# "Lyrical Mathematics": Odysseas Elytis

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**Abstract:** Through the teaching plan that follows an attempt is made to shed light on some aspects of the interface between poetry and mathematics in the work of a major modern Greek poet, Odysseas Elytis, with a view to claiming that, despite their different starting points, these two intellectual activities can be combined to describe and fully interpret our experiential reality, the world and its structure. The teaching scenario is based on the theory of Constructivism, according to which students are given the opportunity to discover knowledge through the construction of broader, richer and more substantial cognitive patterns. By detecting mathematical elements (structural, numeral, geometric) students have the opportunity to attempt a new interpretive approach to Elytis, to document the influence of ancient Greek philosophy as well as that of the folk and ecclesiastical tradition on his poetry and to discover the significance of nature's secret numbers for his thought. They are also invited to investigate the ways in which Elytis converses with artwork (synikones), thereby documenting his interest in the work of the Cubists, in geometric form as well as in the purity and simplicity of structures based on artistic compositions and images from antiquity.

**Key words:** poetry and mathematics, Elytis, interpretation of the world, constructivism

## 1. Introduction

The present teaching proposal is made within the context of interdisciplinary approach to knowledge, a key component of the new Curriculum in Secondary Education which emphasizes the acquisition of holistic knowledge. In this perspective, Elytis' combination of literary and mathematical elements, apart from posing a challenge for teachers, has also provided cause for initial surprise and questioning on the part of students. Before working under guidance in class in order to trace mathematical elements in our poet's work, students were given the opportunity to gather basic information about his life and work and to attempt a first approach to his poetic work through a selection of passages.

### 2. Elements of Implementation

Teaching was designed to take place in the 2nd grade of General Lyceum consisting of 23 students at a large urban school. There is going to be a three-hour teaching course (135 minutes).

## 3. Pedagogical Framework

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In order to achieve the objectives of the teaching scenario, the theory of constructive approach to knowledge was utilized. Based on the work of Jean Piaget and Jerome Bruner, constructivism emphasizes the importance of students' active involvement in building up knowledge about themselves as well as new ideas or concepts based on current knowledge and past experience (Smith, 2002). All variants of constructivism were used in the teaching proposal: active learning, exploratory learning and knowledge building. These variations promote students' free exploration within a given context or structure (Devries & Zan, 2003). The role of the speakers was regulatory and inspiring, encouraging the participants to discover and gain knowledge.

## 4. General Purpose

Interconnection of poetry with mathematics within the framework of cross-curricular approach to knowledge, initially aiming at reflection and then awareness that they are two intellectual activities that complement each other and contribute to the understanding of the world and the decipherment of its beauty (Aharoni, 2014; Lynch, 2019). A further aim is the identification of mathematical charts in the work of a great Greek poet, O. Elytis, and the realization through a critical view of his work that mathematics is part of his cosmology and his epistemology.

## 5. Learning Objectives

### 5.1 Pedagogical Objectives

Students should:
- Understand, through the use of multimodal texts and works of art, the relevance and relation of representations, ideas and images coming from different fields of study.
- Learn to observe structures and to practice assuming structural ratios that allow for a more holistic view without the limitations of a single specific field of knowledge. This exercise strengthens a cross-disciplinary and multidisciplinary approach.
- Develop critical thinking by looking at ideas and information objectively while remaining open to the opinions of others.
- View the taught subject from various perspectives, which complement add and reveal further truths.
- Experience exploratory-discovery learning.
- Complete their personality by developing observation, attention, power of concentration, perseverance, initiative, creative imagination, disciplined thinking and behavior.

### 5.2 Cognitive Goals

Students should:
- Extend their reading experience by coming in contact with multimodal texts that suggest a different, dynamic and multiform model of understanding literature.
- Revise the view that mathematics and poetry are not related and that mathematical elements cannot be detected in poetry but also in other forms of art.
- Come in contact with the work of a great Greek poet, O. Elytis, and attempt a new interpretive approach by detecting therein mathematical elements more or less prominent.
- Get acquainted with the use of ICT for the collection, processing and presentation of data (digital literacy)

- Appreciate O. Elytis' "lyrical mathematics" as a language for the expression of ideas and emotions associated with his cosmology and his cognition.
- Demonstrate their own skills and competences through creative writing or creating visual arts.

