Students' Perceptions on Mobile Phone Use for Knowledge Construction in Chinese Higher Education

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Abstract: This qualitative study explored how Chinese university students perceive and use mobile phones to help construct scholarly knowledge, an under-explored issue in existing studies that tend to examine the impact of mobile learning on scholarly achievement, motivation, or distraction. As a corrective to this gap in studies, the research tried to find out how students use mobile phones as a learning tool in everyday scholarly practice. Semi-structured interviews were conducted with 25 Chinese university students from diverse disciplines. By thematic analysis, the study demonstrated that students used mobile phones in context-dependent and strategic ways, particularly when time was fragmented or there was no access to laptops. Learners used mobile phones to perform a range of learning activities like multimedia review, note-taking, collaboration, and conceptual exploration. While the mobile phone enhanced access and understanding, students also reported issues such as distraction, information overload, and surface learning. Constructivism and Cognitive Load Theory gave the study its theoretical framework, highlighting how students actively negotiate cognitive benefits and limitations. The results propose novel insights into reflective and psychological mobile learning, necessitating reflective integration of mobile technology into tertiary education for enabling meaningful and autonomous knowledge development.
Keywords: Constructivism; Cognitive Load; Mobile Phones; Higher Education; Mobile Learning

1.Introduction

The use of mobile phones in educational settings has become a common phenomenon in the current age of digitalization. Both students and teachers are empowered by this technology to provide easier access to and processing and production of knowledge (Kraishan, 2024). In fact, for students in university, mobile phones are a fundamental source of information access and retrieval (Rockey et al., 2023). In Chinese higher education, educational technology and e-learning are expanding rapidly; hence, mobile phones are not only utilized as a means of communication but also as cognitive tools for learning both in and out of the classroom (Deroncele-Acosta et al., 2023). Since students have to contend with unique responsibilities on top of managing independent studies, their application of mobile technologies has grown remarkably (Sisouvong & Pasanchay, 2024). Although institutional LMS have significant roles in this regard, it is not possible to escape the fact that the majority of them heavily rely on mobile apps and internet platforms to present course content, review concepts, and engage with one another (Maslov et al., 2021). This phenomenon captures a pedagogical shift in the way students engage in knowledge building. But exactly how mobile phone use actually affects the learning styles, intellectual engagement, and development of

knowledge of the students is not yet established.

Although the existing literature discusses the use of mobile phones in education, much of the research discusses distractions, motivation, mobile addiction, or learning outcomes. In the Chinese context, in particular, scholars have extensively investigated and debated mobile phones' function to enable or hinder students' achievement (Wang et al., 2022; He & Wray, 2020). However, very little has been investigated in mobile phones' cognitive and student-centered character: i.e., little literature exists on how students experience the role played by mobile phones in constructing knowledge. Furthermore, the majority of the existing research employs quantitative measures, which might be insensitive to the patterns that students use in connecting mobile devices to learning. Through adopting students' experience as its viewpoint, this research fills in a key research gap and gains more profound understanding of the psychological process of mobile-mediated learning. In line with the United Nations's Sustainable Development Goal 4 (Quality Education), this research prioritizes equal and accessible access to learning opportunities and resources with quality information (The Global Goals, 2024), particularly in technology-developing regions like China.

This study contributes to what is already established from an analysis of mobile phone use within the framework of two theories of educational psychology: Constructivism and Cognitive Load Theory. It describes how the students utilize mobile phones to retrieve information, as well as construct and use knowledge in real-world contexts. The research involves the lived experiences and reflections of students, offering a real sense of mobile learning beyond performance data. By examining these cognitive and affective processes, the research not only offers a contribution to literature but also offers educators and policymakers immediate feedback regarding how mobile technology may be used to facilitate knowledge construction in higher education.

1.1 Research Objectives

▪ RO1: To explore how Chinese university students use mobile phones as tools for knowledge construction.
▪ RO2: To examine students' perceptions of the impact of mobile phone usage on knowledge construction.

2.Literature Review

Recent research into knowledge construction using mobile phones at Chinese universities has shown a complex interplay between perceived educational value, usage patterns, and challenges to students. In studies across the board, it is repeatedly shown that mobile phones are now embedded in students' learning routines, but that the quality and degree to which they are used in knowledge construction differ extensively.

