

The Role of Social Media in Shaping Chinese Higher Education for International Students: Trends and Implications

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ABSTRACT

With the proliferation of social media, its role in influencing educational outcomes has become a crucial area of inquiry. This study investigates the impacts of social media usage on learning outcomes and engagement among international students in Chinese higher education institutions. A sample of 414 international students in China across various disciplines and academic levels participated. Employing a structural equation model, the study assessed the direct impact of social media usage, both academic and non-academic, on student learning outcomes and explored the mediating role of international student engagement (ISE) and the moderating effect of Self-based Identity (SBI). The results indicate that academic and non-academic social media usage significantly influence learning outcomes. ISE was also positively influenced by social media usage but did not mediate its relationship with learning outcomes, indicating a direct and substantial effect of social media usage on these outcomes. Additionally, while SBI positively impacts learning outcomes, it also moderates the effect of ISE on these outcomes, suggesting that a strong academic self-identity may enhance the benefits of engaging activities on learning outcomes. The findings provide theoretical insights and practical implications for educators, policy makers, and researchers in higher education. The results suggest the strategic integration of social media in teaching and fostering international students' academic self-identity can help improve learning outcomes. The study's outcomes also prompt further research on other potential mediators and moderators in the context of social media usage in higher education.

Keywords: Social Media Usage, Learning Outcomes, International Student Engagement, Self-based Identity, Chinese Higher Education, International Students

INTRODUCTION

The prevalence of social media usage among students in the digital era has significantly influenced their academic performance (Flanigan & Babchuk, 2015). Prior research has demonstrated that social media can positively and negatively impact student learning outcomes, depending on how it is used (Flanigan & Babchuk, 2015; Kojo et al., 2018; Muftah, 2023). Social media platforms have become an integral part of the lives of Chinese higher education for international students. With the widespread availability of internet access and the popularity of smartphones, social media platforms have transformed how international students communicate, collaborate, and access information (Saw et al., 2013; Sin & Kim, 2013). Social media usage has witnessed exponential growth in Chinese higher education. Popular platforms such as WeChat, Weibo, and QQ have millions of active users, including international students (X. Wang, 2019; Xu et al., 2015). These platforms offer features beyond simple communication, enabling international students to form study groups, share lecture notes, discuss coursework, and seek academic support (Flanigan & Babchuk, 2015). Additionally, social media allows international students to connect with professors, follow academic institutions, and stay updated on educational events and opportunities (Hayat et al., 2021; Malik et al., 2019; et al., 2019; Wu et al., 2015).

Despite the growing prevalence of social media in higher education, it is necessary to comprehensively understand its role in shaping the learning experiences and outcomes of Chinese higher education for international students. While previous studies have examined the impact of social media on international student

engagement and academic performance in the Western world (Al-Shaikhli et al., 2019; Sobaih et al., 2022), the Chinese higher education system presents unique cultural, social, and technological dynamics that may influence the effects of social media usage (Dwumah Manu et al., 2023). A critical shortcoming of previous studies lies in their often monolithic and simplified perspective of social media usage. More specifically, these studies treat social media as a singular construct (Dwumah Manu et al., 2023; Lacka & Wong, 2021), neglecting the diversity inherent in how students engage with these platforms. To capture the diverse functionalities of social media, this study proposes a dual-dimensional approach that disaggregates social media usage into academic (SMA) and non-academic (SMNA) categories.

Furthermore, existing studies have predominantly focused on direct relationships between social media usage and learning outcomes, with less attention paid to potential mediators and moderators in this relationship (Manu et al., 2021). To address this gap, our research introduces student engagement (SE) as a mediator and self-based identity (SBI) as a moderator. Both constructs are deeply embedded within educational psychology literature and have been recognized as vital elements in the learning process (Bakadorova & Raufelder, 2017; Manu et al., 2021; Toti et al., 2020). However, their roles within social media usage and its impact on learning outcomes have been relatively unexplored, marking a significant research gap our study aims to fill. Therefore, this study develops a conceptual framework (Fig. 1) that aims to address these gaps in the literature by investigating the role of social media in shaping Chinese higher education, focusing specifically on international students. By examining the direct impact of social media usage on international students learning outcomes, with student engagement as a mediator. Again, the study examines academic self-based identity as a moderator between student engagement and learning outcomes.

The study has several contributions. From a theoretical perspective, understanding these complex relationships will augment the academic discourse surrounding social media's impact on educational outcomes, providing a more nuanced view of the intricacies involved. Practically, educators, administrators, and policy-makers can harness this enhanced understanding to optimize the educational use of social media platforms and formulate targeted interventions. These may range from designing effective digital learning environments to implementing policies that encourage positive social media habits, ultimately improving student learning outcomes.

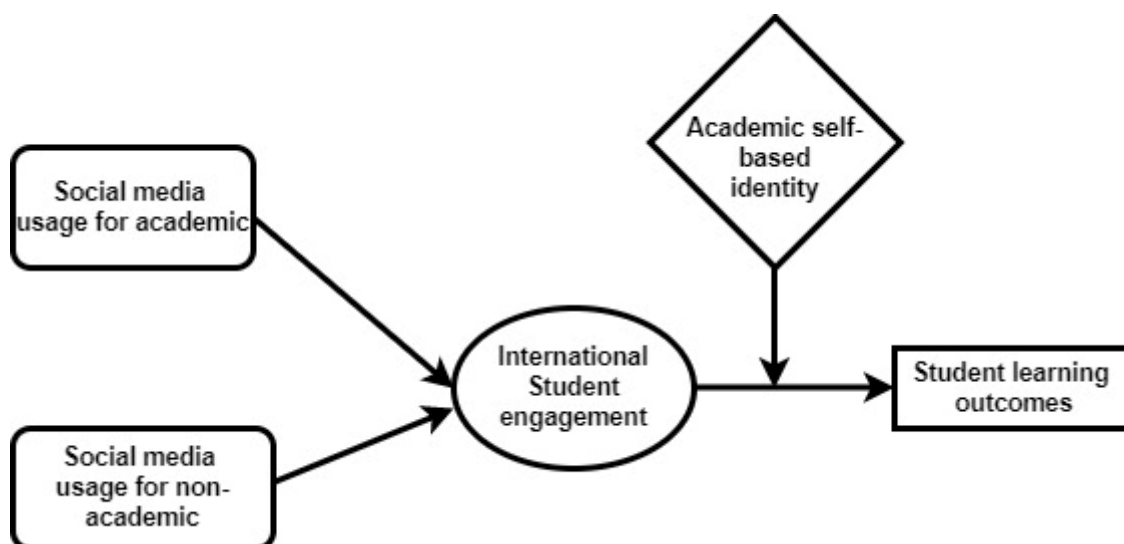


Fig. 1 Conceptual framework

THEORETICAL AND LITERATURE REVIEW

The utilization of social media in Chinese higher education, particularly for international students, is underpinned by both pedagogical and technology adoption theories. Pedagogical theories postulate that social media platforms can augment the learning experience and boost educational outcomes (Cilliers, 2021; Sabah & Altalbe, 2022; Saxena, 2018). The theoretical grounding for these pedagogical arguments lies in the capacity of social media to fulfil Bloom's taxonomy of learning objectives, laying the foundation for constructivism, connectivity, and community-building (Rahimi et al., 2014). Social media facilitate remembering, understanding, and

analyzing and critically foster application, evaluation, and creation (Rahimi et al., 2014). In the context of Chinese higher education for international students, this technology-intensive learning environment may provide comfort, reduce feelings of alienation, and promote cultural integration.

