effect did not result in a significant moderated mediation. One possible explanation is the relatively weak longitudinal effect of self-concept clarity at Time 1 on learning engagement at Time 2, six months later. Previous cross-sectional research has shown a moderate correlation between self-concept clarity and learning engagement (e.g., Liu et al., 2023; $\beta = 0.33$), suggesting that the influence of cognitive factors on learning behaviors may diminish over time. This attenuation underscores the need for further exploration of the mechanisms underlying this change. Future research could investigate additional behavior-related mediators, such as the use of learning strategies (e.g., Gadbois & Sturgeon, 2011), to better map the pathway from self-cognition to learning behaviors. Furthermore, potential compensatory mechanisms, such as a growth mindset, might help sustain learning engagement in the absence of social support (Burnette et al., 2019), providing valuable insights for refining theoretical models on how SNS use affects adolescent development.

Author contribution Jingjing Chen was responsible for research design, data analysis, and writing the first draft of the manuscript. Xiao Wang was responsible for data analysis. Yansong Wang was responsible for data collection. All authors read and approved the final manuscript.

Funding This work was supported by the 2024 Jiangsu Province Education Science Planning Project (No.B-b/2024/01/187).

Data availability The data sets generated for this study are available on request to the corresponding author.

Declarations

Ethics approval The study protocol was approved by the Ethics Committee of the Nanjing Forestry University prior to the commencement of the study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of interest The authors declare no competing interests.

References

Arora, T., Albahri, A., Omar, O. M., Sharara, A., & Taheri, S. (2018). The prospective association between electronic device use before bedtime and academic attainment in adolescents. *Journal of Adolescent Health, 63*(4), 451–458. https://doi.org/10.1016/j.jadohealth.2018.04.007

Astatke, M., Weng, C., & Chen, S. (2023). A literature review of the effects of social networking sites on secondary school students' academic achievement. *Interactive Learning Environments, 31*(4), 2153–2169. https://doi.org/10.1080/10494820.2021.1875002

Aza, A., Guilera, G., Chai, C. A., Gómez-Benito, J., Guerrero, E., & Barrios, M. (2023). The engagement in university students: Preliminary psychometric analyses of the Spanish version of the engagement vs. disaffection with learning scale. In *Proceedings of the 9th International Conference on Higher*

Education Advances (HEAd'23). Universitat Politècnica de València. https://doi.org/10.4995/HEAd23.2023.16152

Bem D. J. (1972). Self-perception theory. In *Advances in experimental social psychology* (Vol. 6, pp. 1–62). Academic Press.

Benvenuti, M., Panesi, S., Giovagnoli, S., Selleri, P., & Mazzoni, E. (2024). Teens online: How perceived social support influences the use of the Internet during adolescence. *European Journal of Psychology of Education, 39*(2), 629–650. https://doi.org/10.1007/s10212-023-00705-5

Burnette, J. L., Pollack, J. M., Forsyth, R. B., Hoyt, C. L., Babij, A. D., Thomas, F. N., & Coy, A. E. (2019). A growth mindset intervention: Enhancing students' entrepreneurial self-efficacy and career development. *Entrepreneurship Theory and Practice, 44*(5), 878–908. https://doi.org/10.1177/1042258719864293

Campbell, J. D. (1990). Self-esteem and clarity of the self-concept. *Journal of Personality and Social Psychology, 59*(3), 538–549. https://doi.org/10.1037/0022-3514.59.3.538

Campbell, J. D., Trapnell, P. D., Heine, S. J., Katz, I. M., Lavallee, L. F., & Lehman, D. R. (1996). Self-concept clarity: Measurement, personality correlates, and cultural boundaries. *Journal of Personality and Social Psychology, 70*(1), 141–156. https://doi.org/10.1037/0022-3514.70.1.141

Cauberghe, V., Van Wesenbeeck, I., De Jans, S., Hudders, L., & Ponnet, K. (2021). How adolescents use social media to cope with feelings of loneliness and anxiety during COVID-19 lockdown. *Cyberpsychology, Behavior, and Social Networking, 24*(4), 250–257. https://doi.org/10.1089/cyber.2020.0478

