

Teaching Chemistry from Laboratory Passive and Unilateral Methods to Active and Interactive (Bilateral) Methods

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Abstract: *In this paper, researcher, by library study of evolutionary and historical trend of teaching chemistry, and through descriptive and analytical method has tried to investigate and compare methods of teaching chemistry, to show the importance of modifying teaching methods from passive to active. Instability of presented contents in the classroom, in the minds of students, on the one hand and the low interest of students toward the contents of lessons, on the other hand is one of the issues that most of educational systems are suffered from it, which one of its main reasons is applying traditional and passive methods of teaching in the classroom. Therefore, the most effective methods of teaching can be using active and interactive (bilateral) methods, such as laboratory and testing. Studying and comparing results of performed researches will prove this important issue.*

Keywords: *Teaching Methods; Laboratory Methods; Traditional Methods; Inquiry; Unilateral Methods, Interactive (bilateral) Methods*

1. THE IMPORTANCE AND NECESSITY OF RESEARCH

This study based on searching documents and field studies, has investigated effectiveness of laboratory activities in teaching - learning chemistry concepts. So that, the position of laboratory activities in methods and techniques of teaching - learning will be expressed. Then, on the basis of research findings, it will present practical strategies to optimal and effective usage of laboratory activities in teaching chemistry at the secondary school. Laboratory has played a critical and distinctive role in sciences education, and science teachers have always believed that there are many advantages, in doing experiments and paying attention to laboratory activities, for students.

The first point in each school will be discovering talent or talents of individuals who are their students (Huntington 1993). Teachers should pay attention to orientation of teaching students by developing skill and habit of thinking through valid researches and evaluating practical experiences in classroom, so that educational and scientific projects become applicable (Windchill, 2002).

Practical activities, beside helping learners to observe and develop information, will help them to achieve an applied understanding from scientific theories, and by their new mental patterns their ability in scientific analyzing and interpreting will develop. These activities, mainly takes place in laboratories, and sometimes, in nature or academic – industrial institutes (Badriyan;2009).

Improving the skills of solving problem is as a result of practical work, removing ambiguities and effectiveness in developing thought, by using creative thinking, improving the creativity after students' involvement in practical work in chemistry. (Abrahams, 2011)

So that, schools and regions can take advantage from obtaining specific and applied skills in converting instrumental methods in math and experimental science (Anderson - Secada and Williams 2003).

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Therefore, to achieve this goal, instruments, methods and facilities should be used that the method of learning and teaching are some of them.

So, understanding and reinforcing learning chemistry concepts is the main necessity of this research. Learning is based on reasonable organization and approach, increasing more and desirable function in laboratory activities, as well as, rising motivation and interest of learning chemical concepts.

2. THE PURPOSE OF RESEARCH

Investigating the impact of passive (unilateral) and active (bilateral) teaching methods on amount of learning theoretical concepts of chemistry among students

3. METHODOLOGY

Researcher, by library study and evaluating the results of scientific performed researches, investigations and experiences, which have obtained during many years of teaching chemistry, has tried to discuss and analyze desired method of teaching. Practical activities are called a series of activities by which, student through them will find an opportunity to deal with objects, by scientific observation and data collection through instruments and models; and the majority of these activities are performed in the laboratory (Hofstein; 2004). Twenty years has been passed since publication of the last critical article about sciences' laboratory researches. Twenty years later, we're in the era, in which new technological resources have developed along with new standards of sciences' laboratory, so that, it has transformed the statues of central sciences laboratory. Obtained methodologies during these 20 years help researchers to be more accurate in their assessments, as well as, students' functions in laboratories will evaluate more precisely. Furthermore, during these 20 years, we can acknowledge the improvement of learning by teachers about principles of expected outcomes (Hofstein and Lunette 2004).

The reports of studies related to effectiveness of laboratory, has suggested that there should be a greater degree of relationship between different levels of experiments in high school and community (Hillocky, Schuman and Schumacher 1998).

Chemistry, until the late 19th century, has been discussed as an experimental laboratory science, and in its educational programs, laboratory techniques and skills to supply chemical material were taught more than other issues.

Before 1980, most of Curriculum experts have been faced with this question, "what issues should be taught in the chemistry curriculum". And in the late 20th century, this question was proposed in the world scientific centers that "what should be learned by students". By beginning 21st century, various factors influenced teaching methods and learning chemistry. Analyzing and reviewing what students have learned and their understanding from various scientific concepts and identifying available misunderstandings have provided many information about effective learning conditions based on teaching and learning approaches, using constructivism, and inquiry approaches (Badriyan2009).

