

The Characteristics of University Students' Self-regulated Learning in the Context of Blended Learning

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Abstract

In order to explore the characteristics of Chinese university students' online self-regulated learning in the context of blended learning, a questionnaire method was used to conduct a collective test on 1342 university students. Based on the process model of self-regulated learning, online self-regulated learning is used as a research tool. The results show that: The overall level of online self-regulated learning of university students is not high; There are significant gender differences in online self-regulated learning of university students, and grades have a significant moderating effect on gender differences; There are no significant differences in grades and urban-rural differences in Online self-regulation learning of university students. The results of the research help reveal the characteristics of online self-regulated learning of university students, as well as the existing individual differences. This is conducive to clarifying the key intervention directions for university students' online self-regulated learning, and has certain enlightening significance for the theoretical innovation of university students' self-regulated learning.

Keywords

Blended Learning; University Students; Self-regulated Learning; Process Model of Self-regulated Learning.

1. Introduction

Self-regulated learning (SRL) is critical to the success of online learners (Littlejohn et al., 2016; Wang et al., 2013) [1,2]. Research on online self-regulated learning has become a hot spot in the field of educational psychology. Some researchers have proposed that existing educational psychology principles and theories need to be re-examined or modified to reflect the unique characteristics of online learning environments and help understand online teaching (Tallent-Runnels, 2006) [3]. The research progress on theoretical models and measurement tools of self-regulated learning has profoundly reflected the above viewpoints.

Self-regulated learning means that learners set learning goals, mobilize the effort and resources needed to achieve the learning goals, and monitor, regulate, and control their own cognition, motivation, and behavior. Self-regulated learners are "metacognitive, motivated to learn, and strategic". Self-regulated learning refers to the process by which learners individually activate and maintain cognitive, affective, and behavioral processes that are systematically oriented toward achieving personal goals (Zimmerman, 2011) [4].

1.1. A Process Model of Self-Regulated Learning

The process definition of self-regulated learning divides learning into three stages: anticipatory, executive and volitional control, and self-feedback. A key aspect of this definition is the

periodicity of self-regulation, it contains a feedback loop linking previous learning to current learning, which means that each variable can be viewed as both a predictor and an outcome variable. Schmitz & Wiese (2006) further optimized the process model of self-regulation learning and named the three stages as pre-action stage, action stage and post-action stage [5] (See Figure 2). Jansen (2018) marked the three-stage model as three stages before learning, during learning and after learning, which is more clear, concise and clear [6]. A process model of self-regulated learning, which divides the learning process into three stages: pre-learning, learning, and post-learning, contains feedback loops that link previous learning to current learning, and reflects the cyclical nature of self-regulated learning (Zimmerman, 2000) [7] (See Figure 1). The process model of self-regulated learning describes an ideal learning process with distinguishable stages and periodicity (Wirth & Leutner, 2008) [8], and is widely cited as the basis for self-regulated learning interventions, training, assistance, and support (Klug et al., 2011; Dörrenbächer & Perels, 2016) [9,10]. In the context of the rise of online education, with the self-regulated learning process model as the theoretical basis, many researchers have explored the measurement and intervention of online self-regulated learning in MOOCs and blended learning.