2.1 Mobile Learning in Higher Education

Mobile learning (m-learning) has made huge contributions to the field of higher education, especially in the post-pandemic period; it has evolved from a supporting tool to a centerpiece of teaching and learning. Recent systematic reviews recognize that m-learning takes advantage of the ubiquity of cell phones to achieve greater flexibility, accessibility, and interactivity in learning environments, with exponential research and implementation since 2020 (Naveed et al., 2023). Empirical research has used theories including Behaviorism, Constructivism, and the Unified Theory of Acceptance and Use of Technology to examine the adoption of this kind of technology in university environments. They focus on perceived usefulness, ease of use, trust, and self-efficacy as determinant variables in student acceptance and successful implementation (Al-Rahmi et al., 2022). Yet these studies are mostly quantitative in nature, whilst qualitative and mixed-methods research is the latest requirement to better and more descriptively capture students' and teachers' multi-faceted experiences (Goundar & Kumar, 2021).

Comparative research shows that there are enormous disparities in m-learning adoption between developing and developed countries. Despite the fact that developing countries offer most of the new research, even in these countries, students use mobiles in limited, traditional ways, and that primarily for communication, content management, and basic collaboration (Van De Werfhorst et al., 2022). Yet the world is seeing rapid actualization of more student-centered experiences by the potential of m-learning to transfer learning from formal to informal contexts and offer individualized support and guidance, especially in hybrid or multimodal contexts (Lazaro & Duart, 2023). The pandemic accelerated the integration of mobile learning into online tertiary education, enhancing engagement and collaboration (Constantin, 2022) but also bringing to prominence existing concerns regarding digital divides, pedagogical limitations, and IT support requirements at individual

and institutional levels (Laufer et al., 2021).

Despite the potential, m-learning at the higher education level is a developing field in literature with some evident gaps. Most of the studies focus on students, and minimal attention is given to the perspective of faculty members and administrators, with additional research required on long-term impacts as well as pedagogical changes. Literature corroborates the imperatives of context, cultural matters, and individual characteristics as far as adoption and implications are related, and the fact that successful m-learning initiatives must be learner- and context-specific (Valencia-Arias et al., 2024). With continuously changing technologies and rapidly transforming mobile platforms, future research would be well-advised to focus on inclusive, theory-driven, and context-sensitive approaches toward realizing the full attainment of the pedagogical potential of m-learning in higher education.

2.2 Knowledge Construction, Human Cognition, and Mobile Phones

Smartphones play a complex role in the construction of knowledge, both in terms of problem and possibility. While, on the one hand, mobile phone usage can be used to increase engagement and interest, facilitate recall, and optimize creative thinking in students through controlled and purposeful usage (Aru & Rozgonjuk, 2022), on the other hand, however, smartphone usage without regulation is associated with mental overload, distraction, and academic underperformance, not to mention the possibility of minimizing analytical thinking through withdrawal from deep thinking and reflection (Anwar et al., 2025). Parry (2023) and Niu et al. (2022) also show in their studies that frequent smartphone use has the potential to reduce cognitive capacity, particularly working memory, and that the effect is more pronounced for individuals with higher smartphone dependence or fear of missing out.

Gligorea et al. (2023) discuss that intelligent reinforcement learning algorithms are integrated into mobile learning environments which lead to higher engagement and improved academic performance owing to personalized learning; the algorithms learn to adapt to different students' performance and consequently enable personalized and scaffolded knowledge construction leading to improved learning efficiency (Fu, 2022). Yet frequent smartphone use can have an adverse effect on attention, memory, and analyzing and interpreting information, although some of the effects are temporary and substance-dependent (Gada et al., 2024). While cell phones may enhance efficiency by means of the outsourcing of simple tasks, their widespread usage may encourage cognitive offloading at the cost of intellectual independence (Geetha et al., 2025); they also erode the practice of large-scale mental effort and profound learning, inducing a form of cognitive "laziness" or reliance on extrinsic sources (George et al., 2024).

In general, the impact of mobile phones on knowledge development is complex: they can potentially augment learning and creativity if their use is thoughtful and within appropriate limits, but passive or excessive use can detrimentally impact attention, memory, and higher-order cognition. This calls for digital literacy, policy reform, and judicious integration of mobile technology into learning environments for maximum benefit at a minimal cognitive cost.

