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Exploring self-regulated learning challenges and support needs: A qualitative study of Chinese higher vocational students

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ABSTRACT

This study explores the self-regulated learning (SRL) challenges and support needs of Chinese higher vocational students. Through semi-structured interviews with 8 students and thematic analysis, this study identified specific difficulties across all three SRL phases. The findings show that in the forethought phase, students struggled with vague goals and unstable motivation. During the performance phase, they faced issues such as poor attention management, limited use of learning strategies, and inefficient time management. In the reflection phase, their self-evaluation tended to be superficial, and their learning confidence was easily undermined. To address these challenges, students expressed a need for phased, personalized, and emotionally supportive tools, especially those powered by artificial intelligence (AI). These findings provide important insights for designing targeted educational support solutions for vocational learners.

1. Introduction

Higher vocational education plays a crucial role in China's education system, bearing the mission of cultivating high-quality technical and skilled talents for economic and social development. With the deepening advancement of national strategies like "Made in China 2025," the importance of vocational education has been elevated to an unprecedented height (Wu and Benson, 2017). However, alongside rapid expansion, higher vocational institutions face severe challenges in enhancing education quality and optimizing the talent cultivation process. Among these, the common characteristics of the student population, such as generally weak learning foundations, fluctuating learning motivation, and a distinct application-orientation, make effectively improving their learning quality and sustainable learning capacity a core issue in the current reform of higher vocational education. Yet, how these specific characteristics shape students' self-regulated learning (SRL) processes, and what support they consequently require, remain underexplored.

In this context, SRL ability is seen as key to addressing this dilemma. SRL theory posits that successful learners can actively plan, monitor, and regulate their own cognition, motivation, and behavior. Substantial research indicates that SRL capability is a core element predicting students' academic achievement, enabling students to maintain efficient learning states even in environments with limited external supervision (Broadbent and Poon, 2015). For vocational students who emphasize SRL and skill iteration, strong SRL ability is not only a requirement for completing their studies but also an indispensable core literacy for their future career development.

However, the reality is that higher vocational students often face systematic difficulties throughout the entire SRL process. In the Chinese higher vocational education context, these students usually come from diverse educational backgrounds; many of them have experienced exam-oriented learning environments that emphasize rote memorization over strategic and reflective learning. They often enter vocational colleges with a strong practical orientation but relatively weak foundational knowledge and self-regulatory habits (Li et al., 2025). Research shows that Chinese higher vocational students frequently exhibit vague goal setting and insufficient planning skills in the initial learning phase (Xiao, 2024). During the learning execution phase, they commonly face problems such as singular cognitive strategies, lagging

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metacognitive monitoring, and inefficient resource management (Cao and Lin, 2020). In the reflection phase after learning concludes, their self-evaluation tends to be superficial, making it difficult to engage in deep learning and strategy optimization from experience (Wang and Chen, 2021). These challenges collectively constrain the further improvement of their learning performance.

Although the importance of SRL and the difficulties faced by higher vocational students in this area have gained preliminary recognition, existing research has dual gaps in methodology and perspective. First, most current studies rely on macro-level quantitative surveys. While these can reveal the general overview of SRL levels, they struggle to deeply capture the specific behavioral difficulties, complex cognitive processes, and authentic emotional experiences students undergo during dynamic learning processes. Second, the research perspective is relatively fragmented, failing to systematically follow a complete SRL theoretical framework (such as the three-phase cyclical model) to comprehensively examine the internal relationships between challenges across different phases. Therefore, adopting in-depth qualitative research methods to systematically diagnose the specific challenges and support needs of Chinese higher vocational students throughout the entire SRL cycle becomes a critical step in filling the current knowledge gap and achieving precise learning situation diagnosis.

Consequently, this study aims to use in-depth qualitative interviews to systematically diagnose the specific challenges faced by Chinese higher vocational college students across the three SRL phases and to clarify the types of support they desire during this process. This study is committed to answering the following two core questions:

- What specific challenges do Chinese higher vocational students face in the three SRL stages (Forethought, Performance, Reflection)?
- What types of support do they need during the SRL process?

2. Literature review

2.1. Self-regulated learning (SRL) and three-phase model theories

SRL theory originates from social cognitive theory, emphasizing that learners are active agents in their own learning process, capable of proactively planning, monitoring, and regulating their own cognition, motivation, and behavior (Zimmerman, 2002). This theoretical framework views learning as a goal-oriented, cyclical, dynamic process, rather than the passive reception of knowledge (Xia, 2025). To better understand and analyze this cyclical process, there are a lot of models being developed. Among them, the three-phase cycle model proposed by Zimmerman (2002) is particularly useful. It is widely adopted as a basic framework for understanding SRL due to its clear phase division and practical operability. As shown in Fig. 1, this model deconstructs SRL into three interrelated, cyclically progressive stages.

