

Analysis of the Influence of College Students' Autonomous Learning Ability on Online Teaching Resources Construction

Xiaoqin Wei, Li Yang*, Ce Lai

North Sichuan Medical College, Nanchong, Sichuan, China

*Corresponding Author.

Abstract:

The online teaching activity of "keeping learning during class suspension" has become another teaching mode of school education in the post-epidemic era. Various high-quality online learning platforms provide abundant learning resources for online teaching activities, and students' autonomous learning ability is the key factor of online teaching effect. A survey of the autonomous learning ability of students in a medical college showed that students had some problems, such as unclear intrinsic purpose, high learning anxiety, loose learning process control and insufficient self-evaluation. After analysis, it was proposed that online resources construction should be based on the present situation of students' autonomous learning ability, and help students to coordinate the whole learning process comprehensively and improve the learning effect by constructing concise and visible resources with clear purpose and strong professional identity, introducing exchange discussion sections and formative evaluation system, and strengthening process management.

Keywords: *Autonomous learning of college students, Learning ability, Online resources.*

I. INTRODUCTION

Teaching is the top priority of university education [1-2], which is the purposeful, planned and organized implementation of educational activities by teachers. The educational activities are mainly carried out in the form of "face-to-face classroom teaching and practical operation training" [3-4]. In 2019, the General Office of the Ministry of Education issued the Notice on the Identification of Offline, Online-offline Blended and Social Practice National First-class Undergraduate Courses in 2019. Colleges and universities have taken actions to vigorously develop online education curriculum resources, actively explore online-offline blended teaching mode, and there are many high-quality online curriculum platform resources such as Mocc, Rain Classroom, Superstar and Experimental Space, which provide abundant online learning resources for students' autonomous learning. Due to the outbreak of COVID-19, in 2020, the online teaching activities of "keeping learning during class suspension" were carried out orderly and effectively in colleges and universities. Online educational activities and online teaching materials

achieved unprecedented development. However, some problems were also exposed. Students' autonomous learning ability has become a key factor affecting the teaching effect. Due to the significant differences in students' autonomous learning ability, when building online teaching materials, we should fully consider students' autonomous learning ability, understand their needs, and form high-quality online teaching resources that match their autonomous learning ability from the perspective of students, so as to promote their learning efficiency.

Autonomous learning ability of college students is a learning method in which students actively participate in the learning process in terms of knowledge resources cognition, motivation and behavior [5]. Online teaching resources are an important source for students to study at home. Building online resources that meet students' autonomous learning ability can maximize students' subjective initiative and improve their learning efficiency. Based on the investigation of students' autonomous learning ability, this paper takes undergraduates in an university as the sampling object, uses the kernel density estimation method to estimate and analyze the influencing factors of autonomous learning ability as a whole, and in view of the problems reflected by factor analysis, constructs reasonable and effective online teaching resources, with a view to providing reliable and scientific reference for the online resources construction of colleges and universities and improving the quality of personnel training.

II. RESEARCH METHODS AND DATA

2.1 Data Sources

Using stratified sampling method, a sample survey was conducted on the first-tier clinical majors, second-tier science majors and second-tier engineering majors in a medical college. Zhu Zude's College Autonomous Learning Scale was used [6]. This scale contains two dimensions: learning motivation and learning strategies. Each of them contains six more specific factors, totaling 12 factors (self-efficacy, internal goal, learning control, external goal, learning significance, learning anxiety, general methods, learning help, learning plan, learning summary, learning evaluation and learning management). 987 questionnaires were sampled, and 935 valid questionnaires were returned, among which 614 (65.67%) were from the first-tier clinical majors, 220 (23.55%) were from the second-tier science majors and 101 (10.80%) were from the second-tier engineering majors.

