Research on Productive Failure Teaching Design in Higher Vocational Education

Yuqi Zhuang

Ningbo City College of Vocational Technology, Ningbo, China

Keywords: higher vocational education, productive failure teaching, teaching design, teaching support, learning culture.

Abstract: The definition of productive failure teaching is designing some forms of frustration in the learning process. The key points of productive failure teaching include the complexity of the problem, the necessary teaching support and cognitive support and learning culture creation. Case studies of classroom design are based on the example of "How to Make Sales Calls to Foreign Customers" under the course of "Import and Export Business Operations".

1. What is Productive Failure Teaching

Some scholars such as Kapur have found that designing certain forms of frustration in the learning process can stimulate students to create more problems, representations and solutions, and promote problem-solving and innovation. This article defines this type of frustration as Productive Failure Teaching [1]. Based on the original foundation of the learner, supporting and helping learners to carry out personalized self-learning is the goal pursued by teachers. Learning and teaching activities based on problems can not only promote the acquisition of students' knowledge content, but also help students to develop a flexible knowledge base [2]. Furthermore, it can promote the development of learners' critical thinking and creative thinking, as well as their practical problem-solving skills. In the whole problem-solving process, the teacher should provide materials to the students, and let the students personally discover the conclusions and make the students become discoverers.

The basic steps of Productive failure teaching are: (1) Proposing and clarifying issues that are of interest to students; making students have a certain degree of uncertainty about the problem, which stimulates inquiry; (2) Every student is encouraged to propose hypotheses on how to solve the problems; (3) Assisting students in collecting information that can be used to make judgments; (4) Organizing the use of various materials to initially solve problems and draw due conclusions; (5) Guide students to use analytical thinking to verify conclusions, and finally make the problem solved. The key to success lies in whether the teacher designed the learning resources to stimulate students' thinking before the class, and whether the teacher can guide the students to actively discuss and help the students to deepen the existing knowledge structure, thus promoting the students' ability to solve problems and the development of innovative ability. Higher vocational students have weak self-management ability, lack of strong motivation for learning, flexible application ability of original knowledge, and certain critical thinking and creative thinking. This paper attempts to deconstruct the instructional design of the productive failure teaching and the corresponding teaching support and cognitive support. It can use the processes and strategies of monitoring, reflection, testing, questioning and self-evaluation to realize the understanding and innovation of

knowledge in order to maximize the training. Productive failure teaching makes students to think independently and learn independently, while creates and develops self-learning culture.

2. The Main Points of Productive Failure Teaching

2.1. The Complexity of the Problem

Students can't solve problems in a short time or solve problems comprehensively, but they can't give up because the problem itself is not challenging. Accurately design productive failure teaching tasks, combined with the student's age and knowledge base, thus activate the student's original knowledge. High quality problems may enable learners to activate their own experiences more actively, broadly and deeply, understand and analyze current problem situations, and generate new understandings and new hypotheses through positive analysis and inference. The result may enrich, adjust, or reconstruct the former knowledge or experience. Low-level questions require students to answer some fact or information or the question is so difficult or complicated that students lose confidence in solving problems [3]. Students will lose the confidence in solving the problem because of strong frustration. When creating a problem situation, teachers should design a challenge that students will not feel helpless.

2.2. Provide the Necessary Instructional Supports and Cognitive Supports.

Researchers and practitioners in the field of education generally believe that efficient learning and problem solving rely on well-designed teaching support and cognitive support, especially at the beginning of learning [4]. Without these teaching support and cognitive support, students will have difficulty reaching expected learning performance. Teaching support and cognitive support usually appear in the form of content support, expert help, tool resources, and structure of the problem itself. It is suitable to provide some support related to problem solving and target content, such as emotional support, metacognitive support, etc., to prevent students from having a meaningless frustration experience in thinking and solving problems. In this process, students self-manage, evaluate and regulate learning, and teachers give some teaching support in due course. Through these supports, students are encouraged to activate prior knowledge related to the problem and to guide students to focus on the core concepts and characteristics of the problem. It is also necessary to prevent giving excessive or premature teaching support and cognitive support, thus losing the meaning of frustrating enlightenment.