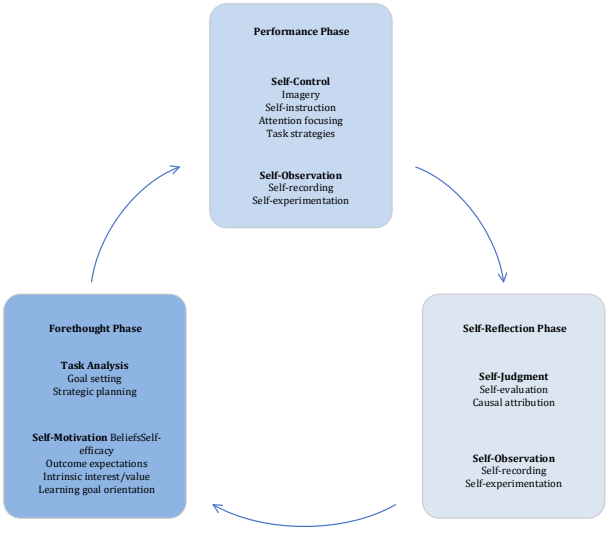

Fig. 1: SRL three-phase cycle model (Zimmerman, 2002)

This model deconstructs SRL into three interrelated, cyclically progressive stages. The forethought phase occurs before learning actions, focusing on proactive preparation and mobilization. Learners in this phase need to perform task analysis, which includes setting specific and challenging learning goals (Zimmerman and Kitsantas, 1996) and formulating strategies and steps to achieve these goals (Eilam and Aharon, 2003). Simultaneously, the learner's judgment of the task's value, their goal orientation (intrinsic interest or extrinsic reward), and their belief in their ability to successfully complete the task (i.e., self-efficacy) collectively constitute the core driving force for learning behavior (Xu and Zhou, 2024).

The performance phase occurs during the actual operation of the learning task, focusing on strategy implementation and continuous monitoring. Learners employ various cognitive strategies (such as elaboration, organization) to process information deeply and use metacognitive strategies for real-time self-observation and adjustment of their level of understanding and learning progress (Winne, 2011). Furthermore, learners need to effectively manage external resources and internal states, including regulating effort, scheduling learning time, and actively seeking help when encountering difficulties; these behaviors are categorized as resource management strategies (Lan and Zhou, 2025).

The reflection phase initiates at the end of a learning cycle, where learners look back and evaluate their own learning process and outcomes. They make self-judgments about their performance, analyze the reasons for success or failure (i.e., attribution), and generate emotional and cognitive reactions based on this; the conclusions from these reflections, particularly the dynamic changes in self-efficacy, directly become key inputs for goal setting and strategy selection in the next learning cycle.

A substantial body of empirical research has established a solid link between SRL ability and academic achievement. Studies show that students who can effectively use SRL strategies generally outperform others in terms of academic persistence, deep knowledge mastery, and final grade performance. Therefore, SRL ability is regarded as one of the key non-cognitive factors predicting student academic success.

2.2. SRL dilemmas among vocational students

Students often behave differently in terms of learning motivation, cognitive strategies, and career orientation. These characteristics may profoundly shape their unique challenges in the SRL process. Firstly, Haisheng et al. (2016) specifically looked at higher vocational students' SRL, and the results show that these students have a strong application orientation; they demonstrate higher learning enthusiasm and identification with practical knowledge and operational skills directly related to future job positions. Secondly, higher vocational students' learning motivation is prone to fluctuate under the influence of external situational factors (Held and Mejeh, 2024). Their learning drive is closely tied to practical rewards such as employment prospects and skill certification (Lin et al., 2025). When facing abstract theoretical knowledge or persistent learning difficulties, the stability of this motivation may be challenged. Furthermore, research indicates that some higher vocational students appear relatively limited in their learning strategies, particularly metacognitive strategies requiring deep thinking and self-monitoring, and tend to rely more on surface-level strategies like repetitive practice and rote memorization. In summary, this combination of strong practicality, extrinsic motivation, and a limited use of deep learning strategies constitutes a distinctive learning characteristic.

These learning characteristics can directly lead to specific dilemmas that students usually face throughout the SRL cycle. In the forethought phase, although students harbor macro goals like "mastering skills," they generally struggle to systematically break down broad course requirements or occupational standards into specific, executable sub-goals and detailed action plans. In the performance phase, students may excel in imitative and operational tasks due to their application-oriented advantage. However, they struggle with using cognitive and metacognitive strategies in tasks that require complex understanding, critical thinking, and flexible strategy adjustment (Jin et al., 2023). This manifests as an inability to effectively switch and optimize learning strategies when encountering obstacles (Winne, 2018). Meanwhile, students usually face difficulties in maintaining attention, managing time, and resisting external distractions, reflecting their persistent challenges at the level of behavioral regulation. In the reflection phase, students' reviews often focus merely on the final score or whether the task was completed. There is a general lack of in-depth examination of their own learning process, evaluation of the effectiveness of the strategies used, and deep attribution analysis of the causal relationship between effort and outcome. This superficial reflection mode hinders their effective learning from experience and constrains the spiral rise of their learning confidence.

Existing research on higher vocational students' SRL has begun to outline the contours of these challenges. Some surveys have revealed the current situation where the overall SRL level of higher vocational students needs improvement. Other exploratory studies have attempted to design interventions supporting their SRL in specific contexts such as online teaching (Sangsawang, 2020).