2.3 Mobile Learning in the Chinese Higher Education Context

China's tertiary education sector is being rapidly digitized, and mobile learning is the focus. Most Chinese students at the tertiary level use mobile learning because it is convenient, easy to reach, environmentally friendly, and learning resources are available round the clock (Wang, 2022). Other benefits include ease in educational equity, empowerment of communication, facilitation of individualized learning, and support in time management (Yuan et al., 2025) and improved academic performance and learning effectiveness in language teaching (Gou, 2023; Li et al., 2022). The students, however, also indicate substantial disadvantages, including distraction, invasion of privacy, health issues, technical issues, outrageous costs, and adjustment difficulties with new software (Wang, 2022). These findings suggest that while mobile learning is valued for its convenience and richness of information, its usefulness is mediated by functional and psychological issues.

Integration of multi-modalities such as video, audio, images, and text into learning programs for use on mobile phones has increasingly improved learning interactions in China. Yuan et al., (2025) demonstrate the efficacy of visual and auditory modalities, especially in function or examination-based programs, as verbal and writing modalities tend to lag behind in engendering engagement. There is support from the modalities in helping students complete assignments and improve performance, especially when supported by expert peers or instructors. Additionally, collaborative mobile-enabled learning

is increasing. Hu et al. (2023) inferred that 73% of the surveyed Chinese undergraduate students had employed collaborative mobile-enabled language learning despite overall adoption being infancy stage in magnitude and flow experience was a primary driver of students' intentions to adopt it in the future.

Environmental and cultural factors also have a crucial part to play in Chinese higher education to embrace and maintain mobile learning. Pedagogical factors such as usefulness and usability of mobile learning tools are the determinants to adopt technology by the students, and social influence and cultural trust are the major contributors (He et al., 2024). The COVID-19 pandemic also accelerated the application of mobile learning, particularly in vocational education, whose implementation success factors were self-efficacy and social support (Li et al., 2022). However, these advances have been met with supervisory challenges, quality information, and equitable availability (Lee & Lee, 2023), which means that additional policy attention and research are necessary to address such challenges for the realization of the full potential of mobile learning in China.

3.Theoretical Framework

This study is based on two theories of educational psychology: Constructivism and Cognitive Load Theory (CLT). These theories were used in order to describe how learners build knowledge using mobile phones and how they handle the mental work needed for this.

3.1 Constructivism

Constructivism assumes that learning is an active process in which students become participants in the learning process and use previous experience, context, and social interaction to construct knowledge (Vygotsky, 1978). This is not a matter of passive reception of information but of problem-solving and meaning-making. Constructivism underlies the assumption that students are able to leverage mobile phones to personalize their learning experience through self-discovery, access to resources in real-time, and engagement with their classmates (Saleem et al., 2021). Technologies such as learning applications, collaborative working platforms, and multimedia rich content allow students to engage in reflective, exploratory, and dialogic learning aligned with constructivist principles (Yakar et al., 2020).

3.2 Cognitive Load Theory

Cognitive Load Theory (Sweller, 1988) is centered on working memory's capacity limitations and the necessity to limit unnecessary cognitive effort during learning. It distinguishes between three types of cognitive load: intrinsic, extraneous, and germane. Mobile learning contexts place high extraneous loads by prompting notifications, multitasking, and split attention (Krumsvik, 2025). At the same time, mobiles can enhance learning by chopping information into manageable pieces, presenting visualizations, or enabling learners to control the pacing of the learning, thus reducing intrinsic load and enhancing germane load (Gkintoni et al., 2025).

In embracing Constructivism and CLT together, this study captures the learner's agency and the psychological cost of mobile learning. This two-theory approach provides a comprehensive perspective to explain how learners perceive mobile phones as not just communication devices, but also as tools for thinking that enable and constrain knowledge construction.

