

# Teaching reform and practice of Business Statistics course based on motivating students to learn

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**Abstract.** This paper focuses on the concept of "student-centered" in response to the guidelines put forward by the Ministry of Education on undergraduate teaching, and the design of the teaching objectives, teaching process and teaching assessment based on the analysis of the learning situation and the reinforcement theory on how to motivate students. The course "Business Statistics" has carried out a series of explorations and practices to stimulate students' learning motivation, and the overall attendance rate and average score of students have been improved to a certain extent, and students' evaluation scores of teachers' teaching have also been improved, achieving good results.

**Keywords:** student-centered; reinforcement theory, learning motivation; Business Statistics; practice.

## 1. Introduction

Ministry of Education of the People's Republic of China (MOE) proposed the quality evaluation theory of "student-centered", "result-oriented" and "continuous improvement" for undergraduate teaching audit and assessment, focusing on teaching and learning effects. In undergraduate teaching, there are still problems that teachers mainly teach in class, students' participation rate is not high, and students' learning initiative is not enough, and the teaching effect is far from the requirements of MOE. Undergraduate university teachers need to design specific and feasible "student-centered" teaching reform programs, and implement them into classroom practice by motivating students to learn, so as to improve teaching quality and ensure the achievement of "result-oriented" teaching goals.

## 2. Analysis of the academic situation of students

"Student-centered" requires understanding students and analyzing their learning conditions. Nowadays, Chinese college students enter colleges and universities after 12 years of exam-oriented education, and there are generally the following factors that hinder the achievement of the expected education and teaching goals.

### 2.1 Lack of learning objectives and insufficient drive to learn.

Nowadays, most Chinese college students are only children, who have the clear goal of getting into college at the primary and secondary school level, as well as the external supervision of teachers and parents, and enter college only after such intense test-based education and learning.

After entering university and becoming college students, they do not have strong discipline and supervisory power, and they lose the core goal of college entrance examination. Moreover, they have not yet found a new goal and a driving force for self-growth during their junior year in college.

Unconstrained and goal-less status can lead to ineffective learning during the student's college years. What's more, the current abundant entertainment and games will make people get addicted to them for quick pleasure and waste their time. Therefore, a considerable number of college students lack of learning objectives and insufficient drive to learn.

### 2.2 Course selection with the sole goal of obtaining a high GPA (Grade Point Average)

A number of colleges and universities have a full-credit system of self-selected courses; many students choose courses with easier course assessment methods or less demanding faculty courses

based on the experience of senior seniors who guide them. In addition, students focus on GPA more than content and do not care about the growth of acquired expertise and skills. This meritocracy is also a reflection of the goal of a high GPA

### **2.3 Attendance rate decreases as the grade level increases**

There is a phenomenon in very many colleges and universities: the higher the grade level, the higher the absenteeism rate and the worse the learning atmosphere.

There may be several reasons for this phenomenon. First, students learn and become familiar with the rules based on their previous experiences and adjust their attendance and class participation behavior according to the requirements of the lecturer.

Secondly, the more advanced students participate in more social things, such as club activities, internships, part-time jobs, etc. These social activities may crowd the study time and affect the learning effect.

Third, under the full credit system, students who fail more subjects are more likely to break down and cause absences from class.

All three situations above can cause students to be insufficiently motivated to learn, which affects learning effectiveness and hinders the achievement of educational and teaching goals.

It is necessary to take advantage of the characteristics of students based on the guidance of scientific theories for specific problems, and guide them toward the right path through appropriate design.

Therefore, it is necessary to start from enhancing learning motivation and designing the corresponding education and teaching system oriented to the learning effect in order to truly realize the student-centered and result-oriented undergraduate education concept

## **3. Reinforcement theory of learning motivation**

Motivation for learning is a tremendous impetus to promote motivation for learning, and it helps students initiate learning behavior and maintain that behavior toward a stated goal. Reinforcement theory suggests that people's tendency to learn behaviors depends on the association between prior learning behaviors and stimuli due to reinforcement, and that reinforcement increases the likelihood that a certain behavior will be repeated. Based on this theory, in teaching, teachers can use external incentives such as rewards, extra credit, and competitions, all of which can stimulate learning motivation. Further, according to attribution theory, people attribute behavioral success or failure externally (environmental attributions) and internally (personal attributions), and teachers need to guide students to develop positive attribution patterns that attribute success or failure to personal effort and enhance their expectations of success rather than to external factors [1,2]. It is also important to help students avoid or mitigate learned helplessness by breaking down learning tasks, communicating timely feedback, and helping them to view things positively and positively. In addition, teachers can use a combination of psychological theories and techniques to help students enhance their motivation and achieve desired instructional goals and learning outcomes through skillful design.