However, research in this field still has two obvious limitations: First, most studies rely on macro-level quantitative questionnaires. There is a lack of research using in-depth qualitative interviews to meticulously reveal the specific behavioral difficulties, cognitive processes, and emotional experiences students undergo at each SRL stage, resulting in a less vivid and three-dimensional understanding of the problems. Second, the research perspective is relatively fragmented, failing to systematically follow a complete SRL theoretical framework to comprehensively examine the internal logical connections and dynamic influence mechanisms between challenges at different phases. This research gap is precisely the core area that this study aims to enter and explore systematically.

2.3. AI-supported SRL interventions

Recent advances in educational technology have highlighted the potential of artificial intelligence to support SRL by providing personalized scaffolding, real-time feedback, and metacognitive prompts (Kasneci et al., 2023). AI tools can assist with goal decomposition, attention management, strategy suggestion, and structured reflection—functions highly relevant to the challenges faced by vocational students. However, few studies have explored what specific AI features vocational students actually need to support their SRL cycles, which this study addresses.

3. Methodology

This study uses a qualitative method, with an exploratory multiple-case study design and semi-structured interviews to investigate in depth the challenges and support needs experienced by higher vocational students during the SRL process. The selection of this methodological approach addresses two key limitations identified in previous research. First, through in-depth interviews, this study obtained detailed descriptions of students' personal experiences. This helps to compensate for the difficulty that quantitative studies have in capturing

the specific behavioral, cognitive, and emotional dimensions of the dynamic SRL process. Second, the investigation is systematically organized according to the three-phase SRL cycle model. This structured framework helps overcome the fragmented perspective found in previous studies and examines the connections between challenges across different phases as a whole.

Within this design, each participating student is treated as a separate case for analysis. The in-depth analysis of individual cases, followed by cross-case comparison, aims to uncover both shared patterns and unique variations in SRL challenges and needs. The ultimate objective is to develop a clear, evidence-based understanding of this phenomenon.

3.1. Participants

This study used a pragmatic mixed sampling strategy to select participants. First, considering research feasibility and the need for in-depth contextual access, one higher vocational college in China was selected as the research site through convenience sampling. Building upon this, purposive sampling was applied to recruit individual participants. A total of 8 students from diverse professional backgrounds within the college, including Accounting, Modern Logistics, Cross-border E-commerce, Business Administration, and Financial Technology Application, were invited to participate.

This approach ensured that the study was grounded in an authentic educational setting while capturing varied learning experiences, thereby providing rich and nuanced insights into the challenges and support needs related to SRL. All participants joined voluntarily after providing informed consent, and strict ethical guidelines were followed, including anonymization of all personal data to ensure confidentiality.

The sample size of 8 participants was determined based on recognized qualitative research guidelines regarding data saturation. In studies using semi-structured interviews and thematic analysis, 6 to 12 participants are often sufficient to reach the point where new data no longer generate novel themes or insights, particularly within a relatively homogeneous group such as students from the same institution (Guest et al., 2006; Saunders et al., 2018). In this study, interview data were reviewed progressively during collection. After analyzing the first six interviews, clear and recurring patterns regarding SRL challenges had emerged. The final two interviews confirmed that no new themes were introduced, indicating that thematic saturation had been achieved with the selected sample. Thus, the sample was deemed adequate to address the research questions in depth while ensuring methodological rigor.

Since the sample is limited to one vocational college, the findings are exploratory and may not be generalizable to all Chinese higher vocational students. Caution is needed when extending conclusions to other institutions or regions.

3.2. Instrument and data collection

This study used semi-structured interviews as the primary data collection method. This approach ensures coverage of all key dimensions of the research topic through pre-set core questions, while also providing the interviewer with sufficient flexibility to follow the participants' train of thought for deeper probing and to capture unexpected valuable information.

The interview guide for this study was carefully designed, with its theoretical structure closely aligned with Zimmerman's SRL three-phase cyclical model. The content systematically covered core dimensions of the forethought phase (goal setting, plan formulation, motivation sources), performance phase (strategy use, attention management, difficulty coping), and reflection phase (effect evaluation, attribution style, confidence changes), ensuring the collected data could comprehensively address the research questions.

All interviews were audio-recorded with participant consent to ensure completeness and accuracy of information. After the interviews, the author transcribed the recordings verbatim into text, forming the raw database for subsequent analysis. The transcription process remained faithful to the interviewees' original expressions, providing a reliable textual basis for analysis (Braun and Clarke, 2006).

3.3. Data analysis and trustworthiness

The analysis of the interview text data then applied thematic analysis (Braun and Clarke, 2006). The analysis process in this study was not linear but iterative and in-depth, primarily involving the following steps.

3.3.1. First cycle: Initial coding and codebook creation

The authors conducted a line-by-line, in-depth reading of all interview transcripts and performed inductive open coding. At this stage, the author focused on extracting meaning from the data itself, assigning initial descriptive labels to all data fragments reflecting SRL challenges and needs, and creating an initial codebook based on this.

3.3.2. Second cycle: Searching for and initially generating themes

After obtaining the initial set of codes, the author moved into the theme search phase. By repeatedly comparing and clustering conceptual links and patterns between different codes, the author began grouping related codes together, initially generating

a series of candidate themes capable of capturing the core content of the data.

