DEVELOPMENT OF STUDENTS' LEARNING ACTIVITY THROUGH TEACHING CHEMISTRY

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Abstract

Today learning activity of students becomes a great significance for success of both education and life. There are at least two concepts of learning activity. One of these concepts considers learning activity as characteristic of personality. The second concept considers that learning activity is a learning action. Learning activity as characteristic of personality includes three levels. First level is reproducing activity. If students have some knowledge of chemistry they can achieve second level was named interpretative activity. Third level is creative activity.

Researchers in chemical education consider mainly learning activity as action. Many methods of stimulating students' learning activity have been developed, but problem of improving learning activity as characteristic of personality in chemical education has not been resolved.

Theoretical and experimental research allowed us to create the pedagogical model for improving learning activity of students as characteristic of personality. Reproducing activity requires stimulating motives for learning. Motives "interestingly" and "usefully" are very helpful for this aim. Improving of interpretative activity requires a success in learning was achieved. The concept of cognitive strategies is very useful to improve a creative activity. There is difference between terms "cognitive strategy" and «learning method". "Learning method" is a particular way of studying. "Cognitive strategy" is a mental technology of thinking.

We tried to help all chemical teachers to realize the model. We had formulated 7 simple rules with the aim of improving learning activity of students.

Key words: *chemistry education, learning activity, students, seven rules*

Introduction

Russia develops the state educational system in the direction of an active learning approach. The Federal Educational Standard declares new requirements for teaching in a school. Teacher should organize systematical and active approach learning work, therefore, the learning activity of students becomes a great significance for success in both education and life.

Learning activity

There are at least two concepts of learning activity. One of these concepts consider learning activity as learning work. Russian researches T.Shamova and G.Shchukina supposed what learning activity as characteristic of personality includes three levels. First level is reproducing activity. If students have some knowledge of chemistry they can achieve second level – interpretative activity. Third level was named creative activity.

Reproducing activity students begin to study chemistry. They haven't a positive experience of solving problems. Their motives for learning depend on teaching methods. To take an interest in chemistry they need a fun. These students have not ability to study without teachers help.

Interpretative activity students have already some knowledge of chemistry. They be able take a part heuristic education, solve chemical problems. These students want to understand essence of chemical phenomena. They want to master new skills. These students know that problems solving gives a feeling of success, a feeling of bliss. They have a some clash of wills to study. These students want to have a learning success; therefore they try to overcome learning difficulties.

Creative activity students have a high level of learning interest. They can understand essence of chemical phenomena. These students can find new way to solve problems. They have a high clash of wills and persistence. These students be able to organize and be able to plan their process of learning chemistry.

Researchers developed various methods for improve learning activity of students. These methods are: problem solving; learning games; a chemical experiment; to improve a motivation; a positive emotional education; an entertaining learning; a heuristic methods of teaching; to use a fiction; using of an information on interaction between chemistry and human life; prepare a situation of learning success.

The model for improving of learning activity in chemistry education

We suppose learning activity can been improved in secondary and high education. Many methods of stimulation learning activity have been develop, but the problem of improving learning activity as characteristic of personality has not been developed. The theoretical and experimental research allowed us to develop the pedagogical model for improving learning activity of students. We created this model on the basis of A. Maslow concept of self-actualization. From our point of view learning motives are part of human needs for an activity. Teachers should choose optimal methods of teaching that depending on learning activity level in accord with our model. Development of reproducing activity requires stimulating motives to learning. Reproducing activity students need to stimulate motives for learning. Motives «interestingly» and « usefully» are very helpful for this aim. The reproducing activity development need to use such methods as educational research and experiments, visualization, educational games, an using a fiction, art, the movies, history of subject, the media, interactions between learning subject and life. Improving of interpretative activity requires a learning success have been achieved. Students need to choose a kind of activity, methods for solving problems. Learning success needs gradual development of subject concepts understanding, an ability to solve problems. Metaphors have a great importance to many students. Metaphors help students to understand difficult subject concepts. Repetitive feelings of learning success allow a teacher to improve learning activity of students. Improving of creative activity requires lot knowledge. These level students need careful thought about their thinking. An understanding of own thinking style helps students to find a creative way to solving problems. Interpretative activity students need other advanced pupils, teamwork in a classroom for overcoming of learning difficulties. Creative activity students should to use project activity, learning research, participation in educational competitions. The concept of cognitive strategies development is very useful to improve a creative activity and students' research competence. According to our experimental research students use algorithmic method as a rule. However most of student can't solve different problems. Students have to use more than one strategy to develop the competence in creative problem solving. For example in addition to mathematical strategy they should use logical or visual strategy. For this purpose teacher should increase step-by-step the difficulty of problems and discuss strategies for solving these problems with students.