Within the context of this study, intrinsic load primarily refers to the inherent difficulty of learning materials, such as understanding legal cases or medical terminology. Extrinsic load arises from distractions during mobile learning, including social media pop-ups, task switching, and multi-tasking operations. Relevant load manifests as students 'cognitive effort in self-directed learning processes, exemplified by creating personalized memory systems using tools like Anki or integrating learning materials through note-taking apps. The interaction among these three types of load in mobile learning forms the foundation for students' cognitive processing of learning content, while also providing theoretical support for explaining differences in learning outcomes.

3.3 Research Gap

While mobile phones are pervasive in higher education, most existing research discusses their impact on students' academic achievement, motivation, or distraction. However, there is scarce qualitative research investigating students' own conception of mobile phones as a means for academic knowledge construction. This study bridges that gap by exploring how Chinese university students use mobile phones to construct, implement, and make sense of what they have learned, under the dual

rubrics of Constructivism and Cognitive Load Theory.

4.Methodology

4.1 Research Design

This study adopted a qualitative phenomenological method to explore the lived experiences and perceptions of university students regarding the use of mobile phones in constructing academic knowledge. The phenomenology method was adopted to capture the depth and richness of lived experiences of the participants so that the researchers could understand how students make sense of their mobile learning activities in real-life academic settings. The study was based on Constructivism and Cognitive Load Theory in both interview questions and thematic interpretation of the responses.

4.2 Sampling and Participants

This study employed purposive sampling to recruit 25 undergraduate students from a regular university in Jinan, Shandong Province, China (not part of the "Double First-Class" initiative). As an urban institution in an eastern provincial capital city, this non-vocational and non-key university primarily enrolled students without elite backgrounds. While participants represented diverse academic disciplines including English, law, education, psychology, business, and medicine, all were from the same university and concentrated in the eastern urban area. Consequently, the sample exhibited limitations in institutional hierarchy, geographical distribution, and urban-rural structure. Participants were selected based on their ability to share personal experiences and reflect on their academic mobile use.

4.3 Research Instruments

A semi-structured interview guide was adapted from Khan et al. (2019) and modified to suit the conceptual framework of the study. The interview guide consisted of six open-ended questions that sought to explore how students use mobile phones as a learning device, perceived effectiveness of such use, collaborative learning activities, and challenges encountered.

The interview had the following questions included:

a. How do you decide when to use your phone as a learning tool?

b. What kind of learning activities do you usually do on your phone?

c. Can you describe a time when your phone helped you understand something better in your studies? What factors made using your phone effective or ineffective in this process?

d, How do you think using your mobile phone affects your ability to build and apply what you learn?

e. How do you use your mobile phone to communicate or collaborate with classmates or teachers for academic purposes?

What challenges or difficulties have you encountered when using mobile phones for learning, and how do you manage or overcome these challenges?

4.4 Data Collection Methods

The interviews were conducted in both English and Chinese through face-to-face encounters or virtual meetings on WeChat. Every session lasted for 10 to 20 minutes, and recording was done with participants' permission. They were then transcribed and translated into English.

4.5 Confidentiality and Ethical Considerations

Ethical standards were upheld at all times throughout the study. The research participants were informed of the purpose of the research, voluntariness, and the right to withdraw. Written consent was obtained prior to interviews. All data were anonymized by using respondent codes, and transcripts were stored securely for academic purposes only.

5.Results

5.1 Participant Overview

Table 1: Participant Demographic Profiles

Respondent ID	Gender	Age	Year	Major	Estimated Phone Usage Frequency
A01	Female	21	Year 3	English	5 hours per day
A02	Male	20	Year 2	Computer Science	3-4 hours per day

Respondent ID	Gender	Age	Year	Major	Estimated Phone Usage Frequency
A03	Female	22	Year 4	Law	6 hours per day
A04	Male	19	Year 1	Physics	2 hours per day
A05	Female	21	Year 3	Education	4-5 hours per day
A06	Male	21	Year 3	Law	More than 6 hours
A07	Male	19	Year 3	Medicine	2-3 hours per day
A08	Female	21	Year 4	Economics	4-5 hours per day
A09	Male	20	Year 2	Business	3-4 hours per day
A10	Female	23	Year 3	Law	2-3 hours per day
A11	Male	22	Year 4	Business	4-5 hours per day
A12	Female	23	Year 2	Literature	2-3 hours per day
A13	Female	20	Year 4	Business	3-4 hours per day
A14	Female	19	Year 4	Business	3-4 hours per day
A15	Male	22	Year 3	Education	2-3 hours per day
A16	Female	23	Year 3	Education	2-3 hours per day
A17	Female	22	Year 1	Education	2-3 hours per day
A18	Female	21	Year 1	Psychology	3-4 hours per day
A19	Male	22	Year 3	Education	More than 6 hours
A20	Male	23	Year 2	Business	More than 6 hours
A21	Male	23	Year 1	Sociology	More than 6 hours
A22	Male	20	Year 2	Psychology	1-2 hours per day
A23	Male	23	Year 4	Literature	1-2 hours per day
A24	Male	20	Year 2	Engineering	1-2 hours per day
A25	Male	22	Year 2	Economics	2-3 hours per day

