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Review Article

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A Past, Present and Future Perspective in Chemistry Teaching

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Abstract

We present herein a new chemistry teaching method entitled 'a past, present and future perspective in teaching'. In our method, we recall the lessons taught in previous class, teaching new topic in the present class and will inform the topic to be studied in the future class. The teaching method is demonstrated by giving certain examples. The students' feedback to our method is very positive.

Keywords: Past, Present, Future, Teaching

1. Introduction

A set of rules framed by a teacher to facilitate student learning is called a teaching method. Selection of a teaching method depends on nature of subject and learner. An efficient teaching method is one which considers learner, subject and quantity of learning [1]. Teaching approaches are mainly classified as teacher-centered and student-centered. In the former case, a teacher actively passes information and knowledge of the subject to students via lectures and direct instruction. While, in the latter case, teacher and learner play equal role, and learning outcome is measured by group projects and class participation [2].

Teaching methods are classified into (1) Lecturing, (2) Demonstrating and (3) Collaborating. In the first method, the instructor with efficient writing and speaking skills teach students in one-way fashion. This method is used in larger classroom sizes particularly in colleges. Further, the lecturer should make prior preparation and has conscious effort to solve student problems. The second method involves teaching through experiments. Demonstrations help students to understand. It can be implemented for science teaching. The collaborating teaching method involves active participation of students in the learning process by talking with each other through discussions. This method can be employed to assess ability of a student to work in a team, presentation abilities and leadership traits. This method can also be used in science teaching. Inquiry-based teaching comes under this class.

In ancient time about 3000 BC, the art of writing demands education. The medieval education wanted all children to learn. In 19th century, the Prussian education system was compulsory, which involves class room teaching. It was implemented in the United States and Japan [3]. The University of Cambridge and the University of Oxford instituted tutorial system which involves very small groups of students who used to meet regularly the tutors. Both science and arts were taught in this way at these universities [4]. In 20th century, teaching methods utilizes technologies such as radio, television, multimedia and internet. However, technology is not a substitute for classical education methods.

We are actively engaged in organic synthesis which involves development of new synthetic methods [5-14] and study of biological activities of synthesized compounds [15-23]. As part of this, we are also engaged in chemistry education. In this connection, we have published an inquire-based teaching method which induces cognitive thinking among student community and also we proposed an art of writing flowchart which induces logical thinking among chemistry students [24, 25]. In continuation of these works, we propose a past, present and future perspective

chemistry teaching in this article.

2. Experimental

We selected many topics to teach in two ways. In the first method, the first author taught chemistry as per the objective of this research article for the academic year 2023-2024. In the second method, a teacher X taught the same topic by direct teaching or lecturing for the academic year 2022-2023. The student strength taken for these experiments is 40. The first author collected the post-experimental data. The data were collected via Google form. The analysis of data is given in results and discussion part followed by conclusion at the end of the manuscript.

3. Results and Discussion

To test our research objective, we selected 'concept of acids and bases' as a model topic. Thus, we explained the Arrhenius, the Bronsted-Lowry and the Lewis concepts of acids and bases. Information related to definition of acids and bases, examples, merits and demerits of these models were given to the students. We summarized the lessons taught by brushing up the key points. At the end, we informed all students that we will teach 'hard and soft acids and bases, and the Pearson's HSAB principle'. Besides, we asked students to read and memorize the lessons taught.

In the next class, we asked all students about the topic taught in the previous class. Thus, we framed these questions to students.

1. What are acids according to the Arrhenius concept?
2. What are bases according to the Arrhenius concept?
3. Give examples to Arrhenius acids and bases.
4. What are the advantages of Arrhenius concept?
5. What are the demerits of Arrhenius concept?

Similarly, below questions were asked to students on the Bronsted-Lowry concept.

1. What are acids according to the Bronsted-Lowry concept?
2. What are bases according to the Bronsted-Lowry concept?
3. Give examples to the Bronsted-Lowry acids and bases.
4. What are the merits of Bronsted-Lowry concept?
5. What are the demerits of Bronsted-Lowry concept?

Later, we asked some questions to students related to the Lewis concept.

1. What are acids according to the Lewis concept?
2. What are bases according to the Lewis concept?
3. Give examples to the Lewis acids and bases.
4. What are the merits of Lewis concept?
5. What are the demerits of Lewis concept?

As we alerted students to read and memorize the topics taught in previous class, most of the students answered the questions. For some questions, some of the students did not answer. In such cases, we passed the same questions to other students until they answer. Only for few questions, none of the students were able to answer. In such cases, we provided the answer. Thus, 25% of the time was consumed to memorize what we taught in the previous class.

With an objective to utilize 70% of the time to teach in the new class, we provided all information related to hard and soft acids and bases, and the Pearson's HSAB principle. Before starting the topic we asked how many of them were prepared for the future class. Most of them attempted to understand the topic suggested for future class. Only, a few failed to understand it. Thus, we taught new topic in new class and summarized it. Besides, we also gave the topic of future class 'solvent system', for which we used 1-2% of time. At the end, we took attendance in the remaining time.

Thus, to get feedback from students about our past, present and future perspective teaching, we asked to answer some questions, which were asked in the Google form. The first question was 'Do you like repetition of the subject taught in previous class in each class?'. For which 95% of the students answered 'Yes' and remaining 5% of students answered 'No'. To the second question 'In way what way do you like repetition?', 50% of the students answered interaction should be through inquiry based method, 35% students require repetition though one way teaching and remaining 15% students highlighted their reply that only key points should be repeated. To the third question, 'Is repetition is helping you?', all students said yes. The fourth question was, 'How do you want teaching in any present class?'. The 75% of students opted to engage class through inquiry based method and remaining students selected direct teaching. To the fifth question 'Do you like to summarize the subject taught in present class?', 95% of the students said yes. Later, for the sixth query 'Will you prepare for future class if I say what I will teach?', 90% of them said yes, 5% said no and remaining people would prepare if the topic is understandable. All students said yes to the seventh question 'Preparation for future classes by you is helping?'. Finally, all students were happy for the question 'This past, present and future perspective teaching is attracting you?'

We compared the performance of students to whom teacher X taught the same topic in the previous academic year by direct lecturing. The results were very astonishing, which indicated that students trained by the first author performed well in tests and examinations compared to students taught by teacher X.

4. Conclusion

In summary, we have developed a past, present and future perspective in chemistry teaching. In our method, we trained students by recalling the lessons taught in the previous class by inquiry based teaching. Also, we taught new topics in the present class by employing inquiry based teaching method as students preferred, followed by summarizing the information given. At the end, we disclosed what will be taught in the future class with an objective to motivate them to prepare for future class. This research was exemplified by considering certain topics in chemistry. We insist all teachers to employ this method of teaching

through this article. We have also discussed the students' opinion on this method of teaching. Students educated via our method were performed better than students trained by direct teaching method in tests and examinations.

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