There are below the basic principles of students' learning activity development.

1. The main aim of our concept is development of student's personality. Our model will allow students to become subjects of the learning process. They will acquire the ability to organize their thinking and learning work.

2. Students need learning work for development their learning activity as property of a personality.

3. Learning work should be the development source of learning activity as property of a personality, if it will be based on internal positive educational motives. These motives can be related students' learning interest, success in solving problems and overcome academic difficulties.

4. Every child by nature has a strong desire for knowledge but not always for class work. This desire becomes stronger in the learning process by using the optimal teaching methods.

5. Students' learning activity reduction is due to several factors: systematic failure of solving problems, negligent attitude to the learning process, individual characteristics.

6. Students' learning activity development in personality-oriented teaching can be built as a result of the gradual actualization learning motives, creating of a learning success, receiving of new

cognitive strategies based on multimodal learning.

7. Students' training and management of students' learning activity are two inextricably linked parties of the educational process.

8. Most important task of a teacher is improving of his ability to choose optimal methods and forms of teaching.

9. Internal positive desire to acquire new knowledge, to gain new skills is criteria for the achievement of lessons success.

10. Learning interest is primary stimulus for study as a rule. It requires minimum volume of knowledge of solving problems success.

11. If interpretation activity students encounter difficulties in the learning process they desire to change will grows faster.

12. Teachers' methods have not only teaching but also diagnostic function.

13. Teachers can choose teaching methods by using students' learning activity level, learning situation, and individual characteristics of students.

14. Teacher can enhance reproducing activities of students by using teaching methods focus on increasing positive emotional background of the training and actualization of motives "interestingly" and "usefully".

15. Students' interpretative activity is based on an achievement of a success situation.

16. Students' creative activity requires the ability to overcome learning difficulties.

17. Each educational topic should been include all levels of learning activity (reproducing, interpretative, creative) methods.

18. Learning success of students is based on the application for teachers to choose optimal methods of development of leaning activity as property of personality.

The diagnostic system for choose optimal teaching methods is the cornerstone of our model. Teaching methods have not only teaching function but also diagnostic function. Diagnosis of group features, individual characteristics and learning situation is the basis for learning methods optimization. Active study, learning success, new cognitive strategies acquisition are the basis for improving of students' learning activity. Thus our model of students' learning activity development includes the new diagnostic tools, new diagnostic criterion, the idea for development of students' cognitive styles and strategies.

Seven rules for improving learning activity of students

All teachers want their students have good knowledge and skills. Learning activity of students should improve for this purpose. Teaching methods need to conforms with level of students' learning activities. It is hard to choose best teaching methods for many teachers, because they have not enough knowledge of psychology and didactic methods. We are suggested only seven easy rules for chemistry teachers.

Rule №1«Firstly, students need to take an interest in chemistry, and just then they'll wish to study chemistry»

No strong actvity,
without pesonal interest.
Lev Tolstoy

In the Russian fairytale that reflects the wisdom of the people, it had told: «Firstly, feed me, give me a drink, lay me to sleep, and just then - ask me!". Motives are the basis of some activity. It is important that these motives were internal. For improving students' interest on chemistry lessons teachers should use: chemical experiments; educational games; teamwork; information about the history of chemistry; interconnection between chemistry and art (poetry, prose, fragments of movie, painting, sculpture), other subjects (physics, mathematics, biology and others), the media (TV, radio, Internet, magazines, newspapers); an interconnection chemistry with human life.

