

Research Article

A New Combination of Teaching and Learning Elements in and out of Class: The PDCA Iterative Improvement Pedagogy and Its Empirical Evidence

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Abstract

In order to address the issues of abundant learning resources under the Internet plus condition, but college students do not invest enough time in learning out of class, and some teachers and students are still accustomed to one-way teaching, a new combination of teaching and learning elements in and out of class, the PDCA Iterative Improvement Pedagogy, is designed. And educational experiments were conducted in two public elective courses. The investigation indicates that after engaging in collaborative learning both inside and outside the classroom, students not only acquire professional knowledge but also experience comprehensive growth in transferable abilities and non-intellectual factors. This holds universal significance for reforming the traditional classroom teaching system, effectively utilizing online learning resources, increasing student engagement in self-study outside of class, enhancing the learning efficiency of the “research-teaching-study nexus,” considering both individual growth and social skills training, integrating professional education with holistic education, and implementing quality assurance practices into the daily teaching process.

Keywords

Inside and Outside of Class, New Combination of Elements, Research-Teaching-Study Nexus, Classroom Teaching, Integration of Professional Education and Holistic Education, PDCA Cycle, Teaching Quality

1. Introduction

Renowned economist Joseph Schumpeter believes that the root of development is innovation, which is achieved through various new combinations of factors that can improve resource allocation efficiency [1]. This actually includes two points. The first is the innovation and elimination of the elements themselves. For example, in the Internet plus era, explicit knowledge and demonstration courses are readily available, which eliminates teachers' one-way teaching in the

classroom [2]. At the same time, it has increased the rich resources for students to self-study outside of class. The second is a new combination of elements themselves. Within a school, this new combination can be developed at both macro and micro levels.

At the macro level, it is primarily aimed at rational planning and allocation of available teaching resources, including course mix, students' growth path, etc. An exemplary initiative in this

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regard is the author's implementation of teaching reforms based on a combined credit system [3] and its associated quality closed-loop management at Gengdan Institute [4].

At the micro level, many of the current teaching reforms and research initiatives in schools primarily focus on the classroom learning environment [5, 6] and the creation of engaging classroom constructs [7, 8]. Some schools have even put forward the slogan "demanding quality and efficiency from the 45-minute classroom." However, there is a lack of understanding, research, and practice regarding how to organize students to use their out-of-class time effectively for self-study and how to collaboratively design the entire teaching and learning process for students and teachers before, during, and after class.

Based on the author's investigation and analysis [9], China's higher education system is currently confronted with three main challenges. Firstly, college students generally devote insufficient time to self-study outside of class. The ratio of out-of-class to in-class study time for the majority of students is far less than 1:1. However, according to internationally recognized teaching principles in engineering and the arts, this ratio should ideally be at least 1:1, and for business and liberal arts disciplines, it should be around 1.5:1. Secondly, between 16% and 38% of teachers still employ a "one-way" teaching method. Thirdly, there is an insufficient integration of teaching with industry practices.

As China's higher education enters a phase of massification [10], students come from diverse family and developmental backgrounds, leading to a common situation where students vary in learning pace and abilities. Under these circumstances, the traditional teaching method, which was designed for the "passive listening" characteristic [11] of the industrial era and tailored to the "one-size-fits-all, uniform industrial education model" [12] for mass talent cultivation, is clearly no longer applicable. The classroom teaching system [13], which was once suitable for a homogenous approach to education, must now give way to more diversified and individualized teaching strategies to accommodate the heterogeneous needs of today's students.

The mission of education is to foster the comprehensive human growth. From the perspective of nurturing non-intellectual factors¹ and transferable abilities², the traditional method of student assessment, which predominantly relied on a few examinations and primarily evaluated students' test-taking skills, short-term memory, and immediate application of knowledge, is no longer applicable. Therefore, there is an imperative need for reform in the current assessment paradigm.

Students' motivation to learn is gradually ignited throughout the process, and their abilities are incrementally enhanced as they solve problems during daily teaching and learning activities. Therefore, it is necessary to increase the proportion of formative assessment.

All these factors call for a shift in educational paradigms from the past's one-way transmission, passive classroom listening approach, to an interactive seminar method, and from

a focus on "textbooks, teachers, and classrooms" to a focus on "student development, student learning, and learning outcomes." [14] This is essentially a consensus among educational theorists today. However, the challenge lies in how to translate this consensus into the daily teaching and learning processes of every teacher and student. To this end, the author has previously proposed five principles of instructional design [9]. These principles were distilled from the educational experiment conducted by the author during the spring semester of 2015 in two courses at Gengdan Institute (hereinafter referred to as "the two courses").

These two courses are respectively the Innovation and Entrepreneurship Training Camp (hereinafter referred to as the Entrepreneurship Course) and the Psychology Adjustment Reading Club (hereinafter referred to as the Psychology Course). They are both public elective courses open to all students on campus (about 5,600 students). The Entrepreneurship Course had 150 students enrolled, spanning 16 weeks, while the Psychology Course had 147 students enrolled, spanning 14 weeks. This presented a severe challenge for the educational experiment. In many schools, elective courses are often referred to as "easy" or "water" courses. Since they are not mandatory, they do not affect whether a student can graduate. If the course is strict and lacks appeal, some students may choose to drop it. This necessitated that the teaching and learning process not only attract active student participation to prevent them from dropping out due to strict course assessment requirements, but also maintain academic rigor and teaching quality to avoid any compromise in educational standards.

2. Educational Philosophy and Mission

Life is akin to an egg breaking from the inside. Breaking from the inside signifies growth, whereas breaking from the outside leads only to destruction. Hence, the paramount mission of education is to ignite the intrinsic motivation within students and teachers and to provide an environment conducive to their comprehensive growth. From the perspective of sustainable development in human society, education also bears the social responsibility of nurturing the virtuous aspects of human nature and reforming the less desirable traits. Consequently, the key to instructional design lies in the continuous stimulation of the intrinsic motivation and innate goodness of both students and teachers throughout the teaching and learning process. The enhancement of these two elements stems from the ongoing ability of teachers and students to recognize their own growth and the positive feedback that growth generates.

3. The Transformation of Teaching and Learning Relationships in the Internet Era

The author sometimes hears teachers complain that their

students are unwilling to learn, and students complain that teachers are unable to teach effectively. This mutual recrimination, with both sides blaming the other without looking inward, does not help solve the problem. The solution lies in teachers and students facing and solving the problem together. In the age of the internet, explicit knowledge is readily available, eliminating the need for teachers to deliver information in a one-way manner. The relationship between teaching and learning has evolved from the traditional “you don't know, I'll tell you” to a more symbiotic relationship akin to that of a farmer and seeds. The teacher is like the farmer, responsible for combining the seeds, soil, fertilizer, water, and environmental conditions in a rational manner. The students are like the seeds, needing to absorb the fertilizer and water to grow on their own. A farmer cannot substitute for the growth of the seeds, nor can he hasten the process by pulling up the seedlings prematurely.

4. The New Combination of Educational and Learning Behaviors Throughout in-Class and Out-of-Class Process

4.1. New Combinations of Teaching and Learning Elements in the Curriculum

4.1.1. New Combinations of Behavioral Elements

Considering the human senses through which information is received, as well as the psychological and physiological characteristics of student learning, it is evident that the use of at least seven elements—listening, watching, speaking, thinking, doing, moving, and stillness—can reinforce key teaching objectives such as knowledge, skills, and character development. By continuously increasing the frequency of reinforcement, students can be fully engaged and immersed in their learning, which significantly enhances their motivation and the effectiveness of their education.

Among the behavioral components mentioned, the current weak links are “thinking” and the output-oriented learning phases of “doing” and “speaking”, which are essential for articulating the outcomes of “thinking”. Presently, the traditional lecture-style teaching prevalent in classrooms involves the teacher delivering the content while students passively listen and watch, devoid of autonomy in their learning process. Therefore, it is crucial to focus on the elements of “thinking”, “doing”, and “speaking”. If these core components are fully leveraged during the course of teaching and learning, they can significantly expand students' thinking capabilities and grant them greater autonomy in their learning journey.

