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Flipped Classroom in Chemistry Classes

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ABSTRACT

"Flipped classroom" is when students and teachers swap their roles (teaching methods and focus of teaching changes) and students become the driving mechanism in the lesson. Recently, this pedagogical method has become increasingly popular as it promotes deeper understanding of more complex concepts. Flipped classroom allows students to learn at their own pace and in any environment and, as a result, become more confident in what they have learned. Meanwhile, teachers can follow students' progress and adapt their teaching in regard to students' individual needs.

Flipped classroom is one of the effective approaches in chemistry as it introduces and integrates technologies in learning. Furthermore, lots of time can be allocated for group discussion, homework guidance, and critical thinking in class. Flipped classroom method could be preceded for guiding slow learners.

Keywords: flipped classroom, pedagogical method, active learning.

INTRODUCTION

Flipped classroom is a pedagogical model in which students get acquainted with new subject material not only in the classroom but in any other environment. Usually, this means that they learn the new information individually as for example, watch educational videos sent by the teacher out of the classroom. Thus, the mandatory in the classroom time can be dedicated mainly to consolidation of the new subject material through various methods: discussions, additional tasks, different case studies, presentations, etc. According to current education goals, it is of primary importance to cultivate comprehension skills, enhanse students' literacy, encourage cooperation with others (teamworking), and develop problem-solving abilities.

SIGNIFICANCE OF FLIPPED CLASSROOM METHOD

Students process new information individually at home in their own pace or without the pressure of keeping short deadlines, e.g. they have the opportunity to make sense of various provided materials such as videos, texts, etc. multiple times or apply other learning strategies. This method works well with students who cannot, for any reason, attend lessons in person. In such cases, generally after the lesson, there is a scheduled online feedback session with the teacher. This learning model suggests that students study in a different way and different environment and they are able to develop high order skills like responsibility, analysis and creativity.

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Honeycut B. describes the flipped classroom model "as moving from an instructor-centered learning environment to a student-centered learning environment". He also adds that "It could… be defined as shifting from individual to collaborative strategies. Although it is possible to flip a class using individual activities such as quizzes, worksheets, reflective writing prompts, and problem solving assignments. The key is to complete these activities during class time" [1].

Some critics of flipped learning have suggested that the instructional materials employed in the model will eventually replace educators. That is misguided. In the flipped learning model, skilled, professional educators are more important than ever, and often more demanding, than in a traditional one. They must determine when and how to shift direct instruction from the group to the individual learning space, and how to maximize the face-to-face time between teachers and students [2].

Recently, the flipped classroom model, as a form of active learning pedagogical method, is becoming more and more popular in chemistry classes both among teachers and students. Active learning has a positive effect on students' academic results too. Chemistry is a challenging subject and conventional pedagogical approaches do not promote active participation on behalf of the students. On the other hand, active learning can improve students' results on the subject. Positive improvement in chemistry final grades are evident after applying the flipped classroom model in lessons in order to stimulate active learning. Students may watch educational videos including theoretical postulates of the discipline as well as practical exercises before lessons and use mandatory classroom time to further explore the topics and the practical application of the concepts included in the videos. Traditional assessment methods can be applied in flipped classroom as well. Final grades and results, when comparing traditional and flipped classroom learning, show that students engaged in flipped classroom have considerably higher achievements in organic chemistry [3].

The application of alternative methods and technologies in the introduction of new subject material outside the classroom is of significant importance in flipped classroom learning. Active learning in lessons is the second prerequisite to ensure the success of the pedagogical approach and to change the quality of the learning process.

The frame of the flipped learning [3] and the main activities are displayed in Fig. 1 and Table 1.

As it was already mentioned chemistry is a challenging subject. Some authors suggest that this is due to the introduction of new and unfamiliar tasks (like drawing and interpretation of three-dimensional molecules on two-dimensional space

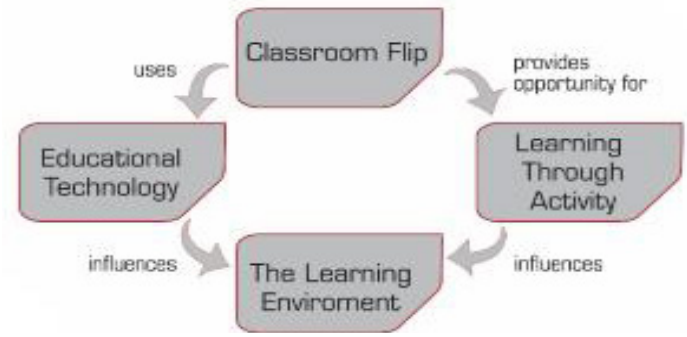

Fig. 1. Flipped classroom frame.

Table 1. What happens in flipped learning.

Where	Activities
At home	• Students study the information after teacher's instructions • Students check the level of understanding and assimilation of information
In classroom	• Students apply what has been learned • Students do tasks and solve case studies
In classroom	• The teacher monitors, guides, develops and enriches students' knowledge and skills • The teacher provokes students' thinking, active learning and creativity

or predicting chemical reaction products based on the characteristics and the reaction rates of the reagents). Generally, chemistry relies to a great degree on mathematical analysis, while organic chemistry focuses on structure-reactivity relationships and challenging intellectual tasks which involve unconventional approaches. Practice is needed to improve the quality of understanding of above-mentioned relationships and organic chemistry problems [4].

Studies report that students enjoy being able to learn in their own pace and that they prefer flipped classroom over traditional approaches. The students appreciated learning through using video material, the opportunity to study in their own pace, flexibility and mobility brought about by accessible video lectures, and that learning is easier and more effective within the frame of the flipped classroom [5].

Flipped classroom learning involves a number of activities: videos, quizzes, self-assessment tasks (prepared by the teacher), online discussions, research, etc. The main idea is, however, to promote student-centered learning. As a result, in lessons the teacher will be able to focus on high order comprehension skills like discussions, deeper understanding and analysis, application of new knowledge and creation of new concepts [4].

CONCLUSIONS

Flipped classroom learning helps to stimulate motivation for learning. This model makes students more active, more independent in searching and understanding information. The flipped classroom used for active, effective and increased learning. Students cope with learning through the use of video material, learn at their own pace. Learning is easier and more effective within an inverted classroom. Teachers do not lecture like in formally structured lessons of the past but instead focus mainly on teacher - student interaction. Flipped learning, compared to traditional teaching, could enhance students' learning motivation and learning attitude. With flipped learning, students feel that the teaching content is easier to learn and internalize. Furthermore, flipped learning allows students to discuss topics with each other and teachers to set new goals for their learning. As a result, teachers will be able to monitor students' progress much easier. Students, on the other hand, will process new information more effectively which will lead to better learning outcomes in chemistry.

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