China Internet Network Information Center (2022). 2019 National report on internet usage among minors[EB/OL] (2024–7–29) http://www.cac.gov.cn/cms/pub/interact/downloadfile.jsp?filepath=ekdHFflbXTKqZLE43DV~bW41Dnafdoj16qe9OeDu0LxRrV72rpxW53D~ksJgNpLJkJAm4iqpm5~JRFs2bQ6CGDEjTcORl73kmCTdYOvdSjs=&fText=2019年全国未成年人互联网使用情况研究报告

China Internet Network Information Center (2024). The 54th Statistical Report on the Development of China's Interne[EB/OL] (2024–8–29) https://www.cnnic.net.cn/NMediaFile/2024/0911/MAIN17260176626560DHICKVFSM6.pdf

Çimen, A., & Yılmaz, M. B. (2017). How should we blend? The impact of blending social networks on high school students' achievement and social networking behaviors. *Education & Science/egitim Ve Bilim, 42*(191), 91–107. https://doi.org/10.15390/EB.2017.7190

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology, 112*(4), 558–577.

Davis, K. (2013). Young people's digital lives: The impact of interpersonal relationships and digital media use on adolescents' sense of identity. *Computers in Human Behavior, 29*(6), 2281–2293. https://doi.org/10.1016/j.chb.2013.05.022

Drogos, K. L. (2015). *The relationship between adolescent identity formation and social network site use* [Unpublished doctoral dissertation]. University of Illinois.

Eccles, J. (2009). Who am i and what am i going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist, 44*(2), 78–89. https://doi.org/10.1080/00461520902832368

Ellison, N., Steinfeld, C., & Lampe, C. (2007). The benefits of Facebook "friends": Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication, 12*, 1143–1168. https://doi.org/10.1111/j.1083-6101.2007.00367.x

Ellison, N. B., Steinfeld, C., & Lampe, C. (2011). Connection strategies: Social capital implications of Facebook-enabled communication practices. *New Media & Society, 13*(6), 873–892. https://doi.org/10.1177/1461444810385389

Fang, J., Wen, Z. L., & Zheng, Q. H. (2021). Mediation effect analysis of longitudinal data. *Journal of Psychological Science, 44*(4), 989–996. https://doi.org/10.16719/j.cnki.1671-6981.20210431

Findley, D. (2013). *Self-concept clarity and self-esteem in adolescence: Associations with psychological, behavioral, and academic adjustment*. [Unpublished doctoral dissertation]. University of South Florida.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Fredricks, J. A., Filsecker, M., & Lawson, M. A. (2016). Student engagement, context, and adjustment: Addressing definitional, measurement, and methodological issues. *Learning and Instruction, 43*, 1–4. https://doi.org/10.1016/j.learninstruc.2016.02.002

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*(1), 148–162. https://doi.org/10.1037/0022-0663.95.1.148

Gadbois, S. A., & Sturgeon, R. D. (2011). Academic self-handicapping: Relationships with learning specific and general self-perceptions and academic performance over time. *British Journal of Educational Psychology, 81*(2), 207–222. https://doi.org/10.1348/000709910X522186

Geng, J., Wang, Y., Wang, P., Zeng, P., & Lei, L. (2022). Gender differences between cyberbullying victimization and meaning in life: Roles of fatalism and self-concept clarity. *Journal of Interpersonal Violence, 37*(19–20), NP17157–NP17181. https://doi.org/10.1177/08862605211028285

Greenhow, C., Gibbins, T., & Menzer, M. M. (2015). Re-thinking scientific literacy out-of-school: Arguing science issues in a niche Facebook application. *Computers in Human Behavior, 53*, 593–604. https://doi.org/10.1016/j.chb.2015.06.031

Huang, C. (2018). Social network site use and academic achievement: A meta-analysis. *Computers & Education, 119*, 76–83. https://doi.org/10.1016/j.compedu.2017.12.010

Huang, J., Wang, S., & Jing, Y. (2024). Network identity experiments and college students' self-identity acquisition: A conditional process model analysis. *Chinese Journal of Clinical Psychology, 32*(4), 789–793. https://doi.org/10.16128/j.cnki.1005-3611.2024.04.013