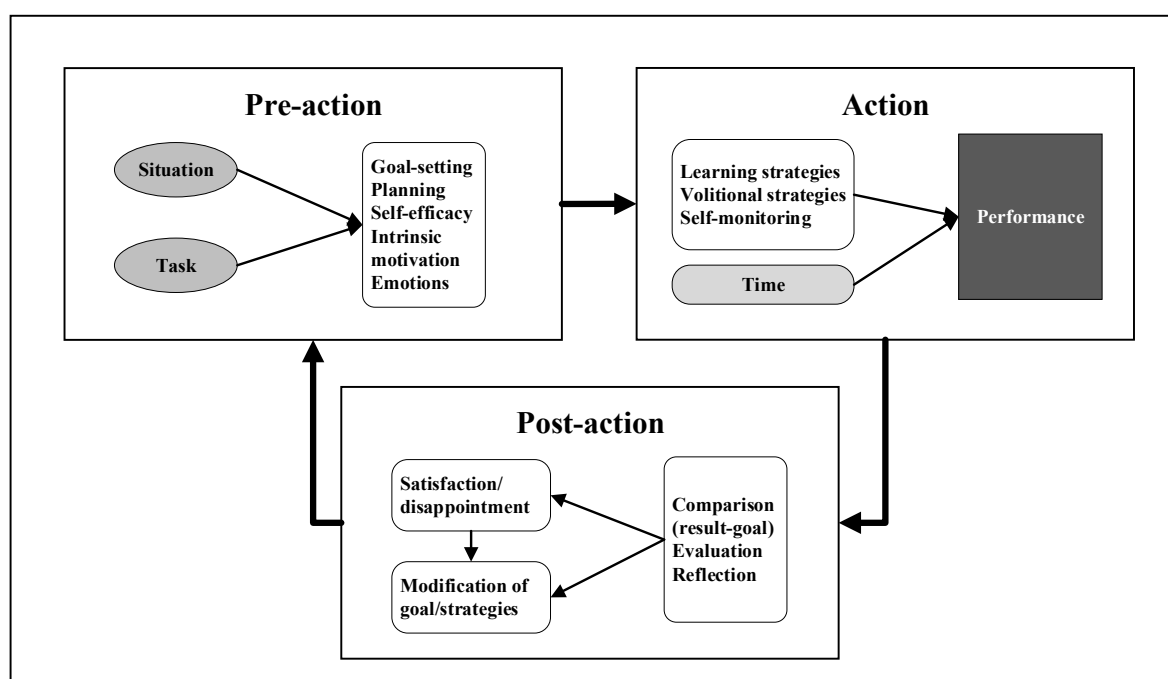


Figure 1. Process model of self-regulated learning (based on Schmitz & Wiese, 2006)

1.2. Measurement Tools for Self-Regulated Learning

1.2.1. Motivated Strategies for Learning Questionnaire (MSLQ)

A component model of self-regulated learning outlines the relatively stable dominant abilities of self-regulated learners (Boekaerts, 1999) [11]. As a classic measurement tool for self-regulated learning, the Motivated Strategies for Learning Questionnaire (MSLQ) was designed based on a component model (Pintrich et al., 1991) [12]. The scale includes two subscales, learning motivation and learning strategies. The learning motivation subscale includes value components (intrinsic goal orientation, extrinsic goal orientation, task value), expectation components (control beliefs, learning and performance self-efficacy) and Affective component (test anxiety), learning strategies subscale including cognitive and metacognitive strategies (rehearsal strategies, fine-processing strategies, organizational strategies, critical thinking strategies, metacognitive self-regulation), resource management strategies (time and learning environment, effort regulation, peer learning, help seeking) two components. MSLQ is the most

widely used measurement tool in self-regulated learning research (Duncan & McKeachie, 2005) [13]. However, the MSLQ developed and designed based on the component model has two major drawbacks. One is that it cannot reflect the entire process of learning. The scale focuses on the learning motivation before learning and the specific cognitive strategies during learning, but it does not reflect the self-regulated during and after learning; second, it cannot reflect the core essence of self-regulation learning. There is an essential difference between self-regulation learning strategies and cognitive strategies. The plan before learning, the regulation and control in learning, and the regulation after learning should be the core focus of the self-regulation learning. In particular, MSLQ has not been validated in an online learning environment that emphasizes self-regulation (Cho & Summers, 2012) [14].

1.2.2. Online Self-regulated Learning Questionnaire (OSLQ)

Online Self-regulated Learning Scale (OSLQ), including six sub-dimensions of goal setting, environment construction, task strategy, time management, seeking help, and self-evaluation, of which goal setting belongs to the pre-learning phase, environment construction, task strategy, time management, and seeking help belong to the mid-learning phase, while self-evaluation belongs to the post-learning phase (Barnard et al., 2009) [15]. A large number of researchers have used OSLQ to conduct online self-regulation learning measurement and intervention research on university students (Zhang Cheng-long and Li Li-jiao, 2018; Li, 2019; Jivet, 2020; Deng Guomin, Xu Xinfei, Zhu Yonghai, 2021) [16-19]. The disadvantage of OSLQ is that it has too little content, is slightly thin, is limited to the self-regulated learning it measures, and is not comprehensive enough. Its advantage is that it basically embodies the essence of the self-regulated learning process model, which is suitable for the measurement of online self-regulated learning in the context of MOOC and blended learning, and has been translated, revised and used by Chinese researchers (Zhang Cheng-long & Li Li-jiao, 2018) [16].

