POSSIBILITIES OF STIMULATING INTELLIGENCE IN STUDENTS DURING THE BIOLOGY LESSONS USING MOZAWEB ONLINE PLATFORM

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Abstract

The purpose of this paper is to highlight how the various intelligences of students can be stimulated within the lessons of biology in middle school, through the use of 3D models and images existing on the mozaWeb online platform, choosing for certain forms of organization of student work, and applying various teaching methods. As a research method we used the analysis of current programs and textbooks, and also the analysis of digital materials made available to teachers by mozaWeb platform. Analyzing the 3D models and images existing on the mozaWeb online platform, and the content of textbooks for fifth and sixth grade, we identified the possibility of stimulating several types of intelligences during the biology lessons. Thus, at sixth grade, within the lesson on "Long-legged birds – Stork", held into a classroom equipped with "intelligent board", the verbal, visual logical and interpersonal intelligences of students can be stimulated. At the seventh grade, within the lesson on "The ear. The ear's function in the process of hearing", if the lesson is held into the computer laboratory equipped with a "intelligent board", and the activity will be carried out by groups of students, the verbal, visual, logical, musical and interpersonal intelligences of the students will be stimulated. Also, at the seventh grade, within the lesson on "The ear. The ear's function in maintaining the balance" held into a classroom equipped with a "intelligent board", can be stimulated the verbal, visual, logical and kinesthetic intelligences of the students. The most frequently challenged intelligences of students, both for lessons carried out into a classroom equipped with "intelligent board", and those carried out into the computer laboratory, were the verbal, visual, logical and interpersonal/intrapersonal intelligences.

Key words: lessons of biology, mozaWeb online platform, multiple intelligences

Intelligence is "the ability to understand easily and well, to discern what is essential, to solve new problems or situations based on previous experience" (DEX on-line). It is "a higher form of knowledge and behavior, wherein the adjustment and balancing of individual interaction with the environment is realized through images, representations, ideas and mental actions" (Dicționar de pedagogie, 1979).

In psychology, there is no uniformity of views on the definition of intelligence. As mentioned by Zlate (2006), the intelligence (lat. *intelligere* – to relate with, to organize; lat. *interlegere* – to establish relations between relations) in considered by many psychologists as "the general ability of the acquisition of knowledge, reason and problem solving". Other psychologists, among whom the aforementioned author remembers Gardner, believes that intelligence "involves different kinds of skills" (Zlate M., 2006).

Gardner, the author of Multiple Intelligences Theory (MI theory), has defined the intelligence as follows: "To my mind, a human intellectual competence must entail a set of skills of problem solving - enabling the individual to resolve genuine problems or difficulties that he or she encounters and, when appropriate, to create an effective product - and must also entail the potential for finding or creating problems - and thereby laying the groundwork for the acquisition of new knowledge." (Gardner H., 1993).

Based on the results of his research, Gardner states that there are no identical persons, and consider that each person is unique and possess a certain intelligence profile. Thus, "each learner's intelligence profile consists of a combination of relative strengths and weaknesses among the different intelligences: linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, naturalistic, interpersonal, intra-personal, and (at least provisionally) existential" (Gardner F., 2006; Moran *et al*, 2006).

Armstrong, referring to the theory of multiple intelligences, states that the number of intelligences may be higher, but other intelligences "have not been identified yet", and each type of intelligence identified by Gardner "can be

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described by certain traits, activities and passions" (Armstrong Th., 2011).

Moran, Kornhaber and Gardner consider that "Intelligences are not isolated: they can interact with one another in an individual to yield a variety of outcomes". […] "And as in an orchestra, one intelligence (instrument) in an individual can interfere with other, compensate for others, or enhance others." (Moran *et al*, 2006).

Gardner consider that "any individual can develop an intelligence if well motivated, if he/she lives in a culture that values that intelligence, and if there are human and artifactual resources (eg, texts, computer programs, study groups) that he/she can use" (Gardner H, 2006; Petruța G.P., 2014).