Social Media Usage and Learning Outcomes

As social media platforms gain prominence in education, their potential impact on student learning outcomes becomes crucial. We can gain a comprehensive understanding of this impact by drawing on the lenses of constructivist learning theory (Bereiter, 1994). The Constructivist learning theory emphasizes that learners actively build their knowledge through experiences and interactions with their environment (Bereiter, 1994). This notion aligns closely with the functionality of social media platforms, where the interactive and collaborative nature enables active construction of knowledge (Cao et al., 2013). For instance, through shared ideas, debated concepts, and collaborative work facilitated by social media, students engage in a deeper level of understanding and personal construction of knowledge (Lacka & Wong, 2021). This active engagement can improve cognitive learning outcomes, such as analytical and critical thinking, and affective outcomes, like increased student motivation and positive attitudes towards learning (Khan et al., 2016). This assumption gained credence in the work of Ansari & Khan (2020), who emphasized the pedagogical potential of social media in shaping participatory learning experiences with academicians in higher education. Their study revealed that online social media for collaborative learning significantly impacted interactivity with peers and online knowledge-sharing behaviour. Therefore, by facilitating user-generated content, collaboration, knowledge co-construction, and social networking, we argue that social media platforms align closely with constructivist learning principles and can effectively foster critical thinking, problem-solving, and self-directed learning, improving student learning outcomes.

Furthermore, non-academic usage of social media platforms also bears significant implications for student learning outcomes. Outside the formal academic context, social media acts as a vital tool for peer interaction, information sharing, and leisure activities (Hussain et al., 2021). This aligns with the socio-constructivist perspective that learning is a social process and happens in diverse contexts, not confined to formal educational settings (Bereiter, 1994). Studies indicate that such non-academic use of social media can indirectly influence learning outcomes by affecting students' self-efficacy and overall well-being (Ansari & Khan, 2020). For instance, for international students in Chinese higher education institutions, social media platforms like WeChat and QQ offer an interactive space for both academic and cultural interactions, contributing to their overall learning experience (Hussain et al., 2021). The student's interaction with their local peers and faculty can deepen their understanding of academic concepts, as well as enhance their cultural intelligence, a critical learning outcome for international students (Li, 2019). A study by Dwumah Manu et al. (2023) provides insights into how social media usage affects international students' acculturation. Their research findings showed that international students' use of social media improves their acculturation process and engagement in school activities through information sharing, establishing contacts, and entertainment. Therefore, drawing on constructivist learning theory, this study suggests that social media platforms facilitate academic discussions and knowledge sharing but also help students immerse themselves in the local culture, ultimately contributing to their cognitive and sociocultural learning outcomes. Based on the above perspective, we hypothesize that;

H1: Social media usage will have a positive influence on international student learning outcomes

H1a. Social media usage for academic purposes will have a positive influence on international student learning outcomes

H1b. Social media usage for non-academic purposes will have a positive influence on international student learning outcomes

Social Media Usage and International Student Engagement

The proliferation of social media has created new avenues for enhancing student engagement, especially among international students who often face unique challenges in adapting to new academic and cultural environments. The role of social media in fostering international student engagement can be examined from both academic and

social perspectives, drawing on constructivist learning theory. According to the constructivist theory, learning occurs as students actively construct knowledge through interaction with their environment (Bereiter, 1994). Social media platforms like Twitter and Facebook or Chinese applications like WeChat serve as interactive environments facilitating knowledge construction (Hussain et al., 2021). International students can participate in academic discussions, collaborate on projects, share resources, and seek help with academic tasks (Ansari & Khan, 2020). Social media also allows immediate feedback and clarification, enhancing the learning experience and engagement (Kumar & Nanda, 2019). Studies by Cilliers (2021) based on the educational theories of constructivism and social learning, in an attempt to reflect on social learning tools employed in a third-year Urban and Regional Planning module at the North-West University, found that social media, when used academically, stimulate student engagement, encourage active learning, and foster a sense of community among students. In the Chinese context, Manu et al. (2023) found that WeChat, a popular local platform, facilitates academic discussions and assists international students in acclimatizing to Chinese culture. These studies collectively underline the potential of various social media platforms in promoting active learning and engagement, which aligns with the principles of constructivist learning theory.

Furthermore, using social media for non-academic purposes also plays a pivotal role in international student engagement. Outside the academic sphere, social media serves as a platform for cultural exchange and social interaction, helping international students acculturate and integrate into the new environment (Lau, 2017). Social networking sites enable students to maintain connections with their home country while creating new relationships in the host country (Ansari & Khan, 2020). This dual role of social media can alleviate feelings of homesickness and foster a sense of belonging, thereby enhancing students' overall engagement with their new environment (H. Wang et al., 2022). We, therefore, propose that social media for academic and non-academic purposes could be a valuable tool to enhance international student engagement in Chinese higher education contexts. Based on this perspective, we hypothesize the following;

H2: Social media usage will have a positive influence on international student engagement

H2a. Social media usage for academic purposes will have a positive influence on international student engagement

H2b. Social media usage for non-academic purposes will have a positive influence on international student engagement

International Student Engagement and Learning Outcomes

International student engagement and learning outcomes are inextricably linked, with high student engagement often correlating with improved learning outcomes (Han, 2020; Soffer & Cohen, 2019). Trowler (2010) defines student engagement as “the investment of time, effort and other relevant resources by both students and their institutions intended to optimize the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution.” From a constructivist perspective, engagement is critical in actively constructing knowledge. This is particularly relevant when considering the use of social media platforms that encourage interactive learning experiences (Gray & Diloreto, 2016). For instance, when international students engage with their peers on platforms like Facebook or WeChat to discuss academic content, they absorb information and actively construct knowledge through interaction and collaboration (Alalwan, 2022; Ansari & Khan, 2020; Manu et al., 2021). This active participation and deep engagement with the learning content can result in better understanding and retention of knowledge, which are key cognitive learning outcomes (Dwumah Manu et al., 2023). Based on the above, we hypothesize that;

H3: International student engagement will have a positive influence on student learning outcomes

The Mediation Role of International Student Engagement in Social Media Usage and Learning Outcomes Relationship

The reviewed literature above demonstrates how social media usage influences international student engagement and learning outcomes. Further, the literature shows that student engagement could positively impact student learning outcomes. Even though no empirical research has examined the relatedness of these three factors-social

media usage, international student engagement, and student learning outcomes, we assume that one can rely on the constructivist learning theory (Bereiter, 1994) to demonstrate the linkages among them. The constructivist theory argues that learners actively construct knowledge through engaging with their environment (Bereiter, 1994). In this sense, social media platforms provide a conducive environment for this engagement, thereby fostering knowledge construction and improving learning outcomes (Lottering, 2017). The interactive features of social media platforms allow international students to participate in discussions, collaborate on projects, and contribute to knowledge-building in a learning community (Alalwan, 2022; Han, 2020).

