

# Research on the Learning Status of Students in High-Level Application Oriented Universities Based on Student-Centered Theory

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## Abstract

Based on the theory of NSSE and the thought of educational ecology, this study explores the current situation of students' learning engagement in applied undergraduate colleges and universities from the perspective of students' main body, using questionnaires and interviews to explore the current situation of students' learning engagement in applied undergraduate colleges and universities. According to the influencing factors of learning engagement, the scale is designed, and the correlation between the five dimensions of the scale is objectively analyzed by correlation analysis method. Finally, practical suggestions are put forward to students' learning effectiveness. This study can reveal the learning problems at present of students in applied undergraduate colleges, cultivate personal learning status, and also exert an essential part in promoting teachers to improve the quality of classroom teaching.

## Keywords

Learning Engagement, Student-Centered, NSSE

## 1. Proposing the Problem

The “student-centered” undergraduate teaching reform concept includes student development as the center, student learning as the center, and learning effect as the center. Since the 1950s, the development of knowledge progress in the fields of brain science and neuroscience, adolescent college students' development research, cognitive psychology and cognitive neuroscience, learning science and learning psychology has provided a scientific basis for the “student-centered” undergraduate teaching reform, promoted the academic and social consensus,

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and finally promoted the “student-centered” undergraduate teaching reform in European and American countries (Zhao & Gao, 2017).

Europe and the United States “student-centered learning” paradigm reform has been implemented for many years and accumulated a lot of experience. Along with the education reform, China also in the “National Medium and Long-term Education Reform and Development Plan (2010-2020)” clearly pointed out: put students as the main body, give full play to the initiative of students, promote the healthy growth of students as the starting point and foothold of all school work. “National Education Development 13<sup>th</sup> Five-Year Plan” further pointed out that China’s education should be learner-centered, focusing on capacity-building, and promote the overall development of people. Thus, the field of education at home and abroad stressed the need to achieve “student-centered” education. China’s education is undergoing a revolutionary change from teaching to learning (Lee, 2019).

In view of this, in order to break through the limitations of existing research on research perspectives, data analysis methods and deeply explore the factors currently affecting college students’ learning engagement, this study is based on NSSE theory and educational ecology (Zhang, 2016). From the perspective of students as the main body, questionnaires and interviews are used to understand how students learn. How about learning effect, efficiency and benefit? How to promote students’ effective learning and improve their quality of learning? These cases are the dilemmas that colleges must pay attention to in adapting to social development under the new economic normal, and the practical needs of this project research.

## **2. Definition and Measurement Method of Learning Engagement**

### **2.1. Definition**

Studies have shown that the quality of education and personal learning directly affecting students’ engagement in learning (Jiang et al., 2010). Therefore, this study hopes to design a questionnaire with the help of three learning engagement methods: behavioral engagement, emotional engagement and cognitive engagement, and finally synthesize the five-level scale percentage system to reflect the current learning status of students in applied undergraduate colleges and universities, so as to help students define their current learning methods and learning attitudes, whether it achieves the purpose of truly effective learning status.

The nature of engagement is multifaceted and can be divided into three ways: behavioral engagement, emotional engagement and cognitive engagement. Behavioral engagement is mainly manifested in participation, including students’ participation in academic, social or extracurricular activities. Emotional engagement includes students’ positive or negative reactions to educators, classmates, schoolwork and school. Cognitive engagement reflects students’ mastery of difficult skills to understand complex thoughts, and their willingness to work

hard for them after deep thinking.

Behavioral engagement is usually manifested in the input of learning and homework, including whether to complete the course work seriously, whether to listen carefully in the classroom, participate in classroom discussion and ask questions to teachers. It reflects the degree of students' participation in classroom learning and after-school learning activities.

Emotional engagement refers to students' emotional response to classroom activities. In this study, by measuring the emotional reaction and interaction between students and teachers to reflect the degree of students' emotional involvement, it is concluded that the degree of students' active cooperation in learning and the degree of interaction between teachers and students. The level of these two indicators reflects the students' expectations of learning and their emotional reaction with classmates, teachers and so on when they complete the tasks related to learning.

Cognitive engagement refers to students' views on solving problems and their thinking on academic problems. Cognitive engagement includes high-level learning and information analysis ability. Through investigation and analysis of students' cognition of different courses and their ability to use knowledge to analyze reality, draw conclusions and solve problems, students' learning challenge is obtained, which reflects students' autonomous learning ability.