5.2 Thematic Analysis

The data was analyzed using manual coding and thematic analysis, and the following themes have been finalized:

5.2.1 Decision-Making and Contextual Use

The thematic analysis revealed that students' decisions to use mobile phones for academic purposes were shaped by task urgency, device accessibility, and learning context. While some adopted phones as intentional academic tools, others used them based on convenience or habit. Some students emphasized the strategic use of mobile phones, often during spare or fragmented times, or when computers or laptops are not readily accessible, as is the case for Respondent 16. Respondent 1, 8, and 18 mentioned using their device "during short breaks" or "while commuting" while Respondent 7 uses it "before clinical rounds" to refresh their "knowledge of certain conditions". Respondents 6, 16, 17, 19, and 20 also mentioned deliberate use of mobile phones when and where required.

Others, such as Respondents 4, 5, 21, and 22, reported using mobile phones passively or out of habit instead of some deliberate or urgent need. Their phone usage is fundamentally habitual and convenience-based. Respondent 4 noted, "I use my phone whenever it's the most convenient option available". This underscores a tendency towards obsessive use instead of a targeted approach. A few others, including Respondents 10, 16, 17, and 20, described deep integration of mobile phones into their study routine as a learning tool. For Respondent 6, for example, mobile phone is "a part of how [they] engage with

content in real time".

5.2.2 Learning Activities and Cognitive Engagement

Similar patterns were observed as far as learning activities and cognitive engagement are concerned. Students described using phones for a variety of academic activities ranging from basic tasks to complex, multi-layered cognitive work. While some found mobile learning efficient and interactive, others admitted to superficial engagement. Respondents 1, 3, 6, 7, 8, 9, 16, 18, and 19 mentioned engaging in diverse and cognitively rich learning activities like searching for or making flashcards, note-taking, content analysis, multimedia support, etc. Respondent 1, for example, uses their phone for video lessons from Khan Academy or flashcards from Anki. Similarly, Respondent 6 uses "apps like Evernote for taking notes and Law Dojo for quick revision quizzes" while Respondent 20 uses applications "like Duolingo or Baicizhan to practice foreign languages".

Other respondents mentioned using their phones primarily for quick searches, watching videos, or looking for references. These activities are less strenuous and do not require sustained cognitive effort over a long period. Respondent 5 admitted, "I try to watch educational TikToks and YouTube videos, but I often end up scrolling through unrelated content", highlighting the risk of distraction owing to content easily accessible through mobile phones. A few students like Respondents 3, 9, 23, and 25 mentioned using their phones for collaboration, idea exchange and "plan[ning] group projects in real-time on Google Docs and WhatsApp", once again highlighting the nuanced use of this technology based on choices, experiences and circumstances.

5.2.3 Collaboration and Academic Interaction

Based on students' responses, mobile phones are central to peer collaboration, allowing real-time discussions, sharing of resources, and virtual teamwork. According to Respondent 3, mobile phones are crucial in accessing "class WhatsApp groups [that] help [them] exchange notes and prepare presentations." Similarly, Respondent 25 highlighted the use of "shared Google Sheets and Telegram channels" for collaboration. Respondents 1, 3, 6-9, 16-20, and 23-25 also highlighted active collaboration via WeChat, Google Docs, and cloud drives.