Research suggests that international students who perceive social media as a useful tool for academic and non-academic purposes tend to show higher levels of engagement and better learning outcomes such as higher academic performance (Azmi et al., 2023; Hameed et al., 2022; Hendrickson & Rosen, 2017). For instance, studies by Khaola et al. (2022) found that microblogging platforms like Twitter could enhance international student engagement and positively affect academic performance. In light of this, international student engagement can mediate between social media usage and learning outcomes. This suggests that the impact of social media usage on learning outcomes is facilitated through increased international student engagement (Dong et al., 2022). Therefore, by understanding and enhancing the role of international student engagement in social media-mediated learning, educators can leverage the potential of these digital platforms to optimize their learning outcomes.

H4: International student engagement will mediate the relationship between social media usage and learning outcomes

H4a. International student engagement will mediate the relationship between social media usage for academic purposes and learning outcomes

H4b. International student engagement will mediate the relationship between social media usage for non-academic purposes and learning outcomes

The Moderation Role of Self-Based Identity in International Student Engagement and Learning Outcomes Relationship

Self-based identity refers to an individual's perception of themselves, and it plays an essential role in motivation, behaviour, and, ultimately, academic achievement (Prodanova & Kocarev, 2023). Past research suggests that international students with a mature self-based identity show commitment to their academics, have a strong passion for learning, appreciate experience sharing, and promote collaborative learning (Hanna et al., 2020). Additionally, the high level of academics' skill-based identity recognizes their enthusiasm for continuous education and skills enhancement and their desire for professional and personal growth (Abu-Alruz & Khasawneh, 2013). Based on its significant impact, we propose that students self-based identity could moderate the positive relationship between student engagement and student learning outcomes. In understanding this relationship, we draw insights from the constructivist learning theory. As per the constructivist view, learning is an active and social process where learners construct their understanding and knowledge through experiences and by reflecting on these experiences (Bereiter, 1994). Under this lens, self-based identity is critical as it influences how students engage with their learning environment, the experiences they seek, and how they process and internalize these experiences (de Valverde et al., 2017). For instance, students with a strong academic self-concept are more likely to take an active role in learning, explore complex concepts, and engage in meaningful dialogues or debates, as they perceive themselves as capable and competent learners (Bakadorova & Raufelder, 2017). These engagements and experiences may reinforce their understanding and knowledge, leading to improved learning outcomes. Conversely, international students with a weaker academic self-concept may view learning tasks as more challenging and may shy away from active engagement for fear of failure (Gomes et al., 2014). This may limit their opportunities for active knowledge construction, resulting in less optimal learning outcomes. Based on the above perspective, we hypothesize that;

H5: Academic self-based identity will moderate the relationship between international student engagement and learning outcomes

METHODOLOGY

Sampling Strategy and Participant Selection

A purposive sampling strategy was used to select participants to provide valuable insights into the research topic. Participants were international students studying in Chinese higher education institutions, representing diverse academic disciplines, levels of study, and countries of origin who were 18 years of age or older and had studied in a Chinese university for more than six months. The sample size was determined based on data saturation, ensuring sufficient information was obtained to address the research questions effectively. Participants were recruited from 12 different universities in eastern, central and western China, including world-class universities (985 project universities) and first-class discipline universities (211 project universities), as well as provincial high-level universities, such as Xi'an Jiaotong University, Tianjin University, China University of Geosciences, Wuhan, Beijing Institute of Technology, Guizhou University, Nanjing University of Posts and Telecommunications, to ensure a broad representation of the international student population.

Data Collection Procedure

We conducted online surveys by administering a questionnaire to gather responses from international students in the above universities across China. Before distributing the questionnaires, we obtained permission from the authorities of these universities' international students colleges to explain the purpose of the study. Participants were asked to provide accurate information and were guaranteed that their data would be collected without revealing personal information and would only be used for this study. Meanwhile, participants were asked to stop participating in the online questionnaire if they had any reservations about it. Again, the school authorities (Teachers and Deans) assisted in distributing the questionnaires to their students. Because it was an online survey, we distributed the questions to as many students as possible.

The participants first completed questionnaires measuring their social media usage for academic and non-academic purposes, engagement, learning outcomes, and self-based identity. They then provided demographic information such as gender, age, degree major, level of study, duration of stay in China, nationality, etc.

Measures

This study employed measures from already existing scales. These measures' psychometric properties (acceptability, reliability and validity) are established and validated in previous studies. We measured all the variables items on a 5-point Likert scale. We again performed pilot testing on the adapted scales with a smaller sample of 103 international students at Jiangsu University to ensure the questions' clarity, comprehensibility, and relevance. The Cronbach's alphas for the piloted scales were checked to ensure they met the 0.70 threshold. When the pilot-tested scales' reliabilities were good, we then tested the questionnaire on a larger sample. All items that are negatively worded were reverse-coded.

Social Media Usage for Academic Purposes

The Social Media Learning Scale developed and refined by Mills, Knezek, and Wakefield (2013) was adapted to assess international student perceptions of the application of social media to support university learning (SMAP) (Mills et al., 2013). In particular, the scale measures university international students' perceptions of using social media for academic learning. Sample questions include; "*I feel a sense of community learning becomes interactive*" and "*Posting questions to my peers helps me understand my readings better*".

Social Media Usage for Non-Academic Purposes

The media usage subscale of the media and technology usage and attitudes scale developed by (Yu et al., 2019) was adapted to evaluate social media usage for non-academic purposes (SMNAP) among university international students (Yu et al., 2019). Sample items include; "*I use social media as a source of entertainment*" and "*I use social media to interact with others*".

Learning Outcomes

International students' learning outcomes were measured using a five-item scale developed by Ajjan & Hartshorne (2008), with items often used in educational assessment (Ajjan & Hartshorne, 2008). Sample questions include; *"Using social media have improved my learning outcomes in knowledge and skills"* and *"Using social media has facilitated me to participate and contribute more in class"* International Student Engagement

International student engagement describes international students' participation in educationally effective practices, both inside and outside the classroom, which leads to a range of measurable outcomes". Based on this definition, we adopt the student engagement measure from (Stearns et al., 2007) to measure students' engagement. Sample questions include: *'I often miss my school/research lab'* and *'I often cut/skip my classes/research workshops'*. All the items were reverse-coded

Self-Based Identity

International students' self-based identity was measured using the scale developed by Abu-Alruz & Khasawneh (2013). Sample questions include; *'I am committed to my studies'* and *'I have a strong passion for learning'*.

Demographic Variables

Participants were instructed to state their (i) gender (male or female), (ii) age, ranging from 1 (18 years–25years) to 5 (41years and above) and (iii) the duration of residence in China on average-point Likert scale, ranging from 1 (less than three years) to 3 (more than five years). These variables have been found to influence students' learning outcomes significantly.

Common Method Bias

The design and methodology of this study were carefully conceived to address the potential issue of common method biases (CMB), in line with recommendations by Podsakoff et al. (2012). At the outset, participants were informed about the research objectives and assured that their responses would be used strictly for academic purposes. They were guaranteed confidentiality and anonymity, with a clear emphasis that there were no 'right' or 'wrong' answers, encouraging sincerity in their responses. These steps, which are endorsed for effective reduction of CMB-related issues, were integral to our approach.