In educational practice it is important both the identification of student's intelectual profile, and selection and application of teaching strategies during lessons to activate those intelligences considered to be their strengths. However, the teacher will have to have in mind that "no one set of teaching strategies will work best for all students at all times", as suggested by MI theory (Armstrong Th., 2009). Consequently, as pointed out by Armstrong, "any particular strategy is likely to be highly successful with one group of students and less successful with other groups (Armstrong Th., 2009).

A teaching mean that can be used within the teaching strategies applied by the teacher in lessons for stimulating different intelligences in students, is the computer. Armstrong believes that if a multimedia software is used, the following intelligences can be developed:

- linguistic, by the text that is presented;
- spatial, by the images displayed;
- musical or linguistic, by sounds;
- bodily-kinesthetic and other intelligences, by video (Armstrong Th., 2009).

Given the possibility of stimulating intelligences of students using a computer, the aim of our research was highlighting how can be stimulated the different intelligences of students in the lessons of biology in middle school through the use of 3D models and images existing on the mozaWeb online platform. Thus, the main objectives of our work were the following:

- highlighting the digital materials available to teachers of biology on the mozaWeb online platform;
- identification of images and 3D models that can be used in biology lessons at secondary school;
- highlighting the possibilities of using digital materials aforementioned in biology lessons, to activate different intelligences in students.

MATERIAL AND METHOD

"In the didactical activity, the personal computer or its portable variant, named laptop, is a modern didactic tool which can perform the teaching activity carried out usually by the teacher, when an educational soft is used." (Petruța G.P., 2010). Currently, through the computer, in addition to collections of Ael and Intuitext interactive lessons, the teacher can use also the digital materials existing on the mozaWeb online platform.

To highlight the ways by which the use of mozaWeb online platform can stimulate the various intelligences of students within the biology lessons in the middle school, we used as method of research the analysis of actual programs and educational materials, as well as the analysis of educational materials existing on the mozaWeb platform.

RESULTS AND DISCUSSIONS

By creating an account on the mozaWeb online platform, any person involved in teaching, teacher or student, has the possibility of studying weekly, free, 10 images, 10 videos, and 10 3D models elaborated for the various school subjects, among which can be found biology. The 3D models "are a way of representation of relief images, three-dimensional, using the computer" (Stanciu M., 2015). The digital materials can be used both in lessons conducted in middle school and high school.

When designing a lesson, the teacher's creativity and originality are important in using the digital materials mentioned above, in order to stimulate students' intelligences.

Thus, at 6th grade class, within the lesson on "Long-legged birds – The stork", held into a classrom equipped with an "intelligent board", verbal intelligence of the students can be stimulated in the stage of capturing attention through a riddle about the stork, told by the teacher, or a few lines about migratory birds from different poems recited by students, for example, the first verse of the poem "Guests of spring" of Alecsandri, or "Heralds of spring" of Coşbuc.

Thanks to the Internet connection, and using the "intelligent board", the lyrics can be presented to the whole class. This type of intelligence can be stimulated also by requiring students to complete a crossword puzzle developed before by the teacher. Through conversation can be found the solution (answer) to each question, and the students will fill in the crossword using smart board markers. Finally, by solving the crossword puzzle, they will

identify some of the lesson title, namely "The stork". How the teacher moves to the new lesson, remain at its discretion. Further, based on the images existing on the mozaWeb online platform about stork (*figures 1, 2*) and by applying the cube method, can be stimulated visual, verbal and interpersonal intelligences of the students.

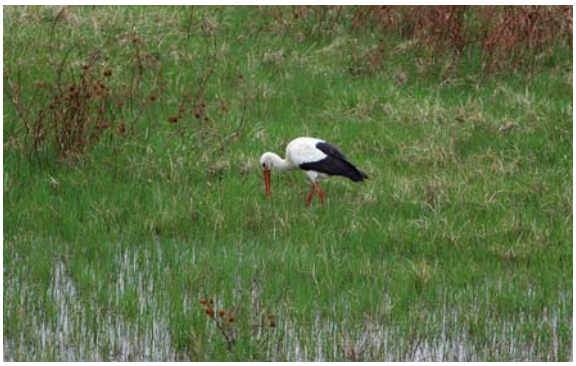

Figure 1 **The stork in the environment**
(http://www.mozaweb.com)

Students in the class will be divided into five groups and each group will be given a workload, which they will need to solve using images from the text of lesson in the textbook, and those from the atlas. Group 1 should describe stork's environment, body shape and color.

