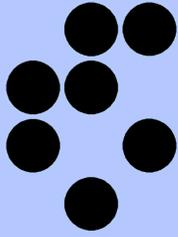# EFFECTIVENESS OF POSSIBLE DISTANT RADIATION PROTECTION TRAINING AND COMPLIANCE WITH THE SLOVENIAN LEGISLATION

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ABSTRACT: *As a consequence of coronavirus disease pandemics technology of education and training has to be adapted to information technology. While the infrastructure is widely available, the technology of distant education and training is known, but not widely accepted. Different approaches have their particular advantages and deficiencies.*

According to current Slovenian legislation, radiation protection training should be performed in a classroom with demonstrations and some exercises, and with a written examination. Refreshing training is not required (except for training for RPOP), and re-examination should be performed every five years.

Analysis of requirements in relevant rules and authorised programs reveals that blended learning is the optimal approach to the implementation of initial and refreshing training courses. Analyses based on Bloom's taxonomy also supports this recommendation.

This type of training could be introduced for refresher training without some additional changes in legislation, but amendments would be required if we want to introduce blended learning to initial training. Methods of examination and re-examination should not be changed.

INTRODUCTION

- **Coronavirus disease (COVID-19) pandemic** has influenced the education of children, adolescents and young people, as well as different training activities of people of all ages.
- As far as **education** is considered, we have seen that existing communications system and information infrastructure could be used for the introduction of distant forms of learning.
- Most of **the training activities** were cancelled or postponed. Reasons:
  - Training is isolated and targeted to smaller groups.
  - Training is specialized.
  - Training should be concluded with official certification, which is regulated and can not be adapted to "adverse" conditions.
- **Radiation protection training** was also postponed
  - It was tempting to perform training as distant learning, but…
  - Radiation protection training must be verified and approved.

SOFTWARE TOOLS FOR MODERN FORMS OF TRAINING AND LEARNING

- Software tools changed from simple editing tools to complex systems that require the support of dedicated professionals and considerable investments.
  - Special training and familiarisation with tools are needed for teachers and trainers before they start using them.
  - Content preparation and implementation require the cooperation of different persons.
  - There are no shortcuts here (work, investments)!
- Basic tools for remote e-learning content preparation are common office suites like Microsoft Office 365, or Google G Suite.
- **Other Specialised tools**:
  - ⇨ Free **authoring tools** for graphics, animations, videos, audio.
  - ⇨ Tools for **video conferencing**.
  - ⇨ **Learning Management System (LMS)** enables teacher/trainer to perform administration, registration, tracking reporting, creation, and delivery of e-learning courses or training programs.
  - ⇨ Software **applications for testing and grading** students.

TRAINING AND LEARNING WITH SUPPORT OF MODERN INFORMATION INFRASTRUCTURE

- Before computers and the Internet (before the nineties): classroom with a teacher/trainer or self-study from books and other materials.
- Computer era (the nineties): addition of electronic books, also some interactive contents.
- **Internet era** (21st century):
  - ❑ **Classroom training and learning:** Ideal for smaller groups in the case when interaction, bonding and communications are vital to achieving learning objectives.
  - ❑ **Live Internet:** A flexible and cost-effective alternative to classroom training and learning, and is achieved by using a Web conferencing platform. There is limited opportunity for interaction and participant cannot speed up or slow down the training to match his/her learning needs. Therefore, highly complex or technical topics should be avoided.
  - ❑ **Self-paced online learning:** On-demand e-learning provided through locally or cloud-based software where trainer uploads existing content into templates and develop multimedia courses.
  - ❑ **Blended learning:** It is a combination of classroom (live) training with live internet or on-demand e-learning.
    - In this way, **the best of all worlds** could be accessed.

EFFECTIVENESS OF TRAINING

- **Bloom's taxonomy** is a model of classifying thinking according to **six cognitive levels** of complexity**:**

  1. Remembering.
  2. Understanding.
  3. Applying.
  4. Analysing.
  5. Evaluating.
  6. Creating.

- These levels are used to **structure the learning objectives, lessons, and assessments of a course**.

- The taxonomy is **hierarchical:**
  - Before you can understand a concept, you must remember it.
  - To apply a concept, you must first understand it.
  - To evaluate a process, you must have analysed it.
  - To create an accurate conclusion, you must have completed a thorough evaluation

- Therefore, learning at the higher levels is dependent on having attained the required knowledge and skills at lower levels.

SLOVENIAN LEGAL REQUIREMENTS

- Occupational training in "normal" conditions are usually a mixture of classroom lectures, demonstrations and practical exercises
- **Requirements for training**:
  i. Radiation protection training should be implemented in the form of a course that consists of **classroom lectures and practical demonstrations and exercises** (also duration is prescribed).
  ii. A **written examination** is required
  iii. Some modern forms of distant training are not foreseen.
- **Requirements for refreshing courses and re-examination:**
  i. Refreshing courses are **not required (and regulated)**, except for professionals, which are involved in RPOP.
  ii. Therefore, **it is possible to perform refreshing courses in any form of distant learning**, but re-examination should be done in the "classical" way.
  iii. Requirements of legislation are fulfilled in this way and there are no obstacles to implement refreshing courses in this way.

POSSIBILITIES FOR IMPROVEMENTS

- Most of the learning objectives in radiation protection training programs belong to the lowest cognitive levels in Bloom's taxonomy (level 6 – remembering, level 5 – understanding, and level 4 - applying).
  - Remote forms of learning could be successfully implemented when cognitive level 6 (remembering), and, in some cases, level 5 (understanding) are required.
  - Cognitive level 4 (applying) is beyond the capability of simple methods of remote learning and should be supported by classroom training and practical exercises.
- **Conclusions**:
  i. Just **introductory and general parts of training** could be implemented in the form of remote learning.
  ii. **Specific knowledge and exercises** must be delivered in a classroom (direct learning) environment with the personal involvement of trainers.
- **Blended learning**, i. e. a combination of distant and classroom training, seems to be an optimal approach for initial training.

CONCLUSIONS

- *Modern information technologies enable us to use different methods of learning and training instead, or in addition to classroom training and learning. It seems that blended learning, which is a combination of classroom training with live internet or on-demand e-learning, is the most suitable for radiation protection training since it is possible to include different categories of cognitive levels.*

- *In Slovenian legislation distant learning is not anticipated for radiation protection training. Classroom training with practical exercises and demonstrations are prescribed and written exams are required. Refreshing courses are not required except for training of persons that must be trained in RPOP. Re-examination (written exams) is required every five years.*

- *If we want to introduce some forms of distant learning, the legislation will have to state that possibility. But for refreshing courses, the introduction of distant learning is possible now.*

- *Transferring examination or re-examination to some Learning Management System platform would require additional approval from authorities.*

- *For Slovenia the blended learning with the preservation of written examination should be optimal for radiation protection training. This conclusion is also supported by the analysis based on Bloom's taxonomy.*

- *Blended learning could be applied to refresher training and re-examination without additional approval from authorities, while the possibility to use blended learning for initial training has to be approved in legislation yet.*