Israelashvili, M., Kim, T., & Bukobza, G. (2012). Adolescents' over-use of the cyber world – Internet addiction or identity exploration? *Journal of Adolescence, 35*(2), 417–424. https://doi.org/10.1016/j.adolescence.2011.07.015

Ivcevic, Z., & Ambady, N. (2013). Face to (face) book: The two faces of social behavior? *Journal of Personality, 81*(3), 290–301. https://doi.org/10.1111/j.1467-6494.2012.00804.x

Jarman, H. K., Marques, M. D., McLean, S. A., Slater, A., & Paxton, S. (2021). Social media, body satisfaction and well-being among adolescents: A mediation model of appearance-ideal internalization and comparison. *Body Image, 36*, 139–148. https://doi.org/10.1016/j.bodyim.2020.11.005

Jiang, Q. J. (1999). Perceived social support scale. In X. D. Wang, X. L. Wang, & H. Ma (Eds.), *Handbook of psychological assessment scales* (p. 115). Chinese Journal of Mental Health Press.

Jiang, T., Wang, T., Poon, K. T., Gaer, W., & Wang, X. (2023). Low self-concept clarity inhibits self-control: The mediating effect of global self-continuity. *Personality and Social Psychology Bulletin, 49*(11), 1587–1600. https://doi.org/10.1177/01461672221109664

Jin, S. H., Dong, M. C., Wu, S., & Zhu, Y. J. (2015). The impact of adolescent social support on online social preferences: The mediating role of self-concept. *Psychological Exploration, 35*(4), 367–370.

Johnson, G. M., & Puplampu, K. P. (2008). Internet use during childhood and the ecological techno-subsystem. *Canadian Journal of Learning and Technology = La Revue Canadienne De L'apprentissage Et De La Technologie, 34*(1), Article n1.

Jong, S. T., & Drummond, M. J. (2016). Hurry up and 'like'me: Immediate feedback on social networking sites and the impact on adolescent girls. *Asia-Pacific Journal of Health, Sport and Physical Education, 7*(3), 251–267. https://doi.org/10.1080/18377122.2016.1222647

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

Kessels, U., Heyder, A., Latsch, M., & Hannover, B. (2018). How gender differences in academic engagement relate to students' gender identity. In Gender and educational achievement (pp. 116–125). Routledge.

Kirschner, P. A. (2015). Facebook as learning platform: Argumentation superhighway or dead-end street? *Computers in Human Behavior, 53*, 621–625. https://doi.org/10.1016/j.chb.2015.03.011

Koranteng, F. N., Wiafe, I., & Kuada, E. (2019). An empirical study of the relationship between social networking sites and students' engagement in higher education. *Journal of Educational Computing Research, 57*(5), 1131–1159. https://doi.org/10.1177/0735633118787528

Lakshmana, G., Kasi, S., & Rehmatulla, M. (2017). Internet use among adolescents: Risk-taking behavior, parental supervision, and implications for safety. *Indian Journal of Social Psychiatry, 33*(4), 297–304. https://doi.org/10.4103/0971-9962.218603

Li, Y., Yao, C., Zeng, S., Wang, X., Lu, T., Li, C., Lan, J., & You, X. (2019). How social networking site addiction drives university students' academic achievement: The mediating role of learning engagement. *Journal of Pacific Rim Psychology, 13*, e19. https://doi.org/10.1017/prp.2019.12

Liang, H. (2020). *The relationship between middle school students' self-concept clarity, perceived social support, and academic engagement*. [Unpublished doctoral dissertation], Jilin University. https://link.cnki.net/doi/10.27162/d.cnki.gjlin.2020.00657010.27162/d.cnki.gjlin.2020.006570.