Group 2 will have to compare the domestic duck (a previously studied bird) and stork, noting some similarities and differences regarding their shape and body size, beak shape, limb length, way of moving around and propagation mode.

Figure 2 **Flight of the stork**
(http://www.mozaweb.com)

Group 3 will have to associate certain anatomical features of stork with the living environment and way of feeding. Group 4 will have to analyze the living environment and limbs in white stork, black stork, crane, gray heron and great egret, and to determine the general characteristics of long-legged birds. Group 5 will have to argue why the stork is a migratory bird, and why is considered a useful bird.

At the end of the lesson, students will be introduced to the educational videos existing on the mozaWeb portal about pink flamingo. By deductive discovery, the students will be asked to establish whether pink flamingos are long-legged birds, by applying the general characteristics of long-legged birds to this species.

Looking carefully at the images and data presented in the video on the living environment of the pink flamingo bird, anatomical features (height, weight, wingspan) way of living (how they live, and how they sleep), food and age in this species, the students will solve this task. Implicitly, will be stimulated the visual and logical intelligences of the students.

At 7th grade class, within the lessons on the ear, the teacher can use many 3D models to highlight the function of ear in the process of hearing and maintenance of balance, as well as to present the otitis media.

Thus, the lesson "The ear. Function of ear in the process of hearing" can be carried out into the laboratory of informatics equipped with an "intelligent board", and using the 3D model "The ear and the mechanism of hearing" (*figure 3*) existing on the mozaWeb platform.

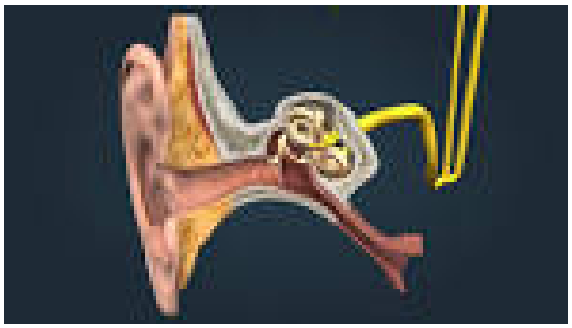

Figure 3 **The ear and the mechanism of hearing**
(http://www.mozaweb.com)

The musical intelligence of the students can be stimulated in the stage of capturing attention by listening a recording, such a piece of music, the song of birds, or the noise produced by car horns. Following the conversation with students, it is emphasized that both treble and bass, and weak or strong sounds, are captured by ear, thus leading them to the title of the lesson. This type of intelligence can be stimulated by using the 3D model, as the presentation of images is performed on a musical background.

By accessing the icon "The mechanism of hearing", the teacher will demonstrate and explain the section made through the skull, which can be enlarged and rotated, the three components of acoustic-vestibular analyzer: peripheral segment, intermediate segment and the central segment. Thus, will be stimulated the visual and verbal intelligences. Students will observe the components of outer ear, pinna (or auricle), and the ear canal (external auditory meatus). At the level of middle ear they will observe the ear drum and the three tiny bones known as ossicles: the hammer (malleus), the anvil (incus) and the stirrup (stapes); at the level of inner ear they will notice the bony cochlea and the three semicircular canals. Then, the students will observe the formation of acoustic-vestibular nerve (colored in yellow) and the route of acoustic nerve to the cortical projection area - the superior temporal gyrus (colored in green).

Further,the students grouped in pairs will access independently icon "The ear" and will observe, by rotating the image, the location of the eardrum outer layer (also known as tympanic membrane), stapes, oval window and round window, Eustachian tube, acoustic and vestibular branches of the acoustic-vestibular nerve, and auditory cortical projection area.

Then, they will access one after other the icons "Ear bones" and "Cochlea", observing the localization of the three ossicles and structure of cochlea, which is presented as a cross section. In this learning activity, in addition to visual and verbal intelligences, the interpersonal intelligence will be also activated.

Directed by the teacher, students will study the structure of the organ of Corti, formation and conduction of nerve impulses through the auditory nerve by accessing the icon "Organ of Corti". Then, they will access the icon "Tonotopy" to understand that high frequency sounds stimulate basal cells of the organ of Corti, and those of low frequency boosts its apical cells. Next, the teacher will access the icon "Animation" in the "intelligent board", showing how the sense of hearing is formed.