The element of “thinking” can be incorporated into the curriculum in various ways. For instance, it can be utilized during the problem-solving process or through the personalized presentation of learning outcomes, which are all mani-

festations of thoughtful engagement. By effectively employing the element of “thinking” in the teaching and learning process and integrating it with other components such as “speaking” and “doing”, we can foster a proactive and individualized learning experience for students under the guidance of a teacher.

4.1.2. New Combinations of Pre-class, in-Class, and Post-Class Learning Activities

Human beings are inherently endowed with the capacity for proactive learning. However, the traditional lecture-based teaching method often suppresses this innate ability. Moreover, this approach overemphasizes classroom learning time and the art of teaching by the instructor, which does not accommodate the varying learning speeds and abilities among students. To address the common issue of insufficient self-study time among Chinese college students and to stimulate their initiative to “think”, as well as to cater to their individualized development, it is necessary to adopt a “learn before teach” approach. This involves assigning students pre-learning task to be completed before the next class, with a deadline for submission. Following this, the principle of “teach according to what has been learned” should be applied. Teachers need to review the pre-assignments before the next class and conduct a second round of lesson planning to address common issues identified in the pre-assignments. Content that students have already mastered through self-study need not be reiterated in class. Instead, classroom time can be more effectively focused on higher-order learning activities such as application, analysis, evaluation, and creation.³

4.1.3. New Combinations of Personnel

To break away from the traditional lecture-based teaching method, it is necessary to form two new combinations of personnel.

Firstly, there is a transformation in the relationship between teachers and students. The traditional model, characterized by one-way transmission and passive reception, is evolving into a “research-teaching-study nexus.” Within this nexus, “research activity is seen both as a compelling form of teaching and as a necessary method of learning,” and “as a basis for teaching and learning.” [15] Students are shifting to become the protagonists of their learning journey, while teachers take on the roles of facilitators and coaches, organizing collaborative learning and innovation among students.

Secondly, to address the common issue of varying learning speeds and abilities among students, peer instruction and cooperative learning are organized. Through peer instruction, not only can students with slower learning speeds or relatively weaker abilities catch up, but also those with faster learning speeds or relatively stronger abilities can enhance their input-based learning ability through output-based learning activity. This is one of the five principles of instructional design that the author distilled in the past [9]. This principle

stems from the understanding that in order to explain concepts to others, one must first thoroughly understand them oneself.

In addition, peer instruction helps to foster a spirit of mutual aid and responsibility among students, as well as enhancing their skills to express and communicate. This approach can maximize the engagement and utilization of the diverse learning resources within the student body, truly transforming the classroom into a space where all students can grow together, starting from different points, learning in different ways, and progressing at different speeds. Throughout this process, students not only acquire knowledge and skills but also develop their understanding, emotions, attitudes, and values, thus achieving holistic education while students learn professional knowledge.

The author and colleagues have previously conducted a large-scale peer instruction experiment and observed that peer instruction not only helps to improve student grades but also promotes a growth mindset and increases the time students invest in out-of-class learning among all students [2]. This serves as a compelling example supporting the aforementioned arguments.

For large classrooms with more than 100 students, it is particularly necessary to organize collaborative group learning. Otherwise, it becomes challenging to facilitate effective learning.

To prevent the transmission and spread of undesirable habits among students, random group assignment may be employed as needed when forming teams for cooperative learning.

4.2. Integrated Design of Teaching and Learning Processes Across in-Class and Out-of-Class Settings

- 1) At the onset of the course, students are divided into groups. For instance, the entrepreneurship class was divided into 25 groups, while the psychology class was divided into 20. During the initial class session, group members introduce themselves to each other and appoint an interim group leader. After engaging in one to two sessions of cooperative learning, a democratic election is held to formally select the group leader.
- 2) Students are expected to engage in independent study and complete the pre-class assignments assigned by the teacher before the deadline. They should independently summarize methods and patterns, and engage in thoughtful reflection (“thinking”), in preparation for targeted learning and discussion during next class. It is a principle that at least 80% of the students should complete more than 80% of the pre-class assignment content.
- 3) Before next class, groups collaborate to communicate and explore, resolving any outstanding issues from self-study, preparing to present to the entire class or

ask questions, mutually correcting assignments, and engaging in internal group communication and peer evaluation.

- 4) The students once again study independently and complete the pre-assignment.
- 5) Teachers base their instruction on the students' prior learning, tailoring their teaching to the learning needs and progress of the students.

By reviewing and grading the pre-assignment, the teacher identifies the key concepts and challenges that the entire class struggles with, and then prepares the lesson a second time, focusing only on what has not yet been mastered by the students. In the courseware, the teacher provides targeted feedback and addresses the issues highlighted by the pre-assignment, while also designing higher-order learning activities and pre-arranging questions for the classroom.

This reflects a fundamental difference between the concept of “pre-assignment” and the common practice of “previewing” in Chinese high schools. As students have expressed: “In high school, previewing means that whatever we previewed is exactly what will be taught in the next class. The content we preview and what is taught are the same. However, in college, it's different. Pre-assignments are distinct. In class, we base our learning activities on the pre-assignment completed beforehand, rather than solely on the knowledge we previewed. What we learn is based on the pre-assignment, not merely on what we previewed.”⁴

- 6) In the next class, the teacher will announce the results of the pre-assignment evaluation, urging students to take appropriate improvement actions. Formative assessment should primarily focus on examining higher-order learning content.
- 7) If the class size is small, it is possible to require each group to take turns reporting. To prevent free-riding, it can be mandated that each group presents with a different member each time. If the class size is large, a random selection process can be used to choose group representatives to showcase their learning insights and identify issues during class, thereby enhancing students' expressive skills.
- 8) The teacher conducts on-the-spot guidance and clarification, addressing common issues highlighted by the pre-assignment, while encouraging and responding to students' questions. This collaborative process is aimed at summarizing and enhancing learning outcomes.
- 9) The teacher instructs on the content for the next phase of group collaborative learning and guides the preparation of pre-assignments for the subsequent class. Students are encouraged to further engage in “thinking,” “doing,” and “presenting.”

Inquiry-based teaching is not about the teacher not lecturing at all; rather, it is about achieving a progressive balance in the new combination of various teaching and learning activities. This includes the teacher providing guidance and summarization, students engaging in cooperative learning in

small groups, presenting their completed assignments, and facilitating open Q&A sessions and classroom discussions.

10) Each class session should aim to create a closed loop for iterative improvement. To vividly illustrate the relationship between pre-class assignments, in-class teaching and learning, and post-class assignments, students have used the metaphor: “Pre-class assignments are like us gathering pearls, the class is where the teacher helps to string these pearls together, and post-class assignments are about me tying a knot to complete the loop.”⁴ This approach not only highlights the central role of students in the learning process but also implements quality management of teaching and learning at a micro level, which has universal significance for the daily improvement of teaching and learning for both teachers and students.

The above process can be encapsulated as the PDCA Iterative Improvement Pedagogy by leveraging the PDCA (Plan Do Check Act) cycle from quality management [3, 9]. In this context, “P” evolves from “Plan” to teachers assigning pre-assignments, “D” evolves from “Do” to students having done pre-assignments before the deadline, “C” is evolved from “Check” to refer to the teacher’s review of the pre-class assignments submitted by students before the next lesson, and the subsequent preparation of the lesson plan to address common issues identified in the assignments, and “A” evolves from “Act” to providing students with formative assessments and urging students’ further action to improvement before the subsequent lesson.

5. Effective Management of Collaborative Learning

Throughout the aforementioned in-class and out-of-class teaching and learning process, teachers and students effectively form a “research-teaching-study nexus” [15] where the teacher guides the students, and there is mutual inspiration and motivation between teachers and students, as well as mutual assistance among students. For such a community, it is necessary to implement democratic and effective management strategies for collaborative learning.

5.1. Listening and Dialogue

During the educational reform process, it is essential to pay attention to the responses of students who are accustomed to didactic education. Engage in candid dialogues with the students.

