USING OPEN EDUCATIONAL RESOURCES IN PHYSICS

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UTILIZAREA RESURSELOR EDUCAȚIONALE DESCHISE LA FIZICĂ

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Rezumat. În contextul ultimilor ani, învățarea la distanță a căpătat noi valențe, fiind preponderentă în vremuri de criză. În plus, societatea actuală se conectează în mediul virtual, cunoscând o adevărată revoluție digitală în toate domeniile. Având în vedere acest progres, educația școlară trebuie să se adapteze. Platformele digitale inundă piața educațională și pun la dispoziția profesorilor instrumente de creare de conținut digital interactiv, teste de evaluare precum și interfațe de comunicare între actorii educaționali, iar materialele educaționale deschise devin accesibile tuturor. Profesorii pot dezvolta sau personaliza conținut inteligent, conform programelor scolare. În România, prin intermediul proiectului național CRED, a fost creată o bibliotecă digitală gratuită cu resurse educaționale deschise pentru învățământul primar și gimnazial, care pune la dispoziția profesorilor și elevilor conținut video. Acest articol prezintă site-ul „Fizica, gimnaziu", în care se regăsesc resursele dezvoltate pentru clasele VI – VIII, precum și crearea unei lecții interactive prin intermediul aplicației Genially. Utilizarea resurselor digitale facilitează crearea de experiențe de învățare personalizate pentru elevi. Utilizarea tehnologiei in educaţie ar putea aduce unele beneficii, precum: un mediu de învățare captivant; laboratoare interactive, prelucrarea datelor experimentale, evaluare interactivă, se adreseaza unor stiluri diferite de învățare; face posibilă învățarea în ritm propriu.

Cuvinte- cheie: predarea fizicii, OER/RED, e-learning, lecție interactivă, instrumente interactive.

Abstact. In the context of recent years, distance learning has acquired new values, being predominant in times of crisis. In addition, today's society connects in the virtual environment, experiencing a true digital revolution in all fields. Given this progress, school education must adapt. Digital platforms flood the educational market and provide teachers with tools for creating interactive digital content, assessment tests as well as communication interfaces between educational actors, and open educational materials become accessible to all. Teachers can develop or customize intelligent content according to school curricula. In Romania, through the national CRED project, a free digital library with open educational resources for primary and secondary education was created, which makes video content available to teachers and students. This article presents the website „Fizica, gimnaziu" (physics, middle school), where you can find the resources developed for grades VI - VIII, as well as the creation of an interactive lesson through the Genially application. Using digital resources makes it easier to create personalized learning experiences for students. The use of technology in education could bring some benefits, such as: an engaging learning environment; interactive laboratories, experimental data processing, interactive assessment, address different learning styles; makes learning at your own pace possible.

Keywords: Physics teaching, OER/ RED, e-learning, interactive lesson, interactive tools.

I. INTRODUCTION

In the context of recent years, distance learning has acquired new values, being predominant in times of crisis. In addition, today's society connects in the virtual environment, experiencing a true digital revolution in all fields. Given this progress, school education must adapt.

Digital platforms flood the educational market and provide teachers with tools for creating interactive digital content, assessment tests as well as communication interfaces between educational actors, and open educational materials become accessible to all. Teachers can develop or customize intelligent content according to school curricula.

In Romania, through the national CRED project, a free digital library with Open Educational Resources (OER) for primary and secondary education was created, which makes video content available to teachers and students.

The Ministry of Education and Research has launched the Digital platform on educred.ro [11], a space created for all teachers who want to capitalize on new technologies in learning activities with students. This platform was developed by the „ Relevant Curriculum, Open Education for All" project team - CRED, with the support of the educational experts Unit for Research in Education (UCE), to support teachers and students to continue learning from home. [9]. Teachers can access learning resources needed to support remote activities with students, digital tools with which such resources can be developed, collaborative learning platforms, adapted to the context of the students' class (and school-level resources), but also useful tools for remote communication and collaboration, as well as learning communities where experiences and resources can be shared with other disciplinary peers. The platform made available by the Ministry of Education and Research also contains a section of OER/ RED, centralized in the „ISE Resources" section of the site. In this virtual space - digital.educred.ro - several types of digital resources and useful information are centralized in the educational activities carried out. All resources collected on the platform are free.

II. „FIZICA, GIMNAZIU" WEBSITE

The „FIZICA, GIMNAZIU" website [7] was created within the CRED project.

The site is structured by classes, each with a distinct page, respectively Class VI, Class VII and Class VIII. Each of these has a subpage with the general skills and the specific skills of each class. On the main page of HOME, you can find the school curriculum for physics, gymnasium, as well as the current legislative regulations. On each of the pages intended for each class, you can find the contents of the school curriculum and the open educational resources developed in the CRED project.

Figure 1. „Fizica. Gimnaziu" website [7]

III. INTERACTIVE LESSON THROUGH THE GENIALLY APPLICATION.

The applications created through Genially can be used both in class, within certain learning sequences, chosen by the teacher, or as self-assessment. It is known that each student has his own learning rhythm, so these can be accessed by students at home, for learning. They can also be used in crisis situations, as was the case during the COVID 19 pandemic, when learning was done online.