Statistical measures were also used to assess potential CMB. We conducted Harman's single-factor test, which involves loading all items onto a single factor. This helps determine if a single factor can account for more than 50% of the total variance, indicating a presence of CMB. If, however, a single factor accounts for less than 50% of the total variance, the data is considered free from CMB. In this study, a single factor accounted for only 32.34% of the total variance, suggesting that CMB did not compromise our dataset. Thus, our findings can be interpreted with a reasonable degree of confidence regarding their validity.

Ethical consideration

The study received ethical approval from the Ethics Committee of International Students Education of Jiangsu University, under approval number JSU2023109, and from the ethics committees of the respective participating universities. Participants in the study engaged voluntarily and were fully informed about the study's objectives through a digital informed consent form, which they electronically signed before participating. Assurances of confidentiality and anonymity were explicitly given, confirming that individual responses would be securely stored and utilized solely for scholarly research.

Data Analysis

The Structural Equation Modeling (SEM) method was employed to analyse the study's framework. SEM is appropriate for establishing a correlation among variables, assessing the theoretical model, and testing the research hypotheses with firm results. More so, the chosen method offers immediate and long-term results. The

data was analyzed using SPSS version 26 and AMOS version 23. The inferential and descriptive statistics were performed using SPSS, while AMOS version 23 was used to test the model fitness using confirmatory factor analysis (CFA). The study analyzed the data using AMOS version 23 and SPSS version 26 softwares. Finally, the path analyses was examined for significance using AMOS version 23.

RESULTS

Respondents' Demographic Characteristics

This study surveyed 414 international students across 12 diverse Chinese universities, providing valuable insights into their demographic characteristics and social media usage patterns. The participants comprised 285 males (68.8%) and 129 females (31.2%), mainly within the age bracket of 18-30 years, indicating a youthful profile of the international student population in China. The participants were culturally diverse, with 55.6% Asians, 40.6% Africans, 2.9% Europeans, and 1% Americans. Regarding their educational levels, 22.7% were undergraduates, 48.8% were master's students, and 28.5% were PhD candidates. Their majors were diverse, ranging from Computer Science and Technology (29.7%) to Social Sciences and Humanities (28.7%), Engineering and Physical Sciences (31.4%), and Medical and Life Sciences (10.1%). Most respondents had resided in China for less than three years (66.9%), while 19.6% had stayed between 3-5 years and 13.5% for more than 5 years.

Social media usage, particularly for academic purposes, exhibited distinct patterns. The primary platforms used were WeChat, by 55.8% of students (231 students), and YouTube, by 28.3% (117 students). DingTalk was used by 6.8% of the participants (28 students) for academic purposes, and 5.8% (24 students) used other unspecified platforms. Platforms like WhatsApp, Instagram, Twitter, and Facebook each accounted for 1% of academic usage (4 students each), whereas TikTok was not used for academic purposes. In contrast, for non-academic purposes, the most used platforms were WeChat (28.3% or 117 students), Instagram (26.1% or 108 students), and Facebook (14.3% or 59 students). Other platforms included WhatsApp, used by 10.6% of students (44 students), YouTube (9.7% or 40 students), and TikTok (4.6% or 19 students). Both Twitter and DingTalk each accounted for 1.4% of non-academic usage (6 students each), and other unspecified platforms were used by 3.6% of participants (15 students).

Analyzing daily social media use, we found that for academic purposes, per day 36.7% of the participants spent between 2 to 5 hours on these platforms (152 students), and 29.7% spent between 1 to 2 hours (123 students). Furthermore, 10.1% of students used social media between 30 minutes and 1 hour daily (42 students), and 9.4% spent less than 30 minutes (39 students). Also, 9.7% of students reported using social media for academic purposes between 6 to 8 hours daily (40 students), and 4.3% for more than 8 hours (18 students). With regards to non-academic use, the most common duration was between 1 to 2 hours per day (140 students, or 33.8%), closely followed by 29.5% of students using it between 2 to 5 hours daily (122 students). Some participants reported shorter usage periods: 16.7% used it between 30 minutes and 1 hour (69 students), and 10.6% for less than 30 minutes (44 students). Finally, 6.3% of students reported non-academic social media usage between 6 to 8 hours (26 students), and 3.1% for more than 8 hours daily (13 students).

Measurement Model

Hair Jr et al. (2021)'s framework was used in this study, where several metrics, including the average variance extracted (AVE), factor loadings, Cronbach alpha, and composite reliability (CR), were used to evaluate the measurement model. According to Gaskin and Lim (2016), convergent validity is achieved when the AVE exceeds 0.50, the CR is above 0.70, and the factor loadings are above 0.50 with p-values less than 0.05 ($P > 0.05$). Table 1 shows that all items significantly contributed to each construct, with values ranging from 0.032 to 1.557. Cronbach's alpha values, ranging from 0.842 to 0.944, surpassed the suggested threshold, implying a satisfactory level of internal consistency. All variables also showed composite reliability above the recommended level of ($P > 0.7$), as well as AVE values above (> 0.5). This data demonstrates a good level of convergent validity for all variables. In terms of the overall model fit indices, the RMSEA=0.030, Chi-square(χ^2) = 1592.477 (367), SRMR=0.062, CFI=0.869, TLI=0.963 p-value and X2/df=4.339. CFI and SRMR. For each measure, CFI and SRMR were used to determine the unidimensionality of the constructs. Byrne (2013) suggested that a CFI above

0.90 demonstrates unidimensionality. Likewise, Gaskin & Lim (2016) propose CFI values <0.95 and SRMR values lower than >0.06. As can be seen, the SRMR and CFI values confirm a satisfactory fit for the constructs' measurement items.

Table 1. Factor Loadings, Reliability, and Validity Analysis.

Variable	Code	Estimate	S.E	P	Ca	CR	AVE
Learning outcome	LOUT1	0.972	0.043	***	0.922	0.922	0.704
	LOUT2	0.913	0.041	***			
	LOUT3	0.994	0.047	***			
	LOUT4	0.962	0.046	***			
	LOUT5	1.000		***			
International Student engagement	ISE1	1.009	0.039		0.944	0.944	0.737
	ISE2	0.970	0.032	***			
	ISE3	1.000					
	ISE4	0.912	0.037	***			
	ISE5	0.906	0.038	***			
	ISE6	0.862	0.038	***			
Social media usage for academic purposes	SMA1	1.008	0.067		0.884	0.803	0.558
	SMA2	1.241	0.073	***			
	SMA3	1.195	0.072	***			
	SMA4	1.000		***			

Social media usage for academic purposes	SMNA1	1.287	0.128	***	0.842	0.886	0.663
	SMNA2	0.819	0.120	***			
	SMNA3	1.000		***			
	SMNA4	1.351	0.129	***			
	SMNA5	1.471	0.135	***			
	SMNA6	1.557	0.143	***			
Self-based identity	SBI1	0.854	0.061		0.909	0.909	0.559
	SBI2	1.100	0.058	***			
	SBI3	1.085	0.054	***			
	SBI4	0.799	0.065	***			
	SBI5	0.922	0.061	***			
	SBI6	1.023	0.051	***			
	SBI7	1.000		***			
	SBI8	1.032	0.060	***			

Note. SBI – Self-based identity; LOUT - Learning outcome; ISE- International student engagement; SMA - Social media usage for academic purposes; SMNA - Social media usage for academic purposes. *p < .05. **p < .01. ***p < .001.

