

## The Use of Animation Film in Studying Some Natural Phenomena and Forming Representations

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### Abstract

*Animation films that focus on narrative topics are frequently watched by pupils, while animation films that focus on natural phenomena are fewer and less watched. The purpose of this study is to analyse a learning activity that uses a film about the consequences of the Earth's rotation and revolutionary motions: the formation of days and nights and the formation of seasons. We analysed the following: the process of selecting the film, the activity of watching the film individually, at home, the activity carried out by the teacher and students on the Zoom platform, the students' results in three tests and in a gap text game, created with the Wordwall application. At the end of the research, we concluded that a learning activity in which animation films and interactive games are used and in which knowledge is mediated by the teacher is more effective than an individual viewing of an animation film about natural phenomena.*

**Keywords:** Wordwall application, Rotation and revolutionary motions, Primary education, Zoom, e-learning, COVID-19

### 1. Introduction and Theoretical Background

The advantages and challenges of ICT and online learning are discussed more and more in the Romanian education system (Manea and Stan, 2016, 2018; Vlada and Jugureanu, 2007; Vlada, Jugureanu and Albeanu, 2011; Vlada, Jugureanu and Istrate, 2009; Vlada et al., 2010). In the literature, the importance of animated films for knowledge and learning is mentioned. The phenomena that occur at the macroscopic or microscopic level can be attractively illustrated by animated films. Computer modelling and animations are used to describe, explain, and predict processes, contributing to science and education (Barak, Ashkar and Dori, 2011; Petrişor, 2015;

Petrișor and Petrișor, 2017, 2018). Animation can provide dynamic information that is not visible or available in static visuals (Lowe, 2003). Through animation films, dangerous phenomena are represented (Dulamă, 2001, 2008, 2013), such as volcanic eruptions, atmospheric phenomena (Vereș, Dulamă and Magdaș, 2020), geomorphological (Dulamă and Gurscă, 2006), hydrological, cosmic systems (Vereș and Magdaș, 2020) and others (Dulamă and Ilovan, 2007). Animations are used to improve the transitions from abstract to concrete mental operations and vice versa (Barak and Dori, 2005; Dori and Belcher, 2005).

The teacher has an essential role in the correct and deep understanding of the contents represented in the animated films, in establishing the connections between the old knowledge and the new information presented in them (Vereș and Magdaș, 2020). In the process of deciphering the content of animated films, groups of children use various strategies (Maine and Hofmann, 2016). Eker and Karadeniz (2014) found an increase in students' academic performance and level of knowledge retention due to the use of animated films. Along with highlighting the role of animated films in learning, the literature claims that the use of game elements motivates students to learn and positively affects learning outcomes (Havola et al., 2020; Magdaș, Vereș and Dulamă, 2019).

The aim of the research is to investigate the role of animated films in understanding some natural phenomena that occur at the macroscopic level. We are looking for the answers to some questions: How do we find and choose the most appropriate film about the motions of the Earth and the consequences of these motions? What is the volume of knowledge gained as a result of students' individual viewing of the film? Is there a connection between the number of views of the film and the students' volume of knowledge? What is the role of the teacher after the students watched the animated film?

## **2. Material and Method**

**2.1. Research design.** The research was conducted in August 2020. (1) In the first stage, we applied a pretest created in Google Drive (cf. Vlada, 2014) to the children, which we sent to them to chat on the Zoom.us platform, in order to establish the level of knowledge on the theme of the film and for sampling. In order to obtain the most accurate results, the students were invited to solve the items themselves. (2) In the second stage, we sent on the Facebook class group, the link to the animated film "Paxi - Day and Night. The Seasons," with the invitation to watch it alone, at home, with the specification of noting how many times they watched this movie, but without insisting on the movie to be viewed several times. (3) In the third stage, we applied the second test (posttest) to check the information volume acquired by children as a result of watching the movie. To determine the efficiency of the viewing, we asked the students, by turn, how many times they viewed the animated film. (4) In the fourth stage, we talked to the students on the Zoom.us platform, to check if they formed correct representations (knowledge) about the Earth's motions (route, duration, consequences) and about the formation of the seasons. We answered the students' questions, we explained and clarified the concepts (phenomena, processes) not understood by some of the children, based on a PowerPoint presentation realised by the teacher. (5) In the fifth stage, to fix the knowledge, the students played individually the game "Day and Night. The Seasons" created by the teacher. (6) In the sixth stage, we applied the retest created in Google Drive and sent it to the students on the Zoom.us platform, in the chat.

**2.2. Data Collecting, Procedure and Research Material.** The data were collected through the three tests applied to the students, from the discussions based on the film and from the game. We analysed the students' answers to the tests through the method of numerical analysis and content analysis. The text of the film was subjected to a thematic analysis of content, and we analysed the images in the film by visual methods. We analysed the individual learning activity carried out by

students at home through an interview and the frontal activity carried out with students on the Zoom platform. The research material included the students' test results, the game, the students' answers to the interview and their own observations.

