

# **Teachers' attitudes, views and difficulties regarding the teaching of evolution**

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## **Introduction**

The theory of evolution (TE) is recognized as the unifying theory in biology and its teaching is considered to be of crucial importance to pupils, and essential to scientific literacy. According to Reiss, Millar and Osborne (1999) "Evolution through natural selection is 'one of the six explanatory stories' to narrate to our students". The teaching of TE is determined among other factors, by: the way of its presentation in the curricula, in biology textbooks, by the attitudes of teachers etc. This study is focused on the biology teachers' views and attitudes, as well as the problems towards teaching TE. The research shows that there are several problems in teaching TE Zetterqvist's research found (2003) that teachers do not have the competence to teach the TE aiming at conceptual understanding, and Jiménez Aleixandre (1994) noticed that they have insufficient competence in identifying their students' everyday conceptions. Much research has addressed teachers' attitudes concerning the evolution-creation controversy in the U.S.A. (Tatina 1989, Shankar & Skoog 1993, Osif 1997, Aguiard 1999, Meadows et al. 2000, Griffith & Brem 2004). Teacher acceptance of evolutionary theory was significantly related to teacher understanding of it (Routledge & Warden 2000). In the Greek educational system, TE is meant to be taught a) in Lower and b) in Upper Secondary School. TE is the last unit in the curriculum of 9<sup>th</sup> and 12<sup>th</sup> grades. However a) many teachers hardly ever manage to teach the TE in the 9<sup>th</sup> grade and b) Since 2000 the unit on Evolution has been omitted on the recommendation of the State and thus excluded from the teaching of biology in 12<sup>th</sup> grade. This study attempts to answer the following questions:

1. What are the attitudes of the teachers regarding teaching TE?
2. How much do teachers really know about the theory of natural selection?
3. Are there any groups of teachers with a common profile regarding teaching TE?

The aim of this research is to shed light on this 'unknown area' in Greece so far, with the purpose of contributing to the promotion of teaching TE, and consequently scientific literacy.

## **Methods - sample**

The sample of the research consists of 111 teachers who teach biology in Secondary education. The questionnaire of the research consists of i) open and ii) closed questions. The closed questions are a) a four-grade scale so that there can be an indication of agreement or disagreement b) questions yes/ no (binary variables) c) multiple response questions. In the processing of the answers, the statistical program SPSS was used. The questionnaire was designed according to the results of a pilot study. The administration of the questionnaires was made in the Laboratory Centers for Science teachers, in the cities. The majority of the questionnaires were answered on the spot without any participation of the researcher. In addition, in small provincial towns the collection of the questionnaires was made, by visiting schools. The research was conducted from October to December 2004.

## **Data analysis - Results**

### **1. Attitudes regarding teaching TE**

- In the first part of the questionnaire teachers were asked to grade eight units of biology, necessary for teaching the subject. The unit of Evolution was among them. At the same time they had to exclude two units. According to their answers, teachers were divided into those who:

- a) excluded Evolution: 15.3 % of them
- b) have included Evolution in the first three choices: 37%
- c) have included Evolution in the last three choices: 47.7%

- In answer to another question, 78.8% of the teachers disagree with the choice of the State to omit the chapter of Evolution from the subject matter of the course in the 12<sup>th</sup> grade, thus excluding it from the teaching of biology in recent years.

- The correlation between the teachers' grading in the selection of Evolution in the units of biology and their view regarding the omission of the chapter of Evolution, showed (p-value  $0.00 < 0.05$ ) that:

- 92.3% and 78.7% of the teachers who have included Evolution in the first and in the last three choices respectively disagree with the choice of the State to omit Evolution.

## **2. How much do teachers really know about the theory of natural selection?**

Teachers were called upon to comment on the answer to a cognitive question students gave regarding the TE. The teachers' reply to this question was set in order to reveal their knowledge about the theory of natural selection. The students' answer was marked according to a four-grade scale from 'Very satisfactory', 'Satisfactory', to 'Barely satisfactory' and 'Most unsatisfactory'. The results were the following:

- 40.4% of the teachers marked the answer 'Barely satisfactory' and 'Most unsatisfactory' (the right answers), while 59.6 % gave the wrong answers 'Satisfactory' and 'Very satisfactory'.