Moreover, the evaluation of the constructs' discriminant validity was conducted. As suggested by Fornell and Larcker (1981), the discriminant validity is represented by the square root of the AVE, which is presented along the diagonal axis of the latent variable correlation matrix. The results, illustrated in Table 2, demonstrate a distinct measure as the discriminant validity scores of the components surpass their corresponding latent factor correlation coefficients.

Table 2. Discriminant validity of the construct

	1	2	3	4	5
SBI	0.748				
ISE	-0.043	0.858			
LOUT	0.657***	0.310***	0.839		
SMNA	0.640***	0.134*	0.777***	0.814	
SMA	0.594***	0.157**	0.646***	0.676***	0.677

Note. SBI – Self-based identity; LOUT - Learning outcome; ISE- International student engagement; SMA - Social media usage for academic purposes; SMNA - Social media usage for academic purposes. The bolded values represent the discriminant validity, which is calculated as the square root of the AVE. *** indicates $p < 0.001$

Hypothesis Testing

Following the guidance of previous research (Pu et al., 2022; W. L. Wang et al., 2021), the structural model underwent a three-step analysis (consisting of the main effect model, mediation model, and moderation model). The hypotheses were examined using AMOS version 23 for the main effect and mediation models. The mean-centred values were calculated using SPSS version 26 for the moderation analysis, and the moderation path analysis was performed with AMOS version 23.

Test of Main Effect Model-Social Media Usage on International Student Learning Outcomes

First, the direct path of the main effect model was analyzed (Fig. 2). Specifically, the two dimensions of social media usage—academic and non-academic—were assessed in relation to international student learning outcomes (H1). Before this main effect analysis, the fitness of the structural model was examined using RMSEA, Chi-square (X^2), SRMR, and CFI. The data in Table 3 indicates a strong model fit (RMSEA = 0.025, Chi-square (X^2) = 1326.455, X^2/df = 1.436, SRMR = 0.03, and CFI = 0.978). As detailed in Table 3 and Fig. 2, the standardized path coefficients of social media for academic purposes on international student learning outcomes were significant, with SMA (β = 0.725***, $p < 0.005$) and SMNA (β = 0.475***, $p < 0.016$). Thus, H1 (both H1a and H1b) is supported.

Table 3. Results of the main effect model

	Without a mediator					With a mediator			
	Direct effect	Estimate (β)	S.E	T Statistics	Sig. (P)	Original Sample (O)	S.E	T Statistics	P Values
H1a	SMA-->LOUT	0.725	0.061	11.885	***	0.440	0.067	6.567	***
H1b	SMNA. -->LOUT	0.475	0.070	6.785	***	0.704	0.059	11.932	***
Controls									
	Gender-->LOUT	0.039	0.073		0.596	0.077	0.070		0.274
	Age-->LOUT	-0.049	0.068		0.472	0.002	0.065		0.974
	Edu. level -->LOUT	-0.030	0.048		0.523	-0.013	0.046		0.781
	Major--> LOUT	-0.014	0.035		0.685	-0.012	0.033		0.708
	Duration --> LOUT	-0.123	0.047		**	-0.125	0.045		**

Note. LOUT - Learning outcome; SMA - Social media usage for academic purposes; SMNA - Social media usage for academic purposes. *= $P < .05$, ** = $P < .01$, ***= $p < 0.001$

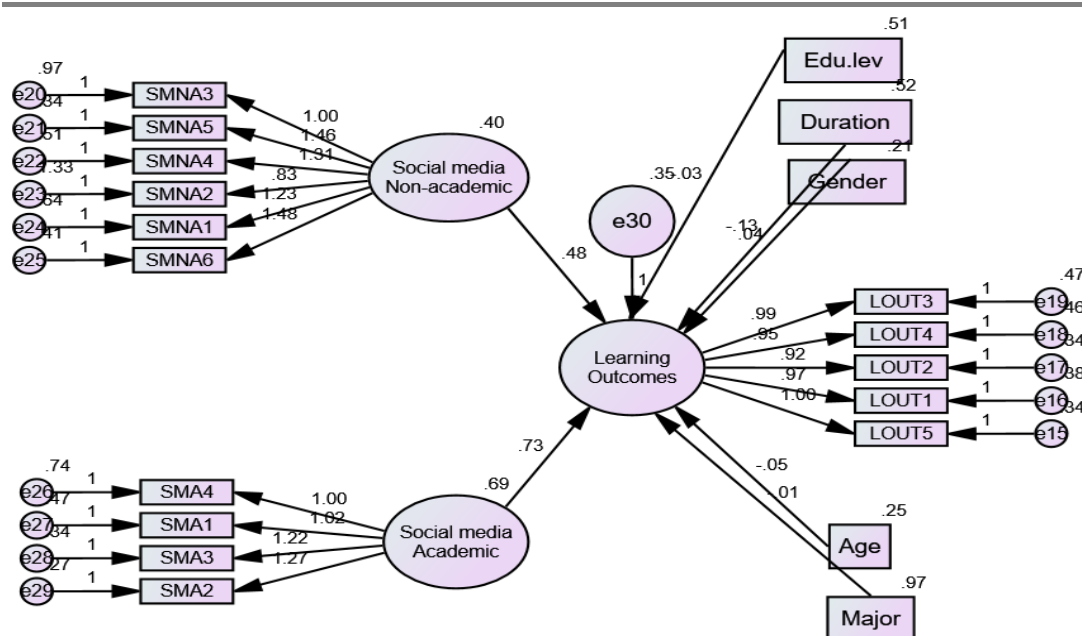


Fig 2. Main effect model

Structural Mediation Model Test

The international student engagement variable was added to the main model to analyse the mediation model, and the fit indices were assessed. The results (RMSEA = 0.042, SRMR = 0.069, CFI = 0.948, $\chi^2 = 1351.029(764)$, $\chi^2/df = 2.016$) indicated a perfect fit model for model 2. The mediation analysis was performed using the plugin from Gaskin et al. (2020) for specific indirect effect estimands. A 95% confidence interval and bias-corrected bootstrap with 2000 samples were utilized for a robust significance test. As per the general rule for bootstrapping, a significant effect is detected when zero does not fall within the 95% CI and vice versa (Hadi, Abdullah, & Sentosa, 2016). From the results of structural mediation model 2, outlined in Table 4 and Fig. 3, both SMA ($\beta = 0.704^{***}$, $p < 0.001$) and SMNA ($\beta = 0.440^{***}$, $p < 0.001$) significantly and positively influenced international student engagement, thereby validating H2a and H2b. Moreover, international student engagement showed a significant positive effect on learning outcomes ($\beta = 0.183^{***}$, $p < 0.001$), supporting H3.

However, as detailed in Table 4, international student engagement did not mediate the relationship between SMA, SMNA, and student learning outcomes. The 95% confidence interval (95%CI) values from bias-corrected bootstrapping [-0.018, 0.058] and [-0.02, 0.09] were situated within the upper and lower confidence limits. Therefore, hypotheses H4a and H4b were not supported.

