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Review article

ELIMINATION OF STUDENTS`PROBLEMS ON THE MEANING OF HYDROCARBONS

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Abstract

The purpose of this study was to investigate the effects on student's achievement and misconceptions of new teaching method developed for the hydrocarbons. The new material included worksheets based on the conceptual conflict strategy. The sample consisted of 63 students. The research was carried out with an experimental/control group design and lasted for four weeks. The Concept Achievement Test was used to collect data before and after the study as pre-tests and post-tests. The results from the post-tests indicated that the students in the experimental group, taught with the new teaching method, showed significantly greater achievement in the unit than did the students in the control group. This shows that the misconceptions in the experimental group were less than in the control group.

Keywords: hydrocarbons, misconceptions, experimental and control group.

1. Introduction

Teachers must always be inspired to be constantly creative in the classroom by implementing constructive and principled methods. Teacher inspiration often has to be improvised at certain moments in creative practice that may arise from the students' initiative or idea, and the same can be realized individually or in groups. Teachers' creativity and innovation is a fundamental condition for progressive and constructive activity because the classroom should be applicable and followed by an atmosphere that promises a positive climate, mood, and creativity.

A priority in their professional work each teacher should realize activities that incite creativity, a good atmosphere, critical thinking models as well as and applicability of classroom teaching appropriation and meaningful process of learning.

The moral value of inspiration should focus on elements of model lessons, student worksheets, with projects initiated by students so that they are not only creative, but the same to realize the practical initiatives of their learning. The very nature of the teacher's profession obliges some of the conditions of responsibility of a moral nature, social and human nature. These responsibilities shape the personality of each teacher, therefore the activity of the teacher is conditioned by the responsibility of a moral nature for the fact that the student before all is a human factor, who must be educated in the spirit of moral virtues because he must be positively educated, and then be a creature that applies, radiates and demonstrates the character of positive morality in the circle and social space in which he lives and acts.

During the work activity, the teacher can have complications and various concerns even very surprising, but there may be activities which can very often be an objective obstacle to the planned realization of the lesson.

In such situations, the teacher must always be prepared to eliminate all obstacles timely, by planning well for the realization of the lesson. The teacher must constantly search for his / her challenge in applying creative methods of the model lessons, with the aim of permanent commitment which focuses on the values of scientific achievement, moral and professional. The teacher should always be engaged in the practical research of the most up-to-date forms and methods so that the scientific achievements to be transmitted and applied promptly and to be as practical as possible on the part of the students.

At the beginning of the new millennium, science, technology, and society as a whole are subject to major changes. The rapid growth of knowledge across a wide range of different sciences initiates numerous scientific and technological achievements that will profoundly influence our lives and will transform everyone's culture, it can rightly be said that every innovation in any field whether in information or communication technology can bring about radical change.

The changes are a consequence of the development of science in many fields and as a result, these changes bring constant growth in each domain. In the past, the evolution of knowledge has been performed at a rapid and measured rate, with time scales of the order of magnitude of one generation, whereas with today's time of technological development, the period of double magnification of knowledge is five or fewer years (Bardhyl Musai, 2005).

On the one hand, the rapid development of science and technology gives hope for the improvement of life on a global scale, on the other hand, the rapid development of knowledge creates a challenge not only for society as a whole, but also for the individual who is obliged to fulfil, but not infrequently, to change what he or she has learned before, and to adapt to new developments. Unforeseen situations and the need for quick response can cause concern for the individual and society at large.

Found in such a situation estimated as a time of rapid change, the quality of science teaching has become a central theme in many countries around the world. Adequate educated students as prospective citizens are counted as the main source of preparation for the future of a country (Anderson, 2001)

For many researchers, it is important to research from which teaching methods the students gain more knowledge of new concepts that naturally contribute to the teaching and learning of the subject of chemistry.