Liu, Y., Di, S., Zhang, Y., & Ma, C. (2023). Self-concept clarity and learning engagement: The sequence-mediating role of the sense of life meaning and future orientation. *International Journal of Environmental Research and Public Health, 20*(6), 4808. https://doi.org/10.3390/ijerph20064808

Lodi-Smith, J., & Roberts, B. W. (2010). Getting to know me: Social role experiences and age differences in self-concept clarity during adulthood. *Journal of Personality, 78*(5), 1383–1410. https://doi.org/10.1111/j.1467-6494.2010.00655.x

Mahatmya, D., Lohman, B. J., Matjasko, J. L., & Farb, A. F. (2012). Engagement across developmental periods. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 45–63). Springer. https://doi.org/10.1007/978-1-4614-2018-7_3

McKenna, K. Y., & Bargh, J. A. (1999). Causes and consequences of social interaction on the internet: A conceptual framework. *Media Psychology, 1*(3), 249–269. https://doi.org/10.1207/s1532785xmep0103_4

Meng, J., Martinez, L., Holmstrom, A., Chung, M., & Cox, J. (2016). Research on social networking sites and social support from 2004 to 2015: A narrative review and directions for future research. *Cyberpsychology, Behavior, and Social Networking, 20*(1), 44–51. https://doi.org/10.1089/cyber.2016.0325

Miloseva, L., Vukosavljevic-Gvozden, T., Richter, K., Milosev, V., & Niklewski, G. (2017). Perceived social support as a moderator between negative life events and depression in adolescence: Implications for prediction and targeted prevention. *EPMA Journal, 8*, 237–245. https://doi.org/10.1007/s13167-017-0095-5

Newcomb, M. D. (1990). Social support and personal characteristics: A developmental and interactional perspective. *Journal of Social and Clinical Psychology, 9*(1), 54–68.

Niu, G. F., Bao, N., Fan, C. Y., Zhou, Z. K., Kong, F. C., & Sun, X. J. (2015). The impact of self-presentation on social networking sites on self-esteem: The mediating role of social support. *Psychological Science, 4*, 939–945. https://doi.org/10.16719/j.cnki.1671-6981.2015.04.025

Ortiz-Ospina, E., & Roser, M. (2024). Are Facebook and other social media platforms bad for our well-being?. *Our world in data.*

Park, E., Song, H. D., & Hong, A. J. (2022). The use of social networking services for classroom engagement? The effects of Facebook usage and the moderating role of user motivation. *Active Learning in Higher Education, 23*(3), 157–171. https://doi.org/10.1177/1469787418809227

Pasek, J., & Hargittai, E. (2009). Facebook and academic performance: Reconciling a media sensation with data. First Monday. https://doi.org/10.5210/fm.v14i5.2498

Qin, Y. Y., & Wang, Y. J. (2022). Preventing minors from becoming a "generation delayed by mobile phones": An analysis of minor's mobile phone addiction and educational interventions. *China Educational Technology, 2*, 1–7+14.

Reeve, J., & Jang, H. (2022). Agentic engagement. *Handbook of research on student engagement* (pp. 95–107). Springer International Publishing.

Reeve, J., & Lee, W. (2014). Students' classroom engagement produces longitudinal changes in classroom motivation. *Journal of Educational Psychology, 106*(2), 527–540.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Sá, M. J. (2023). Student academic and social engagement in the life of the academy—A lever for retention and persistence in higher education. *Education Sciences, 13*(3), 269. https://doi.org/10.3390/educsci13030269

Sarason, I. G., Sarason, B. R., & Shearin, E. N. (1986). Social support as an individual difference variable: Its stability, origins, and relational aspects. *Journal of Personality and Social Psychology, 50*(4), 845–855.

Satıcı, S. A., Kütük, H., & Okur, S. (2024). Mediation of the influence of mindfulness on academic buoyancy by academic hope: A two-wave longitudinal study. *Psychology in the Schools, 61*(12), 4558–4568. https://doi.org/10.1002/pits.23296

Shillair, R. J., Rikard, R. V., Cotten, S. R., & Tsai, H. Y. (2015). Not so lonely surfers: Loneliness, social support, internet use and life satisfaction in older adults. *Iconference 2015 proceedings*.

Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement, 69*(3), 493–525. https://doi.org/10.1177/0013164408323233

Šporčić, B., & Glavak-Tkalić, R. (2018). The relationship between online gaming motivation, self-concept clarity and tendency toward problematic gaming. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 12*(1), Article 4. https://doi.org/10.5817/CP2018-1-4

Statista. (2024). Social media platforms used by marketers worldwide.[EB/OL] (2024–8–29). https://www.statista.com/statistics/259379/social-media-platforms-used-by-marketers-worldwide/. Accessed 28 Jul 2024.