## **4. Instructional design and practice based on reinforcing learning motivation**

### **4.1 Teaching Objective Design**

According to self-efficacy theory [3], the teaching process should cultivate students' self-efficacy and help them design appropriate learning goals so that they will strive to achieve them. Therefore, the development of course teaching objectives should include students' personal learning objectives in addition to the conventional course objectives of developing students' professional knowledge, professional skills and professionalism.

Behavioral psychology research [4] has found that people like to look for a reference point when making decisions, and compare what needs to be decided with this reference point. Reference points are like "anchors" that influence people's decisions, hence the term anchoring effect. Common reference points include historical experience, expected levels, and peer situations.

After explaining the importance of the course and the course requirements in the first lesson, teachers can ask each student to submit personalized learning objectives, such as what they want to learn in class, what skills they want to master, what extensions they want to do after class, how many points they expect to earn in the course, how many points they expect to earn in the regular class, how many points they expect to earn in the final class, what their ranking is, and so on. And the learning objectives submitted by students will be listed on the course platform (most universities have modern information technology teaching platform), which can be consulted before the completion of the whole course. This expected goal (including the grade) will have an anchoring effect and will be internalized in the students' subconscious as a motivation to learn and enhance their learning behavior.

## 4.2 Teaching process design

The improvement of the quality of curriculum teaching must depend on the improvement of the quality of classroom teaching. The classroom is the link between teaching and learning, and it is the process in which teachers export knowledge, experience and emotion, and students acquire skills, develop abilities and improve literacy. Modern classroom teaching advocates student-centered teaching, students are the main body of learning, teachers play the role of observation, help and guidance. Therefore, teaching process design should focus more on motivating students to learn.

Griffith & Burns [5] proposed the FACE theory of four key elements needed to engage students in the classroom: providing feedback to help students understand their progress; giving students some autonomy and not having the teacher talk all the time; challenging students based on their foundations and individual development; and designing interactions to engage students in activities (Engagement), integrating the first three elements and creating an immersive learning experience.

Cognitive psychology research has found that factors such as conceivability, newness, salience, and vividness affect human memory and create an accessibility bias, so information presented in a more vivid and salient way is more likely to be remembered and believed. In classroom design, teachers can make full use of videos, games, case discussions, and simulations to build a vivid and significant classroom and enhance the learning effect through "stimulus-response".

## 4.3 Teaching assessment design

Some of the aforementioned college students are more utilitarian and grade oriented, and the score-only theory, although biased, can be exploited and appropriately guided.

Course assessment should be designed according to the teaching objectives and characteristics of the course itself, and at the same time, it needs to be combined with the results of the learning situation analysis and centered on the core purpose of motivating students to learn and achieving the expected learning outcomes. According to Weiner's attribution theory [6], in order to improve students' achievement motivation, teachers should decompose learning tasks, reduce the difficulty of task achievement, and provide timely feedback to help students form positive, long-term expectations of success and reduce learned helplessness. Therefore, it is desirable that the course assessment model can be designed accordingly.

To achieve timely feedback as well as consistent motivation, course assessment can be broken down into different parts or sections. Process assessment may be a more appropriate assessment model, especially for practical teaching. After each corresponding chapter or module is learned, the corresponding assessment is conducted. The process or stage assessment will provide a reference for students to reflect and improve their learning later.

For theoretical courses, there are certain difficulties in sectional assessment, such as the high cost of organizing offline closed-book exams, which requires the use of online assessment to complete the process assessment. The design of the usual grades can also be explored, such as stipulating the

specific composition of the usual grades, the specific percentage of attendance, class discipline, class participation, after-class assignments, regular tests, group work, and the flexible use of additional or deducted points for different parts to motivate students.