Table 4. Results of the structural mediation model

	Indicator	Estimate (β)	S.E	T-Value	Sig.(P)		Remarks
H2a	SMA-->ISE	0.704	0.059	11.932	***		Supported
H2b	SMNA-->ISE	0.44	0.067	6.567	***		supported
Effect of safety climate on safety performance							
H3	ISE-->LOUT	0.183	0.032	5.718	***		Supported
Results of the indirect effect of international student engagement between social media usage and learning outcomes							
				95.00%			
		Estimate (β)	S.E	LL	UL	Sig. (P)	
H4a	SMA-->ISE-->LOUT	0.019	0.019	-0.018	0.058	0.299	Unsupported
H4b	SMNA-->ISE-->LOUT	0.027	0.028	-0.02	0.09	0.231	Unsupported

NB: SBI – Self-based identity; LOUT - Learning outcome; ISE- International student engagement; SMA - Social media usage for academic purposes; SMNA - Social media usage for academic purposes.

*=P < .05, ** =P < .01, ***=p<0.001

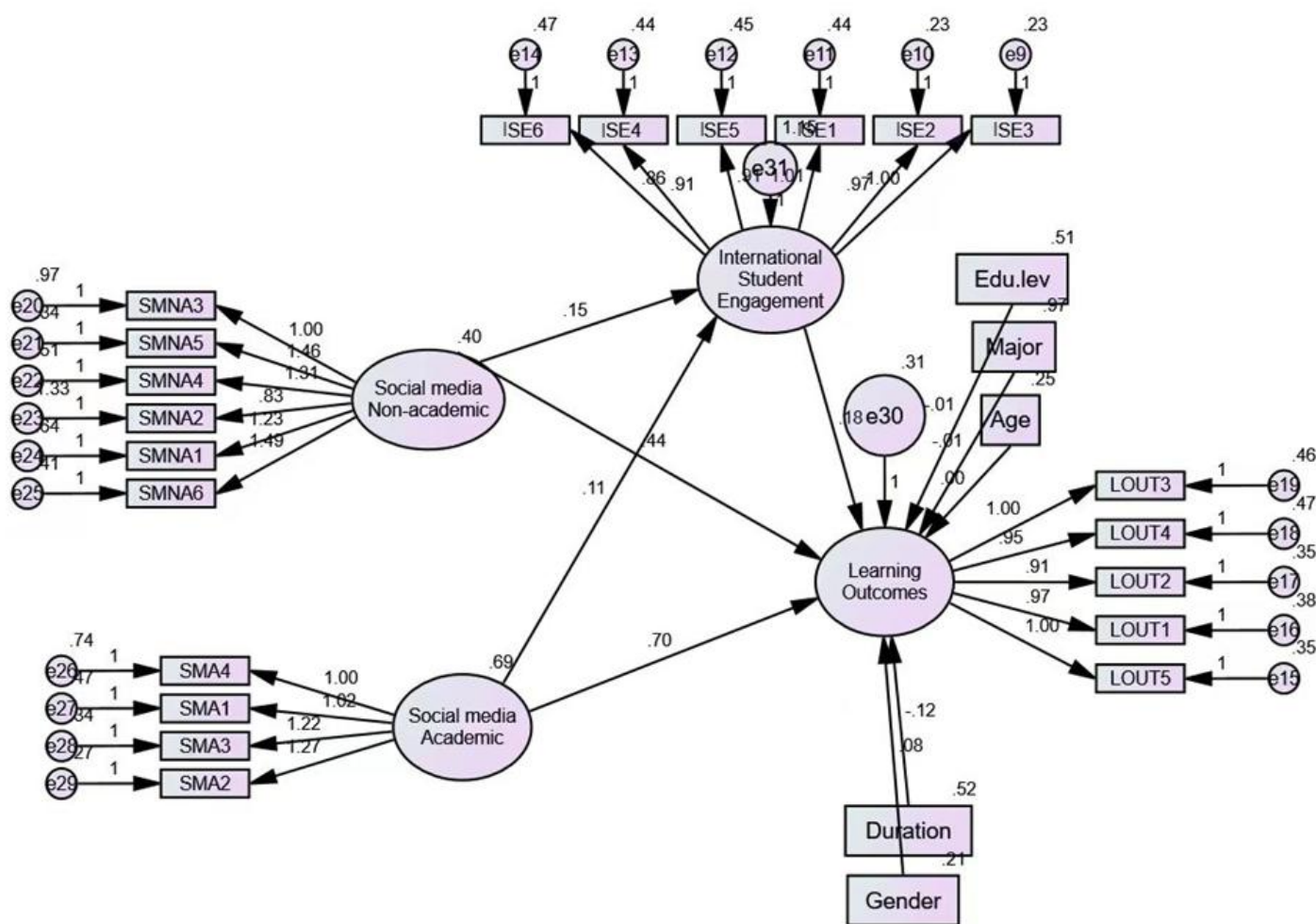


Fig 3. Structural mediation model

Test of Moderation Effect Model

Lastly, the moderating effect of Self-based Identity (SBI) on the positive impact of international student engagement on learning outcomes was examined using AMOS version 23. Before conducting the moderation analysis, the international student engagement (ISE) and Self-based Identity (SBI) variables were mean-centered using SPSS version 26 to facilitate the interpretability of results. Subsequently, the interaction effect was moved to AMOS version 23 for moderation analysis. The outcomes, illustrated in Tables 5 and Fig. 5, reveal that self-based identity positively influenced learning outcomes ($\beta = 0.574^{***}$, $p < 0.005$). After introducing the moderating effect, international student engagement still significantly impacted learning outcomes ($\beta = 0.629^{***}$, $p < 0.001$), providing further support for H3. Additionally, the results indicated that SBI positively moderated the positive impact of international student engagement on learning outcomes ($\beta = -0.104^{***}$, $p < 0.001$). Therefore, H5a is supported.

Table 5. Results of moderation effect of self-based identity on the positive impact of international student engagement on learning outcomes

	Indicators	Estimate (β)	S.E	T-Value	Sig. (P)
H5a	ISE--->LOUT	0.617	0.034	17.941	***
	SBI---> LOUT	0.578	0.044	13.265	***
	ISE*SBI---> LOUT	0.102	0.007	14.393	***

NB: SBI – Self-based identity; LOUT - Learning outcome; ISE- International student engagement.

