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Classroom Action Research: Using Interactive Learning Media to Improve Students' Colligative Solution Learning Outcome.

Yusnidar YUSUF[a*], Endy Syaiful ALIM[a], Tyas Hermala ANINDITA[a***]**
[a]*University of Muhammadiyah Prof. DR. HAMKA (UHAMKA), Indonesia*
*yusnidar_yusuf@yahoo.co.id
**esaitb@yahoo.com
***ty_as15@hotmail.com

Abstract: This research aims to increase the ability of students to understand and improve their learning outcome when studying the subject of colligative solutions in chemistry. It also hopes to improve the ability of teachers to deliver the subject. This research was conducted at SMA Negeri IX Jakarta to the twelfth grade. It was a classroom action research carried out in five months comprising of two cycles. It involved two observers in the school. Based on the result, there is a significant increase of students' test grades from cycle 1 to cycle 2, which is from 76.5 to 79.7. From the students' learning effectiveness records, it is suggested that learning with interactive learning media can successfully improve students' learning outcome, especially in the subject of colligative solution in Chemistry.

Keywords: software, interactive learning media, chemistry, colligative, solution

1. Introduction

Education Unit Level Curriculum (EULC), which is an operational curriculum that is developed and implemented by each educational unit, currently require teachers to develop and compile suitable teaching and learning materials based on the curriculum.

In learning chemistry, many obstacles are faced by the students as well as the teachers in terms of learning materials availability. These include the limitation of equipment and materials, understanding the theoretical and microscopic concept, and the dangerous experiments due to the content of the physical and chemical properties of the experimental products.

The role of learning model, strategy and methodology used by the teacher in explaining the learning materials to the students greatly affect their interest and motivation in understanding the concept of chemistry. As in this case, it is important for a teacher to prepare, plan, deliver, and evaluate materials so that students will like the subject. To a large extent, this is dependent upon the presentation of the materials given by the teacher.

Learning process should pay attention to the students' individual conditions because they are the ones who are doing the learning. Students are unique individuals. Therefore, education should pay attention to the differences in individual, so that learning can effectively change the condition of students from not knowing to knowing, from not understanding to understanding, from unskilled to skilled, and from less behaved to well-behaved.

One of the topics needed to be explained in the chemistry syllabus is the colligative properties of solution. In chemistry, a solution is a homogenous mixture that consists of two or more substances. A substance that has lower quantity inside a solution is called a solute, while a substance in which the quantity is more than all the other substances in a solution is called a solvent. The composition of solute and solvent in a solution is expressed in the *concentration* of solution, while the mixing process of solute and solvent to form a solution is called *dissolution* or *solvation*.

This theoretical description of the colligative properties of solution is difficult for children to understand because imagination is needed to understand the concept. Therefore, there need to be alternative methods to help the children. One of them is the interactive learning method based on computer or ICT.The choice of interactive multimedia learning method is expected to increase the learning outcome of students. Therefore, this study was carried out in order to know if there is an increase in students' learning outcome of the colligative properties of solution.

2. Theoretical Background

Learning is the main activity in the process of education in schools. This means that the success or failure in the achievement of educational goals largely depends on the learning process experienced by the students. Therefore, every teacher should understand the learning process of their students well and the pedagogy used to present the teaching materials so that teachers can give guidance and provide a proper and harmonious learning environment for the students.

2.1. Learning with Interactive Multimedia

According to Von Glasersfeld (1989), education is helping someone to think correctly by letting them think for themselves. Good thinking is more important than having a good way of thinking. Students who could give correct answers may not necessarily be able to solve new problems, possibly because they do not understand how to find the answer. Learning is not an activity to transfer knowledge from teacher to student, but an activity that allows students to build their own knowledge. It is a form of independent activity. Interactive multimedia is a media that consists of teaching materials loaded with programming language. The more commonly used include ***power point*** and ***flash***. Interactive multimedia has several types:

a. Drill dan Practice
   It gives instructions through drill and opportunity to measure ability through test. This type is usually used to increase basic knowledge.
b. Tutorial
   Computer replaces teacher or tutor. It presents information, asks questions and gives responses (feedback).
c. Simulation
   Simulation type is used to present or imitate real situations.
d. Games
   This is suitable to train users to make fast decisions when solving problems especially in competition, challenge, strategy setting and others.