2.2 Research Methods

The kernel density estimation method was used. [7-9], The kernel function was used to effectively estimate the data density distribution function to better make up for the data discontinuity and display the data details. The data collected in this paper are logical data. Using this method to estimate and analyze the density of 12 factors in two dimensions can effectively estimate the density distribution from the sample to the whole. Assuming that the density function of random variable x is $f(x)$, the density function is expressed as:

$$f(x) = \frac{1}{nh} \sum_{i=1}^N K\left(\frac{x-x_i}{h}\right) \quad (1)$$

Wherein, N is the total sample size. $K\left(\frac{x-x_i}{h}\right)$ is the kernel function and h is the bandwidth. According to data density distribution, kernel functions can be divided into Uniform kernel function, Triangle kernel function, Epanechnikov kernel function, and Gaussian kernel function. According to the central limit theorem, this data distribution was estimated by Gaussian kernel distribution. Its expression is as follows:

$$g(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} \quad (2)$$

The density estimation process was calculated by PyCharm2019.1.3, and its density estimation curve was drawn by image visualization technology. Through estimation, the results can be analyzed from aspects including curve distribution, kurtosis and extension, so as to guide the rational allocation of university education platform resources.

III. RESULTS AND ANALYSIS

The kernel density curve was used to estimate the collected data as a whole, with a total of 2 dimensions and 12 factors. The results are visualized as Figure 1.