However, some students experienced blurring of academic and social boundaries, mentioning that academic group chats sometimes became too overwhelming for them. Respondent 11 mentioned the creation of "separate channels" due to group chats turning "more social than academic". Similarly, respondent 13 complained of "too many notifications" while Respondent 15 mentioned "fatigue caused by long-term use", highlighting cognitive overload and physical fatigue. However, the general consensus endorsed mobile phones as important tools for collaboration and academic interaction through focused and controlled use.

5.2.4 Perceived Educational Value

Students' reflections on how mobile phone use enhanced or hindered knowledge construction varied widely. Many reported increased understanding, access to diverse resources, and stronger learning autonomy, and shared moments where phones helped clarify complex ideas, visualize abstract concepts, or relate theory to the real world. "I understood judicial review better through a podcast that used real-world examples", noted Respondent 14. Similarly, Respondent 7 mentioned getting help with a case study from "a video comparing currency devaluation" and Respondent 18 cited "Bilibili videos [that] made P-value probability much clearer" for them.

Others expressed concern about over-reliance and surface-level learning due to distraction, shallow browsing, and dependence on digital shortcuts. Participant 2 shared his worries "that relying too much on [their] phone means [they] don't fully memorize things." while Respondent 12 was concerned about "impatien[ce] with complex tasks" due to "quick access to answers". Overall, the responses emphasized the need to use mobile phones only as tools and not as replacements to original and critical thinking.

5.2.5 Challenges and Coping Strategies

While phones offer flexibility, they also pose psychological challenges like distraction, screen fatigue, information overload, and reduced deep work as highlighted by the students. According to Respondent 13, "Information overload makes it hard to focus". The view was supported by Respondents 19 and 23. Students developed personal strategies to overcome these barriers. Participants 5, 16-21, 23, and 24 admitted to facing attention fragmentation, information fatigue, and physical

discomfort from extended phone use. Respondent 17 mentioned getting "distracted by social media, news, or irrelevant apps during study" and Respondent 4 acknowledged facing the same problem due to "social media and games".

However, many students including Respondents 1, 6, 17, 8, 19-22, and 25 showed high levels of metacognitive awareness, using focus modes, app blockers, study routines, and critical evaluation of sources to cope with these challenges. Respondent 19 uses "focus mode and turn[s] off notifications or use[s] "Forest" type apps to study independently"; Respondent 17 mentioned "uninstall[ing] addictive apps before exams and train[ing] to single-task", and Respondent 1 highlighted having "learned to use website blockers for social media", efficiently developing independent coping mechanisms to fight cognitive overload and construct knowledge effectively.

6. Discussion

RO1: To explore how Chinese university students use mobile phones as tools for knowledge construction.

The study found that mobile phones are not peripheral learning aids, but their use is embedded deep in the daily lives of the students as multi-functional knowledge construction tools. The students all consistently reported utilizing phones for purposes like searching for real-time information, learning ideas through multimedia tools, note-taking, timetabling for studies, and utilization of digital libraries. All these practices are most conducive to Constructivist theory, where situated learning, active participation, and meaning construction from experience are preferred (McLeod, 2025). Most of the respondents demonstrated what Jonassen & Strobel (2006) call intentional learning: in this case, technology is used not only for the sole passive reception of information but also to understand and interpret, reflect on, and construct it deliberately (Alam & Mohanty, 2023).

The study contributes new insight through the contextual judgment process in identifying when and where learners use mobile phones. For instance, they used them tactically in their free time (as when in transit or queuing), which is a development towards planning the learning environment. Mobile learning has, as opposed to traditional class-based construction of knowledge, enabled ubiquitous microlearning where the learners effectively utilize learning content beyond formal learning spaces. Such a form of practice demonstrates a culturally responsive learner-centered knowledge construction, especially in Chinese higher education where learning intensity and flexibility are concurrent. Existing research has largely overlooked these acts of decision-making, focusing on fixed variables such as screen time or frequency of usage. Placing students' own words and day-to-day experience at its foundation, however, this research fills this gap in literature and puts mobile phones as thinking, conscious tools in the classroom.

RO2: To examine students' perceptions of the impact of mobile phone usage on knowledge construction.