## 2.2. Measuring Tools

The measurement research of learning engagement mainly focuses on the index and the questionnaire design of corresponding scale. The current generated learning scale draws on the National Survey of Student Engagement, academic engagement scale and classroom learning scale. NSSE is a more comprehensive education quality assessment method that takes into account both students and schools (Kong, 2022).

The National Survey of Student Engagement (NSSE) is an internationally recognized survey system for learning engagement in many countries. It mainly investigates from two levels. One is what students do to measure the time and energy they put into effective learning. The second is what the school has done to measure whether and how the university has adopted effective measures to attract students to participate in activities.

With the long-term theoretical development of NSSE, Jennifer A Fredricks proposed to divide learning engagement into three dimensions: cognitive engagement, behavioral engagement and affective engagement. In these three dimensions, Jennifer A Fredricks found that learning engagement focuses first on emotional engagement, then cognitive engagement, and finally behavioral engagement. Among them, emotional engagement determines the enthusiasm of learning engagement, cognitive engagement determines the way and level of learning engagement, and behavioral engagement determines the degree of learning engagement (Qiu et al., 2018). Therefore, this three-dimensional division is in the scale of learning engagement in the questionnaire design stage of this study.

It also creates an entry point for the data analysis stage to reasonably define the learning engagement of students in applied undergraduate colleges.

At the same time, Luo Yan and other researchers introduced the NSSE questionnaire into China as early as 2008, and revised and supplemented the questionnaire according to the actual situation of higher education in China, and finally formed NSSE-CHINA (Wang, 2021). Until now, it has been widely used in the evaluation of domestic universities. The system includes five dimensions: academic challenge, active cooperative learning, student-teacher interaction, educational experience and campus environment support. Therefore, the mature survey system and research results of NSSE-CHINA have also become the source of inspiration for the index design of this questionnaire.

To sum up, based on the NSSE and NSSE-CHINA system, combined with the existing cognition of the current college students' learning state, this study finally forms five more targeted indicators to analyze the students' learning engagement in applied undergraduate colleges, including: learning challenge, active cooperation, student-teacher interaction, teaching support, teacher's feedback.

### 3. Research Methods

#### 3.1. Questionnaire Survey Method

In order to explore the factors that affect students' learning engagement in application-oriented universities, this study uses questionnaire survey to extract the relevant variables that really affect learning engagement from massive data.

The questionnaire is divided into five dimensions: learning challenge, active cooperation, student-teacher interaction, teaching support and teacher's feedback. Options are divided into 5 gradients which are extraordinary disagree, disagree, agree, agree, extraordinary agree. The whole questionnaire design is divided into two parts which contains basic information 5 questions (gender, parental education, origin, GPA) and learning engagement 30 questions.

The subjects of the survey are the students of the five courses of 2020 in the school of Economics and Management of Beijing University of Petrochemical Technology. Five courses are economic law, accounting, big data management and applications, microeconomics, and statistics. In this study, a total of 1881 questionnaires were distributed in the sequential classes of each course, and 1621 valid questionnaires were collected. The rate of effective recovery of the questionnaire was 86%, ensuring that all students in the five courses were covered.

##### 3.1.1. Reliability Analysis

The calculation formula of reliability coefficient:  $f = \text{sec}^*a$ . Reliability is reliability, which refers to the degree of consistency of the results obtained by repeated measurements of the same object using the same method. Reliability analysis is used to study the reliability and accuracy of quantitative data.

The correlation coefficient is the earliest statistical index designed by the statistician Carl Pearson. It is the amount of linear correlation between variables, which is generally expressed by the letter. The formula indicates that the greater

the correlation coefficient, the higher the reliability. When the coefficient is 1.00, the reliability of the test reaches the highest level. When the coefficient is 0.00, the reliability of the test is minimized.

For this reason, we divide the Cronbach's  $\alpha$  coefficient values into three categories. First, if the value is higher than 0.8, it means high reliability; if the value is between 0.7 and 0.8, the reliability is good; if the value is between 0.6 and 0.7. Second, the reliability is acceptable; if the value is less than 0.6, indicating poor reliability. Second, if the CITC value is less than 0.3, you may consider deleting the item. Third, if the value of the deleted  $\alpha$  coefficient is significantly higher than the  $\alpha$  coefficient, then it may be considered to reanalyze the deleted item.

Using SPSS platform to test the reliability of data. As shown in **Table 1**, the Cronbach's  $\alpha$  coefficient of the reliability test of learning engagement in the questionnaire is greater than 0.8, which indicates that the research data has high reliability and can be further analyzed.

