

# ADVANTAGES OF USING PEDAGOGICAL TECHNOLOGIES IN TEACHING PLANT PROTECTION SCIENCE

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## Abstract

The article discusses the theoretical and practical possibilities of using modern pedagogical technologies in teaching plant protection science. The effectiveness of interactive methods - problem-based learning, cluster, conceptual map, laboratory modeling, STEAM approach, digital simulators, game technologies and competency-based tasks is scientifically analyzed. Also, 9 educational games that can be used in such areas as phytopathology, entomology, and weed control are given with a methodological description.

**Keywords:** Pedagogical technologies, plant protection, STEAM, simulator, interactive games, phytopathology, entomology, competence.

## Introduction

The effective functioning of the plant protection system in agriculture directly depends on a qualified specialist, his diagnostic, assessment and decision-making capacity. Therefore, being limited to traditional lectures and practice in the process of teaching this subject does not meet modern requirements. The agronomist and soil scientist of the 21st century must have digital skills, be able to comprehensively evaluate agrotechnical measures, and model the spread of diseases.

Modern pedagogical technologies are an effective tool for meeting these requirements. Interactive methods, information and communication tools, game elements, and project tasks make the complex biological processes of plant protection science understandable and memorable.

Pedagogical technology is a scientifically based system of designing, organizing and evaluating the educational process. In plant protection science, this means:

1. Active learner position. The student is not a consumer of knowledge, but participates as a subject involved in its creation.
2. Orientation to competence. Identifying a disease, identifying a pest, assessing the level of damage, and choosing a protective measure are practical competencies.
3. Modeling. The development period of the phytopathogen, population dynamics, and environmental conditions are simulated.



4. Problem-based learning. The student is presented with a realistic situation: “Septoria leaf spot has increased in the wheat field. What measures would you choose?”

5. Game-based learning. The game develops memory, observation, analysis, and quick decision-making skills.

Advantages of pedagogical technologies in plant protection science: the ability to virtually model real processes, safe experience, solid competence, active involvement of students in the lesson, collaboration and communication.

Below is the game technology.

1. “Find the Disease” Phytodiagnostics Tournament
2. “Pest-Boss” Compatibility Test
3. "Pesticide Laboratory" virtual simulator
4. Solving the problematic situation of the "Phytopathologist Judge"
5. Agrogeography project "Weed Map"
6. "Entomological Race" relay race
7. “Who are we running from?” diffusion model
8. "Biological Agents Auction"
9. “Defense Strategy Builder”

**Below is a detailed version of the diagnostic-based educational game “Find the Disease!”**

**The goal of the game.** To develop students' phytopathological thinking, skills in differentiating diseases by symptoms, making diagnoses, and choosing the right protective measures, to strengthen their visual analysis skills regarding plant diseases, and to develop active participation in a group, competition, and communication competencies.

**Necessary equipment.** Photos of diseases (with above-ground and below-ground symptoms), cards (name of disease, causative agent, control measures), projector or monitor (optional), scorecard. How is the game played? (in stages)

**Stage 1. Grouping,** The students are divided into small groups of 3-5 people. Each group is given a name: “Phytopathologists”, “Diagnosticians”, “Protection specialists”

**Stage 2. Demonstration of disease photos.** The teacher shows 10-12 photos of plant diseases in sequence. Examples: Alternaria, Oidium (powdery mildew), Fungal spot, Bacterial rot, Viral mosaic,

**Stage 3. Group discussion (2-3 minutes)**

Each group carefully studies the picture: Determines the name of the disease, names the type of pathogen (fungus, bacteria, virus), explains the main external signs, Determines which protective measure is appropriate: biological method, chemical fungicide/insecticide, agrotechnical method

**Stage 4. Respond.** Groups take turns answering. Points for each correct answer:

Correct disease name → 2 points, Type of pathogen → 1 point, Interpretation of symptoms → 1 point, Correct choice of protective measure → 2 points, Stage 5. “Complex picture” round. The teacher shows a mixed state of several diseases or plant stress in one photo.



**Groups:** It analyzes which diseases are involved, which symptoms belong to which disease, and a comprehensive defense strategy. This round is rated up to 5 points.

**Stage 5. Final evaluation.** The group with the most points wins. The teacher analyzes the process and gives a mini-lecture on the main mistakes.

**The pedagogical effect of the game.** Strengthens diagnostic skills, Increases the speed of recognizing disease symptoms, Develops practical thinking, Forms teamwork skills  
Conclusion. The use of pedagogical technologies in plant protection science enlivens education, strengthens analytical thinking, makes laboratory processes safer, forms phytosanitary competence, and increases students' motivation to study. The game technologies presented in this article are a great help in the effective organization of lessons.

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