2.2. Classroom Action Research

Classroom Action Research (CAR) is a study which is based in the classroom. It is implemented by teachers in order to solve learning problems faced by them. These include either fixing the quality and study results, trying new learning method for the sake of quality, or simply to improve results. According to Zulfikri (2010), based on the quantity and behavioural traits of the members, CAR can be in the form of individual or collaborative, which is known as individual CAR and collaborative CAR. In individual CAR, the teachers conduct CAR in their own or other classes, while in collaborative CAR, several teachers will be conducting CAR at the same time in their own classes or between members exchanging classrooms' visits.

CAR has a number of characteristics as the following:

a. Cyclical, which means that CAR uses cycles (planning, give action, observation, and reflection), as concrete research procedure.
b. Longitudinal, which means that CAR should take place in a certain time frame (for example 2-3 months) and continuously obtaining the required data. It is not finished in "one shot".
c. Particular-specific, so it does not intend to generalise in order to obtain theories. The results are not for generalisation, although perhaps can be replicated by other researchers in similar context.
d. Participatory means teacher as the researcher, as well as the object of change who has problem to be solved. This requires the teacher to play double roles.
e. *Emik* (not *etik*), which means that CAR views learning from the people inside which are near to the object of research and it is not based on the point of view of the people outside who are far from the object of research.
f. Collaborative or Cooperative, which means that a collaboration or working together between the researchers (teacher) and other parties always occur within the conduct of CAR to ensure validity and achievement of research objectives.

g. Casuistic, which means that CAR works on specific or particular cases in learning which are real and affordable by the teacher; working on big problems.
h. Uses natural classroom context, which means that class as the area of implementation of CAR do not need to be manipulated and/or engineered for the needs, importance, and the achievement of research objectives.
i. Prioritize the sufficiency of data needed to achieve research objectives, not the representativeness (number representation) of samples quantitatively. Because of that, CAR only demands the use of simple statistics, not complex.
j. Intend to change reality, and learning situations to become better and meet expectations, not intending to build theory and test hypothesis.
k. The objective of CAR is as the following:
l. Fix and improve the quality of educational practices implemented by teachers in order to achieve learning objectives.
m. Fix and improve learning performances implemented by teachers.
n. Identify, solve and overcome learning problems in class for quality education.
o. Improve and strengthen teachers' ability in solving learning problems and making the right decisions for students and classes taught.
p. Explore and produce creations and innovations in education (such as approach, method, strategy, and media) that can be done by teachers for the quality improvement of processes and study results.
q. Try out ideas, thoughts, tips, ways, and new strategies in teaching in order to improve education quality other than the innovative abilities of teacher.
r. Explore education that is always insightful and based on research so that education can focus on the empirical reality of class, not only focusing on general impression or assumption.
s. The four main steps that are interrelated in the implementation of classroom action research are often called as one cycle. Visually, the stages in every cycle can be described in Figure 1.

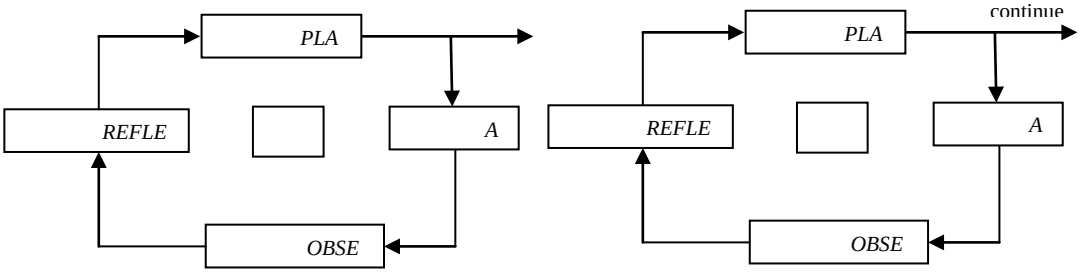

Figure 1. Classroom Action Research Cycle Model

In implementing actions or corrections, observations and interpretations are done simultaneously. In order for the implementation of action to be according to the rules of CAR, these six criteria need to be adhered to:

1. Research methodology should not disturb teachers' commitment as the implementer of education.
2. Data collection should not waste too much of the teachers' time.
3. Methodology should be reliable so that teachers can implement appropriate strategy within the classroom situation.
4. Problems addressed by the teachers should be in accordance with the ability and commitment.
5. Teachers should pay attention to several rules (ethics) connected to their assignment.
6. CAR should receive support from the school community.