3.3.3. Third cycle: Reviewing and refining themes

This phase was key to the entire analysis process. The researcher systematically reviewed the initially generated themes. This process involved two levels: first, within each theme, checking the coherence between the candidate theme and the codes and raw data fragments it contained; second, at the overall theme level, comparing all candidate themes against the complete interview dataset to assess whether they comprehensively and accurately reflected the overall meaning of the data. Based on this review, the author merged, split, adjusted, and refined the themes to ensure their representativeness and explanatory power.

3.3.4. Final phase: Defining and naming themes

For the final set of themes confirmed after rigorous review, the author provided clear definitions and precise names, explicitly stating the core connotation of each theme and its position within the research framework. To ensure trustworthiness, two independent coders analyzed all transcripts. The initial coding agreement rate was 91%, and disagreements were resolved through discussion until full consensus was reached. Member checking was conducted with three participants to confirm that the themes accurately reflected their experiences, and no revisions were needed.

The data analysis finally produced a series of themes organized according to the SRL three-phase model. These themes, which directly address the two research questions concerning challenges and support needs across the SRL phases, are presented in the Findings section through Tables 1-3, which display the core themes alongside representative interview excerpts for each phase. They serve as the primary empirical findings of this study and transparently trace the progression from the raw data to the thematic conclusions.

4. Findings

The findings are organized according to Zimmerman's SRL three-phase cyclical model, detailing students' dilemmas and needs within the framework of the forethought, performance, and reflection phases.

4.1. Challenges and needs in the forethought phase

The forethought phase is the initiation stage of learning activities, concerning direction and motivation. This study found that students in this phase are plagued by vague goals and fluctuating motivation, and they desire structured external support.

Table 1: Frequency of SRL challenges mentioned by participants (N = 8)

SRL phase	Specific challenge	Number of participants	Percentage
Forethought phase	Vague/non-specific goal setting	7	87.50%
	Unstable/externally driven motivation	6	75.00%
	Lack of detailed learning planning	5	62.50%
Performance phase	Poor attention management/distraction control	8	100.00%
	Limited use of deep learning strategies	7	87.50%
	Inefficient time management/procrastination	6	75.00%
	Difficulty in seeking help when facing obstacles	4	50.00%
Reflection phase	Superficial/results-only self-evaluation	7	87.50%
	Unstable self-efficacy/confidence loss after setbacks	6	75.00%
	Lack of systematic knowledge integration	5	62.50%

Percentages reflect the proportion of participants who explicitly mentioned each challenge during the interview.

Table 2: Challenges and support needs in the forethought phase

Category	Theme	Sample quotes
Challenges	Vague goal-setting and execution anxiety	(1)P1: "Worried that after setting goals, I can't complete them, because there will be specific time periods when I don't feel like studying." (2)P2: "Hard to persist." (3)P5: "Afraid I can't persist; might want to persist today but feel too tired and want to give up tomorrow."
	Extrinsic and unstable learning motivation	(1)P2: "Driving factor is wanting to get a scholarship; lost motivation due to encountering unfairness (e.g., unfair bonus points)." (2)P5: "Driving factors are interest in the course, or seeing classmates studying seriously pushes me to learn; lose motivation when friends ask to go out." (3)P7: "Driving factor is wanting to get the diploma; lose motivation because it's too tiring."
Needs	Need for scaffolding in goal and plan decomposition	(1)P8: "Make plans based on the content taught in class, use AI to look up information, read related materials."
	Need for sustained motivational and emotional support	(1)P3: "Most need words of encouragement." (2)P5: "Most need encouragement from family and friends."

Theme 1: Vague goal setting and execution anxiety: At the level of goal setting, students could establish macro intentions but struggled to translate them into clear action paths. Several students expressed the desire to "ensure passing and strive for excellence," but this positioning itself was outcome-oriented, lacking procedural planning for "how to strive for excellence." For example, Participants set their goals as "guarantee passing the course, strive for excellence" (P4). While this goal was clear, it lacked measurable criteria and specific implementation steps, reflecting a weakness in

decomposing macro goals into sub-goals. Theme 2: Extrinsic and unstable learning motivation: Simultaneously, students' learning motivation showed significant external dependence and instability. Their driving force primarily stemmed from external incentives like scholarships, grades, and diplomas, rather than intrinsic interest in knowledge itself. The statement from P2 was particularly typical: "The driving factor is wanting to get the scholarship; losing motivation due to encountering unfairness (e.g., unfair grade bonuses)." This indicates that their learning investment was highly dependent on the fairness and immediate feedback of the external reward system; once expectations were frustrated, motivation quickly diminished.

Theme 3: Need for scaffolding in goal and plan decomposition: To address the above challenges, students showed a strong need for tools that assist planning and stimulate motivation. Regarding planning, they needed support that could transform vague goals into concrete action plans. The behavior of P8 directly pointed in this direction, as he mentioned "making plans based on what the teacher covered in class, using AI to look up information, reading related materials." This clearly indicates that some students have begun actively seeking technological tools to perform the metacognitive function of "making plans." They need scaffolds that can systematically accomplish goal decomposition and task management.

Theme 4: Need for sustained motivational and emotional support: Regarding motivation maintenance, students generally craved continuous emotional encouragement. When asked what kind of immediate help they needed most during the learning process, multiple participants unanimously pointed out that "most need words of encouragement" (P3) or "most need encouragement from family and friends" (P5). This reveals that in the face of tedious or difficult learning tasks, positive external emotional feedback is not just a bonus but a key factor in sustaining their learning efforts.