Ozmen in his research has found misconceptions valuable in students' understanding of chemical bonding (Haluk Ozmen, 2004), while Michal in his studies has researched the impact of books and teaching methods for understanding reactions of acids and bases (Schmidt, 2005). Referring to studies always done in this field, we learn that the researcher Inci has also studied some factors that may affect students, such as their abilities to use computer simulations (Inci Morgila, 2003). Over the last three decades or so, various teaching models have been developed to change learners' misconceptions into scientific conceptions. This type of study has been phrased as conceptual change models (Posner G.J., 1982). In general, conceptual change has been described as part of a learning mechanism that requires the learners to change their conceptions about a phenomenon or principle either through restructuring or integrating new information into their existing schemata (Hewson P. W., 1981). The best-known conceptual change model has been that of Posner, Strike, Hewson, and Gertzog (1982). Based on conceptual change theory, cognitive conflict is known as an important factor in conceptual change (Posner et al., 1982; (Hewson H. P., 1984); (Hewson P.W. and Thorley N.R., 1989); (Niaz, 1995), even though there are still questions about its positive and negative effects on science. Several researchers have shown that instruction based on conceptual change can be effective at changing students' chemistry conceptions (Basili P.A. and Sanford J.P., 1991); (Ebenzer P. and Gaskell J., 1995). Hewson and Hewson (1983) employed a conceptual change approach to promote conceptual change in students regarding density, mass, and volume concepts. This study showed that the use of instructional strategies taking students' misconceptions into account results in better acquisition of scientific conceptions. Basili and Sandford (1991), however, have found that most students retain their misconceptions, and teachers may have difficulty teaching conceptual change. Moreover, many strategies have been suggested for facilitating conceptual change in the literature (Driver R., 1989); (Dykstra D., Boyle C. and Monarch I., 1992); (Guzzeti B., Snyder T., and Gamas W., 1993); (Smith C. Blakeslee E. and Anderson T., 1993). Through the chemistry education process, many remaining pending controversies are resolved, such as students moving from a state of ignorance to a state of knowledge from a state of incomplete knowledge to complete knowledge, or from the state of knowing the content of knowledge to a certain degree, until the maximum immersion in the content of occurrences.

Such a characteristic of the educational process enables us to conclude that through the educational process, students' knowledge of chemistry is realized, specifically considered as a good opportunity to discover their abilities rapidly to acquire the knowledge that humanity knows.

The process by which humanity throughout its existence has been fulfilled with knowing is called knowledge. This process is primarily accomplished through scientific research aiming at new results and discoveries that are unknown to both the researcher and all mankind.

Clarifying the learning process, its main principles and laws, and solving problems for active learning students are considered some of the educational problems in learning, therefore teaching methods should be used to solve such problems which provide quality discourse for all students to fairly apply, to remember and use knowledge by aiming that through acquired naturally knowledge to be created the necessary habits. By using different teaching methods during the learning process, students will increase their expressive and intellectual abilities always in line with existing norms. Proper application of teaching methods enables students to gradually adapt to the observation of knowledge and to scientifically explain it through acquired studies.

For a successful fluidity in the way of new perceptions are conceived, it is essential that the researcher fairly chooses the teaching method of lecture of the new teaching content and should not always use it, because each method is useful to a particular place.

Recent studies point out that scientific efforts have been made constantly for the most effective application of chemistry teachings, focusing mainly on the questions:

- *What should we lecture to students?*
- *How to teach them?*

While studies have concluded that students must constantly:

- *Think like scientists*
- *Know of any scientific content.*

In this regard, the computer presents a high potential advantage by becoming an irreplaceable instrument for scientific research in the science of chemistry, creating opportunities for improving the learning process to a high level more sophisticated than the traditional way of teaching.

The main goals of this research are:

- To present the most suitable method for a better and easier grasp of doubts over the hydrocarbons.
- To be realized the questions and activities that encourage high-level scale assessment knowledge, based on Bloom's Taxonomy levels.

2. Methods and sample

2.1 Research Methodology: The research was conducted in three first-year classes (age 15) with 63 students in High School “Skenderbe” - Preshevo where three experimental groups were selected. In two of the experimental groups, the learning units were implemented using computerized simulations, and real experiments with additional literature, therefore the appendix that we think - should have been present at the same time when different activities took place. While in the other group, the learning process was developed using the same traditional method. The same teaching content was realized without any experiment based on the traditional method and with ordinary gymnasium textbooks.

2.2 Activities: The students from the EG were divided into five groups, and each of them consisted of five to six students. Every group received a teaching sheet with instructions on how to perform the activities. Students did real experiments and answered the requests and questions from the sheet while performing simulation experiments on the computer to supplement real experiments, and they also observed animations which helped them get a clearer picture about processes at a molecular level. Then, they were supposed to present their results, discuss and explain, and draw conclusions. Two weeks later, both groups did a post-test.

2.3 Research methods: The paper entitled "Elimination of problems on the meaning of hydrocarbons" was implemented based on the methods: Computerized and experimental methods and the classic method.
Through the use of the above-mentioned methods, we have tried to highlight some data on the effectiveness of the above methods for students.

2.3.1 The learning process in the control group: The control class used the conventional method (project-based learning). Control class conducted in one meeting, the activity consists of initial, core, and final activity. In the initial activity, the teacher evaluates the initial knowledge of students by giving a pretest for 15 minutes. Student's achievement in the control class gets from the result of the test in the posttest. In the core activity, students taught by using the conventional method, which explained hydrocarbons, especially alkanes. The teacher gives questions to the students to know the ability of the students to understand hydrocarbons. The last activity is where the teacher and student conclude together. Then they are given the posttest to measure how far the student understands about the topic that was explained before.

