

## **Project P633 EDUCATION AND AWARENESS-RAISING IN UKRAINE**

### ***Report***

2<sup>nd</sup> Testing of the educational module

(March 30, 2017, Chernivtsi, Ukraine)

The 2<sup>nd</sup> Testing of the educational module developed within the Project P633 was held at the Yuriy Fedkovych Chernivtsi National University, Department of Molecular Genetics and Biotechnology, Chernivtsi, Ukraine on March 30<sup>th</sup>, 2017.

The 2<sup>nd</sup> Testing consisted of the pre-reading homework stage and the classroom activities. 'Advances in science and technology and the evolution of bioweapons capability' was the subject of the lesson. A team-based learning (TBL) was used. The target group was Master-level students of 4 course (21 persons) and their teacher (Dr. Antonina Shelyfist, Associate professor at the Department of Molecular Genetics and Biotechnology). Guests: the faculty and administrative staff, other engaged employees (9 persons). Auditors: Dr. Galyna Gergalova and Dr. Iaroslava Maksymovych.

### **Testing results**

For this testing, Dr. Shelyfist used Chapter 3 'Advances in science and technology and the evolution of bioweapons capability' of 'Preventing Biological Threats: What You Can Do' and Chapter 3 'Advances in Science and Technology, and the Biological and Toxin and Chemical Weapons Conventions'. Dr. Shelyfist used Team-Based Learning approach during the lesson. Students performed the following activities: Individual Readiness Assurance Tests (iRAT), Team Readiness Assurance Tests (tRAT), First and Second application exercises. The teacher adapted the TBL method for her lesson had changed the duration of activities. The 21 students were divided in four groups (5 persons were in 1<sup>st</sup>, 3<sup>rd</sup> and 4<sup>th</sup> groups, 6 persons in 2<sup>nd</sup> group).

#### 1) iRAT and tRAT analysis.

After the homework pre-reading, in the classroom participants passed the individual quizzes (iRATs) well. Average score was 72%. The easiest question was the following: 'Which statement BEST describes the state of microbiology in the late 19th century?'. 95% of participants chose the correct answer 'Scientists had begun to understand the relationship of specific microorganisms to specific diseases'. More detailed results of iRAT and tRAT tests are presented in Table 1. Additionally, the table shows that the students passed tRAT more successfully than iRAT (80% and 72% of correct answers correspondingly). It sustains the effectiveness of team-based learning, when students have possibility to share their knowledge, discuss and choose the correct answers.

Table 1. Answers to iRAT and tRAT tests

Question	Correct Answer	iRAT, %*	tRAT, %
1 Which statement BEST describes the state of microbiology in the late 19th century?	<i>Scientists had begun to understand the relationship of specific microorganisms to specific diseases.</i>	95	100
2 During the First World War	<i>Germany was the only country that deployed biological weapons.</i>	86	100
3 Which of the following statements is FALSE, according to Chapter 3?	<i>The ethical concerns of scientists in the laboratory were a key factor when decisions about the use of biological weapons had to be made.</i>	81	100
4 The history of the Soviet bioweapons programme demonstrates	<i>the challenges of setting up a secret system for the development of biological weapons</i>	38	80
5 When assessing the development of third generation biological agents, it is possible to conclude that	<i>scientists can do little to prevent its misapplication for malevolent purposes</i>	14	80
Average Score		72%	80%

\* percent of students that provided the correct answers on the question.

## 2) First application exercise analysis.

During the First application exercise, the students answered on the following question: ‘Based on the information provided in Chapter 3, which was the main factor in the use of the life sciences to develop offensive biological weapons programmes during the 20th century?’

- A. The lack of international agreements prohibiting the use of biological weapons;
- B. The lack of international agreements prohibiting the development of biological weapons;
- C. The unquestioned effectiveness of biological weapons;
- D. The need for effective retaliation in case of first use by a state’s enemy;
- E. The willingness of life scientists to take part in biological weapons programmes as part of their patriotic duty;
- F. The readiness of scientists to exploit the state’s interest in biological weapons and thus attract additional research funding;

- G. The fact that other areas of science (e.g. physics and chemistry) had already been widely deployed for offensive purposes and biology was in no way different;
- H. The conviction that wars have no rules and any kind of weapon can be used.

All groups had to complete the task within 20 minutes. The students' choices were the following: 1<sup>st</sup> and 4<sup>th</sup> groups selected option C (see above) but 2<sup>nd</sup> and 3<sup>rd</sup> groups selected option D (see above). The students provided strong arguments to support their choices and provoked the long discussion. The students asked Dr. Shelyfist to share her opinion. Her opinion differed from students' and this provoked discussion extension. The students showed strong understanding of learned materials and capability to put forward their ideas.

### 3) The Second application exercise analysis

The Second application exercise encourage students to use their knowledge in practice.

The task of the Second application exercise was: Biological control ('biocontrol') refers to the development and deployment of naturally occurring pathogens and insects for the protection of crops from disease caused by pathogenic agents and disease caused or transmitted by insect vectors. The technique is targeted against noxious organisms in the context of agriculture, such as weeds. It is developed and deployed for peaceful purposes with the consent of farmers and local authorities.

As a team of scientists working on the development of novel 'biocontrol' agents, you come across a fungus that attacks coca plants – the plants used for the production of cocaine. After you have published your research, you discover that the military in your country have used your data to develop a method for the mass production of the fungus, and have used it against coca plantations in the territory of a neighboring country, as a means of curtailing the production and spread of illicit drugs. The operation has been conducted without the consent of the victim country's government. Moreover, you also begin to come across reports about the deleterious effects that the use of the fungus has on the environment, the soil, and on human health. You feel that you have a moral responsibility to take an action. What would that be?

The task was completed within 20 minutes. All groups have done this exercise well. All students' group proposed to share information with effected country's government and draw attention of media, scientific and ethics communities to this case. The 1<sup>st</sup> and 3<sup>rd</sup> group proposed to inform BWC too. The 4<sup>th</sup> group proposed to promote efforts to find the antifungal agents for reducing the consequences of fungus usage on the environment, the soil, and on human health. All groups condemned of destructive use of the life sciences and other related research.

### 4) Participants' feedback

After the main activities completion, students provided positive feedback. They emphasized the TBL is very interesting for them. During the lesson they had possibility to use their knowledge, to share their opinions and promoted them. The students indicated that competition stimulates to be more creative and team work encourages their responsibility.

The teachers who observed the classroom activities discovered TBL features and capabilities. The teachers indicated that this learning approach provides possibility to see students from other side: during this lesson not only students' leaders shared their opinions, all students were involved in the application exercises. TBL improve the students skills to present their ideas and participate in discussions.

The University administration is preparing a document on the effectiveness of the module implementation at the University.