*=P < .05, ** =P < .01, ***=p<0.001

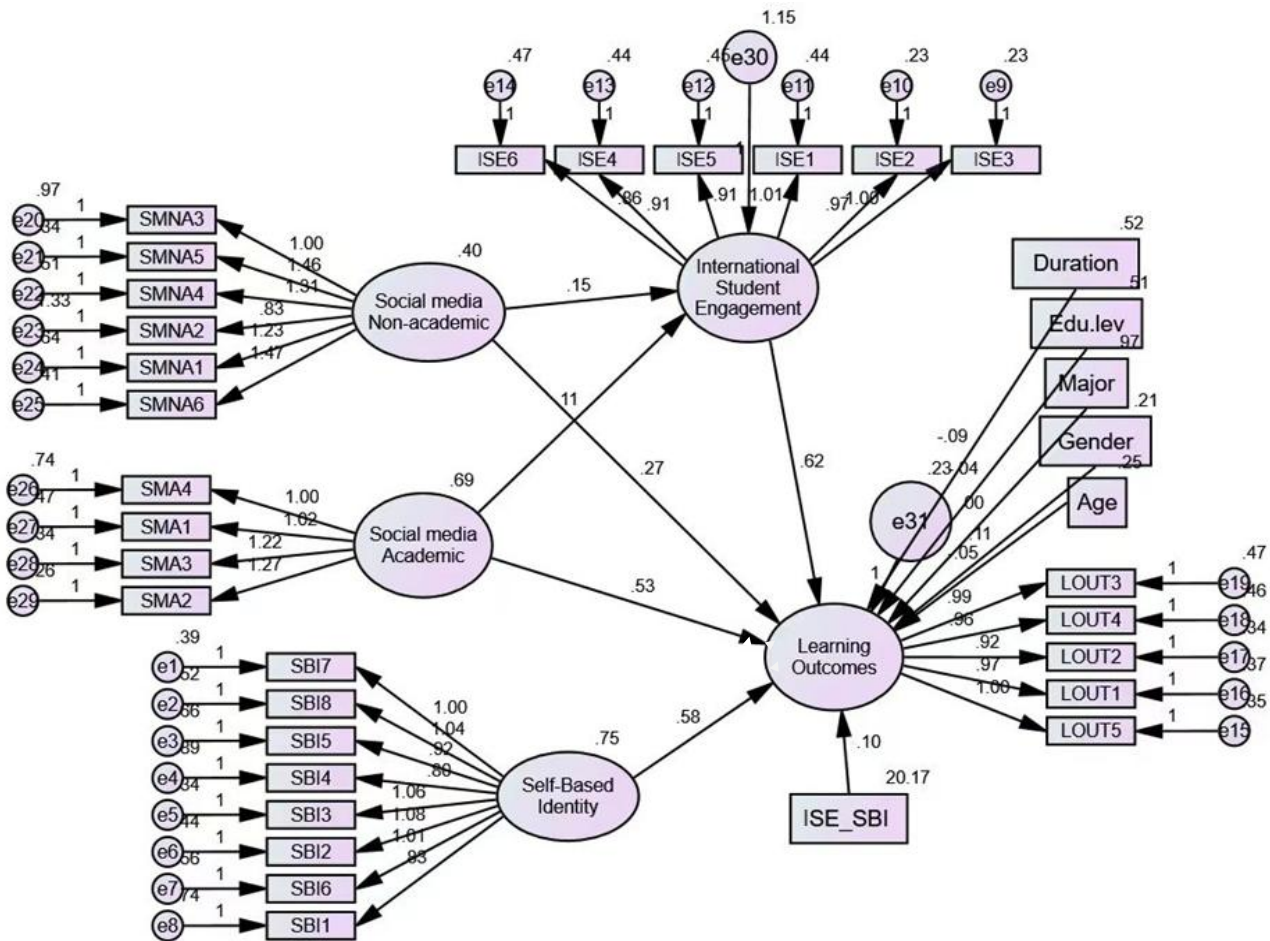


Fig 4. Moderation effect model

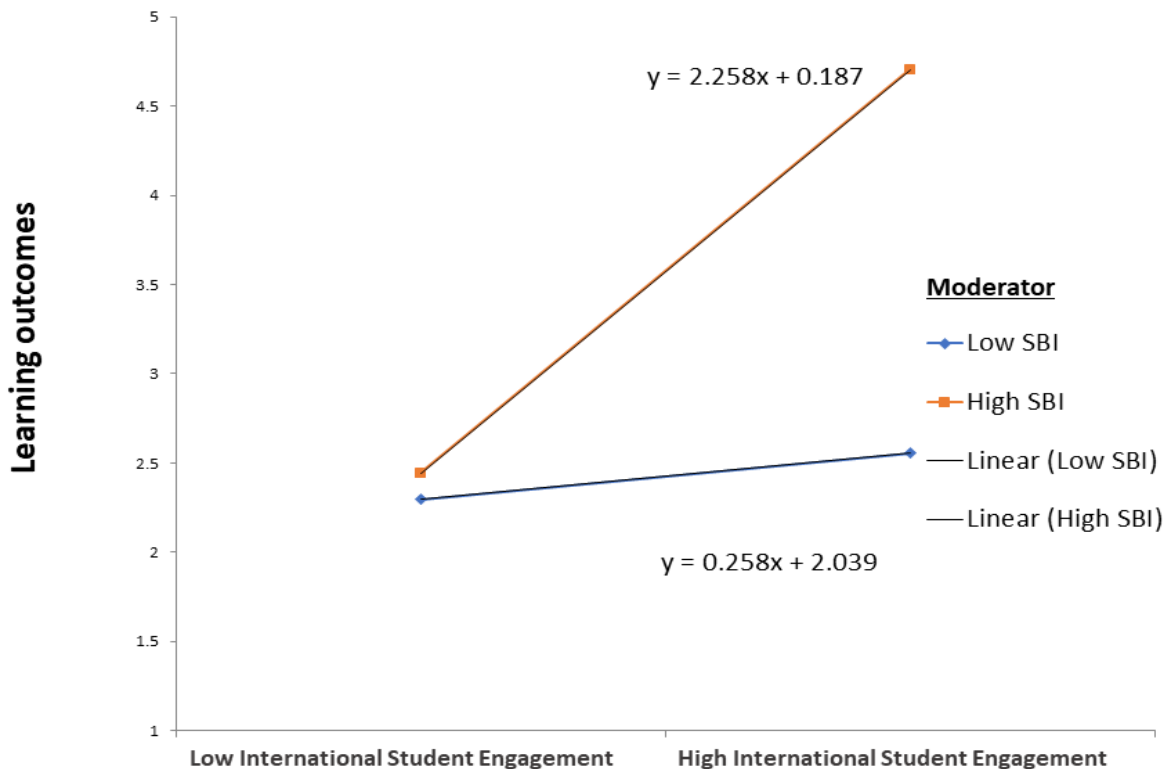


Fig 5. A graph showing the moderating effect of self-based identity on the relationship between international student engagement and learning outcomes.

DISCUSSION

This study aimed to understand the effects of social media usage, in academic and non-academic contexts, on student learning outcomes within Chinese higher education for international students. Additionally, we assessed the mediating role of international student engagement (ISE) and the moderating effect of Self-based Identity (SBI) on these relationships.

Our results revealed a significant direct relationship between social media usage and international student learning outcomes. This result underscores the importance of social media in today's educational landscape, not only as a communication tool but also as a catalyst for academic performance. In particular, both academic (SMA) and non-academic (SMNA) uses of social media showed strong positive impacts on learning outcomes. This might be due to the enhanced accessibility of resources and information, collaboration opportunities, and the potential for personalized learning that social media provides. Moreover, non-academic use of social media might contribute to a sense of social belonging and emotional well-being, indirectly influencing learning outcomes. The findings align with the findings of (Lau, 2017), who similarly established a relationship between social media usage and academic performance. They concluded that when used correctly, social media can provide students with access to learning materials and promote collaboration, which may enhance their learning outcomes. These findings align with constructivist learning theory, which emphasizes the importance of social interactions and active learning in knowledge construction (Bereiter, 1994).