4.2. Challenges and needs in the performance phase

The performance phase is where plans are put into practice, and it is the stage where student challenges are most concentrated and complex. Attention dispersion, superficial strategy application, and inefficient resource management are the main obstacles in this phase.

Table 3: Challenges and support needs in the performance phase

Category	Theme	Sample quotes
Challenges	Difficulty in managing attention and resisting distraction	(1)P2: "Hardest to resist is the poor atmosphere created by dorm mates not studying." (2)P3: "Hardest to resist is phone distraction; method to refocus is to tell myself I must study hard, but the effect is poor." (3)P4: "Hardest distractions to resist are my own love of fun and personal hobbies."
	Insufficient application of cognitive and metacognitive strategies	(1)P1: "When you can't figure out the next step, realize there's an issue with the previous one. Solutions include... first trying to work it out yourself, then using the internet or finding resources to understand it if you still don't get it." (2)P3: "During lecture, when the teacher covers new content and suddenly don't understand, realize the difficulty. Solution is to ask classmates." (3)P7: "Couldn't solve a major math problem. Looked online for solutions, followed someone else's method and got it done, but didn't necessarily understand it."
	Inefficient time management and help-seeking behaviors	(1)P2: "When time is tight, will perfunctorily submit, or use AI, refer to others. Will reflect afterwards on why didn't finish on time." (2)P3: "Deadline the night before final exam, start in the afternoon. Prioritize ensuring quality, believe completing the day's tasks on the same day is more important." (3)P7: "Forgot to write psychology assignment, was out playing, directly didn't submit. Hypothetically would choose to ensure speed and submit first, would regret afterwards."
Needs	Demand for a "learning partner" providing in-depth explanations	(1)P1: "Most need clear explanations of knowledge points, because only after mastering the knowledge points can one draw inferences." (2)P6: "Most need the teacher's explanation of problem-solving steps to resolve confusion." (3)P7: "Most need the teacher's help to solve the problem (re-organize the knowledge points)."
	Expectation for systematic and empowering support	(1)P2: "Hope to utilize online courses and other online learning resources." (2)P3: "Hope to use AI tools." (3)P5: "Most hope AI can help with related knowledge analysis, in order to master the knowledge points for solving problems and handling tasks, rather than just solving a single problem"
	Latent need for effective attention management tools	(1)P4: "Will make phased plans, for example, prepare for review during the final exam period." (2)P5: "Method to refocus attention is to hide the phone, put it farther away." (3)P6: "Method to refocus attention is to first think about how to finish the distracting thing, then continue studying."

Theme 1: Difficulty in managing attention and resisting distraction: Attention management was the first major difficulty students faced. Internal impulses and the external environment together constituted powerful sources of distraction. P3 candidly stated, "The hardest thing to resist is the distraction from the phone; the method to refocus is to tell myself I need to study hard, but the effect is not good." This statement not only reveals the source of distraction but, more crucially, points to a dilemma—students have the awareness for self-regulation but lack effective methods, causing willpower to often fail in the face of temptation.

Theme 2: Insufficient application of cognitive and metacognitive strategies: A deeper challenge lay in the insufficient application of cognitive and metacognitive strategies. Students often remained at the surface level of obtaining answers rather than pursuing deep understanding. P7 demonstrated this when describing an experience of being "stuck" in

learning: "Couldn't solve a major math problem. Looked online for solutions, followed someone else's method and got it done, but didn't necessarily understand it." The huge gap between "got it done" and "didn't necessarily understand" accurately reflects the lack of metacognitive monitoring; they could imitate steps but failed to ensure they truly grasped the core concepts.

Theme 3: Inefficient Time management and help-seeking behaviors: Furthermore, inefficiencies in time management and help-seeking behavior also constrained learning effectiveness. P2's choice when pressed for time, "When time is tight, I will perfunctorily submit, or use AI, refer to others," was both a consequence of failed time planning and reflected a passive, even potentially academically dishonest, inefficient help-seeking strategy.

Theme 4: Demand for a "learning partner" providing in-depth explanations: Facing multiple obstacles in the execution process, students urgently needed a "learning partner" that could provide immediate, precise, and in-depth support. Their core need was to gain a profound understanding of knowledge points, not just answers. For example, P1 explicitly stated, "Most need clear explanations of knowledge points, because only after mastering the knowledge points can one draw inferences about other cases." This demand for "drawing inferences" clearly requires that the support tool's function should upgrade from "information provision" to "cultivation of conceptual understanding and transfer ability."

Theme 5: Expectation for systematic and empowering support: Furthermore, students expected this support to be systematic, helping them solve problems fundamentally. The expectations for an AI assistant precisely defined this high-level need: "Most hope AI can help with related knowledge analysis, in order to master the knowledge points for solving problems and handling tasks, rather than just solving a single problem" (P5). This indicates they need a tool that empowers their own cognitive processes.

Theme 6: Latent need for effective attention management tools: Regarding the persistent issue of attention management, students' actual behaviors inversely confirmed their need for effective tools. P5's primitive method of "hiding the phone, putting it farther away," though seemingly clumsy, authentically reflected the effort they expend for self-regulation and their desire for effective solutions in the absence of professional tools.