At the onset of the educational experiment, most students anticipated a traditional, lecture-based class where the teacher would spend the majority of the time delivering one-way instruction. They believed that by simply listening, taking notes, completing assignments, and passing exams, they would earn their credits. However, the reality was far from this expectation. Students were required to invest time out-

side of class to complete pre-class assignments and participate in group collaborative learning. Teachers, in turn, had to dedicate substantial time before the next class to review students’ submitted pre-assignments, second round prepare for next class instruction, and tailor their teaching to the students’ learning needs, adhering to the principle of “teaching based on learning.”

Thus, students expressed their surprise and gratitude, saying, “Honestly, at first, I didn’t expect the teacher to take our homework so seriously. It’s truly touching.”⁵ “I don’t like flattery, but you are truly the most responsible teacher I have ever met.”⁶

Groups that perform well in the classes will have the opportunity to share their experiences in front of the class. This is an opportunity that many Chinese students have rarely had before. As one student said, “Thank you for giving our group the chance to present... I used to get nervous when speaking in public, but after our last presentation, I feel much more confident. I hope to have more opportunities to practice in the future.”⁷ The teaching assistant for the course commented, “The peach and plum trees do not speak, yet a path forms beneath them, this describes the proactive attitudes of many students in the group. With such dedicated teacher and such diligent and lovely students, the Entrepreneurship Course has transcended the meaning of just a single course.”⁸

As the Assistant Teacher pointed out, the educational experiment conducted in the two courses signifies a shift in Chinese universities from a transmission-based educational model to a growth-inspired educational paradigm [9]. However, this transition will not be smooth sailing. It requires overcoming the unidirectional teaching model to which both teachers and students have become accustomed. This model demands significantly less time and effort from both teachers and students for teaching and learning, allowing students to earn credits and teachers to receive their salary based on teaching hours. It seems like a win-win situation with less work for everyone, so why not continue with this approach? But with this method, besides memorizing some knowledge points (which they will quickly forget if not used), will the students’ abilities truly improve? Especially in entrepreneurship course, the focus is on cultivating students’ practical abilities, including psychological quality, communication and cooperation skills, learning ability, expression skill, leadership, and problem-solving skill, rather than just the skill to pass exams. Therefore, an interactive teaching method must be adopted. This requires not only more time investment from the teacher but also from the students outside of class. Thus, educational reform, when deeply implemented, is about stimulating people’s innate goodness and transforming laziness.

For instance, in the entrepreneurship course and its corresponding QQ group, there have been debates between students accustomed to the one-way transmission method and those who enjoy and actively participate in the interactive teaching and learning process. The author himself also en-

gaged in open and patient dialogues with students who were not yet accustomed to the new combination of pre-class, in-class, and post-class learning activities, explaining the rationale behind adopting such teaching and learning methods, as exemplified in endnote 6 of this article.

5.2. Democratic Management of Large Classes

In Chinese classrooms, the majority of students tend to be silent. To avoid a situation where the loudest voices dominate, it's necessary to let data speak for itself. To this end, the author issued an open letter to all students in the entrepreneur-

ship class on April 30, 2015, announcing in advance six topics for open discussion in the next class. The letter introduced the international and domestic trend of shifting from teacher-centered, content-oriented teaching methods to student-centered, learning outcome-oriented approaches. It explained the difference between the transmission model and the learning model that focuses on constructing knowledge. It also discussed how to create a student-centered, vibrant, and efficient classroom. On May 5, 2015, a public discussion was organized during class to explore how to jointly improve teaching and learning effectiveness, followed by an anonymous vote. The results were as follows:

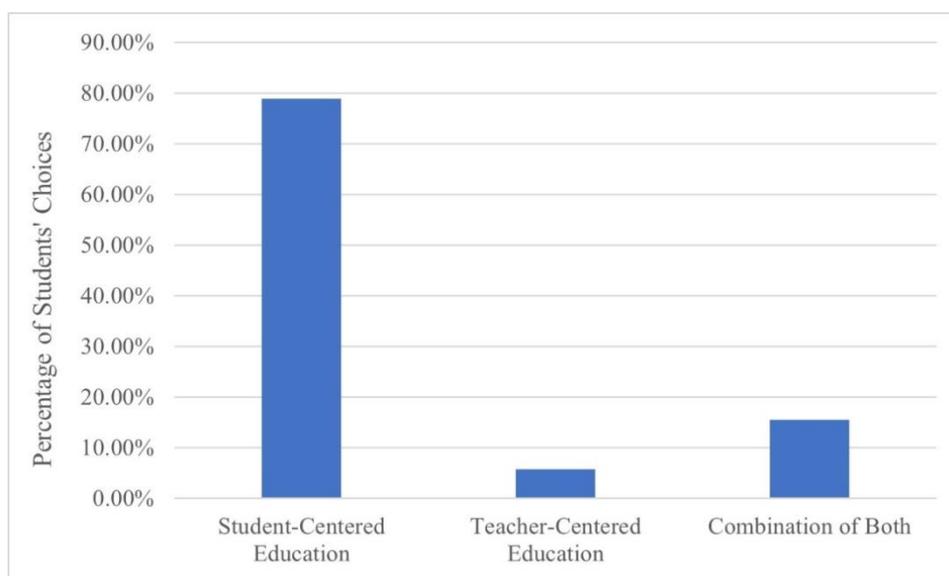


Figure 1. Results of the Anonymous Survey of Entrepreneurship Course Students.

In the survey mentioned above, the explanations of the concepts “Teacher-Centered Education” and “Student-Centered Education” can be found in section 6.1 of this article. A total of 141 students participated in the vote, with 123 valid questionnaires collected.

Through the above-mentioned process of open communication and voting, the general direction of motivating student growth through a new combination of teaching and learning elements inside and outside the classroom has been largely affirmed. Students have also further learned to express themselves rationally, seek common ground while reserving differences, and learn to compromise and cooperate. This, in itself, is an important training component for innovation and entrepreneurship.

5.3. Training on How to Be an Effective Group Leader

Just as the students themselves analyzed, some students “did not earnestly complete the pre-class assignments for several possible reasons: (1) They are not yet accustomed to

student-centered education and are more familiar with a teacher-centered model where the teacher imparts knowledge and the students listen. (2) Due to habits formed over many years, their learning is not proactive; they are truly studying for the sake of credits. (3) The group leader did not perform their role effectively, failing to involve every student, which leads to free-riding. It is likely that many of those who claim they did not learn much are the ones who free-ride.”⁶

Collaborative learning is an essential method of study within the “research-teaching-study nexus.” Students who were previously accustomed to a didactic teaching model may find it challenging to adapt. Many students are unsure of how to act as a group leader or how to assist others in learning. To address this, the author selected group leaders who performed well to share their experiences. As one student group leader stated, “When you realize that even one team member has changed because of your leadership, you gain a lot.”⁹

5.4. Avoiding the Spectator Mentality

The “spectator mentality” and taking a “free ride” are common phenomena in Chinese society [16]. To overcome this, the author has adopted steps such as sharing peer evaluation cases within the group during class and “randomly selecting group representatives to exchange in class”¹⁰ to engage more students who have not yet spoken. Group leaders have also taken measures like rotating the position of group leader⁹ and taking turns to organize the group's report assignments to enhance the sense of responsibility among team members¹¹. As a student put it, “Addressing the issue of free-riding is also a reflection of our capabilities.”⁴ “When everyone has taken a turn as the group leader, the team will undergo significant positive changes due to individual progress.”⁹

5.5. Training on How to Effectively Collaborate in a Group Learning Environment

At the beginning of the course, the author emphasized the importance of group cooperative learning to the students: “We aim to include everyone, acknowledge individual differences among students, and focus on growth. We promote the collective development of all students from various starting points, through different methods, and at their own pace by utilizing a variety of formats such as group cooperation, exchange, and class presentations. This approach encourages students to actively learn, acquire knowledge, and solve problems through cooperation, communication, presentation, and inquiry.”