1.2.3. The Self-regulated Online Learning Questionnaire Revised (SOL-Q-R)

The initial version of the self-regulated online learning questionnaire (SOL-Q), which includes 5 subscales of metacognitive skills, environment construction, time management, effort management, and help seeking (Jansen et al., 2016) [20]. The self-regulated online learning questionnaire revised (SOL-Q-R) subdivides the complex "metacognitive skills" subscale into three independent subscales: pre-learning, learning and post-learning of metacognitive activity. As a result, the validity of the scale is improved, and each subscale can be used independently, facilitating the drawing of specific conclusions for each stage of the self-regulated learning process. Research evidence shows that SOL-Q-R has high reliability, validity and usability (Jansen et al., 2018) [6]. Some researchers have used SOL-Q-R to explore the support mechanism of learners' self-regulated learning in the context of MOOCs (Jansen et al., 2020) [21]. The advantage of SOL-Q-R is that it covers a wide range and is relatively comprehensive, which clearly reflects the essence of the self-regulated learning process model, but it is only suitable for the measurement of online self-regulated learning in the context of MOOCs. No Chinese researchers have revised and localized it.

1.3. Our Study

To sum up, domestic and foreign researchers have conducted extensive research on the measurement of university students' self-regulated learning. The quantitative measurement tools are relatively mature, and the online learning situation Quantitative measurement tools for self-regulated learning of university students are also widely used, providing necessary tools for conducting empirical research. The future research trends of university students' self-regulated learning during the epidemic prevention and control period are mainly as follows: Research on the new characteristics of university students' self-regulated learning during the epidemic prevention and control period. Under the background of normalized prevention and control, the online and offline hybrid teaching mode will be the new normal of university

teaching, and the self-regulated learning of university students will also show new characteristics. These new characteristics require new research.

2. Method

2.1. Participants

Cluster sampling was used to select students from freshman to junior year in two applied undergraduate colleges and universities in Anhui Province for measurement. Senior students did not participate in the questionnaire due to the short teaching cycle. After obtaining the informed consent of the university students, a total of 1443 university students participated in the survey. After excluding invalid samples, there were a total of 1342 valid questionnaires (the questionnaire effectiveness rate was 93%). Among them, there are 810 boys and 532 girls; 577 freshmen, 504 sophomores, and 261 juniors; 202 students from urban areas, 322 from counties and towns, and 818 from rural areas.

2.2. Research Tool

The Online Self-regulated Learning Questionnaire (OSLQ) compiled by Barnard et al. (2009) [15] was used. Contains a total of 24 items (such as "I manage my online study time by setting goals", "I carefully choose where I study during online classes to avoid too much distraction" "I try to Carry out online learning and establish corresponding routines"), including six dimensions of goal setting, environment construction, task strategy, time management, seeking help, and self-evaluation. On a 5-point scale, 1 means "strongly disagree" and 5 means "strongly agree." A higher score indicates a higher level of online self-regulation learning of an individual. Before the test, two teachers from psychology majors and English majors translated and back-translated the scale, and revised the relevant expressions, and finally formed the online self-regulation learning scale for the test. In order to further test the validity of the scale among Chinese university students, the structural equation model analysis software Mplus7.4 was used to conduct high-order confirmatory factor analysis, $\chi^2=1476.802$, $df=246$, $\chi^2/df=6.003$, $CFI=0.954$, $NFI=0.949$, $RMSEA=0.061$, $SRMR=0.034$, the results show that the second-order six-factor model fits well and the scale has good structural validity. In this study, the overall Cronbach's Alpha of the scale was 0.97, and the subscales of goal setting, environment construction, task strategy, time management, help seeking, and self-evaluation were 0.89, 0.89, and 0.89, respectively. 0.86, 0.89, 0.89, 0.87 and 0.91.