2.3. Colligative Properties of Solution

The colligative properties of solution is the property of solution that do not depend on the type of solute but is only depending on the concentration of the particle of dissolved substance. The colligative properties of solution consists of two types, which are the colligative properties of electrolyte solution and colligative properties of non-electrolyte solution. Molecules of the components of solution directly interact in a mixed state. In the process of solvation, the attraction between the particles of pure components are split and replaced with the attraction between solvent and solute. If solvent and solute are both polar, a structure of solvent will be formed surrounding the solute which allows the interaction between solute and solvent to be stable.

If the component of solute is added continuously into the solvent, then at one point the components added could not be dissolved anymore. The quantity of solute in the solution is maximal, and the solution is known as *saturated*. Generally, the *solubility* of a substance is proportional to the temperature. The solubility of liquid in other liquid is generally less sensitive to temperature than solids or gas in liquid. The solubility of gas in liquid is generally inversely proportional to temperature.

2.4. Molality and Mole Fraction

In a solution, there are several substance properties that are only determined by the amount of dissolved particles. Because the colligative properties are determined by the amount of substance particles dissolved, there need to be knowledge about solution concentration.

2.4.1. Molality

Molality is the amount of mole solute in 1 kg (1000 gram) of solvent. Molality is defined as the following equation:

$$m = \frac{massa}{Mr} x \frac{1000}{V}$$

Description:
m = molality of solution (mol/kg)
n = amount in mole of solute (g/mol)
V = volume of substance (L)

3. Method

The research was conducted in SMAN 9 East Jakarta in class XII (twelfth grade) involving two observers (chemistry teacher and principal or element of leadership) in the school. This research was conducted in 5 months period using two 2 cycles. Before the cycles, the students went through the assessment phase in which the students were tested to measure their initial ability and explore problems faced by the students which were linked to the desired competence.

In the first cycle, the researcher and the observers (teachers) surveyed the problems and difficulties faced by the teachers in order to increase students' interest and examination results of the chemistry subject (colligative properties concept). It was then continued with the discussion regarding the students' initial test results to determine the action plan to the problem. The determined action plan was to guide the students through teaching and learning, delivering the materials, describing and explaining the display in interactive multimedia, discussion, and test. The first cycle was completed in two lessons (2 x 45 minutes). The first 45 minutes lesson saw the teacher carrying out some learning activities and one of the researchers gave interactive software material about chemical bonding using the interactive multimedia. Discussion followed the next 45 minutes under the teacher's guidance. This is to explore understanding of the material shown earlier. Monitoring was done during the whole learning process using observation technique and recording. It also includes incidents and changes in behaviors, ways, and documentation technique towards situation and condition in class. Questions and problems that needed to be solved were also given. The monitoring data was then analyzed. The data and medium of collection are described in Table 1.

Table 1: Data and Media of Collection

Data	Medium of Collection
Participative observation result	Observation Sheet
Observation of class activity	Observation Sheet
Measurement of study result	Test Result Sheet

The second cycle was planned based on the analysis and reflection result from Cycle 1. Weaknesses of certain procedures from the first cycle were improved on in the second cycle. Only the materials delivered were the same but treatment was added. Now the students were divided into four groups using **jigsaw** puzzle. Then each group was given an assignment to reflect on what they saw and understand from the interactive learning media. Each group was then given tasks that are different from one another. Throughout the process, the students were asked by the teacher to find sources that they had prepared, either from books, internet search results, or from websites that explain about the colligative properties of solution. The students were then asked to present their discussion using concept mapping. They were advised to make it as interesting as possible so that it would be easier to understand. Later, students from all groups re-grouped. Each member had to now explain what they understood from their initial group so that every member in the new group now has the same understanding. At the end of the learning process, students were tested, similar to the first cycle.

