

Collaborative teaching with Engineering students

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Abstract: *The method of cooperative teaching in small groups is also known by other names such as “Group discussion method” or “Collaborative teaching method”. This is a teaching method in which “Students are divided into separate small groups, responsible for a single goal, accomplished through each person’s separate tasks. Separate individual activities are reorganized and organically linked together to achieve a common goal.” Electro-pneumatic control is a very difficult subject in specialized electrical and electronics subjects. The author has Introducing collaborative teaching methods into classroom organization helps students learn effectively, improving students’ cognitive and creative abilities.*

Keywords: *Teaching methods, cooperative teaching, electro-pneumatic control.*

1. Introduce

Group discussion method is used to help all students actively participate in the learning process, creating opportunities for them to share knowledge, experiences, and opinions to solve problems related to lesson content; opportunities to exchange and learn from each other; work together to solve common tasks.

Implementation process: When using this teaching method, the class is divided into groups of 4 to 6 people. Depending on pedagogical purposes and learning requirements, groups are divided randomly or intentionally, maintained stable throughout the entire class period or changed according to each activity and part of the class period; groups are assigned the same or different tasks[3].

In class, students receive long research exercises, including specialized technical research on valve systems, gas pressure and electrical control systems and design elements[1].

This method creates conditions for students to create new knowledge based on prior knowledge. It helps students to analyze, synthesize and evaluate problems; From there, forming students’ problem-solving capacity and ability to use mathematical language. Therefore, students are trained to solve problems and develop thinking operations. In addition, students can work in groups to discover new knowledge, leading to the formation of students’ ability to cooperate and debate.

Group learning method is one of the modern university teaching methods that organizes students into small groups so that students actively participate in the learning process through discussion, exchange

of ideas and solutions. solve learning problems. This is a teaching method often used to encourage social interaction, develop teamwork skills and help students build knowledge more actively. Students Team members must self-manage time and develop plans to ensure progress and complete work as required. In this method, the lecturer often plays the role of supporter and guide, rather than the main imparter of knowledge.

2. Research content

Each teaching perspective will have appropriate teaching methods. Each specific teaching method also has appropriate teaching techniques, but there are also many exceptions.

The distinction between teaching methods and teaching techniques is sometimes only relative. For example, brainstorming, in some cases is considered a teaching method, sometimes considered a teaching technique.

There are teaching methods that can be taught in general for many subjects, but there are also specific methods that can only be applied to a specific subject or group of subjects. A teaching method or subject technique will be called by many different names[7].

2.1. Grouping technique

- Based on attendance order, color,...
- Based on the puzzle: the teacher will cut a picture into many pieces, then let students pick them randomly. If children have puzzle pieces that form a picture, they will be in the same group.
- Based on interests: Arrange students with similar interests into a group
- Based on month of birth: put students with the same birth month in the same group[6]

2.2. Implementation process

- Identify problems and situations that need to be resolved
- Search for situations related to the problem that needs to be solved
- Provide ways to solve problems
- Analyze and evaluate results of problem solving options
- Compare the results of the measures
- Choose the most optimal solution
- Follow the chosen method

2.3. Collaborative learning process

Step 1: Work together as a class

- The teacher introduces the topic or raises discussion issues, identifies cognitive tasks; General theory and implementation of knowledge about electrical control [2].
- State the problem, identify cognitive tasks;
- Organize groups, assign tasks to groups, stipulate time and assign working positions to groups;
- Instructions on how to work in groups (if necessary).

Figure 2: Partitioned collaborative method

Step 2: Work in groups

- *Assignment in groups, each individual works independently; Work independently to research issues of stop valves, pressure valves as well as gas pumping systems and determine technical methods using kachnough and boole[10].*
- *Exchange opinions and discuss in groups;*
- *Appoint a representative to present the work results of the electro-pneumatic control system design team as required.*

Step 3: Discuss and summarize in front of the whole class

- *Representative of each group presents the results of the group's discussion;*
- *Other groups observe, listen, question, comment and add ideas;*
- *The teacher summarizes and comments on the next exercise or problem.*

Instead of mid-module tests, groups will present research on assigned long exercises. Including research and criticism from teachers.

In the teaching process, it is important to help students explore and predict formulas themselves. Organizing students to cooperate with each other will increase students' problem-solving ideas[5]. From here, the process of exploring and proving predictions is more effective. Incorporate the idea of

organizing interaction between students[5].

4. Electro-pneumatic control

With the strong development of electric power, the role of using compressed air power is gradually reduced. However, the use of compressed air energy still plays a crucial role in areas where using electrical energy would be dangerous, using compressed air energy in small tools, but moving at high speeds. large, using compressed air energy in equipment such as air hammers, stamping tools, riveting tools, etc. And many other tools such as detail clamping jigs.