2.3. Research Procedures and Data Analysis

The test semester is the first semester of the 2020-2021 school year, that is, the first semester of returning to school under normalized epidemic prevention and control after a semester of online teaching in the national colleges and universities. The testing week is the 12th-15th teaching week, that is, university students in all courses have experienced a 3-month teaching period of online and offline mixed courses. The test time is the offline teaching class of a certain course. The group test is conducted in the classroom as a unit. Before the test is administered, the teacher will explain to the students the purpose of the test, the way of answering, the principle of confidentiality and the principle of being free to withdraw from the test at any time. Questionnaire stars are used for online measurement. All students complete the answers on their mobile phones, and click submit directly after completion. Students are required to complete the answer within the specified time (10 minutes). After eliminating the invalid questionnaires, it is the valid data for this test. Data were analyzed using SPSS 23.0 software.

3. Results

3.1. Grade Characteristics of Online Self-Regulated Learning among 1st to 3rd Grade University Students

Table 1. The mean and standard deviation of the online self-regulated learning scale for 1st to 3rd grade college students of different genders

Grade	Gender	Num	Mean and standard deviation of the total scale and subscales M(SD)						
			Total	goal setting	environment construction	task strategy	time management	seeking help	self-evaluation
Total	Male	810	3.78(0.78)	3.78(0.84)	3.90(0.83)	3.64(0.94)	3.75(0.90)	3.79(0.85)	3.80(0.86)
	Female	532	3.62(0.75)	3.67(0.80)	3.75(0.79)	3.41(0.92)	3.56(0.90)	3.64(0.84)	3.64(0.85)
	Total	1342	3.72(0.77)	3.74(0.83)	3.84(0.82)	3.55(0.94)	3.67(0.90)	3.73(0.85)	3.74(0.86)
freshman	Male	411	3.83(0.78)	3.83(0.84)	3.95(0.82)	3.66(0.98)	3.78(0.92)	3.88(0.85)	3.86(0.87)
	Female	166	3.53(0.72)	3.65(0.78)	3.66(0.76)	3.28(0.92)	3.40(0.93)	3.59(0.83)	3.56(0.82)
	Total	577	3.74(0.77)	3.78(0.82)	3.87(0.82)	3.55(0.98)	3.67(0.94)	3.80(0.86)	3.77(0.86)
sophomore	Male	308	3.74(0.81)	3.76(0.85)	3.85(0.85)	3.66(0.91)	3.74(0.89)	3.71(0.87)	3.75(0.89)
	Female	196	3.69(0.79)	3.71(0.86)	3.81(0.80)	3.52(0.94)	3.70(0.90)	3.73(0.85)	3.70(0.87)
	Total	504	3.73(0.80)	3.74(0.86)	3.83(0.83)	3.61(0.92)	3.72(0.89)	3.71(0.86)	3.73(0.88)
junior	Male	91	3.68(0.69)	3.65(0.84)	3.82(0.77)	3.51(0.87)	3.64(0.84)	3.69(0.72)	3.75(0.67)
	Female	170	3.61(0.71)	3.65(0.75)	3.79(0.81)	3.40(0.89)	3.55(0.85)	3.60(0.84)	3.65(0.85)
	Total	261	3.63(0.70)	3.65(0.78)	3.80(0.79)	3.44(0.88)	3.58(0.84)	3.63(0.80)	3.68(0.79)

Table 2. Comparison of differences in online self-regulation learning levels of college students