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

Thomas, C. R., & Gadbois, S. A. (2007). Academic self-handicapping: The role of self-concept clarity and students' learning strategies. *British Journal of Educational Psychology, 77*(1), 101–119. https://doi.org/10.1348/000709905X79644

Tsai, H., & Liu, S. (2015). Relationships between time-management skills, Facebook interpersonal skills, and academic achievement among junior high school students. *Social Psychology of Education, 18*(3), 503–516. https://doi.org/10.1007/s11218-015-9297-7

Valkenburg, P. M., & Peter, J. (2011). Online communication among adolescents: An integrated model of its attraction, opportunities, and risks. *Journal of Adolescent Health, 48*(2), 121–127. https://doi.org/10.1016/j.jadohealth.2010.08.020

Valkenburg, P. M., Peter, J., & Schouten, A. P. (2006). Friend networking sites and their relationship to adolescents' well-being and social self-esteem. *Cyberpsychology & Behavior, 9*(5), 584–590. https://doi.org/10.1089/cpb.2006.9.584

Vogel, E. A., Rose, J. P., Roberts, L. R., & Eckles, K. (2014). Social comparison, social media, and self-esteem. *Psychology of Popular Media Culture, 3*(4), 206–222. https://doi.org/10.1037/ppm0000047

Wang, E. S. T., & Wang, M. C. H. (2013). Social-support and social interaction ties on internet addiction: Integrating online and offline contexts. *Cyberpsychology, Behavior, and Social Networking, 16*(11), 843–849. https://doi.org/10.1089/cyber.2012.0557

Wang, S. Q., Tong, Y. H., & Su, X. (2022). Self-presentation on social networking sites and college students' self-identity. *Journal of Jinan University: Social Science Edition, 32*(3), 136–143. https://doi.org/10.20004/j.cnki.ujn.20220524.002

Wen, Z. L., & Ye, B. J. (2014). Mediation effects analysis: Methodology and model development. *Advances in Psychological Science, 22*(5), 731–745.

Wohn, D. Y., & LaRose, R. (2014). Effects of loneliness and differential usage of Facebook on college adjustment of first-year students. *Computers & Education, 76*, 158–167. https://doi.org/10.1016/j.compedu.2014.03.018

Xanidis, N., & Brignell, C. M. (2016). The association between the use of social network sites, sleep quality and cognitive function during the day. *Computers in Human Behavior, 55*, 121–126. https://doi.org/10.1016/j.chb.2015.09.004

Yin, Z., Guo, W., & Wang, Y. (2023). The effect of psychological distress on adolescents' academic engagement: The roles of social-emotional competence and teachers' caring behavior. *Psychology Research and Behavior Management,* 5011–5021. https://doi.org/10.2147/PRBM.S438998

Zamani, F., & Talebi, B. (2018). Comparing students' academic engagement based on how much they use social networks in learning English. *Interdisciplinary Journal of Virtual Learning in Medical Sciences, 9*(2), e65552. https://doi.org/10.5812/ijvlms.65552

Zeng, C. W., Zhang, B., Zhang, A. Q., Zeng, Y. X., Dai, H. F., Xiong, S. C., ... & Yang, Y. (2025). The longitudinal effects of school connectedness on adolescent smartphone addiction: The role of social anxiety and parental attachment. *Psychological Development and Education, 41*(2), 256–264. https://doi.org/10.16187/j.cnki.issn1001-4918.2025.02.11

Zhang, M., Zhang, Y., Xin, Z., & Zhang, Q. H. (2016). The relationship between online sameness experiments and self-identity among college students: The roles of online socialization tendency and compulsive internet use. *Psychological Development and Education, 32*(1), 98–105. https://doi.org/10.16187/j.cnki.issn1001-4918.2016.01.13

Zhang, T. Y., Zhang, Y. L., & Zhang, X. K. (2024). Effects of social networking site use on adolescent body dissatisfaction and its underlying mechanisms. *Advances in Psychological Science, 32*(9), 1514–1527.

Zhao, W. J. (2017). The effects of social networking site use on college students' self-esteem: The mediating role of the number of online friends and the moderating role of gender. *Psychology: Techniques and Applications, 5*(7), 403–412. https://doi.org/10.16842/j.cnki.issn2095-5588.2017.07.003

Zhou, H., & Long, L. (2004). Statistical tests and control methods for common method bias. *Advances in Psychological Science, 12*(6), 942–950.

Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment, 52*(1), 30–41. https://doi.org/10.1207/s15327752jpa5201_2

Current themes of research:

The corresponding author and first author of this submission is Dr. Jingjing Chen, who has been conducting research on adolescent academic achievement. In recent years, her work has focused on two main themes: the relationship between social class and academic achievement among adolescents, and the impact of Internet use on adolescents' academic achievement.

In the past five years, Dr. Chen has published three academic papers on social class and academic achievement [1–3]. These include the article titled "Why middle school students from low socioeconomic status families struggle to achieve academic success: The multiple mediating roles of educational values and future orientation," published in the Chinese journal *Educational Science Research* [1], and "Poverty stifles ambition: The role of self-efficacy and perceived social fairness in the future orientation of adolescents from financially disadvantaged families," published in the English journal *Youth & Society* [2]. These three papers have collectively been cited 51 times.

Building on this research, Dr. Chen has conducted a series of surveys over the past two years regarding Internet use and academic achievement among adolescents. She has published three related articles in Chinese and English journals [4–6]. These include "The effects of passive social networking site use on middle school students'appearance anxiety," published in the Chinese journal *Chinese Health Service Management* [4], and "Internet use and academic achievement among Chinese adolescents: Examining the mediating role of future orientation in a rural-urban dual system," published in the English journal *Psychology Research and Behavior Management* [5]. To date, these three articles have been cited 35 times.

The three published papers [4–6] are closely related to the current submission. They explored how internet use impacts Chinese adolescents' academic achievement, providing theoretical and empirical foundations for the research presented in this submission.

Most relevant publications the field of Psychology of Education:

Chen, J. J., & Xu, L. (2020). Why middle school students from low family socioeconomic status are less likely to achieve academic success: the multiple mediating roles of educational values and future orientations. Educational Science Research, 12, 33–38. Retrieved from: https://kns.cnki.net/kcms2/article/abstract?v=Uq4Diyda8XC-LR4-CzwsCF6-UKtms0k_QQ9m_unc7EXUrcz0Jm2y1h7XCnzqLnf_meILdA1-rTMfOMpMoz9wUSlWtU__-wRVUtgT-WRHK71AdS4r9KO6-PIYxXpIO05DsSgiloQmHit9ah4hTt64GA==&uniplatform=NZKPT&language=CHS.

Chen, J. J., & Guo, X. Y. (2023). Poverty stifles ambition: The role of self-efficacy and perceived social fairness in the future orientation of adolescents from financially disadvantaged families. Youth & Society, 00(0), 1–20. https://doi.org/10.1177/0044118X231163242.

Chen, J. J., Jiang, T. N., Liu, M. F. (2021). Family socioeconomic status and learning engagement in Chinese adolescents: The multiple mediating roles of resilience and future orientation. Frontiers in Psychology, 12, 714346.

Chen, J. J., & Pu, J. R. (2022). The effects of passive social networking site use on middle school students'appearance anxiety. Chinese Health Service Management, 39(4),316–320. Retrieved from: https://kns.cnki.net/kcms2/article/abstract?v=Uq4Diyda8XCKvQ_X5vHkqHzH2zjj_EFKhko0ytrnFrtAdE3SU6lv0tQPDAVC3-x-NE-fLsnv2IeGwNU4FmD77qrHFPi1edgtBxcQn5Bkc2w1Y80gwd2RVPUKPuMvi-ZiohRRMtPrOKQF4mUlIFVBqVGHoTPbjBhxAKK-lO45mb90e7IT1VO2Y3u8b7FxqMcOcz7PQB5-aC8=&uniplatform=NZKPT&language=CHS.

Chen, J. J., & Bai, J. (2022). Internet use and academic achievement among Chinese adolescents: Examining the mediating role of future orientation in a rural–urban dual system. Psychology Research and Behavior Management, 15, 2439–2448.

Chen, J. J., Liu, M. F. (2021). Does the Internet expand the educational gap among different social classes? The protective role of future orientation. Frontiers in Psychology, 12, 647351.