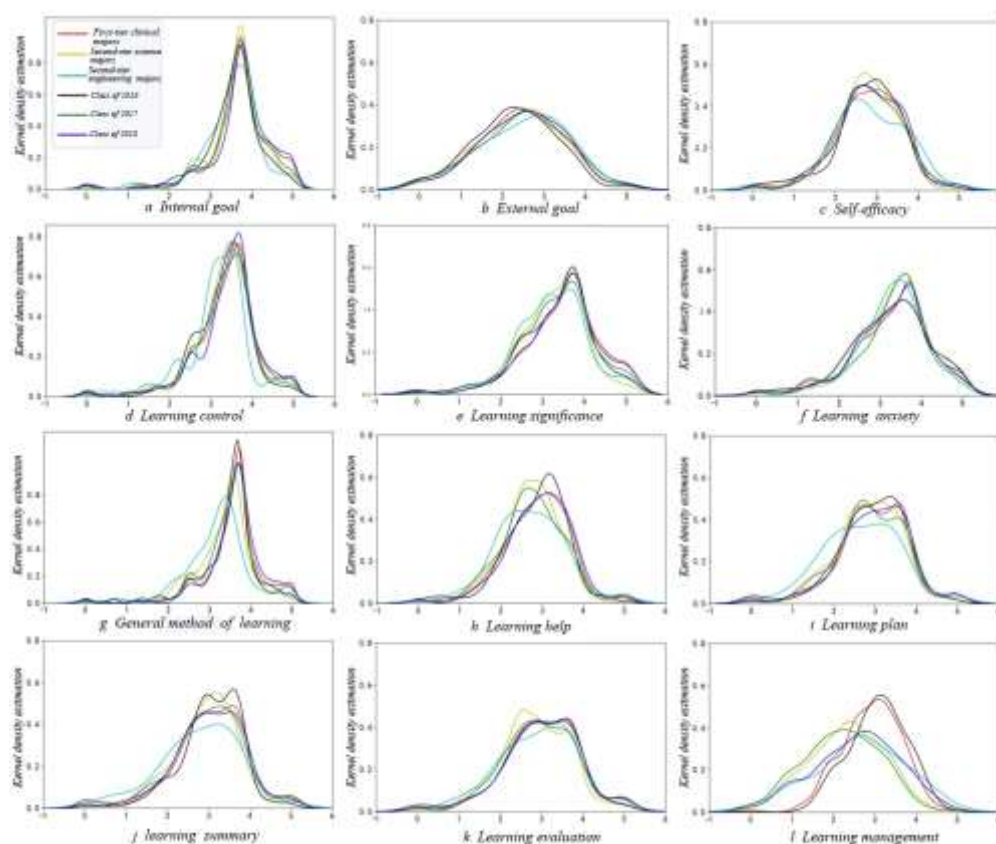


Fig 1: Kernel density estimation of 12 factors

3.1 Internal Goals and External Goals are Inconsistent

From the analysis in Figure 1a, the peak value of the internal goal kernel density curve is higher, and the curve shows a right shift trend, mainly distributed around 4, showing that students have clear internal learning goals. The internal goal of the second-tier engineering students is relatively lower, and the external goal of the second-tier science students is more clear, indicating that students' awareness of majors is different. However, compared with Figure 1b, the kernel density curve of the external goal shows that the kurtosis is low, which is less than half of the internal goal. The data scatter is distributed in the range of 0-5, with a large variance, which shows that students are not sure about their learning goals at each stage, and they are confused about their majors or courses. Compared with the grades, the external goals of the lower grades show a right shift trend, which shows that the external goals of the newly enrolled students are clearer.

3.2 Strong Learning Control Ability, but Insufficient Self-Efficacy

From the analysis in Figure 1d, the peak value of the learning control kernel density curve reaches 0.7 to 0.8, and the variance of the curve is small, showing an overall right shift trend. This indicates that the

overall students have strong learning control ability. However, compared with Figure 1c, the peak value of the kernel density curve of self-efficacy is low. The data are mainly distributed between 2 and 4, and the variance is large. The scattered data are distributed in this interval, which shows that students' self-efficacy is uneven, and the learning efficiency does not match the self-restrained learning control ability. Some curves show a "double peak" distribution, such as 2018 students and second-tier engineering students, indicating that some junior students and engineering students have great differences in self-efficacy, with two-level differentiation.

3.3 Widespread Learning Anxiety

The curve trends of Figure 1e and Figure 1f are similar. The peak values of the kernel density curves are between 0.4 and 0.6, which belong to the upper middle level, and the peak values show a right shift trend. It shows that students have a clear understanding of the meaning of learning, but anxiety is common in the learning process. With the gradual advancement of learning and education, the anxiety of senior students has been relieved to some extent, but it still shows different levels of anxiety. Among them, the second-tier engineering students have lower learning significance and higher anxiety.

3.4 Mastering Learning Methods, but not good at Asking for Help in Learning

From the analysis of Figure 1g, the peak value of the kernel density curve of the general method is higher, showing a centralized single-peak distribution, with a right shift trend on the whole. It indicates that most of the students master general learning methods, while the first-tier clinical students and grade 2016 students are more proficient in learning methods and can use effective resources to improve their learning efficiency. Seen from the analysis in Figure 1h, the peak range of the learning help-seeking kernel density curve is 0.4 to 0.6. The center of the peak is about 3, and the variance is large. The data scatter is between 2 and 4, which shows that more than half of the students do not ask for help from the teacher and are not good at communicating with classmates and teachers about learning problems. With the further adaptation to university study, senior students are more willing to communicate with their teachers.

3.5 Loose Control of Learning Process and Insufficient Self-Evaluation

The kernel density curves of Figures 1i, 1j and 1k are similar, with the center of the peak value at about 3 and the peak value range of 0.4 to 0.6. Especially, the peak value of learning evaluation is the lowest, and the peaks all show a "bimodal" distribution. The data scatter points are between 2 and 4. This shows that students are generally polarized in three aspects: learning plan, learning summary and learning evaluation. Some students can effectively control the learning process, while others are weak in autonomous learning ability and loose in process control. As can be seen from Figure 1k, students are even less willing to evaluate the learning development process and effect.

3.6 The Learning Management is Uneven

According to the analysis in Figure 11, part of the learning management kernel density curve takes 2 as the peak center point, and part of it takes 3 as the peak center point. The peak value is about 0.5, and the variance is large. It shows that the level of students' learning management is uneven. Senior students and first-tier students can better restrain themselves, and systematically manage their own learning and improve their autonomous learning ability, while junior students and second-tier students do not handle their learning management well.