Demographic variables		Total	goal setting	environment construction	task strategy	time management	seeking help	self-evaluation
Gender	Male	3.78(0.78)	3.78(0.84)	3.90(0.83)	3.64(0.94)	3.75(0.90)	3.79(0.85)	3.80(0.86)
	Female	3.62(0.75)	3.67(0.80)	3.75(0.79)	3.41(0.92)	3.56(0.90)	3.64(0.84)	3.64(0.85)
	<i>t</i>	3.809 **	2.409 *	3.204 *	4.506 **	3.794 **	3.157 *	3.415 *
	<i>p</i>	0.000	0.016	0.001	0.000	0.000	0.002	0.001
Grade	freshman	3.74(0.77)	3.78(0.82)	3.87(0.82)	3.55(0.98)	3.67(0.94)	3.80(0.86)	3.77(0.86)
	sophomore	3.73(0.80)	3.74(0.86)	3.83(0.83)	3.61(0.92)	3.72(0.89)	3.71(0.86)	3.73(0.88)
	junior	3.63(0.70)	3.65(0.78)	3.80(0.79)	3.44(0.88)	3.58(0.84)	3.63(0.80)	3.68(0.79)
	<i>F</i>	1.856	1.944	0.729	2.731	2.503	3.550*	1.001
	<i>p</i>	0.157	0.144	0.482	0.066	0.129	0.029	0.368
Birthplace	City	3.76(0.77)	3.76(0.83)	3.86(0.81)	3.61(0.97)	3.75(0.89)	3.80(0.82)	3.79(0.82)
	Town	3.72(0.76)	3.76(0.85)	3.84(0.83)	3.53(0.92)	3.67(0.91)	3.73(0.85)	3.76(0.83)
	Village	3.70(0.78)	3.72(0.82)	3.84(0.83)	3.54(0.94)	3.65(0.90)	3.72(0.86)	3.72(0.88)
	<i>F</i>	0.491	0.351	0.057	0.468	0.957	0.673	0.713
	<i>p</i>	0.612	0.704	0.944	0.626	0.384	0.51	0.49

On the whole, the scores of university students' online self-regulation learning scale showed a downward trend with the increase of grades (See Table 1, Figure 2). There are significant grade differences in the scores of the help-seeking subscale, and the scores of the lower grade students on the help scale are significantly higher than those of the upper grade students; there is no significant grade difference in the scores of the total scale and other subscales (See Table 2).

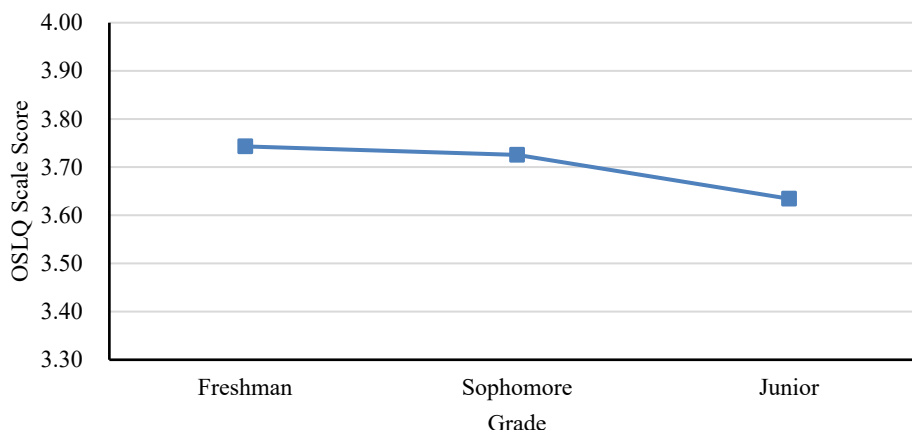


Figure 2. Grade characteristics of online self-regulated learning among 1st to 3rd grade college students

3.2. Gender Differences in Online Self-regulated Learning among 1st to 3rd Grade University Students

Taking the demographic variable gender as the independent variable, and taking the online self-regulated learning total scale and subscale scores as the dependent variable, an independent sample t-test was performed, and the results showed that there were significant gender differences (see Table 2). Sophomore girls scored higher than boys on the Help Seeking Scale (M sophomore girls = 3.73 vs M sophomore boys = 3.71), and junior girls were on par with boys on the Goal Setting Scale (M junior girls/boys = 3.65), in addition, the scores of boys were significantly higher than those of girls (see Table 1). The interaction effect of grade and gender was significant, $F(2, 1336) = 3.491, p = 0.031$. There was a significant gender difference only in the freshman year, and there was no significant gender difference between the sophomore and the junior year. Grade was a moderator for gender differences (see Figure 3). The interaction effect of birthplace and gender was not significant.

