



Stimulating Students' Motivation through the GoScience Project

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Abstract

The article is a study of the Erasmus+ European project “GoScience – creativity and enhanced comprehension in science teaching and learning” (2017-1-BG01-KA201-036209), whose main aim is to stimulate students’ motivation to study science by enhancing their comprehension through creative pedagogical tools commonly used in humanities – story telling, theatre performances, dances, graphics or videos. The project focuses on the role that comprehension has in learning and highlights the need to develop a youth culture based on comprehension. The project’s activities and tools increase students’ creativity, which makes scientific knowledge better understandable and thus increases the probability of implementing it in real life (increased functional literacy for students). The article gives insights into the project’s objectives, methodology and teaching and learning tools as well as its activities and main outputs. The project’s materials enable teachers to control the scientific relevance of knowledge taught and learnt and to motivate students to work independently and take responsibility for their own education. The materials also stimulate students’ creativity and critical thinking skills and their active role in their own learning process, increasing their comprehension of science subjects; they support students at risk (of early school leaving, low achievements, students with migrant backgrounds, young people outside the education system) to learn better, achieve better results at school and most importantly learn difficult subjects such as science subjects in an easy and motivating way.

Keywords: science teaching, pedagogical tools, comprehension, motivation

1. The European project GoScience

The European project GoScience is being implemented by a partnership made up of educational institutions and organisations from seven countries (Bulgaria, Germany, Italy, Latvia, Lithuania, Romania and Spain). The specific aims of this project are:

- Implementation of student centered pedagogical approach that stimulates their creativity and their active role in their own learning process, increasing comprehension of science subjects.
- Training of teachers how to work with the pedagogical approach which will enable them to control the scientific relevance of knowledge taught and learnt and to motivate students to work alone and take responsibility for their own education.
- Support students at risk (of early school leaving, low achievements, students with migrant backgrounds, young people outside the education system) to learn better, achieve better results at school and most importantly learn difficult subjects as science subjects in an easy and motivating way.

The project’s main idea is to develop an innovative method of teaching and learning science by enhancing students’ comprehension through creative pedagogical tools. The aim of the project is to develop and enhance students’ comprehension skills, which will help them to fully understand and follow the information they are exposed to. Solid comprehension skills enable students to interpret and evaluate information; connect information to what they previously learnt; integrate new ideas into their current knowledge to or look at ideas from different perspectives; determine and remember the most important points in the text; read “between the lines” to understand hidden meanings.

2. Enhancing students’ comprehension

Comprehension is a powerful tool because the ability to construct meaning comes from the mind of the reader. Therefore, comprehension has to be taught and instruction is necessary for students to develop effective strategies.

There are six types of comprehension strategies [1]:

- make connections—students develop the ability to connect the new topic or information to previous knowledge they have about the world

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- ask questions—students ask themselves (or others) questions about the new information in order to clarify points, get more knowledge they think it is necessary to get the whole picture of the concept
- visualize — students make a visual mental representation of what they have read about
- identify the structure and the main components of the information—students distinguish the essentials in the text; distinguish between fact and opinion; determine cause-and-effect relationships; compare and contrast ideas or information; analyse problems and find solutions; identify and name the steps in a process; summarize
- make inferences—students use what they know to guess about what they do not know; they use their prior knowledge and current information to draw conclusions, make critical judgments, etc.
- synthesize students combine new information with current knowledge to form original ideas, new lines of thinking, or new creations

Students quickly grasp how to make connections, ask questions, and visualize. However, they may have problems when identifying the essentials in a text, when making inferences or combining information to form new creations. All these strategies should be practised until students successfully use the strategy that helps them comprehend the text. In addition, they must understand that they have use a variety of these strategies in order to be effective [1].

3. Integration of arts learning approaches into STEM education

Integration of arts learning approaches into STEM education has been a popular topic lately. Most arguments supporting this idea state that the arts and humanities can provide students with investigational and interpretive tools enhancing their understanding of diverse concepts and phenomena. The arts and humanities also equip students with the creative and critical thinking skills they need to know in a complex changing society [2].