- The correlation between the answers concerning the teachers' grading in the selection of Evolution (Paragraph 1) and the mark they gave to the students' answer, showed (p-value  $0.04 < 0.05$ ) that:

- 35.7 % and 50% of the teachers, who did not include Evolution at all in their choice, gave the wrong answers: 'Very Satisfactory' and 'Satisfactory' respectively.

- 30.6% και 33.3% who have included Evolution in the first three choices gave the right answer 'Barely satisfactory' and 'Most unsatisfactory' respectively.

## **3. Grouping of teachers with a common profile regarding teaching TE**

a) Teachers chose reasons, which could hypothetically justify their personal choice not to teach TE. Their answers combined with: b) the answers to the question of Paragraph 1 and c) The answers to the question of Paragraph 2, led to the groupings of three sets of teachers, which were defined by the technique Two step cluster analysis.

### **First group (26.6%): Positive about teaching TE**

a) The majority of them gave negative answers – They had no reason to avoid teaching TE.

b) 52% chose Evolution in the first three choices and 28% in the last three.

c) The majority of them gave the answer 'Barely satisfactory' (4%) and 'Most unsatisfactory' (60%) in answer to the question in Paragraph 2.

### **Second group (47.9%): Positive about teaching TE but lack adequate knowledge**

a) 46.6% selected the lack in knowledge as reasons. 53.3% did not, or gave no other reasons to avoid teaching TE.

b) 42.3% have included Evolution in the first three choices and 57.7% in the last three.

c) They gave the answer 'Barely satisfactory' (37.8 %), 'Most unsatisfactory' (6.7 %) and 'Satisfactory' (55.5%) to the question in Paragraph 2.

### **Third group (25.5%): Reluctant to teach TE and lacking in adequate knowledge**

a) 70.8% of them adduced as reasons to justify their choice not to teach TE, the lack in knowledge and 62.5% selected reasons regarding the dealing with problems in teaching, stemming from religious beliefs. 50% selected as reasons the difficulty of TE for the pupils.

b) 37.5% excluded Evolution, 16.7% have included Evolution in the first three choices and 45.8% in the last three

c) Teachers gave the answer 'Satisfactory' (70.8%) and 'Very satisfactory' (20.8%) to the question in Paragraph 2.

The correlation of the answers of the three groups with:

- their view regarding the omission of Evolution by the State showed (p-value =0.05) that:

82.6 % of the First, 90% of the Second and 56.5 % of the Third group disagree with the choice of the State .

- the years they have taught biology in Upper Secondary School (USS) showed (p-value  $0.060 < 0.1$ ) that: 44% - 16% of the First, 46.7% - 20% of the Second and 17,4 % - 13% of the Third group have taught biology in USS from 2 to 10 years and over 11 years respectively.
- the gender, showed (p-value  $0.044 < 0.05$ ) that: 60% of the First group, 31.8% of the Second and 56.5% of the Third group is male.

### **Conclusions - Implications**

1. Judging from their answers the majority of teachers appear to have a positive attitude towards teaching TE. They also disagree with the State's choice made in 2000 onwards to exclude the teaching of TE from Upper Secondary School.
2. However the data reveal a lack of knowledge, by a great part of the teachers, in the theory of natural selection. This lack appears to be related with the teachers' grading in the selection of Evolution in the units of biology.
3. There are groups of teachers with a common profile regarding teaching TE. The two groups with a positive attitude include teachers who have taught biology in (the more demanding) Upper Secondary School. They differ in that: the First group of teachers -male in their majority- does not mention any reasons to avoid teaching TE, while a great part of the Second – female in their majority – adduce the lack in knowledge. The Third group of teachers, (of which many of them), having not worked in USS, adduce their lack in knowledge and difficulty to deal with problems stemming from religious beliefs.

In conclusion two issues are of decisive importance. Firstly, TE in Upper Secondary School must not just be cited on the Syllabus but must be actually taught. Secondly, a teachers' retraining program in cognitive and other issues on TE, should be implemented, in order to align Greece with the rest of the European Union.

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