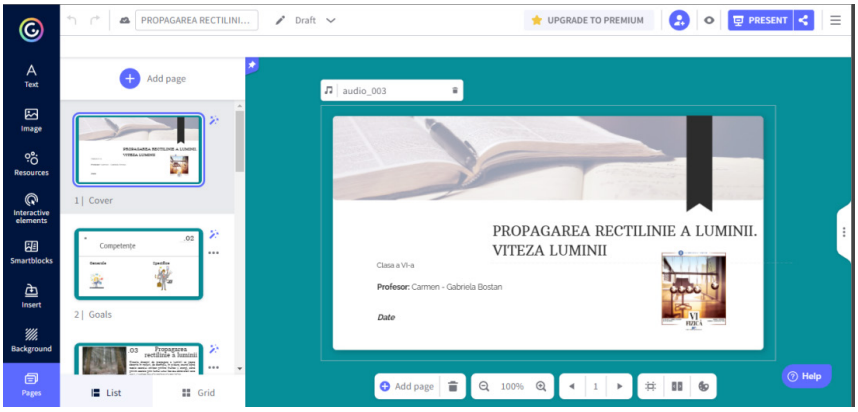

Figure 2. Interactive lesson through the Genially application

On the left side of the screen is the main menu for inserting and formatting a presentation. The role of the principal buttons is: Go to Genially Panel; Text Insert and format text; Image Insert and format image; Resources Resources that can be inserted: Icons, Shapes, Graphs and Charts, Lines and arrows, Illustrations, Scenes, Maps, Silhouettes; Interactive elements Interactive elements that can be inserted: Buttons, Buttons with text, Interactive questions (Multiple choice, True or false, Open question), Markers, Social networks, Numbers and letters, Interactive area; Smartblocks Smartblocks that can be inserted: Data/ Tables/ Graphs, Diagrams, Galleries/ Images, Full size

Insert Insert Audio, Video, Other formats. Files can be inserted, or the teacher can record audio explanations; Background Insert / change or format the background; Pages Insert / add or remove pages; format the canvas size, transitions, or navigation; collaborate with other colleagues; open the formatting menu; look ; Add interactivity (Tooltip - A short label or description appears when you hover the mouse.; Window - A box with text, images, video, or other content opens; Go to the page - Jumps to another page of the genially;

Link - A web page opens; Full screen - The content expands to fit the screen; Audio - Plays music, a voice recording, or a sound; Reveal - Makes other content appear on the screen.) ; Add Animations; Save

With their help, the lesson „ Rectilinear propagation of light. Speed of light / Propagarea rectilinie a luminii. Viteza luminii" and the self-assessment test were created.

III.1 THEORETICAL BACKGROUND

Rectilinear propagation of light [1, p.114].

Light propagates in a straight line. The path of a light ray is independent of the action of other rays and the direction of propagation.

The law of rectilinear propagation of light: In a homogeneous and transparent medium, light propagates in a straight line.

Homogeneous medium means a medium that has the same properties throughout its mass.

The light is propagating in the form of light rays. The direction along which light propagates is called a ray of light. The right direction of light propagation can be observed in nature, for example, in the forest, when the sun's rays pass through the leaves and branches, when we look at the sun through the smoke of a fire or when it is foggy outside, and we see the headlights of cars.

Several light rays form a light beam. If the light rays are concurrent, then the beam is called homocentric or conic. Depending on how the rays are oriented, light beams (fig 3.) can be:

- parallel - the rays are parallel; the rays meet at infinite;
- divergent – the rays leave from a common point; depart from the top of the cone;
- convergent - the rays meet at the same point; the direction of the light rays is towards the top of the cone.

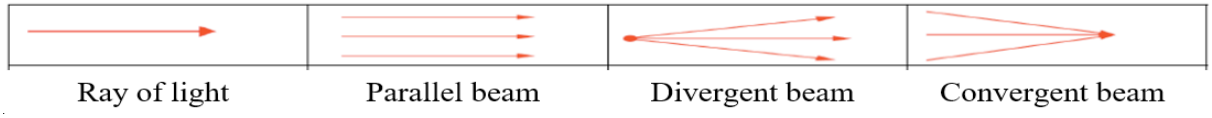

Figure 3.

Speed of light [1, p.115].

In a vacuum, the speed of light is denoted by *c* and has the value *c = 300 000 000 m/s*; this is the highest speed known and calculated so far.

The ratio between the speed of light in a vacuum and the speed of light propagation in that medium is called the index of refraction n of a medium. This index represents a characteristic of the respective environment and is always super unitary. The index of refraction has no unit of measure, that is, it is dimensionless.

$$n = \frac{c}{v} = index\ of\ refraction\ of\ medium$$

A medium is optically homogeneous if, in that medium, the index of refraction n has the same value in all directions.