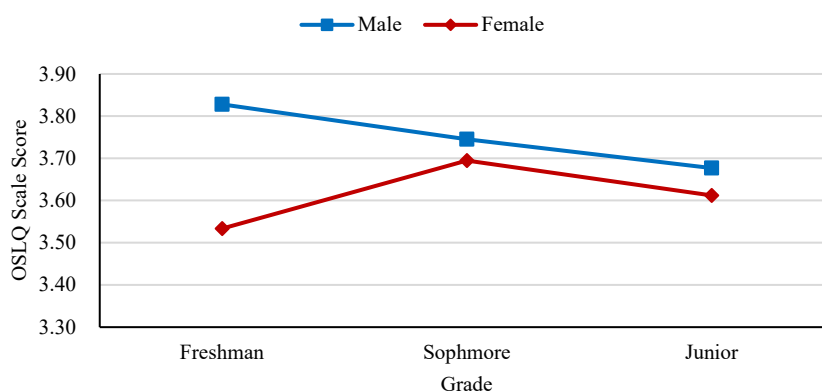


Figure 3. Gender differences in online self-regulated learning among 1st to 3rd grade college students

3.3. Differences between Urban and Rural Areas in Online Self-regulated Learning among 1st to 3rd Grade University Students

On the whole, there is no significant difference in the scores of the online self-regulation learning scale among the 1st to 3rd grade urban, county and rural university students (see Table 2). In addition to the low level, a downward trend can still be seen among urban and rural university students (see Figure 4).

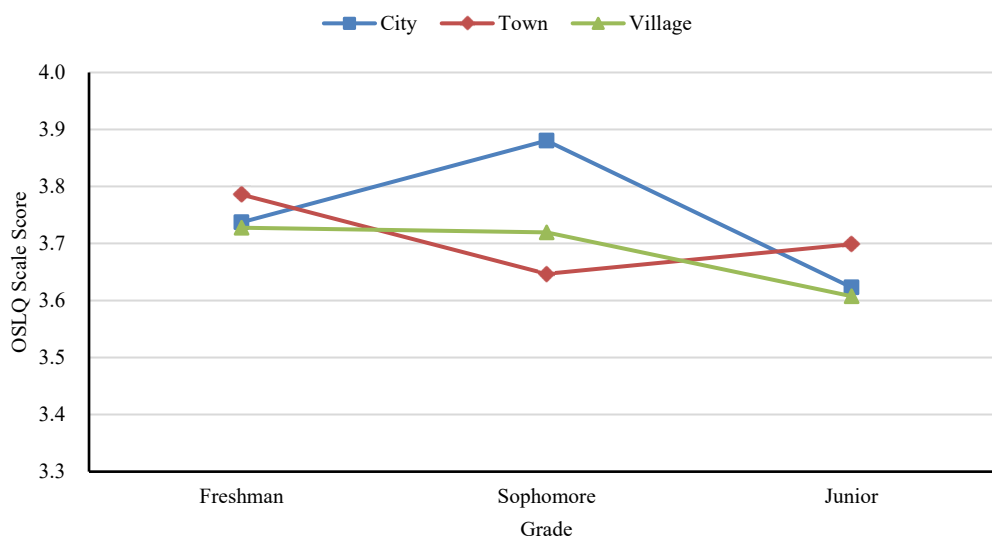


Figure 4. Differences between urban and rural areas in online self-regulated learning among 1st to 3rd grade university students

4. Discussion

In the context of large-scale practice of online-offline blended teaching mode in universities, this study explores the current characteristics of university students' online self-regulated learning from the perspective of the self-regulated learning process model. First of all, the results of this study show that, both the overall level of self-regulated learning and the levels of various specific learning states before, during and after learning, online learning of university students show a low overall level. A series of studies have found that most of the time university students are unable to effectively carry out self-regulated learning (Peeverly et al., 2003; Azevedo & Cromley, 2004; Bol & Garner, 2011) [22-24], our study once again proved the above conclusion. Secondly, this study found that there was a significant grade difference between freshmen and sophomores and juniors on the help-seeking subscale, and there was no significant grade difference on the total scale and other scales, but there were still significant grade differences. A downward trend with increasing grades. Third, the study found that there are significant gender differences in online self-regulated learning of university students, and grades have a significant moderating effect on gender differences. Specifically, there is a significant gender difference in the freshman year, and this gender difference disappears when entering the sophomore and junior year. Bembenutty (2007) [25] found that there are indeed a lot of individual differences in the self-regulated learning of university students. Findings that embodied gender differences were that among white university students, white males reported less frequent use of repetitive strategies than white females, and white males scored significantly lower on organizational strategies than white females. Finally, there is no significant urban-rural difference in the online self-regulation learning level of university students.