4.3. Challenges and needs in the reflection phase

The reflection phase is crucial for closing the learning cycle and initiating a higher-level cycle. However, students' reflections are often superficial, making it difficult to extract effective learning wisdom from experience (Table 4).

Table 4: Challenges and support needs in the reflection phase

Category	Theme	Sample quotes
Challenges	Superficial self-evaluation and externalized attribution	(1)P2: "Look for reasons in myself, like not listening carefully in class; next time change by improving learning efficiency, making full use of time." (2)P4: "Analysis of learning attitude, academic course difficulty, and personal matters; Next time, address changes by focusing on personal attitude and private affairs." (3)P7: "Analyze reason as not listening well in class; next change is to listen carefully."
	Context-dependent and undermined self-efficacy	(1)P1: "Particularly confident in areas of proficiency like operations, system software...; confidence takes a hit in other cross-disciplinary subjects I'm not good at, like marketing." (2)P2: "Confidence is average; especially confident when receiving teacher encouragement or winning awards; easily lose confidence when grades are unsatisfactory, or teacher doesn't seem to like me."
	Lack of systematic reflection and adjustment habits	(1)P2: "Will consciously summarize; will adjust based on effect, for example, adjust memorizing vocabulary from morning to other times." (2)P3: "Do not summarize and record effective/ineffective methods; do not adjust the next learning method based on previous learning outcomes." (3)P7: "Do not summarize and record effective/ineffective methods; will adjust a little bit but won't completely follow through on it."
Needs	Need for tools guiding deep analysis and knowledge integration	(1)P4: "Hope AI can perform related knowledge analysis, help systematically organize knowledge points, to achieve overall mastery rather than just solving single problems." (2)P5: "Most hope AI can teach how to solve problems I can't do, help me analyze knowledge points." (3)P8: "I hope AI can help me analyze the key points of each question and clarify my thinking."
	Continued need for emotional support and positive feedback	(1)P2: "Most need words of encouragement." (2)P5: "Most need encouragement from family and friends." (3)P7: "Also think others' encouragement is important, can provide emotional value."
	Need for support in translating reflection into action	(1)P8: "Will consciously summarize; will adjust based on the effect, for example, last semester's English exam essay was written off-topic, next time during the exam I will read the prompt a couple more times."

Theme 1: Superficial self-evaluation and externalized attribution: Students' self-evaluation tended to be shallow and characterized by externalized attribution. When analyzing reasons for unsatisfactory learning, several students listed aspects like "learning attitude, difficulty of specialized courses, personal matters." This attribution style placed the problem on relatively abstract attitudes or uncontrollable external factors, rather than on specific, improvable learning strategies, hindering effective strategic reflection.

Theme 2: Context-dependent and undermined self-efficacy: Students' self-efficacy was highly dependent on the specific context and could be undermined. Their confidence highly depended on specific domains and past successful experiences. For instance, P1's feeling was representative: "Particularly confident in areas of proficiency like

operations, system software...; confidence takes a hit in other cross-disciplinary subjects I'm not good at, like marketing." This conditional confidence made them prone to shrink back when facing new challenges.

Theme 3: Lack of systematic reflection and adjustment habits: A more fundamental challenge was that some students had not yet established systematic reflection and adjustment habits. For example, P3 admitted that he "does not summarize and record effective/ineffective methods; does not adjust the next learning method based on previous learning outcomes." This indicates a break in the link where learning experience precipitates and transforms, preventing learning ability from achieving a spiral rise.

Theme 4: Need for tools guiding deep analysis and knowledge integration: To break through the limitations of shallow reflection, students needed tools that guide them in deep analysis. The expectations for AI, in this phase, manifested as support for knowledge integration and organization, as stated, "Hope AI can perform related knowledge analysis, help systematically organize knowledge points, to achieve overall mastery" (P4). "Systematic organization" and "overall mastery" are typical characteristics of deep reflection. They need scaffolds that can help them construct knowledge systems and see the full picture of knowledge.

Theme 5: Continued need for emotional support and positive feedback: Emotional support was equally crucial in the reflection phase, especially when facing failure and frustration. Participants emphasized the need for knowledge point explanations while adding, "also think others' encouragement is important, can provide emotional value" (P7). This proves that positive feedback is indispensable for them to repair damaged confidence and maintain learning enthusiasm.

Theme 6: Need for support in translating reflection into action: Students needed concrete support after reflection to help them translate summarized experiences into practical actions. For example, P8 demonstrated this ability to learn from experience, mentioning "Will consciously summarize; will adjust based on the effect, for instance, last semester's English exam essay was written off-topic, next time during the exam I will read the prompt a couple more times." However, this effective summarize-adjust behavior currently relies mainly on students' personal consciousness and insight. This case precisely proves that if external tools or guidance could systematize and routinize this effective reflection-adjustment model, it could help more students like P8 achieve continuous optimization of their learning methods.

4.4. Cross-phase systematic relationships

Challenges in earlier phases directly contribute to difficulties in later phases. Vague goal-setting in the forethought phase reduces strategy use and attention control in the performance phase, which in turn leads to superficial self-evaluation and unstable self-efficacy in the reflection phase. Weak reflection then fails to improve goal clarity for subsequent learning cycles, creating a vicious cycle (Table 5).