2.3.2 The learning process experiment class: The learning process is the same with the control class, this process aims to know the initial knowledge of the student in both of the classes before doing the treatment. To make a comparison between experiment and control. In the core activity, the researcher gave a mind map about hydrocarbon generally using project-based learning. Then explained hydrocarbons, especially about alkane using PowerPoint and real experiments. Besides that, in the subject matter of molecular structure. After finishing making the molecular structure, the researcher showed students the molecular shape in 3D. Making students interested in the learning process. Although it was not too effective because students couldn't try it by themselves because of limited computers, but it made them more interested to see the 3D shape of molecular structure. For the learning process, students were active in answering every question that was given. The last step is evaluation. That is obtained from students' achievement; students' achievement is obtained based on their score in the evaluation test of posttest who answer rightly. There are 10 questions in each test that cover the hydrocarbon topics.

3. Result and Discussion

The research was conducted in three first-year classes (age 15) with 63 students in High School "Skenderbe" - Preshevo where three experimental groups were selected. In the control class, there are 22 students, the average pretest score is 25.57% and the posttest score is 47.07%. In the experiment class (EG), there are 21 students. The average pretest score is 31.27% and the posttest score is 71.59%. In the virtual class (VG), there are 20 students. The average pretest score is 34.28% and the posttest score is 63.85%.
The gain percentage between the post-test score in the experiment (EG) and the control class is 24.52% and the gain percentage between the post-test score in the experiment (VG) and the control class is 16.78%. It shows that there are differences in student achievement between EG and VG with control class.

Table 1. Comparison of results of the pre-test and post-test for the controlling group (CG) and experimental group (EG). *N* is the number of students; $\bar{x}$ is the average result; *s* is standard deviation; $\Delta\bar{x}$ is the difference in the pre-test and post-test results; *t* the result from the test statistics.

Statistical parameter	**CG**		**EG**	
	Pre-test	Post-test	Pre-test	Post-test
N	22	22	21	21
$\bar{x}$/%	25.57	47.07	31.27	71.59
S	16.27	14.64	7.66	10.90
$\Delta\bar{x}$/%	21.5		40.32	
T	5.11		16.55	

Table 2. Comparison of results of the pre-test and post-test for the controlling group (CG) and experimental group (VG). *N* is the number of students; $\bar{x}$ is the average result; *s* is standard deviation; $\Delta\bar{x}$ is the difference in the pre-test and post-test results; *t* the result from the test statistics.

Statistical parameter	**CG**		**VG**	
	Pre-test	Post-test	Pre-test	Post-test
N	22	22	21	21
$\bar{x}$/%	25.57	47.07	34.28	63.85
S	16.27	14.64	4.37	1.53
$\Delta\bar{x}$/%	21.5		29.57	
T	5.11		12.43	

Based on the explanation above, if we compare the mean of the post-test in class control and class experiment, there are significant differences in the score where the score in the experiment class is higher than in the class control. It is shown from the table above student scores in both experiment groups were higher than student scores in the control groups.

Based on the calculation, t_{test} in both experimental groups is bigger than the control groups, so it is a significant difference between teaching using the chemsketch using PowerPoint with the conventional teaching method, where teaching using the chemsketch, is effective.

4. Conclusions

The study showed that all groups had better achievements in the post-test. This is due to the additional activities in all groups; however, the teaching methods that were used in the experimental groups to eliminate gaps and misconceptions, showed better results in comparison to the old traditional teaching approaches in the control group. The best results were achieved in the group, which undertook real experiments. The analysis of correct answers to the questions shows that understanding the processes at a molecular level can be significantly improved by implementing appropriate computer programs and applications. The insufficiently understood notions and concepts were also explained in the control groups, but the class was mainly controlled by the teacher himself and just a few students actively participated in class. We should also add that students in experimental groups were more motivated and interested, just because they were more actively engaged in the learning process. We have to point out that the organization of the class with active participation of students and instructions for activities planned in the form of a worksheet can produce bad results too, unless all the activities and questions from the worksheet are discussed at the end, because students themselves may draw incorrect conclusions too. Just because of this, we should not go through lessons only formally and superficially, but rather, as modern education standards require, adapt and comply with the needs and achievements of the students.

4.1 Recommendations:

- As a recommendation from this paper, could highlight some important points where the students should be focused:
- Increasing specific knowledge based on technology and not just to depend on classical methods;
- Their impact to be massively increased, by contributing to the external environment;
- Advancing the work dynamic within the frameworks or required limits;
- To be efficient in knowledge development
- To link the hydrocarbons with other sciences and apply them to coordinate, for the benefit of scientific and social contribution;
- Being sober in knowledge;
- Be efficient in managing the data and their conversion into information regarding the matter in question;

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