Additionally, the author suggested that “group peer assessments should focus on the following aspects: the extent of student interaction, discussion, collaboration, and mutual assistance; attentiveness in class, proactive learning, independent and active thinking, and seeking clarification through reading or consulting when confused; the habit of taking notes during lectures, annotating while reading, and not engaging in reading or responding without thoughtful consideration; the meticulousness in writing, careful consideration in problem-solving, and meticulous attention to detail; the ability to reflect on mistakes, make timely corrections, and pay attention to accumulation of knowledge; and the practice of integrating knowledge with action, starting with oneself, and being strict in self-discipline.”¹²

Besides, it is also crucial to maintain strict management

during the educational experiment process while also “providing opportunities for improvement to groups with poor assessments.”¹⁰ For instance, students could be offered the chance to submit their late assignments within a specified period, albeit with a deduction in their grading for late submission.

6. Empirical Evidence

6.1. Survey on Student Growth and Development

To objectively illustrate the impact of collaborative design and implementation of new combinations of teaching and learning elements both in and outside the classroom, the author devised a teaching and learning status survey¹³. On March 16, 2015, the survey was conducted anonymously for the first time with 106 students enrolled in the psychology course, and on March 17, 2015, with 100 students enrolled in the entrepreneurship course. The purpose was to ascertain the students' initial states at the beginning of the courses.

After the course had been in progress for some time, the author conducted a second anonymous survey using the same questionnaire on April 27, 2015, with 111 students in the psychology course and on May 19, 2015, with 115 students in the entrepreneurship course. The purpose was to observe the changes that occurred in the students after they had gone through the teaching and learning process.

The questionnaire and survey results are as follows:

(1) Which teaching and learning model do you expect to be the most effective?

A. Student-Centered Education: This model emphasizes students taking the initiative in learning, engaging in pre-learning activities, collaborating and communicating in groups, and presenting in class (e.g., occupying 20% to 50% of class time). The role of the teacher is primarily that of a “guider”, responsible for instructional design, addressing difficult concepts, summarizing information, and facilitating overall improvement.

B. Teacher-Centered Education: This model highlights the teacher's role in lecturing, with the educational activities in the classroom predominantly focused on the teacher's instruction.

C. Other (please specify)

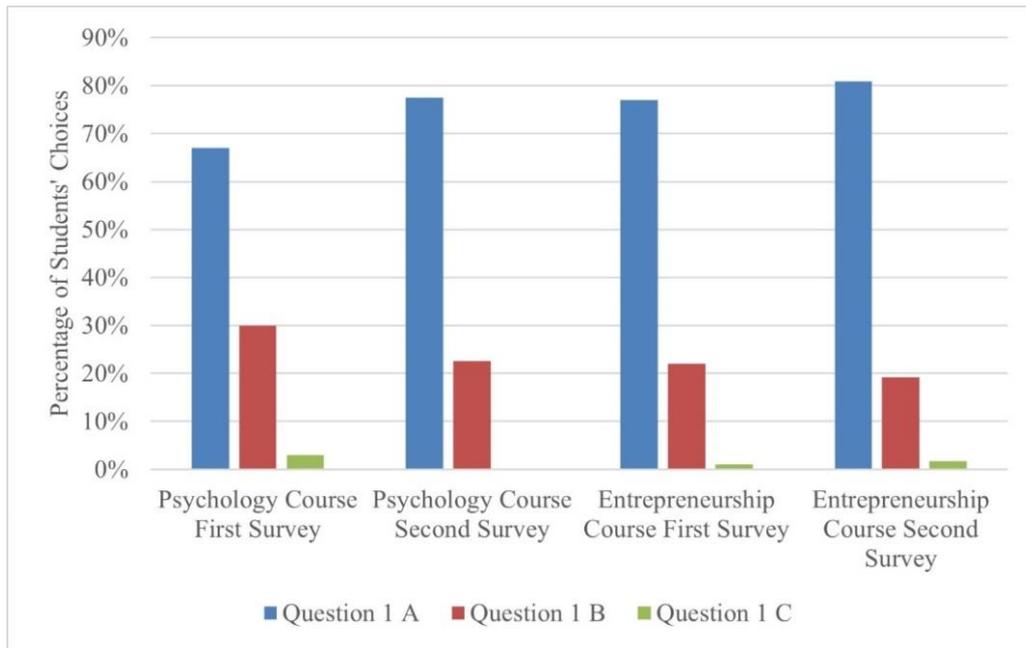


Figure 2. Survey Results for Question 1.

This result indicates that as the course progressed, the students in both courses showed an increased acceptance of student-centered education.

(2) Do you feel that you are capable of taking the initiative in your learning (e.g., by preparing in advance, consulting books or seeking advice when confused)? A: Yes, I can. B: No, I cannot.

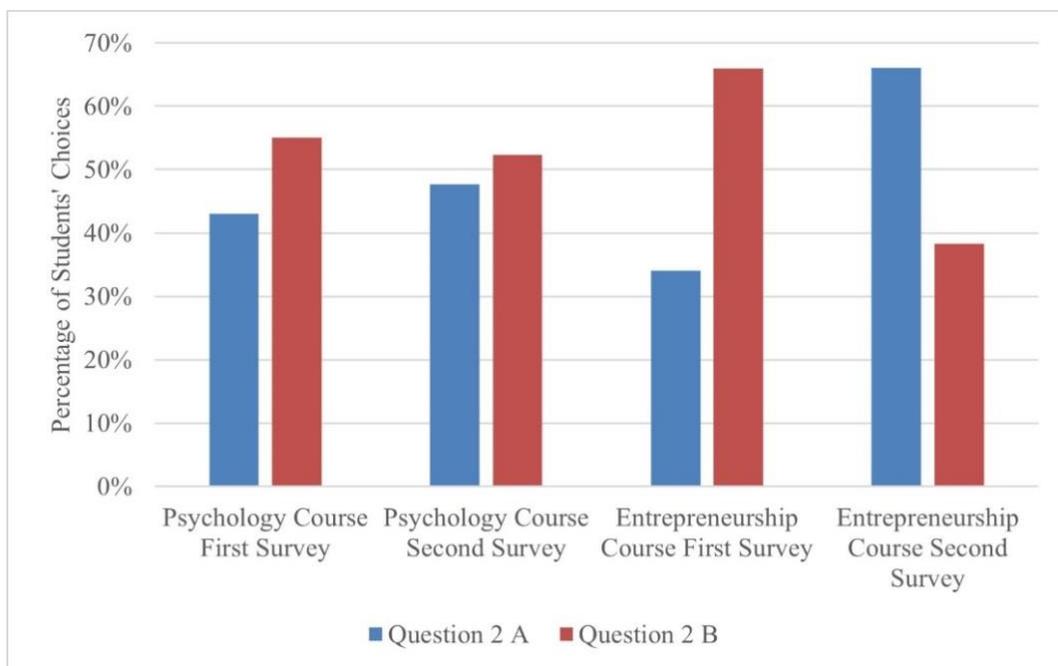


Figure 3. Survey Results for Question 2.

(3) Do you have the habit of being meticulous in your writing, thoughtful in considering problems, and conscientious in your approach? A: Yes, I do. B: No, I don't.