IV. DISCUSSION AND SUGGESTIONS

Students' autonomous learning ability is closely related to their professional knowledge, learning resources and learning communication. Online learning resources do not exist in isolation, but should follow the status quo of students' autonomous learning ability. It is necessary to build educational resources platform in a rational mannerto improve the efficiency and quality of education and teaching.

4.1 Resource Construction should have Clear Purpose to Enhance Major Identity

The purpose of resource construction is to improve the quality of education and teaching by enhancing the ability of autonomous learning. At present, teachers spend a lot of time and energy to build excellent online shared resources. However, due to the lack of knowledge and practical experience related to online information construction, some teachers unilaterally stand on the position of curriculum teaching, which leads to the rich and colorful resources after the completion. However, the lack of practical professional application makes students unable to enhance their major identity and strengthen their internal learning goals.

In view of the low major identity of students and their unclear learning objectives, resource construction should be considered from the perspective of the whole university education process. When online course resources are built, more course introductions and industry applications should be introduced to improve students' major identity. Each course set up and implemented has its existence value, and the construction of course resources should also emphasize the purpose of course learning and its significance in professional knowledge.

4.2 More Attention should be paid to the Simplicity and Visibility of Resources

Students' anxiety and lack of self-energy efficiency in the learning process are often due to their failure to understand and master knowledge in the learning process. When building resources, we should subdivide the curriculum knowledge points. The resource construction of important knowledge points is not to copy all the contents of textbooks intact, but to take the explanation and application of knowledge points as a short content, and to build the core and essence contents of the curriculum into concise and

effective resources. We should make students truly understand and master knowledge in the process of learning, instead of cramming for exams.

In resource construction, there are also some knowledge that cannot be fully and clearly explained. Resource visualization can present abstract principles and complex procedures that are difficult to understand and master with vivid pictures. In recent years, major teaching platforms have also launched the virtual simulation teaching project one after another. The construction of curriculum resources should be combined with advanced technology, and some principles, methods, steps and other contents that can not be reproduced or applied in real life should be displayed in the form of virtual simulation, so as to enhance students' curriculum understanding and knowledge induction, reduce their learning anxiety and improve their learning efficiency.

4.3 The Introduction of Exchange and Discussion Resources

The construction of knowledge system is not only to learn from curriculum resources, but also to reflect and summarize constantly in the exchange and discussion. Students' major cognition, internal goal setting, learning plan planning and implementation all need communication between teachers and students. Therefore, the construction of online resources should not only include curriculum-related materials, but also pay attention to the exchange and expansion of curriculum content. This kind of communication and discussion resources can be introduced by the course content. We may horizontally discuss the application of knowledge and matters needing attention, and vertically discuss the related knowledge problems and industry development trends encountered in the implementation of high-level projects of the course.

The construction of resources should not be one-way. Students should not only receive the information transmission of resources, but also give feedback on the problems encountered in the transmission process. Teachers should not only build resources, but also communicate with students' feedback and questions. According to the survey, students' help-seeking scores are low, and some students are unwilling to ask for help face to face with their teachers. The exchange and discussion section of online resources just provides students with a platform for communication, helps them solve their academic problems. In addition, it also provides teachers with teaching feedback, thus giving full play to the two-way efficiency of resource construction.

4.4 Online Formative Evaluation System should be introduced to Strengthen Process Management

The survey results show that students' evaluation scores of learning development process and effect are low. University curriculum evaluation system mainly includes offline summative evaluation, process evaluation or formative evaluation. These evaluation systems are all implemented in various schools and play a role in supervising the learning process and strengthening the learning effect to varying degrees, while online curriculum resources have no complete evaluation system. During the period of "keeping learning during class suspension" in COVID-19 epidemic, we can use online shared resources to adjust the

learning plans and learning processes of students' "studying at home", and summarize their learning in stages; for online learning, it is necessary to strengthen process management and supervision, and regulate the whole process of teaching and learning, so as to understand the needs of students' development, maximize their autonomous learning ability and evaluate their learning effect objectively and fairly.