## 6. Expected Learning Outcomes

- Students should:
- Realize that Mathematics and Poetry have common elements and contribute to the process of understanding the world.
- Cast off the stereotyped notion that mathematics is an abstract language of numbers and discover what mathematicians report as the beauty of mathematics.
- Document the conscious use of mathematical evidence by O. Elytis and understand the term "lyrical mathematics" he uses.
- Detect mathematical elements (structural, numerical, geometric) in the work of a great Greek poet, O. Elytis, thereby attempting a new interpretive approach.
- Compare O. Elytis' "lyrical mathematics" with the mathematical elements existing in the work of French poet Guillevic by identifying similarities and differences.
- Understand that O. Elytis "lyrical mathematics" is a language for the expression of ideas and emotions and is connected with the poet's cosmology and cognition.
- Detect the influences of ancient Greek philosophy on his work and, mainly, of the numerology of the Pythagoreans, by selecting, researching and reformulating information from texts given to them (critical literacy).
- Recall examples of everyday use of numbers, their presence in our folk and ecclesiastical tradition, and discover their influence on the work of the poet.
- Discover how the laws of mathematics find expression in the beauty of nature through the study of norms and symmetries under the guidance of the poetic work of O. Elytis.
- Discover the links between the speech and the imagery of Elytis' poetic and nonfiction work with artwork (collage and painting).
- Observe O. Elytis' preference for the work of the Cubists, the geometric form, purity and simplicity of the structure through visual compositions and images from antiquity.
- Compose their own poetic work on the basis of a structural mathematical model that he followed — albeit unconsciously — or create a collage or painting by experiencing the writing or general artistic process.
- Cultivate reading skills such as reading aloud and listening to texts, as well as present their works, and be able to make but also accept criticism by others.
- Apply the study of mathematical ratios in a game-mathematical puzzle, enjoy and try to solve a mathematical problem formulated in a poetic way (ancient epigram).
- Discover how there are verbal and non-verbal languages and that they can all give pleasure thanks to the symmetry and the harmony that characterizes them.

## 7. Suitability of the Classroom

The learning level of the class is good with a willingness to learn and collaborate. Several students, in fact, have developed critical competence. The room is large, suitable for creating work groups. It does not have a computer or projector and therefore there will be a need to transfer the appropriate equipment for the needs of the lesson.

## 8. Methodology of Teaching

### 8.1 Recommended Educational Method

- Cooperative and group-centered, interactive and exploratory
- Questioning teaching
- Recall of prior knowledge
- Interdisciplinary

### 8.2 Techniques

Use of learning strategies and techniques proposed in the new curriculum:
- Brainstorming
- "Think, Pair, Share (TPS)"
- Artful thinking
- Creative Writing or other creative techniques (creating collages and paintings)
- Game in the classroom

### 8.3 Logistics Infrastructure

- Computers
- Worksheets
- Projector
- Board
- Digital camera

## 9. Development of Learning Plan: General Description

### 9.1 1st hour

Stage 1

Starting by recalling previous knowledge and views

Psychological and cognitive preparation of students. Students are invited to reflect on and express their views on the possible relationship they may consider that mathematics and poetry have.

*Activity 1*

Step 1: The words "mathematics" and "poetry" are written on the board.

Step 2: Brainstorming method attempts a first approach to finding the relationship between these two concepts.

*Activity 2*

Step 1: A worksheet is distributed to students with texts of O. Elytis and they are asked to document their conscious use and to understand the term "lyrical mathematics".

Step 2: Students work together and answer questions.

Step 3: Views from each pair-group across the classroom are presented.

Step 4: Debate. Final conclusions. The students, after compounding the views of all the groups, are led to the conclusion, according to the statement of the poet himself, that the existence of mathematical elements in his work is due to the instinct of Geometry that is inherent by birth. Also, when they come in contact for the first time with the term "lyrical mathematics" that he uses, (Elytis, 1986, p. 286) they explain its content and talk about their value and usefulness based on what our great poet says.