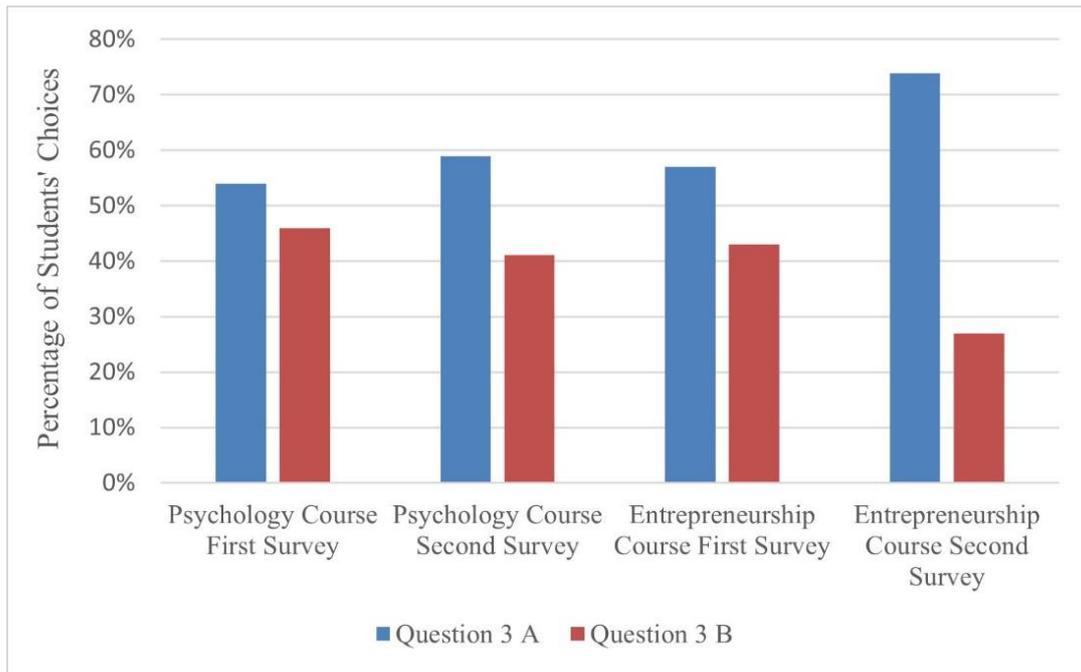


Figure 4. Survey Results for Question 3.

(4) How would you rate your skill to express yourself? A: Good, B: Average, C: Weak.

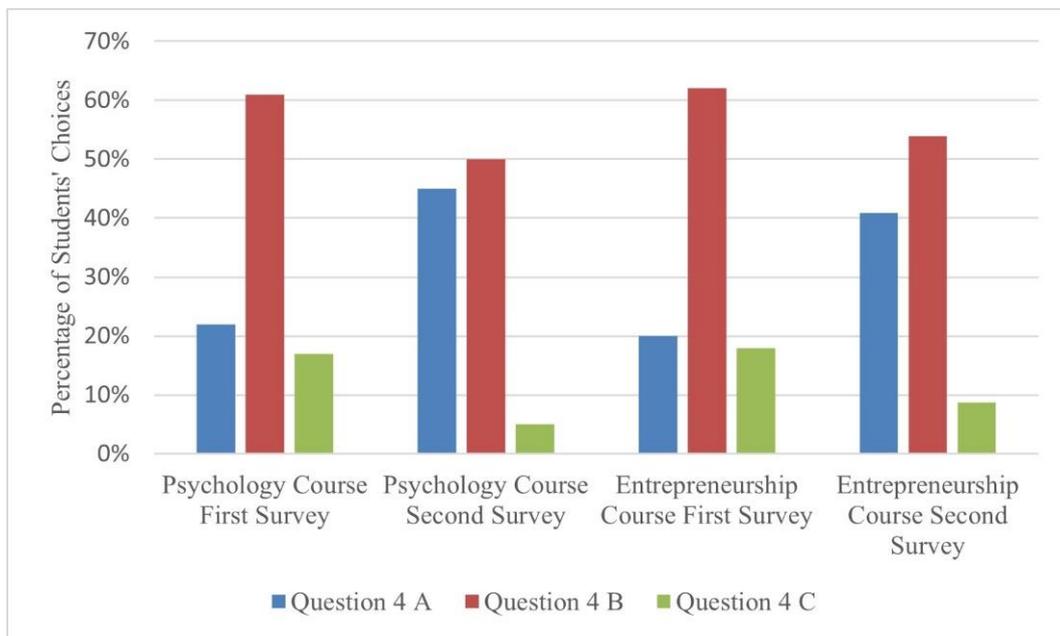


Figure 5. Survey Results for Question 4.

(5) How would you rate your skill to communicate with others? A: Strong, B: Average, C: Weak.

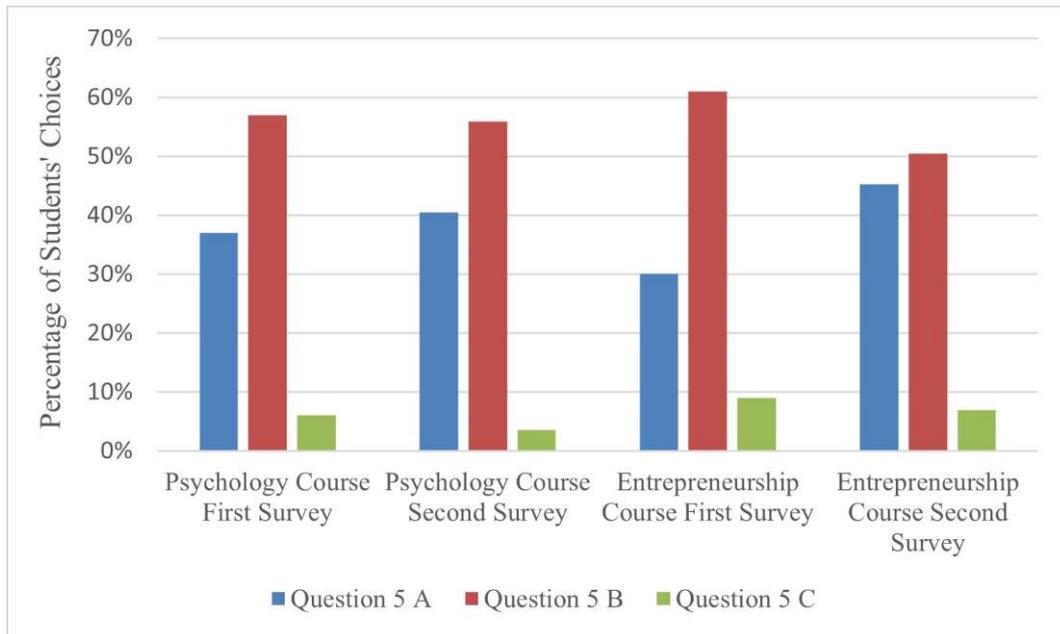


Figure 6. Survey Results for Question 5.

(6) How would you evaluate your level of cooperation and mutual assistance with your classmates? A: Good, B: Average, C: Not so good.

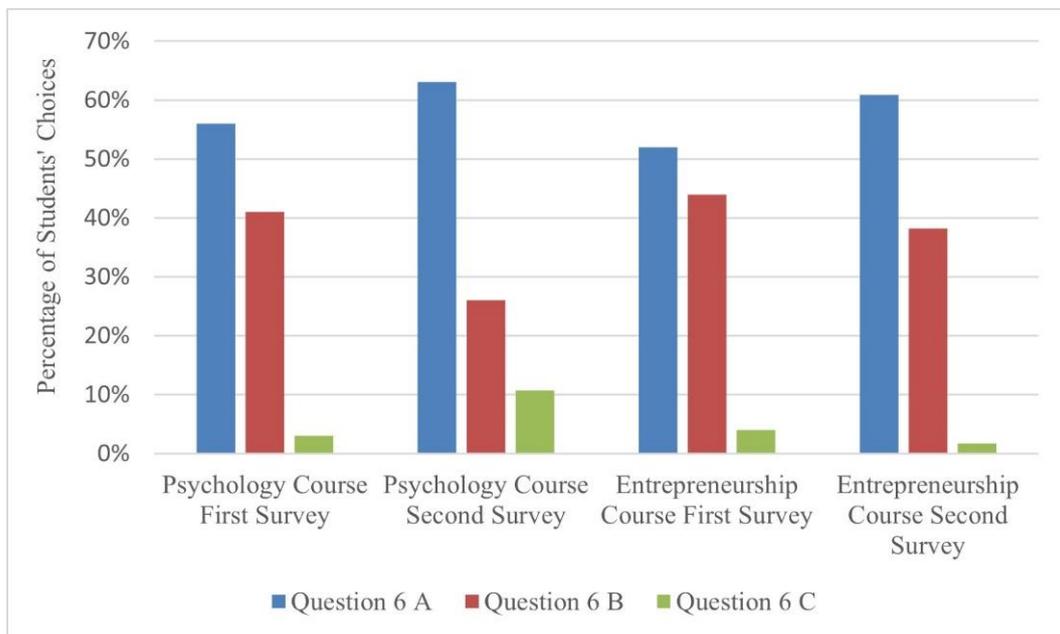


Figure 7. Survey Results for Question 6.