The study found that the participants hold contradicting views about the use of mobile phones even though the majority view them as learning tools. The students identified the power of the instant availability of information, multimedia visualization, and collaborative technology of these tools and observed an instantaneous expansion of the Constructivist principles of social learning and multimodal representation, through which knowledge is more accessible when learners can access it through various avenues (Nasir et al., 2021). A majority of the students reported acquiring conceptual knowledge using animations, podcasts, video essays, and infographics, which all facilitated productive cognitive processing and more learning. The mobile phone is, therefore, an amplifier of knowledge and a scaffold when it is used appropriately.

These same students, however, elaborated on issues of mobile phone use. Recurring screen exhaustion, shallow browsing conduct, and distraction by multitasking or ongoing notifications suggests that mobile phones also induce extraneous cognitive load (Boere et al., 2024) by, in particular, dividing student attention between academic and irrelevant activities like browsing social media among others (Krumsvik, 2025). The duality creates a tension in cognition: whereas the phone is convenient and flexible, it can diffuse attention and prompt surface processing, especially when learning is self-directed as opposed to systematic (Tanil & Yong, 2020). Perhaps most significantly, many of the participants illustrated metacognitive awareness in the guise of app limits, focus modes, or using computers for high-cognitive-load activities. These adaptive responses are a learner-generated reaction to cognitive overload, another sign of the necessity of personal regulation in mobile learning environments.

By capturing these opposing but simultaneous experiences, this research does not just affirm but also reaffirms our

understanding of the psychological effect of mobile learning. It also differs from previous research that explained mobile phone use in binary terms, either as facilitation or distraction, and instead illustrates students negotiating cognitive load in knowledge construction, often dynamically within a learning session. This multi-faceted observation fills a substantial research gap, specifically in Chinese higher education, and carries implications for the manner in which educators can proceed with designing learning experiences that take advantage of the use of mobile without taxing learners cognitively.

Through analyzing students' mobile device-based knowledge construction behaviors, cognitive load theory provides an effective perspective for understanding their learning processes. Some students reduce internal load by using visualized videos and adaptive apps to disperse information when handling complex tasks, while demonstrating higher related load investment when utilizing collaborative platforms and document management tools. However, many students report significantly increased external load due to social app distractions and attention fragmentation, which hinders deep processing and knowledge transfer. Most respondents developed metacognitive strategies such as "focus mode" and "uninstalling social apps" to counteract these load disturbances, demonstrating their ability to dynamically regulate loads for effective learning.

7.Conclusion

This study sought to examine Chinese university students' attitude and applications of cellular phones to construct knowledge in the learning environment. Drawing on Constructivist theory and Cognitive Load Theory, this study discovered that students apply cellular phones to conduct various cognitive operations, including information retrieval and visualization, cooperative work, and idea generation. Whereas mobile phones enhance flexibility and support learner-centered learning strategies, they introduce cognitive difficulties like distraction and surface processing.

The findings underscore that the use of mobile phones during learning is not negative or beneficial but a subtle balance between overloading and potential. The learners are actively not objects but feel when, why, and how they are utilizing their phones, which are dynamic in nature to balance learning productivity and mental load. This observation contributes to the enhanced understanding of mobile learning psychology and has implications for pedagogy design that is sensitive to mobiles in higher learning.

8.Limitations and Future Research

Just as with any qualitative study, the present study has its limitations. Even though the population was diverse, the sample was limited to 25 undergraduate students, and its findings might not capture every variation in universities or areas of study. Additionally, since interviews were conducted over a specific semester, the findings were based on a moment that might change over time or under different academic pressures.

Nevertheless, the research makes good and relevant contributions by focusing on student agency, perception, and psychological experience, domains not often dealt with by mobile learning literature. Future work might extend such research by comparing undergraduate and postgraduate perceptions, employing observational or longitudinal approaches, or uncovering how mobile learning behavior is shaped by policy at the institutional level. Examining changes in phone use patterns within post-pandemic hybrid learning modes might also reveal useful insights.

Furthermore, while the study sample demonstrates diversity in academic disciplines and educational levels, all respondents were drawn from a regular undergraduate institution in Jinan, Shandong Province. This limitation affects representativeness regarding institutional type, regional distribution, and urban-rural context. Future research could adopt stratified sampling to expand coverage across "Double First-Class" universities, vocational colleges, and multiple regions including eastern, central, and western China, particularly through urban-rural comparative samples. Such enhancements would strengthen the external validity and practical applicability of the findings.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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