**2.3. Participants.** This research was attended by 11 first grade students from "Lucian Blaga" Gymnasium School, in Jibou, Sălaj County, Romania, astronomy enthusiasts participating in the "AstroKids" Summer School, organized by the primary school teacher of the class, the first author, Ph.D. student at Babeş-Bolyai University. Students were selected based on the initial test to have a similar level of knowledge and form a homogenous group based on this. One student participated in tests and activities, but was excluded from the research because he obtained poorer results in the posttest although he watched the film several times and this result was explained by the presence of another child of the same age who represented a disruptive factor. Students made the connection and entry on Zoom.us themselves because during this period they participated in many online activities.

### **3. Results and Discussions**

#### **3.1. Analysis of the animation film selection process**

To choose the most suitable animated film for the theme "Earth's Motions and the Formation of the Seasons," we watched on YouTube several animated films: "Paxi - Day and Night. The Seasons" offered by the European Space Agency ESA (2017), "Day and Night, video for kids" and "Seasons in Earth - video for kids" offered by Learning Junction (2017, 2018), "Day and Night Explanation, Causes. Science for Kids" offered by Makemegenius (2014). We selected the animated film taking into account the previously identified criteria: soundtrack in Romanian, explanations offered by an animated character, known to children, short duration, content adapted to the children's age and level of knowledge (Vereş, Dulamă and Magdaş, 2020), and the existence of the explanation for the formation of days, nights and seasons.

#### **3.2. Analysis of the animation film**

The film "Paxi - Day and Night. The Seasons" is part of a series of films in which the main character is Paxi, an alien from the planet Ally-O, who plays the role of a guide who came to Earth on vacation and helps children discover the world. Paxi approaches the children as friends with whom he "had so many adventures in space", he addresses them familiarly ("I'm glad to see you again!"). The duration of the film (3.52 minutes) is optimal for children aged 7-8. The oral text of the film (482 words) is a collage of narrative texts, explanatory texts, and informative texts. Paxi tells, informs, explains, describes, and indicates. From a didactic perspective, Paxi stimulates and motivates children for knowledge, arouses their curiosity, invites them to a journey, to an adventure in space, initiates them to observe cosmic bodies and their dynamics and to ask questions. He puts them in trouble and helps them see the contradictions ("It looks like the Sun is moving around the Earth. But is this really happening?"; "The Earth orbits the Sun"; From Earth, it looks like "the Sun and the stars move, but in fact it is the Earth that revolves").

In this narrative context, the film provides a lot of scientific information, and of this, about 30 concepts are needed to understand the formation of days, nights, and seasons. Many concepts are specific to astronomy (rotational motion, revolutionary motion, Earth's axis), to physics (optical phenomena: light, brightness, optical illusion, day, night, sunset, sunrise), to geography (effects of rotational motion and revolutionary motion).

#### **3.3. Analysis of how to increase the interactivity degree of the lesson by using the *Wordwall* platform**

The platform for creating educational resources, *Wordwall*, offers the possibility of creating interactive activities and printable teaching materials. We created the game “Day and Night. The Seasons” (Vereş, 2020) using the “Missing Word” template provided by the platform. We designed a series of incomplete sentences and, in each of them, the children chose the right word from a list of 3 answers (Table 1).

Table 1. The game “Day and Night. The Seasons”

Statement	Correct answer	Wrong answers
The earth receives light and heat from ...	Sun	Moon; Mars
The rotational motion of the Earth around its axis is done in ... hours.	24	23; 25
When the Sun ... begins the day.	Rises	Sets; stay up
The imaginary line that connects the North Pole with the South Pole, and around which the Earth revolves, is called ...	Axis	Orbit; Moon
The Earth makes a complete rotation around the Sun during ...	365 days and 6 hours	365 days; 366 days
Compared to the surface of the orbit, the axis of the Earth is ...	Tilted	Right; horizontal
When the Earth is tilted with the northern hemisphere toward the Sun, in the northern hemisphere is the season ...	Summer	Spring; winter
The length of the days is longer in the season ...	Summer	Winter; spring
When the Earth is tilted with the southern hemisphere toward the Sun, in the northern hemisphere is the season ...	Winter	Spring; autumn
The formation ... is influenced by the inclination of the Earth's axis.	Of the seasons	Of days; of nights

Children must give the correct answers within a time frame given by the teacher, and at the end of the game, they receive the result (correct and wrong answers), the correct answer to the question they answered wrong, the place in the class ranking.