(7) How clear do you feel about your future life direction? A: Clear, B: Unclear.

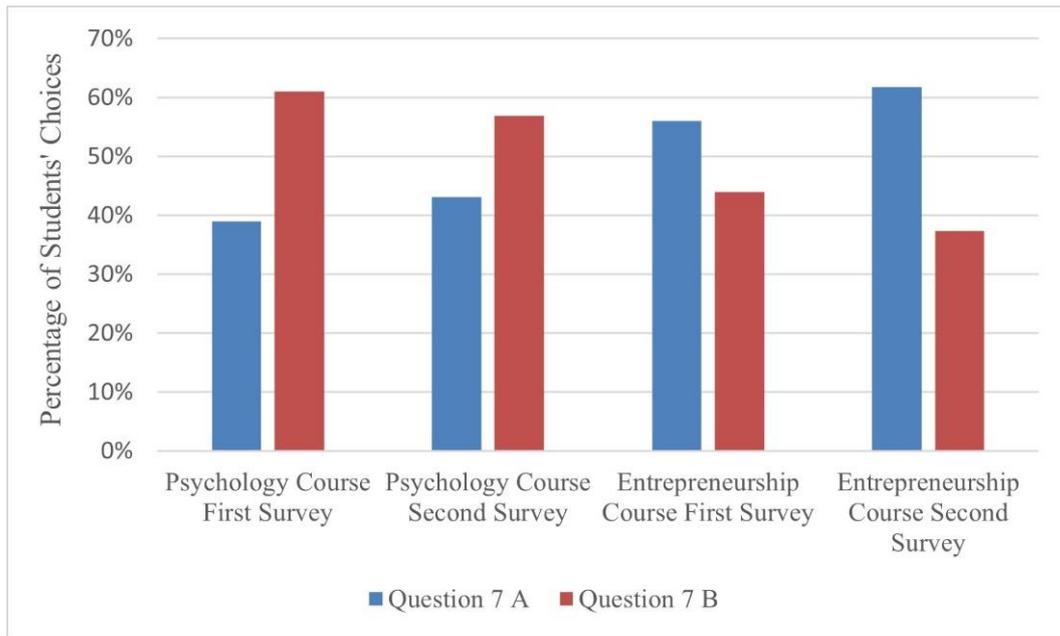


Figure 8. Survey Results for Question 7.

(8) How would you rate your sense of life happiness? A: Happy, B: Average, C: Unhappy.

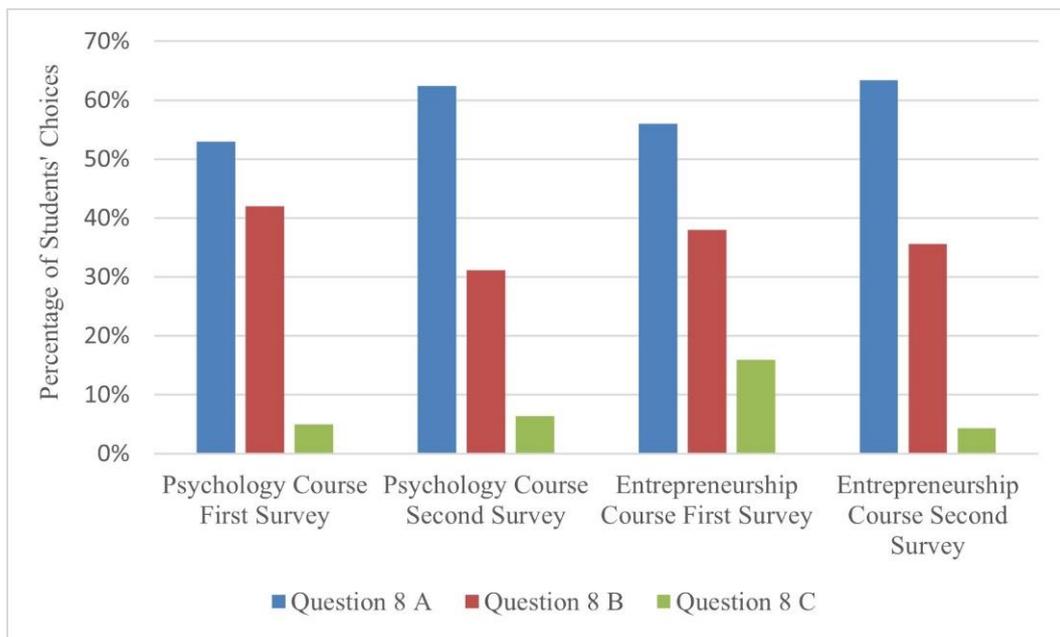


Figure 9. Survey Results for Question 8.

(9) Do you have the habit of integrating knowledge and action (practice what you preach)? A. Yes, B. No.

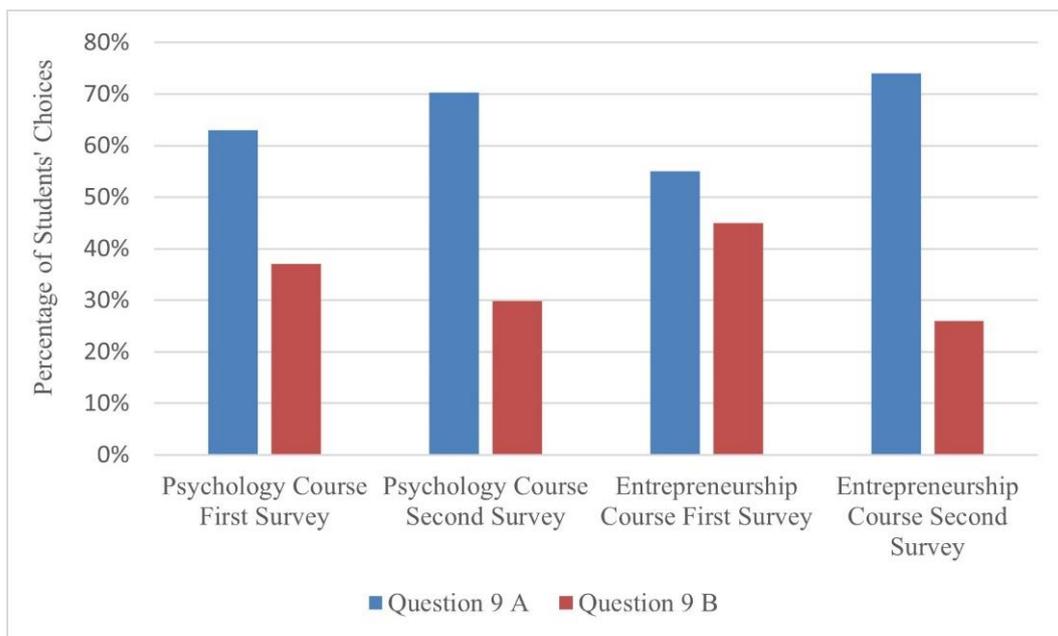


Figure 10. Survey Results for Question 9.

(10) Do you have the habit of starting with yourself and being strict with yourself? A. Yes, B. No.