The Goscience method relies on techniques which are commonly used in humanities – story telling, theatre performances, dances, graphics, videos etc. Science and art naturally overlap. The connection between arts and science can be traced back to the Egyptian pyramids. What is more, in ancient Greece, the word for art was “techne”, which is the root of technique and technology terms. Science and arts are both tools investigating our world and involving the development of ideas, theories, and hypotheses. The arts and sciences are products of human creativity. Art has long been recognized as an important part of a well-rounded education. Through their emotional side the arts tap into many different interests and abilities and forms of learning, which will lead to students getting a deeper understanding of the new concepts [2].

3.1 Focus on the development of students’ creative skills

Creativity is an important asset of our condition, which is more than ever required nowadays when people have to continuously adjust to increasingly dramatic changes in our society. It goes without saying that schools should become important places to develop and shape students’ creative thinking skills, which are necessary and fundamental assets to the achievement of a person, organization or country. Creativity should go side by side with critical thinking to help young people achieve their potential. Aksoy’s findings [3] confirmed that science instruction, based on creative thinking, has increased the creative thinking level of the students, has improved their academic success level and has advanced their attitudes to the lesson of science knowledge. The Goscience method encourages the development of students’ creative and critical thinking skills through challenging activities [3].

4. The project’s activities-further developments

The project involves five schools for each partner. Each partner will carry out solid research on creative pedagogical approaches, tools and practices, which are used in science teaching and learning in each country. A starter kit (manual) for teachers of physics, chemistry, biology and mathematics will be devised, being based on the findings of this research. The manuals will also promote creative pedagogical tools and tests which can be used for science teaching. Model lesson plans, which can be implemented with students, will also be developed.

4.1 The project’s outputs

The project will create the following outputs:

- Database of creative pedagogical tools (videos, models, short theatre performances, stories told).



- A starter kit (manual) for teachers of physics, chemistry, biology, and mathematics, which will include:
 - a. Formulation/definition of the theoretical themes (concepts and relations) of the subjects in the curriculum.
 - b. At least one pedagogical tool of each theme, to be used as a comprehension model of the theoretical concept (i.e.: a video of a short theatre performance arts), a story, or another tool teachers and students create.
- The manual will cover important and necessary scientific concepts, which will allow students to use them in high school. The manual will enable students to get an overall view of the subject and the relation between concepts they will be studying. Thus the manuals will be usable in any science subject and any grade in any country, regardless of the curriculum. The manuals will enable teachers to help students make connections among scientific concepts, which are often taught at different levels in schools.
- Methodology for teachers: training them how to use the pedagogical approach of enhanced comprehension in teaching science through creative pedagogical instruments.
 - Model lesson plans for enhancing comprehension in teaching and learning sciences.
 - Tests and assessment tools for checking of students' progress and knowledge acquired using the methodology and approach of enhanced comprehension through the use of creative pedagogical instruments.
 - Online tools for teaching and learning, based on the concept of crowd sourcing, which is the practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community [7].
 - Training of teachers to work with the pedagogical approach of “teaching science through humanities” -10 teachers from 7 partner countries -70 people – trainings to be held for 5 days in Bulgaria (two courses – 35 people per course).

5. Conclusions

Given the role that science and technology has in our society and students' lack of interest in these school subjects the European project GoScience has embarked on stimulating students' motivation to study science by using innovative means. The project's innovative method enhances students' comprehension through creative pedagogical tools commonly used in humanities – story telling, theatre performances, dances, graphics or videos. The project's activities and tools increase students' creativity, which makes scientific knowledge better understandable and thus increases the probability of implementing it in real life (increased functional literacy for students). The materials also stimulate students' creativity and critical thinking skills and their active role in their own learning process, increasing their comprehension of science subjects; they support students at risk (of early school leaving, low achievements, students with migrant backgrounds, young people outside the education system) to learn better, achieve better results at school and most importantly learn difficult subjects such as science subjects in an easy and motivating way.

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