Stage 2

*Activity 3*

Step 1: The students are given a worksheet with poems, prose, interviews by O. Elytis and website addresses with his works and the students are asked to find through the collaboration groups the mathematical tiles existing in his work. They should also find correlations of his work with Pythagorean philosophy, ecclesiastical tradition, folk songs, everyday use of speech and the secret numbers of nature. (Triantafyllou, 2012) Three poems by the French poet Guillevic are also being studied and a comparison is made as to how the two poets use the language of mathematics (Guillevic, 1967).

Step 2: Students process the worksheets by groups and answer the questions.

Step 3: The representative of each group announces the findings of the work.

Step 4: A short video is shown for math in nature (Vila, 2010).

Step 5: Debate. Final conclusions. The students find out that the mathematical parts in the work of O. Elytis are numerous and have the form of structural elements, numerical references and geometric elements. They point out the frequent presence of numbers 3 and 7 and interpret thereof. They also find similarities and differences between the poetic work of O. Elytis and poems by the French poet Guillevic.

*Activity 4*

Step 1: Summary of the key points - outcomes from the above activities.

Step 2: Assignment of homework.

**9.2 2nd hour**

Stage 3

Beginning with a video from the "Swan Lake" (Tchaikovsky, 2019) and the 40th Symphony of Mozart (Mozart, 2019) a video showing fireworks at Fuji mountain (Kinoshita, 2019), pictures with the starry sky, as viewed from El Teide, Spain's highest mountain in Tenerife (Sorgjerd, 2019), a video with pictures from a kaleidoscope (Pixabay, 2019) with the Parthenon (Tsalkanis, 2020), projection with the help of a projector of a mathematical proof and two schematic poems, "With Light and with Death", from "Little Nautilus" of O. Elytis (Elytis O, 2002, p. 518) and "Calligraphy" from the Logbook B of G. Seferis (Stamou, 2009).

*Activity 1*

Step 1: With the help of the projector, the videos and both poems, as well as the mathematical proofs are displayed.

Step 2: A discussion about the material that was shown follows, about whether the previous pictures are giving some form of pleasure to the students, the common reason they feel pleasure, and if they show a preference for some of the pictures. The students discover that there are verbal and non-verbal languages and that they can all give pleasure thanks to the symmetry and the harmony that characterizes them.

Stage 4

*Activity 2*

Step 1: A worksheet with learning resources (poet's collages, paintings, sculptures, vases and mosaics from antiquity) is distributed to the students who are then are asked to track down their relationship with Elytis' poems and prose.

Step 2: Students process the worksheets in groups and answer the questions.

Step 3: The representative of each group announces the findings of their work.

Step 4: Debate. Final conclusions. The students understand the conversation of speech with the image, the poetic and prose work with the visual art but also the preference of O. Elytis in cubism, (Aggelidou et al., 2001), the geometric shapes, the simplicity of the lines of the ancient Greek art (Triantafyllou, 2012*)*.

*Activity 3*

A summary of the key points - findings from the above activities is made.

**9.3 3rd hour**

Stage 5

Beginning with audio materials. Psychological and cognitive preparation of students. Students have the opportunity to enjoy Elytis' poems set to music and prepare for the next activity.

*Activity 1*

Step 1: A worksheet is given to the students.

Step 2: The poem "Of the Aegean" (set to music) from the collection "Orientation" (GPITRAL4 Greek Music, 2015) is heard.

Step 3: Students are asked to identify the basic structural elements of the poem.

Step 4: Students identify them working in pairs.

Step 5: They report their findings

Step 6: Debate. Final conclusions. The students realize that the poet even unconsciously followed a structural mathematical model for the composition of the poem.

*Activity 2*

Step 1: Students are asked to compose their own poem by following the structural mathematical model of the previous poem or create a painting or collage with images from the poem.

Step 2: Within the time given, students compose their work.

*Activity 3*

Step 1: Students read through the use of digital camera the poems they composed or display to their classmates the collages and paintings they have created.

Step 2: The works are evaluated by the other students.

Stage 6

*Activity 4*

Step 1: A worksheet is distributed to students with a math puzzle (Hercun, 2019, p. 47) and an epigram containing a math problem (Weisstein, 2021).

Step 2: Students are initially invited to enjoy and then solve the puzzle based on mathematical relationships and ratios.

Step 3: Solutions are suggested and the right one is emphasized.