### 3.1.2. Data Analysis Conclusions

#### 1) Horizontal comparison questionnaire results analysis

Through the collection and statistics of the questionnaire, we summarized the learning engagement of the five disciplines according to the percentage system.

Through the horizontal comparison table in **Table 2**, it can be seen that the difference in scores of different dimensions will lead to all the differences in the total score and self-score of students' learning engagement. Among them, the

**Table 1.** Course reliability test data results.

	1	2	3	4	5
Learning challenges	0.95	0.955	0.954	0.929	0.948
Active	0.942	0.907	0.929	0.927	0.92
Student-faculty interaction	0.895	0.844	0.882	0.886	0.855
Teacher support	0.925	0.92	0.939	0.898	0.871
Teacher feedback	0.931	0.915	0.956	0.902	0.931
Learning engagement	0.954	0.952	0.948	0.951	0.951

**Table 2.** Horizontal comparison.

The lesson number	Learning challenges	Active	Student-faculty interaction	Teacher support	Teacher feedback	Objective	Self-assessment
1	74.99	73.69	66.95	77.15	77.2	74.12	73.34
2	75.23	73.83	68.39	78.22	77.84	74.7	73.9
3	77.42	76.31	71.36	78.73	79.33	76.57	76.05
4	74.86	73.67	66.5	76.5	78.67	74.04	74
5	75.76	74.89	68.56	76.9	77.05	74.63	55.58
<b>Equipartition</b>	75.652	74.478	68.352	77.5	78.018	74.812	70.574

average score of student-teacher interaction is the lowest, and the average score of teaching support and teacher’s feedback is the highest. Therefore, we use regression analysis to analyze in detail how the scores of the three dimensions of student-teacher interaction, teaching support and teacher’s feedback affect learning engagement.

a) Dependent variable: objective score

Through the regression analysis table of **Table 3**, a regression analysis model can be constructed with the objective total score as the dependent variable and the five-dimensional score as the independent variable (the interaction between students and teachers is  $X_1$ , the teaching support is  $X_2$ , and the teacher feedback is  $X_3$ ):

$$Y = -19.631 + 1.339X_1 + 1.592X_2 + 5.462X_3$$

The equation shows that there is a positive correlation between the score of learning engagement and the interaction between students and teachers, and the score of learning engagement increases by 1.339 points for every 1 point increase in the interaction between students and teachers. There is a positive correlation

**Table 3.** Regression analysis.

model	Non-standardized coefficient		standardized	t	significance
	B	Std err	coefficient Beta		
(constant)	-102.467	60.279		-1.7	0.11
student-faculty interaction	1.339	0.864	0.425	1.55	0.142
teacher support	1.592	1.431	0.387	1.112	0.284
Teacher feedback	5.462	1.614	1.57	3.383	0.004

**Table 4.** Correlation analysis.

Dimensional		Learning challenges	Active	Student-faculty interaction	Teacher support	Teacher feedback
Learning challenges	correlation coefficient	1	0.897	0.572	0.797	0.717
	significance	.	0	0.007	0	0
Significance	significance	0.897	1	0.569	0.788	0.755
	significance	0	.	0.007	0	0
Student-faculty interaction	correlation coefficient	0.572	0.569	1	0.627	0.258
	significance	0.007	0.007	.	0.002	0.26
Teacher support	correlation coefficient	0.797	0.788	0.627	1	0.718
	significance	0	0	0.002	.	0
Teacher feedback	correlation coefficient	0.717	0.755	0.258	0.718	1
	significance	0	0	0.26	0	.
Degree of freedom (N)		21	21	21	21	21

between the score of learning engagement and the score of teaching support, and for every 1 point increase in teaching support, the score of learning engagement increases by 1.592 points. There is a positive correlation between the score of learning engagement and teacher's feedback, and for every 1 point increase in teacher's feedback, the score of learning engagement increases by 5.462 points.

#### 2) Five-dimensional correlation analysis

According to the Pearson correlation form, 0.00 - 0.19 is extremely low correlation, 0.20 - 0.39 is low correlation, 0.40 - 0.69 is moderate correlation, 0.70 - 0.89 is high correlation, 0.90 - 1.00 is extremely high correlation.

It can be seen that only the correlation coefficient between learning challenge and active cooperation is 0.897 in the range of 0.7 - 0.89, and the significance is 0, which indicates that the two are strongly correlated and the correlation is significant.