Currently, the application of compressed air energy in control technology is developing strongly. With new pneumatic tools, equipment, and elements being invented and applied in different fields, the combination of pneumatic energy sources with electricity and electronics is the decisive factor for development. of future control engineering. FESTO (Germany) has a variety of programs to develop pneumatic control systems, not only serving industry but also serving the development of teaching aids[5]

5. Subject characteristics

In terms of quantity: available everywhere so it can be used in unlimited quantities.

About transportation: compressed air can be transported easily in pipelines, over a certain distance. Return pipes are not necessary because the compressed air after use will be released into the environment after the work has been completed[8].

Regarding storage: air compressors do not necessarily need to be used continuously. Compressed air can be stored in tanks to be supplied when needed.

Regarding temperature: compressed air rarely changes with temperature.

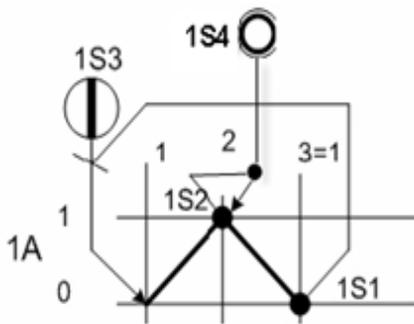
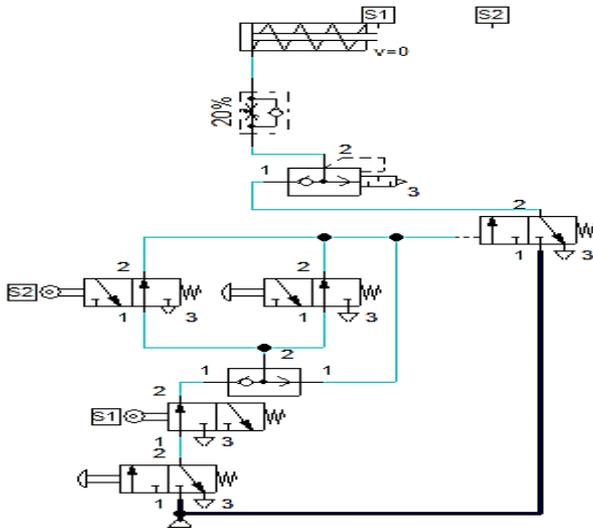
Regarding fire and explosion prevention: there is no risk of fire caused by compressed air, so there is no cost for fire prevention. Compressed air usually operates at a pressure of about 6 bar, so explosion prevention is not too complicated.

Regarding hygiene: compressed air used in equipment is filtered of dirt, impurities or water, so it is usually clean, without any hygiene risks. This property is very important in industries. especially: food, fabrics, forest products and leather [9].

The system has a step stroke chart (picture), for a single-acting cylinder, using a one-sided control reversing valve, which can adjust the speed when the piston comes out; The retracting piston has a quick

release valve.

Let's design the system principle diagram:
Fully controlled by compressed air



Regarding device structure: simple so it is cheaper than other automatic devices.

The operating principle of the devices is atmospheric air, which is sucked in and compressed in an air compressor. Then from the air compressor it is fed into the compressed air system. Air is a mixed gas, including the following components (table 1.1):

Regarding speed: compressed air is a flow with high velocity allowing to achieve high speed (working speed in cylinders is usually 1-2 m/s).

Regarding adjustment: the speed and pressure of pneumatic working equipment are adjusted steplessly.

Example of an exercise brought into the classroom: Show a state diagram of the cylinders of a control system with three cylinders as shown. Design the control circuit according to the cascade control method

3. Conclusion

When encountering a new situation, students tend to compare and contrast it with previous similar problems, thereby finding ways to solve the problem. Using analogical reasoning in the teaching process requires students to work on previous knowledge to discover new knowledge for themselves. Therefore, students are proactive and active to form new hypotheses. This process promotes thinking development because it requires learners to consider, analyze, compare, contrast, and generalize knowledge; From there, it encourages students' passion for learning and is a driving force to promote independent thinking, critical thinking and creative thinking.

This is a method where students can perform many tasks in many different areas in the classroom, meeting many different learning styles such as: practice, discovery, opportunities to develop creativity, opportunities to Read and understand the assigned tasks, then apply and experience them.

To be able to apply active teaching methods, lecturers need to clearly understand professional knowledge, have pedagogical skills, be skillful in behavior, and be proficient in information technology skills to apply them. into teaching, properly orienting students to the set goals while still ensuring cognitive freedom for students.

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