Rule №2«Firstly, students need to learn substances, secondly, they'll want to study their structures»

From living perception to an abstract thought,
and from it to a practice
V. Lenin

Substances and their properties are the subject of chemistry. Firstly, students need to learn substances, secondly, they'll want to study their structures, chemical formulas and chemical equations. This rule applies to both the method of constructing an initial course of chemistry, and the method of constructing each individual topic.

If we ask students: "Where do we find chemical elements?" We can hear the answer: «In the Periodic Table!». This answer is the indirect indication that the rule №2 has not been realized. The expected response can be like this: «Chemical elements exist all around us and into our body. All material world, including you and me are made from tiny particles called chemical elements. More than 100 chemical elements well known».

Rule №3 «Firstly, students need a practical experience, secondly, they can learn a theory»

Grau, teurer Freund, ist alle Theorie,
Und grün des Lebens goldner Baum
Johann Wolfgang von Goethe

What majority of students prefer, to learn theory or practice? We think that the answer is clear. A theory is a scientifically valid way to solve problems of human life. Theory as an instrument to solve practical problems is significant and full of meaning. But a theory without practice hasn't significance, not uderstandable for students. They need to encounter life' problems then this theory will be important, easy to understand.

Rule №4 «Interconnect chemistry with human life»

Teachers need to use information from other areas of life: a history of chemistry; an art (a poetry, a prose, the cinema, painting, sculpture); daily life (health, a household, professions); media (TV, a radio, the Internet, newspapers, journals); other subjects (biology, geography, physics, literature, mathematics and others).

Example of chemical problem: «Alchemists didn't know about the chemical composition of substances. They used words instead of chemical formulas and equations. Goethe in "Faust" wrote an example of the alchemical procedures:

Da ward ein roter Leu, ein kühner Freier,
Im lauen Bad der Lilie vermählt,
Und beide dann mit offnem Flammenfeuer
Aus einem Brautgemach ins andere gequält.

We can suppose that the «roter Leu» is a red mercuric oxide (HgO), and the «der Lilie» is hydrochloric acid (HCl).

1) Write the equation of chemical reaction between "roter Leu" and "der Lilie".
2) What mass of «roter Leu» will react with 100 g 36,5% "der Lilie" solution?

Rule №5 «Learn chemistry deeply»

It is necessary to combine a hearing
and a vision, a talk with activities of hands
Comenius

A teacher shouldn't begin a new topic until students achieved success in learning. It is necessary to ensure that students: in their thoughts have seen substances, and their structure, be able to demonstrate structures of substances using models and formulas, know how to describe their

internal representations by words. Visual, auditory, kinesthetic, digital styles of representation should integrate into a common image. Students should use these styles to think.

Rule №6 «Students should use chemical calculations to understand chemical formulas and chemical equations»

Chemistry is fundamental science. Chemistry is the scientific study of the structure of substances, but formulas and equations have great importance for understanding chemistry. If students hadn't understood what is "chemical formula", "chemical equation", purpose of teaching chemistry is not achieved.

Students need to use mathematical calculations for the understanding of the concepts of "chemical formula" and "chemical equation". Difficulty of chemical calculations should be increased gradually.

Rule №7 «Prepare a success in learning of chemistry»

If teachers have performed six previous rules students will be ready to self education. Teacher should explane easy way of solving problems to students. Because of students can use different cognitive strategies, they will any way for solving chemical problems or offer on their own. It may happen that a one student will choose a one method of solution, and an other student will choose a second way, and a third student will propose his own method. In this case students can discuss various methods of solving chemical problems without a teacher. A content of the course can be depends on what the students would like to study. Following teaching methods can be used:

- an heuristic conversation;
- a best choice content of course, methods and ways to solve chemical problems;
- educational research activities;
- self reflection of cognitive styles and cognitive strategies;
- training students for competitions and conferences;
- solving chemical problems should interacts with problems of human life.

Conclusion

Our experimental research showed that using of these rules increases learning activity of students. For example we found that chemical problems with a life context had increased the number of participants in the regional Chemistry Competitions for 2 years in more than 2 times.

References

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