4. Result and Discussion

In the first cycle, the 37 twelfth grade students in the Science class results is shown in Table 2, while the distribution of results of the second cycle is shown in Table 3. Based on the data collected, the initial average result of the students was 54.9. After cycle 1, the average result of the students was 56.8. After cycle 2, the average result of the students was 79.7.

Table 2: The distribution of results obtained in cycle 1

No.	Student Group	Total	Percentage
1	Students with test result <75	34 Siswa	89,47 %
2	Students with test result 75<x<85	4 Siswa	10,53 %
3	Students with test result > 85	0 Siswa	0,00 %

Table 3: The distribution of results obtained in cycle 2

No.	Student Group	Total	Percentage
1	Students with test result <75	8 Siswa	21,05 %
2	Students with test result 75<x<85	19 Siswa	50,00 %
3	Students with test result > 85	11 Siswa	28,95 %

Based on the result, there is a significant increase in the average students' test grades from cycle 1 (56.8) to cycle 2 (79.7). Possible explanation for the increase could be due to the more dynamic discussion. This type of discussion happened because every student was active in their group and had to explain again what they have learned to the other members in the newly appointed group. Another possible explanation for the increase in test grade is the concept mapping made by each group which increased their ability to memorize and understand the concept given. As such, we can conclude that the application of interactive learning media in the learning process is successful in improving the learning outcome of the students.

5. Conclusion

From the records and the results discussed above, it can be concluded that using interactive learning media can successfully improve the learning outcome of the twelfth-grade students in SMA Negeri IX Jakarta Timur in Colligative Solution in Chemistry.

References

Akbar, M. F. (2010). Penggunaan Sifat Koligatif Larutan. Retreived July 21 2011, from http://indonesiakutercinta.wordpress.com/2010/08/13/penggunaan-sifat-koligatif-larutan/

Asmaini, M. J. (2008). Tips Menjadi Guru Inpiratif. Yogyakarta: Kreatif.Diva Pre.

Arikunto, S., Suharjono, Supardi. (2006). Penelitian Tindakan Kelas. Jakarta: Bumi aksara.

De Porter, B. and Hernacki, M. (2001). Quantum Learning.Membiasakan Belajar Nyaman dan Menyenangkan. Bandung : Penerbit Kaifa.

Justiana, Sandri, and Muchtaridi. (2009). Chemistry for Senior High School Year XII. Jakarta:Yudistira.

Lierberman. (1987). Education as a Profesion. New Jersey: Prentice Hall.

Purba, M. (2007). Kimia Untuk SMA Kelas XII Semester 1. Jakarta: Erlangga.

Ryan, L. (2000). Advanced Chemistry for You. UK: Nelson Thornes Publisher

Sagala, S. (2003). Konsep dan Makna Pembelajaran: Untuk MembantuMemecahkan Problematika Belajar dan Mengajar. Alfabeta: Bandung.

Sardiman (2005). Interaksi & Motivasi Belajar Mengajar. Jakarta: PT.Raja Grafindo Perkasa

Silitonga, P. M. (2009). Pengaruh Kemampuan Awal dan Model Pembelajaran Terhadap Hasil Belajar Kimia SMA. Medan: FMIPA Unimed.

Slameto. (1978). Belajar dan Faktor-faktor yang Mempengaruhinya. Jakarta: PT Bina Aksara.

Suhardjono. (2009). Pertanyaan dan jawaban di sekitar penelitian tindakan Kelas dan tindakan sekolah. Malang: Cakrawala Indonesia.

Suryosubroto. (2002). Proses Belajar Mengajar di Kelas. Jakarta: Rineka Cipta.

von Glasersfeld, E. (1989). As quoted and retrieved July 21 2011, from http://repository.upi.edu/operator/upload/t_ipa_0706723_chapter2.pdf

Zulfikri (2010). Penelitian Tindakan Kelas (Classroom Action Research). Retrieved July 21 2011, from http://pakguruonline.pendidikan.net/penelitian_tindakan_kelas.html