### 3.4. Analysis of the teaching activity

**Watching the film.** The students watched the film at home as many times as they wanted, at the time of their choice. To determine if there is a link between the number of views and the results in the posttest, in the discussion with the group on the Zoom platform, when the teacher asked how many times they watched it, we found that three students watched the movie once, four students watched it two times, and four students watched it three or more times. The students who watched the animated film several times are passionate about the topic and motivated that they were curious, that they found the film interesting, that they wanted to better understand its content, that they wanted to clarify some information, to retain and learn it. Four students discussed the content of the film with their parents or older siblings.

**Discussions with the teacher and colleagues based on the film.** In the 45-minute meeting, initiated on Zoom.us, we discussed the content of the film with the students. We asked them, in turn, to say what they found difficult to understand, what they did not understand. The children asked “what is the South Pole and the North Pole,” “why it is summer when the Earth is farther from the Sun.” We found that they had misrepresentations of the position of the Sun in the Solar

System (they believed that the Sun is the one that moves) and that not everyone understood how the revolutionary motion of the Earth is realized. We used a PowerPoint material through which we explained these notions.

We supported the students to notice that the Earth received light from the Sun, that on the illuminated side it was day, and on the opposite side it was night. We explained the formation of days and nights. We explained the difference between the real size of the Sun, compared to the Earth, we specified the real distance between the two cosmic bodies and the length of time that elapsed while light moved between them. We directed the students to observe the axis of the Earth, its inclination to the plane of the orbit and we helped them understand that, due to this fact and the shape of the planet, the sun's rays did not distribute evenly heat and light over the entire surface of the Earth. We explained the formation of the seasons as a consequence of the inclination of the axis of rotation and of the rotational and revolutionary motions of the Earth. In the absence of these explanations, animated films and cartoon representations of the revolutionary motions can lead to the formation of misrepresentations about the Sun and the Earth, their motions, and the consequences of these motions.

**The game.** In the last 10 minutes of the activity, we sent the children, via chat, the link to the game "Day and Night. The Seasons" created on Wordwall. All the children participated happily. At the end of the game, everyone said that they found it interesting and that they could learn from mistakes. At the end of the game, the students received the analysis of the answers, and the place they occupied in the class ranking.

### 3.5. Analysis of student results

The grade point average of the class in *Test 1 (pretest)* was 9.73, indicating that students have the prior knowledge necessary to understand the content of the animated film. Students obtained an average of 8.09 in *Test 2 (posttest)*, which is lower than in the initial test. The range of scores was between 7 and 9. The result can be explained by the fact that this test included items with a higher degree of difficulty and that could be solved only if students understood correctly the motions of the Earth and the formation of seasons, as well as other concepts and if their knowledge is well fixed in memory. In Table 2, the connection between the number of views of the animated film and the results obtained by the students is observed. We found that a single viewing of the animated film does not lead to a thorough acquisition of knowledge regarding the formation of days, nights and seasons, the rotational motion and the revolutionary motion of the Earth. Although they have watched the film several times, in order to understand the phenomena and processes represented, students need a teacher to explain the content of the watched film.

Table 2. Number of views of the animated film and the students' results in the posttest

Number of students	Number of views	Average
3	1	7.33
4	2	7.75
3	3	9
1	5	9

The results of the students in *Test 3* were better, compared to the previous test ( $m = 9.91$ ), which indicates the efficiency of the activity carried out together with the teacher. 10 students obtained the maximum score. The average obtained by the students at the game "Day and Night. The Seasons" was very high ( $m = 9.45$ ). Analysing the students' results in the three tests and the applied game (Table 3), we find that the students have made progress.

Table 3. Students' results in the three tests and game

Test 1 (Pretest)	Test 2 (Posttest)	Game	Test 3
9.73	8.09	9.45	9.91

#### 4. Conclusions

In this research, we found that students watch with interest animated films about cosmic bodies. The results indicate that a single viewing of the animated film is not enough to understand and acquire the knowledge about the rotational and revolutionary motion of the Earth, the formation of days, nights, and seasons. We found that the teacher has an important role in students' correct representations formed on the basis of the film, especially in situations where some aspects of reality cannot be represented correctly (shape and size of cosmic bodies, distances between them) or require explanations wider and additional visual aids to facilitate understanding.

The teacher can involve students in an interactive activity on the Zoom platform, after they have been involved in a learning situation based on perception, in which they had a passive role, as spectators. Through the discussion on the platform and through the tools offered by various applications (Google Drives, Wordwall), the teacher increases the degree of teacher-student interactivity, provides additional information, asks questions, listens to answers and provides feedback, leading to active learning, which results in the understanding, deepening and fixing of knowledge by students. Finally, we consider that a learning activity in which the animation film and the interactive game are used and in which knowledge is mediated by the teacher is more effective than an individual viewing of an animation film about natural phenomena.

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