Online resource allocation is the supplement and improvement of offline teaching, and online teaching evaluation is the detection means of effective use of online resources. Online teaching evaluation should follow the educational reality and construct different evaluation systems according to different educational stages, starting from vertical evaluation and horizontal evaluation. In the vertical evaluation, we can carry out evaluation such as stage test and task completion from the perspective of course and carry out process evaluation such as project declaration, implementation and conclusion from the perspective of project. Professional summary evaluation such as opening report, academic value and industry dynamic grasp can be implemented from the graduation thesis. In horizontal evaluation, each specific evaluation process will be involved, and task points will be set. Students can enter the next stage of study only after completing the planned tasks. Through the formative evaluation process, students can consciously adjust their learning plans, improve their learning methods and complete their learning tasks, so as to improve their academic performance and finally achieve the coordinated development of teaching and learning.

ACKNOWLEDGEMENTS

This research was supported by 2018-2020 Higher Education Talent Training Quality Teaching Reform Project of Sichuan Provincial Department of Education (Grant No. JG2018-635) and the Study and Research Center of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era (Grant No. 2020ZD001) and College Education and Teaching Research and Reform Project of North Sichuan Medical College (Grant No. 21-31-094) and Educational teaching research and reform projects of North Sichuan Medical College(grant no.21-31-093).

REFERENCES

- [1] Yohannan DG, Oommen AM, Umesan KG, et al. Over-coming barriers in a traditional medical education system by the stepwise, evidence-based introduction of a modern learning technology. *Med Sci Edu*, 2019, 29(3):803-817
- [2] Lu Juan, Shi Yang, Joline. Overview of post competency model based on medical education reform. *Basic Medical Education*, 2019, 21(12):1005-1012
- [3] Lu Haixia, Wang Yuan, Zhang Li, Han Lei, Hou Fanxing, Yang Juan, Hou Ni, Li Yiheng, Cheng Yanbin. Practice and thinking of distance teaching of basic medical courses during epidemic prevention and control in COVID-19. *China Medical Education Technology*:1-4, 2020. <http://kns.cnki.net/kcms/detail/61.1317.g4.20200306.1614.004.html>.
- [4] Lu Haixia, Wang Yuan, Liu Wenbin, Lu Yi, Yan Hong. Challenges and coping strategies of PBL teaching activities during epidemic prevention and control in COVID-19. *Medical Education Research and Practice*:1-8, 2020. <http://kns.cnki.net/kcms/detail/61.1507.G4.20200302.1247.002.html>.

- [5] Gong Xue, Yu Xiulan, Ding Tingting. Analysis on the difference of autonomous learning ability of different types of undergraduates-Based on the survey of 859 undergraduates in Jiangsu Province. *China University Teaching*, 2017(09):91-96.
- [6] Zhu Zude, Wang Jingqiong, Zhang Wei, et al. Development of Autonomous Learning Scale for College Students. *Psychological Development and Education*, 2005 (3):60-65.
- [7] Lee Yun-Ju, Liang Jing Nong. Characterizing intersection variability of butterfly diagram in post-stroke gait using Kernel Density Estimation. *Gait & posture*, 2020, 76.
- [8] Pamphile T. Roy, Lluís Jofre, Jean-Christophe Jouhaud, Bénédicte Cuenot. Versatile sequential sampling algorithm using Kernel Density Estimation. *European Journal of Operational Research*, 2019.
- [9] Li Weijiang, Luo Panhu. Diversified recommendation algorithm integrating kernel density estimation and singular value decomposition. *Journal of Chinese Computer Systems*, 2020, 41(01):56-60.