The speed of a light wave is dependent on the properties of the medium, respectively on its optical density. The denser a material is from an optical point of view, the slower the speed of light.

III.2. EXPERIMENTAL BACKGROUND

We will be using the experimental kit. The experiment is carried out on front or groups of pupils. [1, p.114].

1) The projection lamp, a screen with a circular opening and a transparent vessel (an optical tub) filled with water, in which I put chalk dust, are mounted on the optical bench. In the water, we observe an illuminated portion, namely the beam of light. [1, p.114].

2) The projection lamp, a screen with a circular opening and an opaque screen are mounted on the optical bench. A candle or spirit lamp is placed between the two screens. Above the flame, through the smoke produced by it, the beam of light will be observed. [1, p.114].
3) In a transparent glass with water, pour sodium bicarbonate or chalk powder and mix. To visualize a narrow beam of light, the light from a laser flashlight is projected onto the transparent glass. Observation is better in semi-dark conditions [1, p.115].

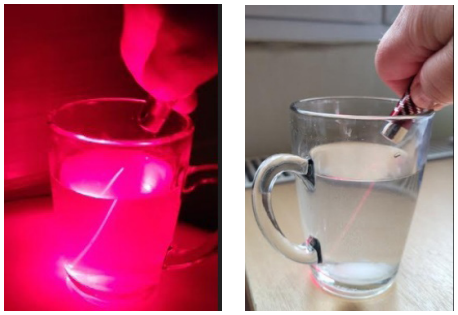

Figure 4. Light beam in a semi-dark conditions / daylight

III.3. COMPUTATIONAL BACKGROUND

For creating this lesson, it was used the digital platform Genially (fig.5.). The platform can be used for the purpose of didactic design. With Genially platform, the teachers can create various presentations, infographics, gamification, interactive images, didactical videos, training materials etc. (fig.6.)

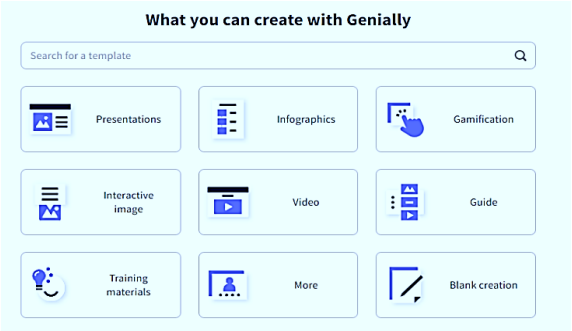

Figure 5. Panel - Genial.ly

Figure 6. Digital unit of learning. https://app.genial.ly/editor/612e638ac840a20dd9662058

III.4. DIDACTICAL METHODS

Teaching methods used are explanation, conversation, experiment, demonstration, discovery, and computer modelling.

The learning unit: „ Rectilinear propagation of light. Speed of light / Propagarea rectilinie a luminii. Viteza luminii"

The need to study this topic: the phenomenon is present in everyday life: the student interacts with light, light beams, light rays, the notion of speed/ velocity.

- The form (gradual level): the class-6th grade (the student's age – 13 years old).
- The type of the lesson: teaching/learning.
- The didactical tools: video, experimental kit and after, completed with simulation on the computer (Genially).

The didactical intention: to define rays of light, light beams, The law of rectilinear propagation of light, speed of light, index of refraction of medium.

Instructions for teacher and the students:

- checking previous knowledge and homework;
- making the connection with the new lesson;
- carrying out the experimental activity on groups of students if the lesson takes place in a physical format. In online format, the experiment is conducted face-to-face, by the teacher;
- drawing conclusions, generalizing observations with the help of the teacher.
- deepening the knowledge learned with the help of the application created in Genially., resuming and discussing some stages of the lesson;
- feedback - self-evaluation with the application from Genially;
- homework. Students have online access to the lesson created through the application, to learn at their own pace (Fig. 6).

VI. DISCUSSION AND CONCLUSIONS

Physics teaching/learning has evolved from traditional transfer methods - whiteboard demonstrations and laboratory experiences - to e-learning platforms that facilitate distance teaching/learning. E-learning applications include web-based learning, computer/tablet/phone learning, virtual classroom opportunities, and digital collaboration. The new interactive means of teaching/learning, digital platforms and OER emphasize the role of technology-enhanced environments in science learning, and allow students to observe and explore scientific phenomena interactively in a virtual environment, without decreasing the quality of the didactic act, or in the development of skills. [2]. Thus, the teacher can integrate multimedia educational resources in the didactic training in different stages of the learning units or can carry out the educational act at a distance. Using ICT in education can promote and improvement curiosity, capacity of research, communications.

Multimedia educational resources have an important impact on the teaching-learning process of Physics. OER stimulate audio-visual memory, put students in the midst of phenomena and complete their skills [3].

Digital resources also facilitate the creation of personalized learning experiences for students. The technology in education could bring some benefits, such as: interactive laboratories; experimental data processing; interactive assessment; address different learning styles; an engaging learning environment; makes learning at your own pace possible.

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