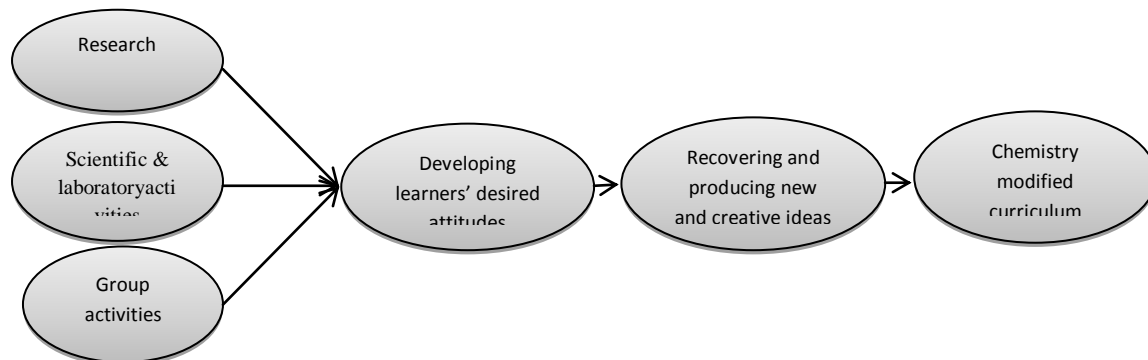
In the 20th century, the importance of science and technology has led to increasing paying attention to teaching sciences, which were the origin of technology and economic development, and chemistry also was one of them. In the years after First World War (1914-1918), there were some progresses by discovering oil reservoirs around the world, manufacturing all kinds of automobiles and airplanes, oil-dependend industries and energy-supply from fossil fuels. Therefore, reformulating curriculum and teaching chemistry rose more than before. So that, in those years, chemistry, in comparison to others, became the most important curriculum.

World War II led to intensive decrease in teaching chemical and curriculum in the years of 1940-1945. While Europe and other countries which were involved in World War II have passed reconstruction period, United States of America could attract migrants from teachers, instructors, scientists and eminent professors from different universities of the world, as well as, develop new curriculum based on scientific findings and experiences of different countries.

Since the main goal of these programs was training and developing future scientists and students' entering to university, laboratory activities and presentational experiments in teaching chemistry has been more than before; and it has tried to convert content of lessons from theoretical and

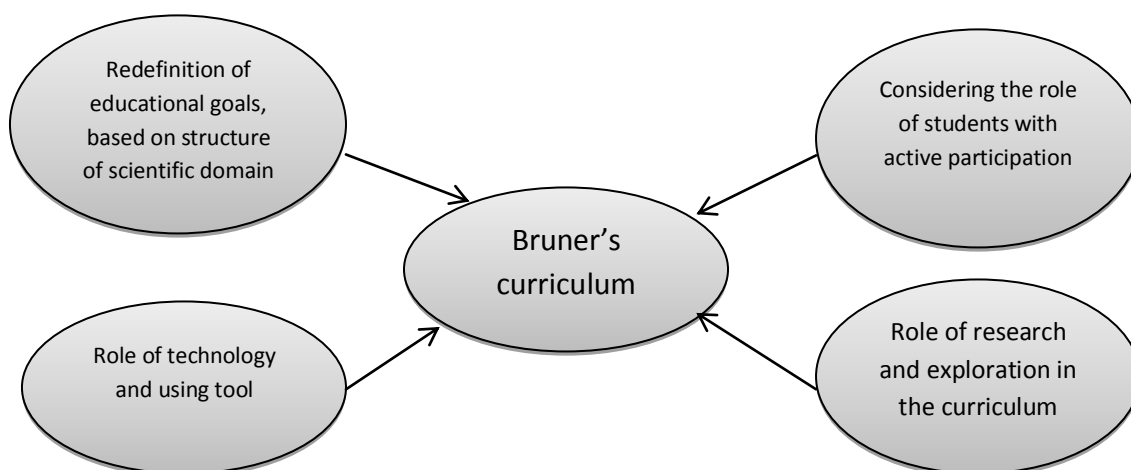
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descriptive form to discovering concepts. Using problem-solving method in teaching chemistry and implementing laboratory activities has provided new developments in chemistry curriculum (Badriyan2009); and on the basis of it, proposed model can be seen as follows.



