

Effective Teaching and Learning of Biochemistry and Molecular Life Sciences with Action-oriented and E-learning approaches vs. Instructor-dominated Lecture Methods

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Innovation in education is an action of creating both new educational instruments and new educational applications, organizations and technologies. The globalization and enormous advancement in molecular life sciences (MLS) area, embracing science, technology, health, genomics, nanoscience, and increased demand for bioinformatics skills; different learning needs, recognition of individuals' knowledge, skills and competence, certification necessitated gaining additional qualifications more open to experiment with new innovative pedagogies.

Today as happened in almost every field, the computer and internet usage in education is increasing in a direct proportion with developing technologies.

The developed virtual classroom and virtual laboratory applications will be able to overcome the possible exceeding time and lecture hall limitations.

Although studies carried out on this field have not reached to a requested level qualitatively and quantitatively, the students are expected to help lifelong learning and teaching of subjects out of class hours by benefiting from multi-media applications (text, images, illustrations, audio, video and computer animations displays, storage and transmission from the network)

Besides the traditional teaching activities carried out in universities, **virtual laboratory** applications can provide;

- * theoretical background by distance learning applications
- * positive contribution to the educational process
- * a shorter educational period at university
- * instructional videos, animations, easy to reach teaching resources
- * access e-books, teaching videos, learning resources over internet
- * can increase the permanency of transferred information, the continuance of the imparted knowledge
- * can affect exam performance of the students by increasing knowledge and understanding level of the students,
- * can increase the students motivation and willingness to learn
- * can prevent the limitations such as not having laboratory equipment, the equipment with higher costs,
- * individualistic failure can be prevented by following every student separately,
- * can help the students gain different skills (creative thinking, problem solving)
- * experiments can be cost effective in the virtual environment
- * experiments with higher risks in the frame of health can be provided to realize without any risk

In recent years, considering the facts as inadequate;

- the lack of sufficient test equipments in universities,
- time consuming experiments conducted by students,
- educational experiments as being time-consuming for insufficient number of instructors and
- students wasting their times during the data collection, biochemistry and molecular laboratory education systems are changing to the Virtual Laboratories to enrich the students' learning experiences in educational environments.

But this situation brought the discussions of whether traditional hands-on/wet laboratory applications or virtual applications have been more effective and preferable.

Conclusions

According to the opinions of students involved in this study, only virtual laboratory practices have not solely been enough, instructor centered wet laboratory practices should be realized after virtual applications.

Also, as educational materials (e-book, animations, etc.) prepared in digital environment before the experiment have been presented to the students, the result of increasing the permanence of the learnt knowledge and taking interest in the course has been reached.

Aim

The aim of this research is to determine the opinions of the students on “Virtual Laboratory Applications” and “Educator Centered Traditional hands-on/wet laboratory Applications” at medical, pharmacy, science, biochemistry and molecular laboratory courses by forming a virtual laboratory with simulations prepared related with biochemistry and molecular life sciences education .

Method

This research is a qualitative research related to the evaluation of ideas of the students on Virtual Laboratory and Educator Centered Traditional hands-on/wet Laboratory Applications.

Descriptive situation study method has been used.

Data of the research has been collected during the semester of 2014/2015 academic year. In the content of the research, ideas of medical faculty students on Virtual Laboratory and Educator Centered Traditional hands-on/wet Laboratory Applications have been taken with semi-structured interview which is a type of interview.

Ideas of 30 students participating in virtual laboratory course have been collected by “comparison interview form of Virtual Laboratory and Educator Centered Traditional hands-on/wet Laboratory Applications. The data taken from the students have been evaluated by **descriptive analysis method**.

Findings

Application of the experiment:

Most of the interviewed students stated that they wanted to make hands-on/ wet experiments by themselves or with their friends..

S3: I want to make the experiment with my friend. I want to touch the equipments and learn them..

Educational materials prepared for the experiment:

The common opinion of the students is that it is important to have prepared resources at digital environment or written ones before the experiment. Also, most of the students stated that educational materials which have been prepared for the experiment should be relevant to the developing technologies, they preferred the resources prepared in e-book form which include animations related to the experiment and interactive communication.

S5: I want pre-prepared resources at hand. But the resources should not be boring. Because of this reason e-books are more enjoying, I like experiment animations. They take my interest more..

Comparison of used educational method and techniques:

The students state that it is not sufficient to have lessons only with virtual laboratories, it is hard for them to understand how experiment applications have been made by this way, firstly virtual laboratory then reel wet experiment applications should be made and permanence of the courses can increase by this way, they preferred using these two methods rather than using only one method.

S1: if it is only barcovision and one's show, why don't we have our courses in lecture halls? Someone is doing and we are spending time. We do not understand what is happening. If the laboratory will be like this, you explain in the classroom and we become comfortable. We are only watching. I do not know to make application in a laboratory...