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Activity-based chemistry teaching: A case of “elements and compounds”

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Abstract

This study aims at observing students’ understanding of “Elements and Compounds” unit which is taught through the use of several activities such as card activity. In this case study, a card activity was prepared by the chemistry teacher. In the next stage, “Elements and Compounds” unit was presented through the activities mentioned above. The study was implemented in one 9<sup>th</sup> grade classroom. The students found the activities entertaining and helpful for remembering the subjects. The results are also very remarkable for teachers who are open to use new methods or activities in their teaching.

Keywords: Activity; chemistry teaching; students; teachers.

1. Introduction

Chemistry teaching is important in high schools since it plays a significant role in understanding the daily life. Uzuntiryaki and Boz (2007) stated in their study that significant role of the course of chemistry as follows: “…Chemistry develops students’ way of thinking in a way that they use scientific method. Then, they can use these thinking abilities they gained in the chemistry class in any problem in their life. Also, students’ critical thinking ability can be improved by chemistry. For this reasons, chemistry should be taught…” However, as stated by Demircioglu, Demircioglu and Ayas (2006) have stated that chemistry is perceived as one of the difficult disciplines by students since it includes some abstract concepts.

Sökmen and Bayram (1999) in their study on ninety-seven ninth graders conclude that students are not able to significantly learn various chemistry concepts such as elements, compounds, mixture, raw materials, homogenous mixture, chemical change, physical change and so on and that they have many misconceptions about chemistry. Then, they argue that these negative points may be results of very extensive school programs and memorizing the facts.

Tezcan and Uzun (2007), on the other hand, compared the high school students’ achievement on the unit of “Elements and Compounds” using the cooperative learning and traditional learning... It is found that those students who were taught through cooperative learning method have higher levels of achievement in contrast to those receiving traditional one.

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1.1 Different teaching methods and techniques in Chemistry teaching

Various teaching methods and techniques are used in chemistry teaching to facilitate students’ learning and understanding several chemistry topics. Recently, because of tendency towards student-centered teaching approaches teachers are requested to employ those teaching methods and techniques that are consistent with these approaches. Students are active participants of their learning and teacher role is mainly that of facilitator in student-centered teaching approaches. Active participation on the part of students means that they should actively participate in the courses. Active class participation, as suggested by Gözütok (2007, p.180), is the prerequisite for constructive learning. However, teachers should be informed about student-centered teaching approaches and practice the teaching methods and techniques consistent with these teaching approaches.

Various factors affect the selection of teaching methods and techniques to be used. Such factors may include student interests and needs, class size, physical conditions, financial resources, etc. the nature of the topic to be taught may also play a role in selecting the teaching methods and techniques. Lectures may be suitable for teaching some topics whereas other topics may require the use of questioning or another teaching technique. Some techniques and/or some teaching activities are employed in order for students to facilitate the comprehending or deeply understanding the topics. Research on various teaching methods and their efficiency in teaching process basically deals with the different learning outcomes achieved through the use of these methods and techniques.

There are many instructional methods and techniques including lectures, questioning, role playing, etc. One of these instructional methods is educational games. Educational games refer to joyful arrangements that are effective in students’ achievement (Gözütok, 2007, s.182). Students can acquire various skills such as strategy development, orderly thinking and decision-making, etc. (McFarlane, Sparrowhawk and Heald, 2002).

Educational games produce many desired learning outcomes. Such outcomes can be discussed for both teachers and learners. However, educational games should be employed by taking into consideration several points. For instance, Sönmez (2007, p.252) states that the following points should be considered while employing educational games in the classrooms:

1- Educational games should be designed so as to make it possible for students to gain objectives of the course.
2- Such games should be consistent with the students’ age, gender and also, with general conduct rules.
3- They should have the quality of being practiced in the classroom.
4- Educational games should be easy for students to be understood and to be practiced in the classroom.
5- They should not be time-consuming.
6- They should not lead to undesired behaviour in students.
7- They should not lead to any dangerous situation for students.
8- Their instructive and tutorial nature should be dominant and they should also be joyful.

Educational games can be seen as a facilitator of learning which also improves individuals’ physical, cognitive, and also aesthetic characteristics. However, the games used in education should be used for realizing an aim in the classroom for the children.

This study aims at observing students’ understanding of “Elements and Compounds” unit which is taught through the use of several activities. In other words, the effect of the instructional activities on students’ learning is examined.