2.3. Creation of a Learning Culture

The creation of a learning culture plays a key role in the interaction and collaboration between community members. Creating a secure shared discussion environment and sharing trust among community members are the basis for productive failure teaching design. Teachers should encourage students to compare solutions to various tasks, discuss why certain methods are superior to other methods under certain conditions, reflect on the wrong ways in problem solving, and conduct effective peer review. It is essential for students to achieve effective knowledge and skills learning that gradually creating a learning environment that emphasizes collaboration, motivation, and evaluation systems. How to build a good learning culture? The author believes that the following four points are very important: to establish a culture of collaborative learning in the classroom-the teacher's lectures are transferred to the focus of the students' discussion; the teachers' questions need to be gradually transferred to the students' self-defined inquiry questions; from the rebuttal of stubborn opinions to the acceptance and improvement of multiple opinions; from teacher

evaluation to student self-evaluation and mutual evaluation. Design a good learning culture, encourage students to explain, contrast, compare and reflect on their strengths and weaknesses, promote safe inquiry and discussion, and then make teaching design more successful [5].

3. Case Study of Productive Failure Teaching Design

Productive Failure Teaching design consists of two phases of modeling/innovation and consolidation/integration. Through the two phases of learning, it can activate and use the prior knowledge related to the target concept, guide students to pay attention to the key features of the target concept, explain and refine these key features, and integrate them into the target task. The modeling and innovation phase based on the student's prior knowledge, provides students with a comprehensive task or problem, guides students to develop a preliminary plan, and by contrast, discovers the diversity of the program and generating new problems. In the consolidate and integrate phase, teachers encourage students to introduce the results and clarify and refine their own expressions through the questions and give mutual comments between peers, while provide corresponding suggestions, so that students can clearly focus on key points.

This study aims at the sophomore students who participated in the *"Import and Export Business Operation"* course of Ningbo City College of Vocational Technology. It is a task in the course "How to Make Sales Calls to Foreign Customers" with the failure productive teaching design.

3.1. Modeling and Innovation

Modeling/innovation is a process of constantly adjusting and clarifying concepts referring to the learning phase before class and focusing on the student's “closest development zone”. Firstly, how to accurately design learning resources. It is evaluated mainly from whether the learning resources can activate the students' prior knowledge, and whether they can stimulate students' desire to learn and solve problems, and cultivate students' creative thinking. Simple tasks for some students may not be simple for other learners. Whether the learning process can smoothly follow the predetermined goals depends on the knowledge variants and learning experiences available to the students. Quality learning resources can stimulate prior knowledge and experience Secondly, they are vital for the completion of task of providing some teaching support and cognitive support, such as: evaluation results of learning results, provision of tool resources, emotional support, tips for important concepts, etc., integrated into activities designed to help students develop metacognitive awareness and ability. Finally, in the course of the activity, it is very essential to create a situation that can be safely explored, encourage students to cooperate and share learning results, and promote students to think and reflect on the process and skills in task completion. Putting students in a group doesn't mean that collaboration can happen naturally. Teachers should guide students' collaboration from time to time to maximize the effectiveness of collaborative learning. The following is a task name, task’s requirements and task supports in the task of "How to Make Sales Calls to Foreign Customers" from the course *"Import and Export Business Operations"*.

Task : Make Calls to customers in the list from Google to sell the specified product.

Requirements: (1) At least 5 customers per week.
(2) Every call should last over 1 minute.
(3) Ask for the social account of the customer.

Support: (1) Video course "How to Make Sales Calls"; common sentence expressions in English.
(2) Wisdom Wall, pasted the notes and marked the connections between notes.
(3) A WeChat group, teachers and students reporting the process and discussing the main problems regularly every day.