### 3.2. Structured Interviews

Structural interview is a standardized interview mode, and interviewees need to answer unified questions autonomously. The advantage is that the interviewer can observe the attitudes and behaviors of the interviewees in addition to answering the questions, which helps to make up for the fact that the data analysts in the self-administered questionnaire model cannot obtain many non-verbal information about the students' learning status (Cheng, 2010).

Therefore, this study takes the students of the School of Economics and Management of Beijing Institute of Petrochemical Technology as the interview object, and adopts the method of sampling survey to interview 10 students randomly. The interview theme revolves around whether the teaching mode of five different courses attracts students and whether teachers and students interact. The average interview time is about 20 - 30 minutes.

Through the analysis of the interview process, it is found that the factors affecting the respondents' learning engagement are mainly concentrated in the following three aspects: teachers' teaching methods, curriculum assessment methods and personal learning methods. Among them, teaching methods and assessment methods are the objective factors affecting students' learning engagement, and personal learning methods are the subjective factors directly affecting students' learning engagement. Therefore, this section will analyze the above three aspects and summarize the internal and external causes of each respondent's engagement in the course to reflect the current state of student learning.

#### 1) Teachers' teaching methods

Through interviews, it was found that 5 of the 10 respondents liked the big data management and application course, indicating that students were more satisfied with the course. The reason is that this course is more practical than others. Among them, respondent 1 says that every time the teacher speaks about the meaning of a programming language in the classroom, he will randomly ask students in the classroom to enhance students' concentration in the classroom, and urge students to understand the logic and connotation of the code and then

implement it in the application. Therefore, as far as teachers' teaching methods are concerned, respondents hope that teachers can put teaching in a relaxed and harmonious environment in the process of teaching, make full use of interactive teaching methods, and constantly collide with the spark of students' thinking, so as to improve the teaching effect, make teachers and students learn from each other, and finally achieve the purpose of improving students' learning engagement (Ye, 2010).

### 2) Course assessment methods

In this paper, the assessment methods of five courses are counted. Among them, the microeconomics course uses course paper plus test paper as the final assessment method, and the other four courses use the traditional test paper to assess the learning results. Previously, some scholars mentioned in the study of the washback effect of examinations on learning that the positive washback effect of examinations on curriculum learning is greater than its negative effect (Wang, 2014). In the interview process, this study also asked the interviewees' views on the assessment methods for learning engagement. Among them, the interviewee 9 said that taking the course of microeconomics as an example, the teacher finally asked us to use the knowledge of microeconomics to explain a paper on social phenomena. This form can not only allow us to switch our perspective in the world, but also cultivate our proficiency in using HowNet and other databases that bring together cutting-edge scientific research. Skills can enrich our horizons and also lay a solid foundation for senior paper writing. Therefore, in terms of course assessment methods, respondents believe that the essential purpose of any assessment method is to help students consolidate what they have learned and play a positive role in improving their learning engagement. Compared with course paper, test paper is more aimed at the implementation of basic knowledge, but lacks the extensibility of knowledge. Course thesis can exercise students writing ability, information retrieval ability and other abilities besides classroom knowledge, which is helpful to improve students' comprehensive ability and finally realize the mastery of curriculum knowledge.

### 3) Personal learning methods

Through interviews found that 4 of the 10 respondents have formed a set of their own learning methods, 6 for the respondents just follow the teacher's footsteps to complete the homework. From the perspective of personal learning methods, students have different problems due to their own factors in the learning process. At the same time, some people still have certain partial subjects. In this case, in the learning process, the selected methods are not the same, different from different problems, with different methods to solve, so as to ensure the effectiveness of learning. Therefore, students' finding personal learning methods is a decisive factor in improving autonomous learning and a prerequisite for improving learning engagement. Therefore, in terms of personal learning methods, students generally do not form their own complete learning system, and they all face the study of college professional courses with a passive attitude. Most students have not yet found a suitable learning method for themselves and are not



interested in the knowledge of professional courses, which leads to the learning of knowledge only stays at the level of dealing with examinations, and the learning engagement is low.

## **4. Conclusions and Recommendations**

### **4.1. Conclusion**

Through the previous investigation, the correlation analysis between the five dimensions of the questionnaire found that there is a link between the dimensions, and they are positively correlated. Among them, the positive correlation between the two dimensions of active cooperation and student-teacher interaction and other dimensions is the most prominent. It can be seen that focusing on improving active cooperation and student-teacher interaction is more conducive to improving students' learning engagement. Therefore, on the basis of the previous analysis and research, this chapter focuses on the three elements of students, classroom and extracurricular that affect the degree of learning engagement and combines the conclusions of data analysis, and puts forward countermeasures and suggestions for improving the learning engagement of students in applied universities from the student level and classroom level respectively.