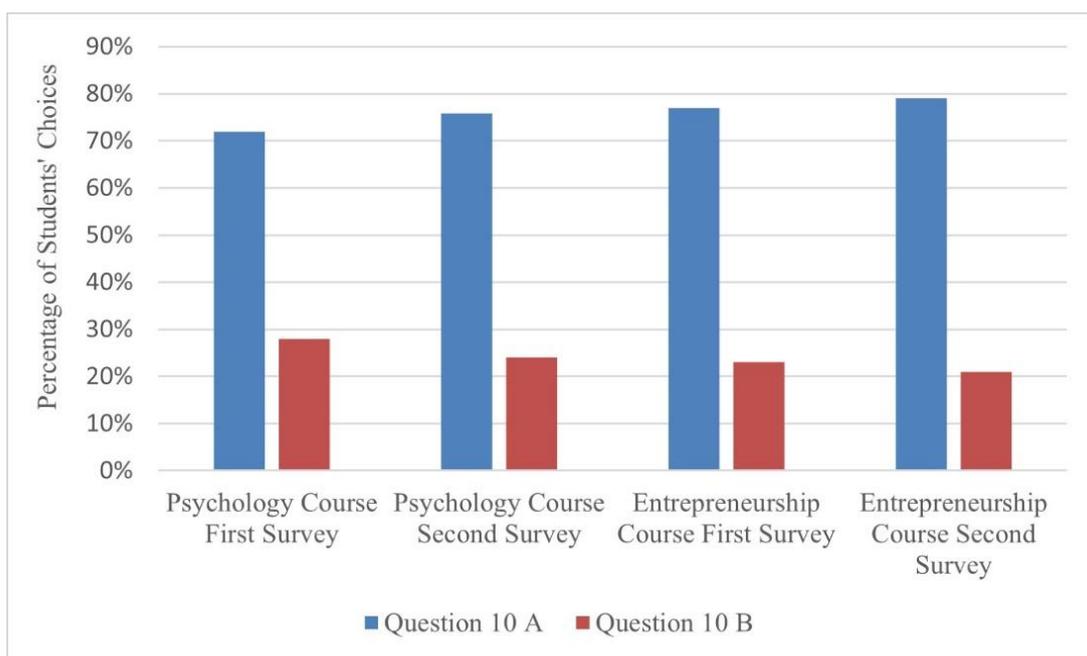


Figure 11. Survey Results for Question 10.

Figures 3 to 11 demonstrate that after experiencing the new combination of educational and learning behaviors both inside and outside the classroom, as described in Section 4 of this paper, students have indeed shown comprehensive growth in various aspects such as initiative in learning, meticulous study habits, expressive skills, communication skills, cooperativeness, clarity in future life direction, life happiness, the integration of knowledge and action, and self-discipline.

This confirms that through the new combination of teaching and learning elements both in and out of class, students are not only able to acquire professional knowledge but also cultivate their non-intellectual factors and transferable abilities, achieving an integration of professional education with holistic development.

6.2. Proportions of Students Receiving Different Grades in Two Courses

Adhering to the principle of emphasizing formative assessment [9], the grading for the two courses is primarily

based on the students' ongoing performance. Each student's grade is determined by aggregating the performance of their respective group, peer evaluation scores within the group, attendance, and classroom performance. The results are as follows:

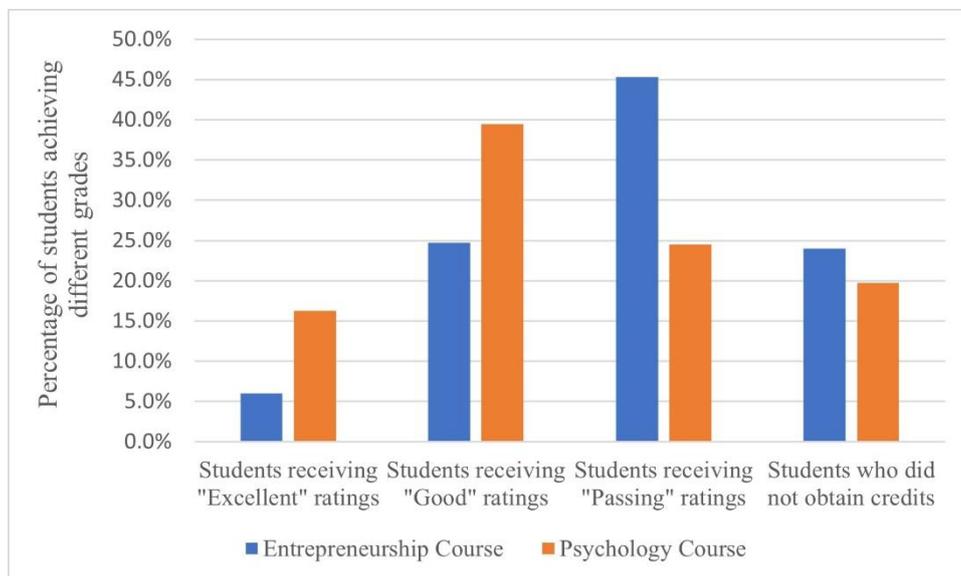


Figure 12. Percentage of students achieving different grades in the two courses.

As shown in Figure 12, despite the rigorous formative evaluation implemented in both courses before, during, and after each class, due to the innovative teaching and learning methods¹⁴, the author's dedication and responsibility⁶, as well as the provision of "correction opportunities" for students¹⁰, both courses, even as elective courses, have been well-received and appreciated by students. There were not many students who dropped out midway through the courses. 76% of the students in the entrepreneurship course obtained credits, and 80.3% of the students in the psychology course achieved credits. The overall grades exhibit a distribution resembling a normal distribution, indicating that the process assessment methods for both courses are reasonable.

7. Promotion of the PDCA Iterative Improvement Pedagogy

The aforementioned educational experiments and results have been recognized by the Board of Directors of Gengdan Institute. They have been promoted across the entire institution.

The result of promoting this pedagogy has brought about profound changes in the concepts of both teachers and students, such as their understanding of what constitutes a "good student." As one student said, "Previously, a good student meant paying attention in class, taking notes, and being able to answer everything the teacher taught during exams. But

now, it's different. Now, we ask questions ourselves and learn independently. Previously, we doubted how students with our level of foundational knowledge could manage self-study, but now, with this learning approach, we are able to study independently. However, there is still some fear because it doesn't conform to what everyone considers as the standard. But in reality, our abilities may be stronger, such as our ability to self-study, express ourselves, and even manage (as group leaders) in future work... A few students in our class who didn't study much before are now working much harder than before. Not only do they learn what the teacher teaches, but they also study what the teacher doesn't cover. Their notes are even more detailed than what they made before high school graduation. It seems that the reform has sparked their enthusiasm for learning."⁴

The results of this pedagogical approach's widespread adoption have led to a comprehensive enhancement of students' abilities. In addition to the empirical evidence provided in Section 6.1 of this paper, indirect evidence comes from a third-party big data company, which compared the average monthly salaries of graduates from Gengdan Institute in the years 2014, 2015, and 2016 with the national average for undergraduate graduates during the same periods. It can be observed that although the average entrance scores of Gengdan Institute students were below the market average at the time of admission (otherwise, they would not have had to wait until the third batch of university admissions), their average salaries upon graduation exceeded the market average

[17]. This indicates that Gengdan Institute's teaching approach enhances students' abilities beyond the market average.

This pedagogy has subsequently been applied in faculty training at Gengdan Institute, Hunan College of Foreign Studies, Xinyang Aviation Vocational College, and Zhuhai Gree Polytechnic (under preparation), as well as in executive training at the Lyceum of the Philippines University, yielding favorable results in each case.

8. Discussion

As discussed in the first part of this paper, the traditional classroom teaching system is no longer suitable for the Internet age. There is a need for a new and more effective combination of educational elements.

The new combination of educational elements can take on various forms. The case presented in this paper can be regarded as a new approach to organizing large and medium-sized seminars, which is essentially a form of the "research-teaching-study nexus" [15]. This organizational method has been widely applied in American graduate education, such as in small seminars, workshops, and laboratories. "This seems to be the core of the success of American universities as research-centered organizations." [18]

With the abundance of online learning resources and the implementation of blended learning models that combine online and offline instruction, this teaching organization form has been applied to general education in Chinese universities and vocational colleges, such as the cases provided in this article; and in professional education, such as the Gengdan Institute's SHOWBIM Situational Teaching Studio [17], and Zhuhai City Polytechnic's practice to break away from the traditional natural class teaching system by establishing studios that integrate teaching and learning management, student management, and enterprise-oriented training into one unit. [19]

9. Conclusion

Through collaborative design and implementation of a new combination of educational and learning behaviors before, during, and after class, it is found that this new combination can not only effectively promote the professional development of students, but also promote their comprehensive development in terms of transferable abilities and non-intellectual factors. This approach holds universal significance for reforming the traditional classroom lecture system, effectively utilizing online learning resources, increasing students' investment of time in learning outside of class, enhancing the learning efficiency of the "research-teaching-study nexus," balancing individual growth with social function training, integrating professional education with holistic education, and implementing quality assurance loops in every class, in every teacher's daily instruction-

al design, and in every student's learning behaviors both in and outside of the classroom.