After learning the task supports provided by the teacher, the students start to make sales calls. In the process, encountering various problems such as telephone failure, customers hanging up the phone, customers chatting and not talking about products, students should try to solve these problems and achieve the target task. Teachers organized a series of activities, such as group collaboration, group and group discussions, and the application of the Wisdom Wall. Teachers also provided cognitive supports to students, such as encouraging students to express my opinions, my reasons, I want to know, classifying ideas, etc., activating previous knowledge related to task solving and guiding students to focus on core issues, while helped students learn how to accurately ask questions, organize expressions and good cooperation. Everyone communicated from time to time. Teachers often encouraged students to comment on each other's notes and reflected on what they had learned and what they needed to add. This was a dynamic process. The more problems students can create and the more solutions they have in the task-solving process, the more they can help students develop awareness of problem-solving and inquiry processes, and thus better develop independent and collaborative learning. Competence, as well as the ability to reflect on the process, can also help students improve their learning experience.

3.2. Consolidation and Integration

In the consolidation and integration phase, students provide a comparison of the relevant problem representations and solutions that have emerged during the task completion process, then organize and integrate them to become more effective and correct solutions. Teachers and students jointly initiated a class discussion every week. Based on the results of the WeChat group and the wisdom wall, students independently designed and proposed further issues to be discussed. When students introduced their results and problems, the teacher asked them to clarify and refine their statements. The teacher provided some suggestions to the students according to the discussion. Through various means such as role-playing, the teacher guided the students to continuously improve their expressions and pointed out which directions were more worth exploring: if they were fully prepared before making a call; did you have a hypothesis before making a call; what were the common problems and personality problems? At the same time, students were encouraged to evaluate each other, and students were encouraged to compare each group's solutions and discuss the advantages and disadvantages of each solution. When designing a participatory structure, students should be encouraged to increase their intellectual input. How teachers promote students' participation, from teacher questions to students' self-study questions, from the contradictions of stubborn opinions to the improvement of multiple ideas, largely determines the students' representations and solutions to various problems. It has been proven that this approach can promote students' sharing, refinement, criticism, interpretation and evaluation of learning outcomes. It can help students activate and discern previous experiences and promote students' attention, interpretation and refinement of key points. In consolidation and integration phase, students through self-reflection, questioning and self-assessment, sum up the reasons for previous failures, comprehensively consider various elements, refine the task points, start a new round of sales calls, and achieve more than the previous round.

A good failure productive teaching design requires students to be provided with support and assistance that is not directly relevant to problem solving, such as providing emotional support, metacognitive support, creating collaborative sharing culture, managing classrooms, etc. During collaborative learning in a safe environment, students can develop problem-solving and innovation-related skills, and their meta-cognitive skills (such as planning, monitoring, and reflection), thus promote the ability of learning migration and transformation.

4. Conclusions

This is the path of productive failure teaching design: design tasks; students solve tasks on their own; ask questions; analyze and explore; solve tasks and propose new ones. With a wealth of technology and resources to create a flexible learning environment for students, and to provide suitable task supports, students can actively define, complete and create their learning tasks, which is the goal of productive failure teaching.

Productive failure teaching as a new design concept and perspective, encourage students to actively participate in problem-solving activities and meta-cognitive activities in the learning process, to stimulate students to make full use of their original knowledge and cultural background, and independently find ways to solve problems initially. It is also beneficial to train students to become active learners, build a safe environment for inquiry and discussion, and promote a good learning culture. Research in this field is still in its infancy. Students are proactive in mobilizing existing knowledge and learning experiences to shape their learning environment, rather than teacher-controlled learning of pre-customized learning materials. The applications often have a distance from the expected results. To maximize the effect, it still takes a long way to go. The research of productive failure teaching requires a lot of practical cases to support.

References

[1] Kapur, M. Productive Failur[J]. Cognition and Instruction, 2008, 26(3):379-424.

[2] Zhang Jianwei. Knowledge Construction Based on Problem Solving[J]. Educational Research, 2000, (10): 58-62.

[3] Yang Yuqin. Research on the ecological design framework of MOOC learners' personalized learning[J]. China Electro-chemical Education,2014,08:32-37

[4] Kapur, M., &Bielaczyc, K. Designing for Productive Failure[J]. Journal of the Learning Sciences, 2012, 21(1): 45-83.

[5] Kapur, M. Comparing Learning From Productive Failure and Vicarious Failure[J]. Journal of the Learning Sciences, 2013, 22 (1): 1-27.