2. Method

The study has the design of “case study” aiming at discussing some observations regarding the use of activity-based teaching in the Chemistry course. The research was undertaken by one of the authors who is a chemistry teacher in a public school. The study was initiated based on the author’s quest for alternative teaching methods to produce effective learning the Chemistry course and her search for them. The study reported here shows that various distinct instructional methods, techniques or strategies can safely be employed in the Chemistry course.

The Chemistry course has a significant position within the secondary education programs. Since knowledge and skills gained in the course are very functional for students, effective teaching of the course will lead to effective student learning.
2.1. Procedure

The author who planned and implemented this case study is the chemistry teacher in a ninth grade classroom in a high school. The activities about the unit “elements and compounds” were carried out through question-answer cards and work-sheets. The author is the chemistry teacher of this class. Students’ contributions to the course and their achievement were observed particularly in the study. As stated earlier, the study was carried out by the author on her own students. The class was selected randomly out of ten ninth-grades in the school during the school year of 2006-2007. After selecting the class, the author developed question cards for the “Elements and Compounds” unit. Additionally, worksheets were prepared for the same unit. One of the reasons for choosing this unit is that it is quite difficult to comprehend for the students.

2.1.1. Development of activity cards

The author developed separate activity cards for “Elements” and “Compounds”. On the front side of the cards the formula of a compound or the symbol of an element are written down. On the back side of the card the title of another compound of element is written down. The number of cards is determined according to the class size. After teaching of the topic, these cards were given to the students. First, the cards concerning elements were distributed to the class and secondly the cards concerning compounds were delivered. At the beginning of the activity, the teacher had shown the card that includes the name of an element to the class and asked who had the card with the symbol for this element. Looking at the cards the students searched for the element at hand. The student who had the card with the symbol for the element shown the card to the class and then the teacher asked him to read the name of the element written on the front side of his card. By this way all elements were read together with their symbols by the class. The activity lasted nearly for 20-25 minutes. The same procedure was followed for the compound cards. Samples for the activity cards are given below:

<table>
<thead>
<tr>
<th>Front side of the card</th>
<th>Back side of the card</th>
<th>Front side of another card</th>
<th>Back side of another card</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>K</td>
<td>Fe</td>
<td>Sodiu</td>
</tr>
<tr>
<td>Lu iniu oxide</td>
<td>I₂O₃</td>
<td>Potassiu carbonate</td>
<td>₂O</td>
</tr>
</tbody>
</table>

Figure 1. Sample element cards

Figure 2. Sample compound cards

3. Conclusion

The findings of the study indicate some significant implications for the activity-based chemistry teaching.

- The students found the course more enjoyable.
The students’ learning of the formulas of the compounds and the symbols of the elements was deeper and lasting.

Two or three weeks later, the students could answer correctly the questions regarding elements and compounds indicating that they could still remember what that learned through the card activity.

The card activity positively contributed to increase the student positive attitudes and interests towards the course.

The topics taught through the card activity were more easily reinforced in contrast to those topics taught through traditional one.

The card activity increased the interaction of the students.

An increased of the active participation of the students was observed.

4. Suggestions

The findings of the study clearly show that student-centred teaching approaches, specifically activity-assisted teaching, have many advantages for teaching of the chemistry topics. The study investigates the effects of the activity-assisted teaching on only one topic and class. However, it still provides some significant implications for the teaching chemistry. The students enjoyed the activity-assisted teaching and actively participated in the course. Therefore, this and other similar activities seem to contribute to teaching and learning process.

On the other hand, the sample size can be increased in a more detailed study to reach more generalizable results concerning the activity-assisted teaching and the use of activity cards. Since this study is a case study, only some of the significant observations are discussed in the study. It is certain that there are other subtopics that are appropriate for developing activities like “Elements and Compounds” unit in the chemistry course. Therefore, chemistry teachers may develop activities for such subtopics in the chemistry course.

In the teacher training programs, the development and use of such activities can be taught to student teachers through necessary knowledge and skills in several teacher training courses such as Special Instructional Methods or General Instructional Methods. Through such course, student teachers may be prepared to use activities in the classroom settings. However, the development and use of the activities are also important for the teachers, too. Therefore, they may be informed about these activities through in-service activities. In brief, the results of the study might be useful for the chemistry teachers who are open to use new strategies, techniques, methods or activities. It is obvious that it is not possible to generalize the findings of the study for every subtopic of Chemistry but the more important thing is to derive some clues from the observations.

References