Step 4: The professor gives information to the students about the epigraph and the mathematician

Diophantus.

Step 5: Students are invited to read the epigraph, to enjoy it, and to find out if there is a mathematical problem in the guise of a poetic form.

Step 6: Students are asked to solve the problem individually, although emphasis is given on the effort and enjoyment that students feel.

Step 7: Solutions are announced and the right one is emphasized.

Stage 7

*Activity 5*

Step 1: Students are asked to note in the personal diary the new data they have learned and to ask themselves whether they have revised their initial view on the relationship between mathematics and poetry.

Step 2: Debate. Final conclusions. Students realize that they have changed their original point of view and that mathematical elements can be found in poetic texts, but also that mathematical problems and puzzles can be formulated in a poetic way offering aesthetic pleasure. Ultimately, that poetic intuition and mathematical reasoning can not only coexist, but, if combined, can contribute to the deeper interpretation of the world and the decipherment of its beauty.

## 10. Student Assessment

The evaluation process is carried out during teaching on the basis of the individual papers and the answers given in the worksheets. In addition, homework is given so that an additional opportunity is given to the students, without classroom and time stress to process aspects of the subject. Further, the ability of creative expression through the composition of a poetic work or the creation of a collage or a painting is evaluated. Finally, the evaluation also takes into account the active participation of pupils in all activities.

## 11. Evaluation of Teaching Plan — Self-reflection

The initial surprise of the students after the announcement of the title of the teaching plan was followed by the expression of interest, which remained vivid throughout and resulted in the active participation of all students. At first, students found it hard to see what kind of relationship or common elements might possibly exist between such different intellectual fields as poetry and mathematics, preferring to focus on the differences between them. However, at a later stage, through the variety of activities and educational material given to them for processing, on the one hand, and through exchange of views, on the other, they came to reconsider their initial point of view — as evidenced from their personal diaries during the last activity of the plan — realizing that the combination of poetic insight and mathematical reasoning makes for a fuller understanding of the world. Familiarity with the study of multimodal texts enhanced their observation and creative imagination as they had the opportunity to approach the subject under consideration from different viewpoints and cultivate their critical thinking, while remaining open to the views of others.

Therefore, in attempting a more general evaluation of the application of the teaching scenario, we would say that the general purpose and the specific objectives were achieved to a great extent, as the participants through multiple visual approaches to the subject and the activation of their creative thinking were able to see the coexistence of mathematics and poetry in the work of O. Elytis as part and parcel of his cosmology and epistemology, to identify similarities and differences of his "lyrical mathematics" with the work of the French poet

Guillevic and to experience the pleasure verbal and non-verbal languages can offer thanks to the harmony and symmetry that inform them. They were also led to clearly see how Elytis brings together poetic word and artwork (synikones), his preference for the pure forms, outlines and geometric shapes of cubism, and his alignment with the purity of the lines and shapes of ancient Greek art.

In this context, particular emphasis should be given to the use of creative writing and other creative techniques (collage, painting), which have proven to be pleasant and enjoyable processes. In particular, the practice of creative writing can contribute to the initiation of students in the techniques of textual construction, encouraging their shift from the position of receiver to that of transmitter (Nikolaidou, 2009). Thus, in the long run students are expected to enrich their reading equipment. Moreover, the alternative choice of other creative techniques enabled more students to get involved in the learning process. The enthusiasm of the students was great when they presented their works through a digital camera and then expressed and accepted the criticism of the other classmates in a process of supporting their point of view with arguments and accepting the evaluation of others.

It is also worth mentioning that the clear organization of the material and the clearly defined objectives pursued in the course of each activity contributed to sufficiency of time for the activities of each teaching hour.

## 12. Expansion

There is room for study and critical comment on more texts from ancient and modern Greek poetry, in pursued in Homer's *Odyssey* (rhapsody 16, verses 232–255), in epigrams from the 14th book of the *Palatine Anthology* which contain mathematical problems, riddles and puzzles, as well as in poetic compositions by: Aris Alexandrou, G. Ritsos, Tzeni Mastoraki, Prodromos Markoglou, Pantelis Boukalas, Giannis Yfantis, Hector Kaknavatos and Manolis Xexakis, in whom the combination of mathematical elements and poetry is of special interest (Balis, 2001).

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