Table 5: Cross-phase relationships among SRL challenges

Challenge in earlier phase	Influence on subsequent phase	Cyclical effect
Vague goal-setting (forethought)	Reduced learning strategy use & poor attention control (performance)	Weak execution increases task difficulty
Unstable motivation (forethought)	Inefficient time management & procrastination (performance)	Low learning completion
Superficial strategy use (performance)	Shallow self-evaluation & weak reflection (reflection)	Cannot improve future plans
Attention difficulties (performance)	Unstable self-efficacy & confidence loss (reflection)	Motivation further declines
Superficial reflection (reflection)	Vague goal-setting & poor planning (forethought)	Vicious cycle of SRL

5. Discussion

The findings of this study illuminate the SRL challenges and support needs of Chinese higher vocational students through Zimmerman's three-phase model. The findings not only strongly affirm the model's applicability to this specific group but also deepen the theoretical understanding by delineating how the distinctive characteristics of these students manifest concretely across the SRL cycle.

5.1. Challenges across the SRL phases: Underdeveloped metacognition and group characteristics

The first research question focused on identifying specific SRL challenges. The findings reveal a pattern of systematic difficulties. These difficulties are rooted in underdeveloped metacognitive skills, and this pattern is further shaped by the students' vocational orientation and their motivational profiles.

In the forethought phase, the primary challenges were vague goal-setting and execution anxiety. This observation aligns with the task analysis sub-process described in Zimmerman's model (Zimmerman, 2002). Effective self-regulation requires the decomposition of broad objectives into actionable plans. The students' struggle with this step resonates with existing research. Eilam and Aharon (2003) noted that learners, particularly in non-traditional educational pathways, frequently establish goals that are overly macro and lack operational clarity. For Chinese higher vocational students, this challenge may be exacerbated. Their prior educational experiences have often emphasized examination outcomes over the cultivation of strategic planning skills (Li et al., 2025). During the performance phase, challenges focused on attention management, a

limited repertoire of learning strategies, and inefficient time management. Difficulty in resisting distractions, particularly from digital devices, highlights a significant deficit in behavioral regulation. From a theoretical perspective, this reflects weak inhibitory control and limited metacognitive monitoring, which are more pronounced in vocational students due to less prior training in self-management. A more profound issue was the insufficient application of cognitive and metacognitive strategies. Students often resorted to imitating procedural solutions without achieving deep conceptual understanding. This indicates a critical gap in self-monitoring. Winne (2018) emphasized that continuous self-monitoring and strategy adjustment are essential during the execution of learning tasks. Although higher vocational students demonstrate aptitude in applied, operational tasks (Haisheng et al., 2016), they may not have routinely engaged in the deep cognitive processing required for theoretical or complex problem-solving. This limitation hinders their ability to adapt strategies when encountering obstacles.

In the reflection phase, students exhibited tendencies toward superficial self-evaluation and context-dependent self-efficacy. Their causal attributions for learning outcomes were often externalized or abstract. For instance, students cited factors like task difficulty or general attitude, rather than analyzing the effectiveness of specific learning strategies. This superficial reflective practice stops the cyclical progression of SRL. Zimmerman's model posits that insightful reflection is crucial for translating experience into improved subsequent performance (Zimmerman, 2002). The students' limited reflective depth disrupts this upward cycle. Furthermore, the finding that their academic confidence was easily undermined by setbacks aligns with prior observations regarding the instability of vocational students' motivation.

5.2. Unique SRL profiles of vocational students vs. general university students

Compared with general university students, who often show stronger intrinsic motivation and deeper strategy use, vocational students in this study displayed more extrinsic motivation, greater attention difficulties, weaker metacognitive skills, and stronger needs for emotional support and step-by-step scaffolding. These differences stem from their educational background, career orientation, and learning foundations, making their SRL needs distinct and targeted.

5.3. Support needs: Phased, personalized scaffolding and AI functions

The second research question is about the types of support students require. The expressed needs are not generic. They are directly tied to the phase-specific challenges previously outlined, thereby forming a coherent blueprint for intervention design (Table 6). In reply to the forethought phase challenges, students expressed a need for scaffolding to decompose goals and formulate plans. They need tools to translate vague intentions into manageable, sequential tasks. This need directly addresses their identified deficit in strategic planning. Furthermore, a strong desire for sustained motivational and emotional support was evident. Students frequently mentioned needing encouragement from peers, family, or teachers. This underscores the external dependency and fragility of their learning motivation, a characteristic documented in earlier studies.

Therefore, effective support systems must integrate both cognitive structuring and affective reinforcement to facilitate the initiation and maintenance of learning efforts.

Table 6: Support needs mentioned by participants (N = 8)

Need type	Specific need	Count	%
Goal/plan scaffolding	Help decompose goals into steps	7	87.50
Knowledge explanation	Clear step-by-step explanations	7	87.50
AI learning assistant	AI for analysis & understanding	6	75.00
Emotional support	Encouragement & positive feedback	6	75.00
Reflection guidance	Organize knowledge & review	6	75.00

For the performance phase, the needs were more complex. Students clearly requested a "learning partner" capable of providing in-depth conceptual explanations rather than mere answers. Their desire to draw inferences indicates a need for support that fosters deep understanding and knowledge transfer. This expectation is congruent with their applied, vocational mindset. As Haisheng et al. (2016) noted, such students aim to master underlying principles to navigate variable real-world scenes. Their interest in AI tools was specifically framed around this need for systematic knowledge analysis and empowered guidance. This suggests a desired shift in the role of technology from an information repository to a metacognitive partner that can stimulate deeper processing and strategic thinking, as envisioned in some contemporary educational technology research (Jin et al., 2023). In addition, students' initial efforts to manage their attention, such as putting their phones away, suggest a potential need for more effective self-regulation tools.