Due to limitations in time and resources, the student growth survey conducted in this study was confined to the nine survey questions designed by the author at the time. In the future, a more comprehensive growth mindset questionnaire [20] could be employed to further measure the effectiveness of the pedagogy proposed in this paper in stimulating student growth.

The current compensation system for university faculty is often tied to the number of classroom teaching hours, a legacy from the era of the "classroom teaching system." This easily leads teachers to focus on in-class teaching rather than out-of-class education activities. If we want teachers to truly focus on the collaborative design of both in-class and out-of-class educational activities, it is necessary to reform the salary, evaluation, and incentive systems for teachers. This requires further research in the future.

Abbreviations

PDCA Plan Do Check Act

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Author Contributions

Xiaoliang Ding is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Joseph Alois Schumpeter. *Theory of Economic Development* [M]. Translated by Zou Jianping. Beijing: China Pictorial Publishing House, 2012.
- [2] Ding Xiaoliang. The Reason, Solution and Empirical Evidence of Chinese School Can't Cultivate Outstanding Talents [J]. *International Journal of Education, Culture and Society*. 2023 8(4): 195-203. <https://doi.org/10.11648/j.ijecs.20230804.17>

- [3] Ding Xiaoliang, Yong Jinhui. Multiple Choice and Comprehensive Cultivation: A Practical Exploration of the Combined Credit System [J]. *University Academic*, 2017, (3): 40-47.
- [4] Ding Xiaoliang, Zhao Junxian, Li Jingzeng. Establish a Closed-loop Multi-monitor Evaluation System of Teaching Quality - Taking Gengdan Institute of Beijing University of Technology as An Example [J]. *University Academic*, 2018(5): 15-21.
- [5] Lu Genshu. Classroom Learning Environment, Learning Styles, and College Student Development [J]. *Fudan Education Forum*, 2012, 10(4): 46-55.
<https://doi.org/10.13397/j.cnki.fef.2012.04.011>
- [6] Tian Mei, Lu Genshu. Analysis of the Relationship Between Students' Perceived Classroom Learning Environment, Learning Styles, and Satisfaction with Teaching Quality [J]. *Fudan Education Forum*, 2016, 14(1): 38-44.
<https://doi.org/10.13397/j.cnki.fef.2016.01.007>
- [7] Sun Jihong. Interpretation of the connotation of a vivid classroom and its construction: A case study of curriculum reform in Yinzhou District, Ningbo City [J]. *China Moral Education*, 2015(23), 25-29.
- [8] He Li, Lu Genshu, Li Hongbo. Classroom Environment and Its Impact on Teaching Effectiveness [J]. *Contemporary Education Theory and Practice*, 2016, 8(6): 88-91.
<https://doi.org/10.13582/j.cnki.1674-5884.2016.06.029>
- [9] Ding Xiaoliang. Research on the New Model of Growth Motivation in Higher Education [J]. *University (Research and Management)*, Featured Article of September, 2020, (35): 5-11.
- [10] Sun Yahui. Higher Education: From Mass to Universal (China Education This Decade 2) [EB/OL]. *Guangming Network*, 2022-05-30.
<https://doi.org/10.28656/n.cnki.nrmrh.2022.001583>
- [11] Qiu Lei, Editor. *Dewey Education Proverbs* [M]. Shanghai: East China Normal University Press, 2015.
- [12] Li Xigui. *Education for Individuals* [M]. Beijing: Educational Science Press, 2014: 1.
- [13] Xia Zhengnong, Chen Zhili editor in chief, *Lexicographical Work · Education Volume*, Entry: Great Teaching Theory. Shanghai: Shanghai Dictionary Press, 2015.
- [14] Zhao Juming. On the New Three Centers: Concept and History—A Study of Student-Centered Undergraduate Teaching Reform in the United States [J]. *Higher Engineering Education Research*, 2016(3): 35-56.
- [15] Burton R. Clark. *Places of inquiry: Research and advanced education in modern universities* [M]. Bingley: Emerald Group Publishing Limited, 2000.
- [16] Ding Xiaoliang. On the Sublation, Inheritance and Innovation of Chinese Traditional Culture [J]. *International Journal of Education, Culture and Society*. 2022, 7(6): 287-295.
<https://doi.org/10.11648/j.ijecs.20220706.16>
- [17] Xiaoliang Ding. Design and Empirical Evidence of Teaching Resource Allocation Model and Reform Path [J]. *International Journal of Education, Culture and Society*, 2022, 7(4): 220-226. <https://doi.org/10.11648/j.ijecs.20220704.17>
- [18] Burton R. Clark. *AAU: The Association of American Universities: A Century of Service to Higher Education 1900-2000*.
- [19] Liu Huaqiang, Gao Jing, Chen Xiaoqing. *Vocational Education in China: Theoretical Exploration and Practical Implementation of the "Dual Ternary" Vocational Education Model* [M]. Beijing: National Library of China Press, 2015: 159-164.
- [20] Dweck C S. *Mindset: The New Psychology of Success* [M]. New York: Random House, 2006.

1 Non-intellectual factors, which refer to the psychological elements that do not directly participate in the cognitive process during intellectual activities, include: 1. Ambitious ideals and goals; 2. High aspirations; 3. Resilience and willpower in the face of setbacks; 4. A lively personality and broad-mindedness; 5. Self-confidence and a competitive spirit; 6. Interests and hobbies; 7. Pleasant emotions and passion for one's endeavors; 8. Anxiety. In contrast, intellectual factors encompass: 1. Attention; 2. Observation; 3. Imagination; 4. Memory; 5. Thinking ability; 6. Creativity.

2 Transferable abilities refer to those abilities that can be carried over from one job to another and are applicable to the completion of various types of work. These include the capacity for continuous learning, as well as abilities in expression, communication, collaboration, time management, emotional regulation, critical thinking, problem-solving, and adaptability.

3 American educational theorist Benjamin Bloom categorized learning activities into six levels based on the cognitive complexity of the tasks, ranging from lower to higher order thinking. Memorization and comprehension are considered lower-order cognitive activities, which should primarily be conducted independently by students outside of class. In contrast, application, analysis, evaluation, and creation represent higher-order cognitive activities that can be collaboratively completed with the teacher during in-class learning sessions.

4 Quoted from the Meeting Record of the Student Symposium on the Conclusion of the Beijing Municipal Education and Teaching Reform Project on November 28, 2016.

5 Quoted from the interaction between the leader of Group 12 of the Entrepreneurship Course and the author in a QQ group on April 6, 2015.

6 The excerpt is from the lecture PowerPoint presentation on May 5, 2015, titled

"Teaching Method Issues I Hope to Discuss with Everyone."

7 Quoted from the interaction between the student Lu Chenchen of the Entrepreneurship Course and the author in a QQ group on April 5, 2015.

8 Quoted from the remarks of Assistant Teacher Ma Zhiliang in the Entrepreneurship Course QQ group on April 7, 2015.

9 Quoted from Ji Yunfei's speech in the Entrepreneurship Course: Talking about My Experience and Lessons as a Group Leader.

10 The quote is from the course syllabus of "Entrepreneurship Course," available at <https://max.book118.com/html/2017/0812/127416678.shtm>.

11 Quoted from Yang Jie, a student, during her speech at the Entrepreneurship Course: How to be a Good Team Leader and Lessons Learned.

12 The quote is from the course syllabus of "Psychological Course," available at <https://max.book118.com/html/2018/1205/6120210003001234.shtm>.

13 Excerpted from "Teaching and Learning Survey Report" by Xiaoliang Ding, Spring Semester 2015.

14 Quoted from a WeChat message sent by student Liu Wenli to the author on April 27, 2024.