At the end of the lesson, it will be stimulated the logical intelligence of students, who are asked to solve everything in pairs with a simple choice test by accessing icon "Quiz" and a dual choice test with visiting icon "True or false". Each test is composed of five items. The marks obtained by students to the test, for example, "Excellent", "Be more carrefully" or "try again" (the first test) or the statement "You can go forward" (the second test) are a sign, both for the teacher and for students, of the extent to which new knowledge has been acquired by students.

Students can solve numerous tests at home after they have learned the lesson content, as they are very effective in learning the scientific content, whereas the previous test questions, that were answered incorrectly, are included in the next test.

The next lesson, on "The ear. The ear's function in maintaining the balance", can be held into a classroom equipped with an "intelligent board", the teacher having the possibility to use the 3D model "Sense of balance" (*figure 4*) or the videos "Sense of balance" (*figure 5*) existing on the mozaWeb platform.

Figure 4 **Sense of balance**
(http://www.mozaweb.com)

Figure 5 **Sense of balance**
(http://www.mozaweb.com)

Checking the knowledge acquired previosly about the ear can be achieved by accessing icon "The ear". By using demonstration of a 3D material realized by students, observation and conservation, in this stage of the lesson will be stimulated the visual and verbal intelligences of students.

Among the questions that the teacher may ask students to answer, we mention the following: What is the role pinna? What importance is the Eustachian tube? What is the route that vibrations go through up to auditory cells of membranous cochlea? What is the intensity of sound waves perceived by the human ear? But their frequency? Where the sensation of hearing is formed?

In the stage of transition to the new lesson, the students may be asked to make some lateral and rotational movements of their head and body, in which they can keep or lose their balance. This will stimulate the kinesthetic intelligence of students. The teacher will emphasize that the ear plays an important role in both hearing and stability (maintaining balance).

Visual and verbal intelligences of students can be further stimulated by accessing the icons.

By accessing the icon "Inner ear", the teacher will demonstrate and explain the orientation of the three semicircular canals in the three planes of space and the formation of acoustic-vestibular nerve. It will state that dilation of each semicircular canal is called the ampoule and that at its level is the ampullary crest, which is the sensory organ comprising the receiver cells.

By accessing the icon "Detection of angular acceleration" students will observe in the three 3D video materials presented what happens in the inner ear when a person tilts his head from left to right, it rotates and tilts it from right to left. They will also notice which semicircular canal receives angular acceleration in the three cases mentioned, this canal being colored blue, and what happens at the level of receiver organ from this channel. Thus, the students will understand how the receiver ciliated cells are stimulated by the movement gelatinous mass that covers them, produced due to the movements of endolymph.

Then, the teacher will access icon "Detection of head motion and position", and will demonstrate and explain the structure of otoliths existing in the saccule or utricle of the inner ear, specifically in the vestibular labyrinth. Students will observe the supporting cells and receptor cells provided in the apical pole with cilia, covered by a gelatinous mass that contains otoliths. Based on this information, students will understand how nerve impulses are produced when detecting the head motion or changed position, or the change of linear velocity, due to the movement of otoliths.

At the end of the lesson, can be activated the intrapersonal intelligence, the students being asked to describe individually on a worksheet what happens when a person moves his head in a certain direction, at their choice.

CONCLUSIONS

In the biology classes, there are numerous possibilities of stimulating students' multiple intelligences. This depends on the teacher's creativity and originality. Thus, when designing the lessons, the teacher can choose for the use of certain methods and teaching aids, and for certain forms of organization of student work, aiming at stimulating different intelligences in students, and taking into account the students' intelligence profile.

By using images, videos and / or 3D models available on the mozaWeb online platform, presented using an "intelligent board" either in the classroom or in the computer lab, can be stimulated in students 4-5 types of intelligences, according to the strategy chosen by the teacher on conducting the lesson. These should be considered as highly valuable learning tools, as the intelligences stimulated and developed by them, such as verbal, visual, logical and interpersonal/ intrapersonal intelligences are often required.

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