How to interpret the above findings? According to the process model of self-regulated learning, the crux of the problem that university students cannot self-regulated learning may be before, during or after learning. Teachers need to provide timely support, assistance or intervention, which is the key to the success or failure of blended teaching (Ding Hao, Wu Chang-fa, Zhu Jia-ming, 2021) [26]. When university students arrive on a university campus, they experience a fundamental change in their learning environment. At the secondary level, home and school are important external regulators of student learning. For example, "After you go to university, I won't care about you anymore" is a typical saying of Chinese parents; "The school adopts various scientific methods to help students make full use of their spare time", which is represented by Hebei Heng-shui Middle School. After coming to the university, the learning of university students relies more on self-regulation, that is, internal regulation. This is true of traditional face-to-face education, especially online teaching and hybrid teaching during the epidemic prevention and control period. The results of this study prove that the self-regulated learning level of university students cannot meet the requirements of online learning during the epidemic prevention and control period. The epidemic prevention and control period is not only a testing ground for university students' self-regulated learning, but also a training ground. Attention must be paid to the intervention of university students' online self-regulated learning in the context of blended learning. In particular, after several years of university study, the self-regulation learning ability of university students has not improved qualitatively, but has a downward trend. This shows that teachers should pay more attention to teaching people how to fish in the process of teaching them how to fish. To sum up, the main reason for the low level of online self-regulation learning of university students during the epidemic prevention and control period lies in the lack of effective intervention, support, assistance and training. Teachers should not only pay attention to their own offline teaching, but also pay attention to students self-study, using scientific means to intervene in online self-regulated learning of university students is a must. In addition, in this study, the individual differences of university students' online self-regulated learning are mainly reflected in gender differences, which suggests that different guidance must be provided according to the background differences of learners, and gender is also an obvious individual characteristic. The main reason for the absence of grade differences and urban-rural differences may be that the overall level of university students' online self-regulation learning is relatively low.

For the intervention research on online self-regulated learning of university students during the period of normalized epidemic prevention and control, the findings of this study have important significance in the following aspects. First, the results of this study show that the online self-regulation learning level of university students during the epidemic prevention and control period is not high, which is all-round, spanning the three stages of pre-learning, learning and post-learning, so the intervention should be an all-round process intervention. Second, the results of this study prove that there are individual differences in the online self-regulation learning of university students during the epidemic prevention and control period. We should pay attention to the background differences of university students and provide differentiated guidance.

The limitations of this study suggest future research directions. First, during the normalized epidemic prevention and control period, a large number of colleges and universities promoted the use of online and offline hybrid teaching models. This study selected two of them as samples. In future research, the sampling scope should be further expanded. Second, as the research tool, the OSLQ is not the most ideal online self-regulated learning scale. In future research, SOL-Q-R needs to be localized and revised, especially to verify its applicability in the context of blended teaching during the epidemic prevention and control period in China.

Before the outbreak, many researchers explored the mechanism of online self-regulated learning of university students (Zhu et al., 2016; Panadero et al., 2017) [27,28]. After the

outbreak, researchers have successively explored the mechanism of online self-regulated learning of university students during the lockdown period and the pandemic period (Hong, Lee, & Ye, 2021; Shah et al., 2021) [29,30]. However, no researchers have explored the mechanism of online self-regulated learning of university students during the period of normalized epidemic prevention and control in China. Fourth, this study discusses the current situation of university students' online self-regulation learning during the epidemic prevention and control period, that is, "what is it", and it is urgent to find out the effective intervention measures for university students' online self-regulation learning during the epidemic prevention and control period, that is, "how to do it". In the future, an intervention study on online self-regulation learning of university students during the period of normalized epidemic prevention and control in my country should be carried out.

5. Conclusion

"I am the master of my learn, can I really take the responsibility of learning?" What is the answer of Chinese university students to this question? This study confirms that in the absence of effective intervention, assistance, support and guidance, as is the case with most university students in the world, according to the standards of educational psychology self-regulated learning, most university students cannot effectively regulate their own learning, but in the case of effective intervention, the opposite is true. Specifically, our findings found: The overall level of self-regulation learning is not high, which suggests the necessity of self-regulation learning intervention.

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