Analysis about the idea of STEAM used in science teaching

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Abstract: STEAM is short for science, technology, engineering, art and mathematics. The development of the teaching of STEAM in china and other countries are specified in details. To specify the special teaching mode , an example of making grape wine is taken .

1. Introduction

STEAM is short for Science, Technology, Engineering, Art and Mathematics. STEAM is well-known for its high efficiency of teaching that are widely used in many high schools in Europe (Xuqing Wang,2015). While in China,the new teaching mechanism is first used in many highly developed cities such as:Beijing ,Hangzhou ,Shenzhen , Hong kong(Qijun Liu,2016). While compared with the STEAM method of teaching in high schools, it is widely used in universities. Different from the conventional teaching methods in class,the STEAM idea urges people to use more experiments and combines science, mathematics, engineering ,technology together to make students' skills best excised. Due to the special teaching targets of STEAM, the classes are often going on in labs and their homework is basically shown as science engineer projects such as the production of robots that can best specify the abilities of students. Apart from the professions that are concerned, art has been added to the research areas to make their products more humanistic. As is calculated that the abilities that has been cultivated during the teaching of STEAM system, students seem to have a far more flexible skills while completing tasks. Although the teaching methods of STEAM may cost more facilities and energy than common teaching methods, the results surprised us a lot and the students that have completed the tasks may likely tend to be more skillful in professions in science than common students. Due to the high teaching abilities that are needed, teachers may need some training before class. The STEAM idea seems to be a promising teaching method in the long run.

2. Steam teaching status from home and abroad

2.1 Compared with the teaching status in China the STEAM teaching idea has been widely used for years

Launched in America, the STEAM teaching method was first used in many European high schools which cooperated with many outdoor school institutes such as the public libraries (Jiagui Zhou, 2017). While in European schools, students are encouraged to be good learners in their whole lives.

2.2 Hongkong is known as the best city that has used the STEAM idea of learning

Different from the conventional studying system, the STEAM studying system combines the education of the universities with the high school in subjects like science, biology, physics, chemistry, mathematics, engineering, computer science. The universities offer places and facilities for the experiments and some technical support when needed. While students in high schools try their best to accomplish their experiments. Some special facilities like the 3D printer and many high price electronic equipments are available in universities. High school students have the most curious towards nature and science,and may be the most energetic ones to tackle with the obstacles when

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they do the experiments. With the combination of the universities and the high school, students in the high school are more likely to choose science as their major subject while they entering the university and may work in the relevant professions.

In many rural areas in China the education leakage has been the teachers and some studying equipments compared with the highly developed areas such as Beijing and Shanghai. To make the STEAM teaching idea widely into use, the government and the local universities have to help the high school in science teaching. Only by this way, can the teaching efficiency been largely improved and the consequences may surprise us beyond our thought.

3. A teaching example in biology as the making of grape wine

The general principals of the experiment:

As we all know that the breathing mode are included of two types: the aerobic respiration and the anaerobic respiration. The aerobic respiration mode is:

$$C_6H_{12}O_6+6O_2+6H_2O=6H_2O+12CO_2+ATP \quad (1)$$

The anaerobic respiration mode is:

$$C_6H_{12}O_6=2C_2H_5OH+2CO_2+ATP \quad (2)$$

To make the grape wine delicious, the grapes have to be the anaerobic respiration breathing mode as far as it can.

Equipments to measure the emission of CO_2 (Figure 1, Table 1, Figure 2):

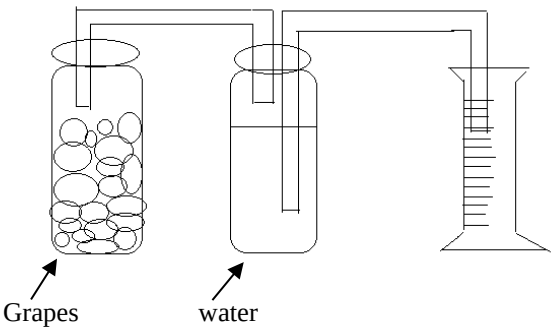

Figure 1: Equipments of the experiment.

Table 1: Record of the experiment

	First day	Second day	Third day	forth day
The volume of CO_2				
The volume of C_2H_5OH				
The transference of $C_6H_{12}O_6$				

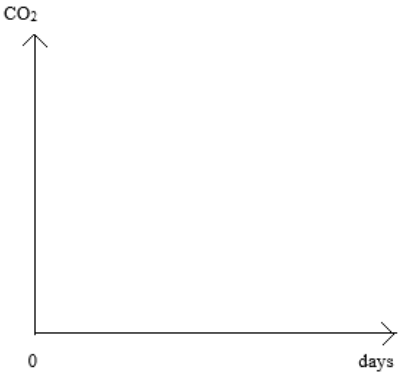

Figure 2: the production of CO_2

At the temperature of 35 °C, the grapes can be turned into alcohol without oxygen. Students have to calculate the gases that emit by the grapes to estimate the stages of the chemical reaction.

At the first stage of the experiment, there will be some aerobic respiration since the existence of a merely volume of O2. After a few days ,the production of alcohol will begin. To avoid the suck-back of water because of the emission of alcohol, students can drop a layer of oil on the surface of water at the second bottle of the equipment.

To make the experiment been successfully made ,students should take care of the temperature and time for the experiment. Firstly the materials should be fresh and clean and be care of the peel of the grapes. As the experiment is carried on by the help of the enzymes which exist on the surface of the grapes. Secondly, to avoid the pollution of other bacterium, students have to make sure that the equipments and the environment for the experiment are clean and safe. To make the experiment been successfully done, the amount of sucrose should be 10%-30%. Thirdly, with the production of alcohol, there still exist some impurities such as the methanol which is pretty bad for eyes. To make the alcohol safe, some special measures must been taken to purify the production to get the pure grape wine.

From the experiment, students can combine the knowledge of math, biology, chemistry and engineering together and cultivate an ability to use knowledge and make what they really want.

4. Conclusions

The STEAM teaching mode is a high proficient teaching method which can exercise the knowledge of science, technology, engineering, art and mathematics. Teachers should cooperate to design the classes flexibly to make the STEAM training been completed successfully.

The mechanism is more than a simple teaching method, it is more likely a comprehensive application of the multiple classes such as science, technology, engineering, art and mathematics. Apart from its high efficiency for teaching, the comprehensive teaching method seems to be a challenge to both teachers and students. To best complete the laboratory experiments, students abilities of cooperating with each other are in grate need. The combination of the talents of different students can help them making a good job.

Teachers who are majoring in different professions have to prepare for a mutual class and have to stand by when students are in need of teachers help which may seem outrages compared with the common way of teaching, while the consequences may suppressed us. Students who have completed the STEAM classes are more likely to have an ability to tackle with the obstacles that emerged in their lives which are in desperately need in the modern society. Besides. Students who completed the STEAM tasks are more likely to engaged in the science professions when they are graduated.

Apart from the equipments of the laboratories, teachers when teaching classes may use a multi-class teaching method. While any problems can be solved in many ways more than just one major, teachers can explain a concept in a flexible way that may be a combination of science, technology and mathematics. By the influences of the teaching method of teachers, students are more likely to be able to solve practical problems (Yaping Yang, 2016). By this way, kids are more easily to absorb the true meaning of science and the ultimate teaching target may be completed successfully.

The comprehensive way of analyzing are the key target of teaching. Students who are able to analyses the problems they are faced with in a multiclass thought and solve the problems in an high efficient way no matter what knowledge they use.

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