

PROMOTING AWARENESS OF BIOLOGICAL SECURITY IN THE LIFE SCIENCES: INTEGRATING CARTOONS WITH TEAM-BASED LEARNING PRINCIPLES

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THE CARTOON SERIES WAS DEVELOPED BY DR T. NOVOSSIOLOVA, PROF MALCOLM DANDO, LEVERHULME EMERITUS FELLOW, UNIVERSITY OF BRADFORD, UK AND PROF LIJUN SHANG, LONDON METROPOLITAN UNIVERSITY, UK AS PART OF A [BIOLOGICAL AND CHEMICAL SECURITY PROJECT](#) LED BY LONDON METROPOLITAN UNIVERSITY, UK.

DEFINING **DUAL-USE** LIFE SCIENCES RESEARCH

“Dual use research of concern is life sciences research that, based on current understanding, has the potential to provide knowledge, information, products or technologies that could be directly misapplied to create a significant threat with potential consequences to public health and safety, agricultural species and other plants, animals, and the environment.”

(WHO 2020, [Laboratory Biosafety Manual – 4th ed.](#))

THE DUTY TO **PREVENT** LIFE SCIENCES MISUSE

“Researchers need to participate in discussions about the possible consequences of their work, including harmful consequences, in planning research projects. As the ones who design and carry out research, researchers can provide information on the nature and purpose of research that is not available in any other way.” [emphasis as original] (IAP 2016, [Doing Global Science: A Guide to Responsible Conduct in the Global Research Enterprise](#)).

THE VALUE OF **ACTIVE LEARNING** IN TEACHING BIOLOGICAL AND CHEMICAL SECURITY

“[A]ctive learning’ methods, as opposed to traditional, lecture-based instruction in which students are passive recipients, produce better and longer lasting results. The results hold for factual information and for more fundamental concepts. The methods can be applied in many settings, including the classroom, the laboratory, or the field.” (OPCW Advisory Board on Education and Outreach, 2018, [Report on the Role of Education and Outreach in Preventing the Re-Emergence of Chemical Weapons](#)).

NATIONAL IMPLEMENTATION OF THE BIOLOGICAL AND TOXIN WEAPONS CONVENTION (BTWC)

Article I

Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

(1) microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes.

PROMOTING AWARENESS OF DUAL USE AND BIOLOGICAL SECURITY ISSUES IN PUBLIC AND PRIVATE SECTORS

MANAGEMENT STANDARDS FOR BIOSAFETY AND BIOLOGICAL SECURITY

DEVELOPING CODES OF CONDUCT

BIOLOGICAL SECURITY RISK MANAGEMENT STANDARDS

FOSTERING A CULTURE OF RESPONSIBILITY

DEVELOPING EDUCATION AND TRAINING PROGRAMMES

TEAM-BASED LEARNING (TBL) is a special form of **active learning** using a specific sequence of individual work, group work and immediate feedback to create a **motivational framework** in which the focus is shifted from conveying course concepts by the instructor to the **application of course concepts by learners’ teams**. The TBL format can be used for **biological security training** and it is **easy to replicate**.

PRE-READING

iRAT (individual Readiness Assurance Test)

tRAT (team Readiness Assurance Test)

FEED-BACK

1ST APPLICATION EXERCISE

2ND APPLICATION EXERCISE

REMEMBER

UNDERSTAND

APPLY

ANALYSE

EVALUATE

CREATE

Based on the [TBL Collaborative](#) and [Bloom's Taxonomy \(1956\)](#).

FACILITATING CRITICAL REFLECTION ON BIOLOGICAL SECURITY THROUGH CARTOONS

The cartoon series, **Strengthening the Web of Prevention against Chemical and Biological Weapons** illustrates key concepts related to responsible science, including the issue of **dual use**; the role of **codes of conduct**; the need for **education and awareness**; and the importance of **biological security culture** for safeguarding ‘one health’. The cartoons could be used for the design of **TBL application exercises** as visual scenarios that enable learners to ‘observe’ and consider **indicative situations** of relevance to the implementation of biological security. The cartoons are primarily targeted at **life science stakeholders** and aim to engage them in critical reflection and ethical deliberation on the **process** of fostering a robust biological security culture.