In the reflection phase, students' needs focused on supports that could guide deep analysis and knowledge integration. They wanted assistance in systematically organizing knowledge points to achieve overall mastery, and it is a sign of deep reflection. This need directly challenges the observed tendency toward superficial evaluations. At this phase, students' continued desire for emotional support and positive feedback highlights

the crucial role these elements play in restoring confidence and sustaining engagement after academic setbacks. Therefore, effective support at this point should combine analytical scaffolding to promote deeper cognitive processing with empathetic feedback to strengthen emotional resilience, both of which are essential for long-term self-regulation.

5.4. Specific AI features for vocational students

Based on student needs, effective AI tools should: (1) decompose macro goals into daily tasks; (2) send attention reminders and reduce digital distractions; (3) explain knowledge points rather than only give answers; (4) provide guided reflection questions; (5) offer positive emotional feedback. These functions go beyond generic AI learning tools and are tailored to vocational students' SRL weaknesses.

5.5. Implications

This study makes two primary theoretical contributions. First, it validates and contextualizes Zimmerman's cyclical SRL model within the specific domain of Chinese higher vocational education. More significantly, it details how this group's unique characteristics, such as a strong application orientation and a reliance on extrinsic motivation, specifically shape their SRL behaviors across different phases. This enriches SRL theory by adding granular, context-specific empirical evidence.

Second, the study addresses a notable gap in the literature concerning technology-enhanced SRL. A prevalent paradigm in existing research is solution-driven, often beginning with an existing technology to test its efficacy. In contrast, this study adopts a user-needs-driven approach, grounded in the challenges and needs articulated by learners themselves. The core theoretical contribution here is the provision of a demand-side blueprint. This blueprint can inform the design of future educational interventions, especially those involving AI. It helps ensure that technological development is guided by authentic learner needs rather than seeking to fit pre-existing tools to educational contexts.

The findings offer clear, actionable guidance for educators and instructional designers.

Support should be phased: Interventions should provide goal-setting scaffolding in the forethought phase, act as a metacognitive partner in the performance phase, and offer guided analysis in the reflection phase.

Support should be adaptive and personalized: Given the internal diversity among students, support systems should accommodate varying levels of self-efficacy and strategy repertoires.

Support should function as externalized scaffolding: Effective tools should make hidden thinking processes more visible and easier to use. This helps reduce mental effort and supports the gradual development of self-regulation skills. For educational technology developers, it outlines key functional requirements for AI learning assistants, emphasizing roles as explanatory guides, strategic prompts, and motivational supporters.

5.6. Limitations and future directions

This study also has limitations. Firstly, convenience samples from a single institution limit universality, and future research should use cross-regional, multi-institution sampling to test the broader universality of identified challenges and needs. Secondly, this study mainly relies on self-reported data from students, which may be biased. Future research can integrate learning analysis, classroom observation, or homework assessment to triangulate SRL behavior. Third, the cross-phase relationships identified are preliminary; future quantitative studies can test causal links between phase-specific challenges. Based on this, future research directions include:

- Designing and developing specific generative AI-assisted learning activity prototypes based on the needs identified in this study;
- Testing the actual efficacy of such interventions in enhancing higher vocational students' SRL abilities and academic achievement through rigorous empirical research;
- Deeply investigating how students with different characteristics (e.g., different majors, different initial ability levels) interact with AI support to achieve more precise personalized learning support;
- Exploring how institutional and teaching factors can be adjusted to better support vocational students' SRL development.

6. Conclusion

This qualitative study explored the challenges and support needs of Chinese higher vocational students within the framework of SRL. Two core conclusions are drawn. First, these students encounter systematic, phase-linked challenges across the SRL cycle, rooted in underdeveloped metacognition, unstable motivation, and weak self-management skills. These challenges form a cumulative cycle: poor forethought reduces performance quality, which weakens reflection, further impairing subsequent self-regulation. Second, vocational students need phase-specific, personalized, emotion-integrated support that differs from general university students, including structured goal scaffolding, attention management help, deep-explanation AI support, and guided reflection tools.

This study provides a needs-based foundation for designing AI SRL tools and teaching interventions tailored to Chinese vocational students. By addressing their unique SRL profiles, educators and developers can better foster sustainable learning capacity and career readiness for this key student group.

List of abbreviations

AI	Artificial intelligence
N	Number of participants
P1–P8	Participant 1 to participant 8
SRL	Self-regulated learning

Compliance with ethical standards

Ethical considerations

This study was conducted in accordance with applicable ethical guidelines for research involving human participants. Informed consent was obtained from all participants prior to the interviews. Participation was voluntary, and participants were informed of their right to withdraw. All personal information was anonymized, and confidentiality was maintained throughout the study.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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