Our study found social media usage for academic purposes (SMA), and non-academic purposes (SMNA) significantly influenced international student engagement. This supports the idea that social media can facilitate intellectual interaction and promote student engagement (Ansari & Khan, 2020; H. Wang et al., 2022). While student engagement was positively influenced by social media usage, it did not mediate the relationship between social media usage and learning outcomes. This may be attributed to the already significant direct influence of social media usage on learning outcomes, leaving the additional impact of engagement less noticeable. It's also plausible that other unexamined variables could mediate this relationship. Nevertheless, this finding expands our understanding of international student engagement within the context of social media usage in the Chinese higher education setting, providing valuable insights for further exploration.

Finally, our moderation analysis revealed that Self-based Identity (SBI) played a significant role in the relationship between student engagement and learning outcomes. While SBI was found to influence learning outcomes positively, it also positively moderated the effect of student engagement on these outcomes. This suggests that students with a strong sense of identity are more likely to benefit from engaging activities regarding learning outcomes, echoing previous studies that underline the importance of personal identity in education (Prodanova & Kocarev, 2023). Moreover, self-based identity (SBI) positively influences learning outcomes and continues to impact outcomes even after introducing the moderating effect. These results, viewed through constructivist learning theory, underline the critical role of a learner's self-identity and personal involvement in their learning process. Our findings corroborate previous research suggesting that students who identify strongly with their academic role often have better learning outcomes (Bakadorova & Raufelder, 2017).

Theoretical Implications

Theoretically, this research serves as a pioneering endeavor to empirically test the causal relationship between social media usage and learning outcomes, specifically within the Chinese educational landscape. It provides additional scholarly literature on the subject, furthering our understanding of the digital phenomena in a Chinese context. This offers a unique contribution, as much of the existing literature on social media usage and its impact on learning outcomes has been centred in Western contexts (Fortunato & Pecoraro, 2022; Perez et al., 2023). By expanding the geographical scope of this research, we can start to appreciate the nuances of how social media influences education in different cultural and socio-political settings (Fortunato & Pecoraro, 2022; Oguguo et al., 2020; Sabah & Altalbe, 2022). Consequently, this study enhances the global perspective on integrating technology in education, underscoring the necessity to consider cultural variations when interpreting and applying these findings.

Second, this study elucidates the moderating role of self-based identity (SBI) on the relationship between student engagement and learning outcomes. By revealing this interaction, the study extends the current understanding of SBI's influence within an academic setting. Until now, the literature has primarily focused on SBI as an independent construct influencing students' behavior or learning outcomes. This research enriches this perspective by highlighting the complex interplay between SBI, international student engagement, and learning outcomes. It underscores that the impact of engagement on learning isn't static; instead, it varies according to the students' SBI. As such, the study builds on the existing literature, emphasizing the multidimensional role of SBI and its potential as a moderating variable in academic research.

Finally, by revealing these interactions and relationships, this study advocates for a more holistic and nuanced approach to understanding international student learning in China in the digital age. It signifies the importance of considering the direct effects of digital technologies like social media on learning outcomes and the complex web of factors, such as international student engagement (ISE) and SBI, that moderate these relationships. The study, therefore, sets the stage for further investigations that delve deeper into these dynamics, providing a rich and broad basis for future academic discourse in this area.

Practical Implications

The practical implications of this study have far-reaching impacts, notably in enhancing the educational experiences of international students within Chinese higher education institutions. Chinese universities and colleges are urged to reconsider their teaching strategies, given the substantial influence of social media use, in both academic and non-academic contexts, on learning outcomes. In practical terms, after the profound impact of the COVID-19 epidemic, Chinese higher education institutions should pay further attention to viewing social media as a strategic tool in their pedagogical frameworks. For instance, collaborating with prominent social media platforms to create dedicated academic channels that provide up-to-date study materials and foster intellectual discussions could significantly enrich the learning experience of international students. Moreover, these institutions can use social media to run campaigns that provide insights into Chinese culture, lifestyle, and the unique aspects of customs in China, thus helping international students assimilate into their new environment.

Educators, on the other hand, should receive training to incorporate social media into their teaching methodologies effectively. They could leverage these platforms to provide class updates, answer student queries, and stimulate classroom discussions, making learning more interactive for international students and offering them a familiar channel to connect with their teachers.

This study suggests that international students should view social media as more than a communication tool. Instead, these platforms could serve as a bridge to the Chinese culture, community, and academic life. They could foster a sense of belonging and enhance their overall academic experience by actively participating in academic social media groups and virtual cultural events.

The role of self-based identity, as emphasized in this study, is crucial in determining learning outcomes among international students. Navigating a new academic system and cultural environment often poses challenges for international students. As such, Chinese higher education institutions and educators should endeavor to nurture a strong academic self-identity among these international students. This could be achieved through mentorship programs, workshops, and counselling services designed on the social media platform to build resilience, confidence, and a positive academic self-identity among international students.

Limitations

The following limitations must be acknowledged in this study:

This study was conducted among a specific student population; thus, the findings may not represent all students. Future research should attempt to include a more diverse and numerous student sample across different institutions, academic levels, and geographical locations to improve the generalizability of the findings. Secondly, the measures of social media usage, international student engagement, and learning outcomes were self-reported, introducing the potential for bias. For instance, participants may have overestimated or underestimated their

social media usage or their level of engagement. Additionally, the learning outcomes were self-reported rather than objectively measured, such as through examination scores. Thirdly, the study used a cross-sectional design, which does not allow for conclusions about cause-and-effect relationships. Future studies could employ a longitudinal design to track changes over time and establish causal relationships. Lastly, although this study has introduced the moderating role of self-based identity and examined the influence of international student engagement, many other potential variables were not included in this model. These could include socioeconomic status, student motivation, peer influence, teaching methods, and other personal or environmental factors.

CONCLUSION

This study reveals the significant role of social media usage, both academic and non-academic, on the learning outcomes of international students in Chinese higher education. While international student engagement is influenced by social media usage, it did not mediate its relationship with learning outcomes, suggesting a substantial direct effect of social media usage on these outcomes. The study also introduced the moderating role of Self-based Identity (SBI), showing that students with a strong academic self-identity are likely to benefit more from engagement activities, providing novel insight for improving international student performance. These findings underscore the multidimensional nature of learning outcomes and the various factors at play in a modern educational context, marked by the ubiquity of social media and the evolving understanding of individual identity constructs. They also provide implications for policy makers, educators, and researchers in higher education, suggesting that strategically integrating social media in teaching and fostering international students' academic self-identity could enhance learning outcomes.

List of abbreviations

- SBI - Self-based identity
- LOU - Learning outcome
- ISE - International student engagement
- SMA - Social media usage for academic purposes
- SMNA - Social media usage for non-academic purposes
- LL - Lower limit
- UL - Upper limit
- Sig. - Significance
- Est - Estimate
- S.E - Standard error
- SMAP - Social media usage for academic purposes
- SMNAP - Social media usage for non-academic purposes

Declarations

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author upon request.

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Path study

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