Honey & Mumford's [7] research showed that teamwork was a preferred way for students to increase their learning effectiveness. Other studies [8] have also shown that cooperative learning is more effective than solo learning and that participation and retention are improved. In a cooperative learning state, members coalesce as a community, and students with different levels of intelligence, knowledge outcomes, thinking styles, and cognitive styles inspire and complement each other in the learning process, achieving a cognitive and emotional collision that produces a positive learning atmosphere and learning outcomes. Therefore, students can be encouraged to form learning groups for class discussions, group assignments, scenario simulations and games, and to have their grades graded by group members in the usual grade composition.

The results of the assessment and ranking need to be published for each assessment, and the results are open and accessible, reflecting the principle of timely feedback.

## 5. Classroom Teaching Practice of Business Statistics Course

The course "Business Statistics" at ZHBIT (Beijing Institute of Technology, Zhuhai) is practiced accordingly based on the instructional design scheme of enhancing learning motivation. "Business Statistics" is a course that combines theory and practice, due to the school's orientation as an applied undergraduate university.

In the process of achieving the objective design, after first introducing the importance and application value of the course, and asking students to submit a personal learning objective for the course based on their own situation and the distribution of grades in this course in previous years. The objectives need to include the expected overall grade, the grades for each component, etc. and are uploaded to the Superstar Learning Connect web platform. Students' pre-determined objectives are placed at the top along with the syllabus, available to all at any time, and allow students one opportunity to revise themselves midway through the course. The teacher also uploads the student's report card to the platform at the beginning of the course, adding in the grades for each assessment at any time for everyone to access in real time and as a reference for each other.

The course assessment for this course is designed to consist of a final grade (closed book examination) of 50% and a usual grade of 50%. The usual grade component is further made up of 5% of the total grade for attendance, 5% for class discipline, 5% for class participation, 5% for group contribution points, 15% for usual assignments and 15% for large group assignments. Such a detailed division helps to increase the probability of achieving the objectives, and therefore helps to break down the student's learning objectives into specific steps, allowing for immediate feedback; also because, according to the 'mental accounts' theory of behavioral psychology, people make different risk-averse decisions about the resources allocated to different accounts.

In addition, each section is marked differently. In order to maximize class attendance and discipline, the relatively easy-to-get marks for attendance and discipline marks are marked on a deduction system, i.e. the initial marks on the transcript are both 5, which are modified as appropriate and accessed in real time. Class participation (interaction), group work, regular work and group contribution points are designed to be awarded extra points. The design is based on the psychological finding that people are 'loss averse' to vested gains. The same amount of loss causes far more pain than gain brings happiness. Therefore, points already earned for attendance, discipline, etc., are more likely to be lost than the more difficult to achieve grades such as class participation and homework, which can have a better motivational effect.

In the classroom teaching design, learning groups are formed, with each group consisting of 2-4 people sitting together in the classroom. Also making full use of hardware such as the information platform, the classroom takes the form of group snatching and grading of classroom questions, case studies, classroom exercises and game simulations. At the same time, students are arranged to work

in groups to develop their own research projects, collect data through questionnaires, apply statistical theory and software to analyze and process the data, form group reports and present them in class, i.e. group assignments. The group work is graded by the teacher and assessed by the group, and a ranking is formed based on the ranking to determine the final mark for the project. By working together effectively, students in groups are characterized by positive interdependence, viewing the group as a learning community and making positive contributions and assuming responsibility. The 5% self-assessed group contribution score also prevents free-riding.

As a result of this exploration and practice, the overall student attendance rate increased by 12% compared to the traditional class, the average grade increased by approximately 6 points (76.3 vs. 70.2) and the student assessment score for the course increased by 2.2 points (from 90.3 to 92.5); indicating that teaching based on motivating students to learn is effective in improving student performance as well as satisfaction.

## 6. Summary and Suggestions

Starting from the analysis of students' learning situation and based on the reinforcement theory of learning motivation, the design of teaching objectives, the design of teaching process and the design of teaching assessment are studied to form a whole set of programs. It is also validated through the teaching practice of Business Statistics. It was found that the teaching effect through teaching based on motivating students to learn is much better than the original model. It also has some significance for the teaching of other courses.

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