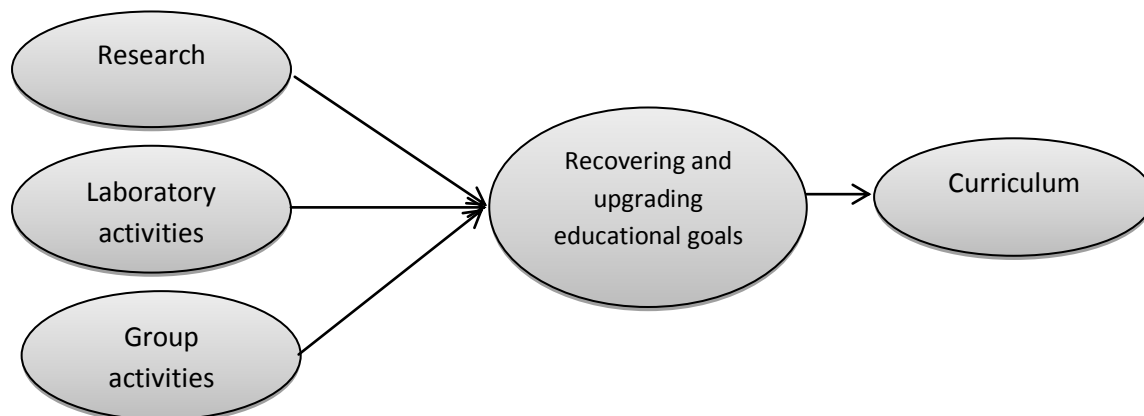
Plan- 1, model (1)

Bruner's curriculum in various branches of chemistry in decades (1980-1950) can be seen as follows.



Plan2- Bruner's Curriculum in new content of chemistry

By integrating this format of curriculum and proposed model1, we will follow proposed model.



Model 2

By comparing model (1) and model (2), we find that in decade 1950-1940, producing and developing learners' favorable attitudes to recovering and upgrading creative thoughts, will change in next three decades (1980-1950) as evolution of educational goals with scientific structure, and will be effective on developing curriculum.

The most important Chemistry educational projects of “Spotting” period, at 1960s, was educational project of Chemical Band Approach (CBA) and Chemical Study in United States and Nuffield Chemistry Education in England, which have provided the basic core of transformations, Chemistry Education reformations in these Countries and other countries (Badriyan2009).

A plan, entitled “chemistry, experimental science”, in 1973, was translated into Persian by Professor AhmadKhaje Nassir Toosi and was taught in previous “teachers colleges”. This project, in addition to Iran, has been used and translated in more than 30 countries, such as the former Soviet Union (USSR). The most important feature of this plan was its methodical approach that has led to experimental data collection, their classification, data processing, system discovery and conceptualization. This plan was completely based on testing and through doing experimentation, has followed the approach of system discovery and concepts (Khalkhali; 1999).

In this project, very precise and purposeful experimentations have been designed that were exciting and stimulating, and their performing have led students to mental models and related concepts. For example, learners, during doing the experiment of candle burning have investigated some other discoveries and free activities such as determining candles’ melting temperature, collecting and identifying metadata of candle burning.

“Huard” (1964) suggests that laboratory work in the classroom should concentrate on important ideas, and textbook should be prioritized; and it is emphasized that laboratory work should much emphasis on examples, explanations and proves (Lunette; 1976).

Chemistry as an experimental science, is one of the most important branches of experimental science, and has a conceptual and a methodological structure. Knowing the way of providing knowledge of chemistry, not only results in a meaningful and sustainable learning, but also will lead to reinforcing students’ intellectual and practical skills (Sultan Beigi;1999).

Learners can achieve some progress toward science and improvement in levels of success work in scientific knowledge, by investigating practical experimental programs. As a result, students through appropriate laboratory instruction, in scientific knowledge will obtain considerably, more scores than those who act without instruction laboratory (Friedman, 2002).

Therefore, applying laboratory and practical work will cause that learners, meaningfully organize realities and facts and find a general and original principle. Deductive skills, in getting the spirit of getting scholarship among learners, and awareness of the nature of science and rational thought play an important role.

4. CONCLUSIONS

Performing experiments through inquiry can help learner to obtain a scientist’s necessary skills. These skills include planning, careful observation, measuring, accurate recording information, accurate providing results, and finding logical relationship between variables, which in addition to doing experiment will help learners to reach a true perception of scientific concepts, as well as will help them to think about the goals of experiment, and actively participate in exchanging information on teacher’s experience and information. Furthermore, testing will cause scientific facts become more actual and will bring more excitement in empirical sciences such as chemistry. The overall results indicate that the factor of teaching method is effective in learning chemistry theoretical concepts, therefore, it can be suggested that if there is great attention in changing patterns of teaching and skills of teaching method, and facilities that help teachers by techniques such as laboratory methods and using software which are designed to basic sciences being familiarize with proper training, teachers can take advantage of appropriate methods and tools, according to the subject of their teaching, while they are necessary.

Current scientific models can assess knowledge obtained from students, collected data by teachers and interaction between them, in science laboratory activities.

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