### **4.2. Recommendations**

#### **4.2.1. Student Level**

##### 1) Establish a sense of ownership

As the main body of receiving social higher education, college students must establish the subject consciousness of seeking self-development by learning and realize the change from "I should learn" to "I want to learn". Students can first discover the fun in the teacher's teaching in the classroom, thus arousing interest and taking the lead in planting a seed for further exploration. Driven by interest, we use the school's digital resources after class to actively discover the relationship between the current facts and the knowledge learned from different angles, and discuss with teachers. This kind of experience-based learning takes the growth of students' experience as the center, takes students' spontaneity and initiative as the learning motivation, and organically combines learning with students' wishes, interests and needs, which helps to realize the transformation from passive indoctrination to active learning, so as to broaden the depth of students' knowledge, play the application value of knowledge, and improve students' learning engagement ultimately.

##### 2) Establish phased goals

After entering the university, many students due to lack of self-control and goal gradually infected with the habit of procrastination. Academic procrastination, as a common phenomenon among contemporary college students, will not only hinder the achievement of college students' learning goals, but also lead to anxiety, depression, and reduced self-identity. Therefore, college students should set high-level appropriate goals in classroom learning, which not only ensures

the difficulty, but also needs to be realized through wholehearted investment, and it should be practical and can be achieved within a certain period of time. This requires each student to be good at excavating their own living habits, learning habits, psychological state and so on. Under the condition of fully understanding themselves, they should explore the most suitable methods for their own progress, and finally promote the sustainable development of learning effectiveness.

### 3) Establish the effect efficiency consciousness

Learning engagement is influenced by many factors, such as family, teachers' teaching methods and students' learning motivation. To achieve high efficiency and quality of self-study, students not only need to try to master a variety of self-study methods, but also need to actively seek teachers, peers, technical support. One is to actively seek the help of teachers, to explain the doubts. Second, with the help of Internet+, big data, artificial intelligence and other means, make good use of the smart classrooms and library resources provided by the school to enrich learning methods, expand learning content and broaden learning horizons. Third, play the role of peer mutual assistance. According to the difference analysis, the degree of learning engagement, cognitive engagement, behavioral engagement and emotional engagement of college students in different majors are different. Therefore, college students should take the initiative to dabble in different professional knowledge on the basis of solid professional knowledge, communicate and cooperate with students in different colleges, give full play to the power of peer help each other, constantly improve their learning engagement, and better promote their all-round development.

## 4.2.2. Classroom Level

### 1) Practice-oriented teaching methods

Schools should set up courses from the macro and micro levels. Macro level should pay attention to practice orientation curriculum. For practical courses such as big data application software, students generally want to increase the practicality of disciplines. Secondly, the current classroom popular with students is no longer static and conservative, but adds many changing and developing factors. Therefore, it is necessary to follow the applicable standard to stimulate students' practical application of the theory they have learned. Micro level schools can refine the requirements of different teaching methods. In the course objectives, course content, teaching methods and other aspects of the specific settings, so that teachers and students have a clear understanding of the specific requirements of professional courses, and clear what professional ideas, professional knowledge, professional ability should be obtained at the end of each course, so as to deepen students' recognition of the course, so as to increase students' learning input and improve the effect of teachers' curriculum implementation (Ren, 2019).

### 2) Stimulate students' learning motivation

The level of interaction between students and teachers in applied undergra-

duate colleges is low. Therefore, teachers can adopt a combination of theoretical teaching and case analysis to stimulate students' association with knowledge points and existing knowledge, deepen knowledge understanding through classroom discussion, and enhance friendship between students and students, students and teachers. It can also strengthen the tracking and supervision of teachers' learning effects after class, so as to promote the cultivation of students' autonomous learning and collaborative ability.

### 3) Create a good academic atmosphere

For application-oriented institutions, students learn to apply theory to practice is essential. Schools should organize more meaningful teaching activities to improve students' active cooperation by increasing the number of group discussions or cooperative tasks and then increase the difficulty of learning or courses to enhance the interaction between teachers and students. By means of promoting learning by competition, competition builds a bridge of communication and learning for the interaction between teachers and students.

## Project-Based

How Far is “student-centered” learning—investigation on effective learning status of students in applied universities (Beijing University student research training project: 2022J00006).

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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