



THE ORIGIN OF MAN: BIOLOGICAL SCIENCES AND PEDAGOGY STUDENTS' CONCEPTIONS

Laucélly Barbara Avelar Rocha

University Center Formiga, Brazil

Hesley Machado Silva

University Center of Formiga and University of Itaúna, Brazil

Graça S. Carvalho

University of Minho, Portugal

This study aims at analyzing Biological Sciences and Pedagogy University students' conceptions on the topic origin of man. It was carried out at the University Center of Formiga, Minas Gerais, Brazil. The analysis focused on the answers to the question of the European questionnaire Biohead-CITIZEN "A.62 - In the list below, tick the three expressions you think are most strongly associated with the origin of humankind" with the following answer alternatives: Adam and Eve; *Australopithecus*; Creation; Evolution; God; Natural selection. The alternatives associated to the theory of evolution were prevalent among students of Biological Sciences, but the number of future biologists that indicated the alternatives linked to the religious field was not negligible, especially the alternative "God". In the second semester of Biological Sciences, the most marked option was "God" whereas in the sixth semester the most marked one was "Evolution", indicating the progress throughout the course towards the Theory of Evolution. Pedagogy students indicated predominantly alternatives linked to the religious field, since in all Pedagogy semesters both "God" and "Creation" answers were the most selected ones. These results are relevant since these future teachers may use their religious views when teaching their students the theme of the origin of life in sciences classes.

Keywords: Education, Religion, Creationism, Evolutionism.

Introduction

Brazilians are very religious, according to the IBGE Census (2010) the Brazilian population is divided into two main religions: Catholic (64%) and Evangelical (22.2%), with an additional of 2.3% of other religions and 8% of nonreligious people. The regime of separation between church and State is secular in the country, according to the Federal Constitution (Oro and Ureta, 2007), but there is strong influence of religion in state issues. This influence is also evident in the school teaching, for example, there is the matter "Religious Education" in public primary schools: "Religious education show up in all federal constitutions since 1934, as an optional registration" (CURY, 2004, p.8).

According to the National Curriculum Guidelines for Secondary Education (BRASIL, 1999) evolution is present in the curriculum. Indeed, “the origin of life and human evolution are part of the school curriculum in science and biology” (SILVA et al., 2014, p.2). According to the “Common Basic Contents” (CBC), of the State of Minas Gerais, the topic Evolution, including its evidence and natural selection, are is part of the school curriculum (Martins et al 2008). However, the theme of human evolution in schools is rarely addressed, and in some schools, the teachers do not address it at all (Pacheco and Oliveira, 1997). Oleaques et al (2011, p. 18) further state: “Even addressing the contents of biological evolution in their classes, the human evolution theme is rarely discussed.” (OLEAQUES et al, 2011, p. 18).

Silva et al. (2013) argue that although Brazil is supposed to be secular, the teaching of biological evolution is strongly influenced by religious issues. Furthermore, there is a strong presence of religion in the development of scientific concepts, which compromises the understanding of Evolution in teachers and students (Carneiro and Rosa (2004).

A survey by IBOPE institute (2005) indicates that 75% of the Brazilians population, think that the creationism should be taught in place of the theory of Evolution in schools. Behe (1997) further suggests the exclusion of Darwinian teaching of evolution in schools, because there are a number of misconceptions in this theory, therefore, according to the author it should be taught the hypothesis of intelligent design, which suggests that there is a creator who guides the evolutionary process.

Having in mind this Brazilian context, a study was carried out to analyze the Biology and Primary School pre-service teachers’ conceptions about the human origin.

Methodology

The Biology and Primary School pre-service teachers involved in the present study were students enrolled in Biological Sciences and Pedagogy courses of the University Center of Formiga, Minas Gerais, Brazil. The total of 318 students included 168 students of Biological Sciences course in three semesters (2^{sd}, 4th and 6th) and 150 students from the Pedagogy course also in three semesters (2^{sd}, 4th and 6th).

The questionnaire of the European project BIOHEAD-CITIZEN (Biology, Health and Environment Education for better Citizenship) was applied to these students according to the prescribed requirements (Carvalho and Clément, 2007). This questionnaire was part of the European research project composed of 19 countries and aimed to “understand how the teaching of biology, health education and environmental education can promote better citizenship” (Carvalho and Clément, 2007 p.1). The questionnaire includes questions about Environmental Education, Health Education, Sex Education, Genetics, Evolution and respondents’ basic personal information on who is answering.

For this s0tudy, the question A.62 about the Origin of Man was selected. It say:

A62. In the list below, tick the THREE expressions that you think are the most strongly associated with the origins of humankind.

- Adam and Eve
- Australopithecus
- Creation
- Evolution
- God
- Natural selection

The statistical chi-square test (χ^2) was used for data analysis. The hypothesis tested was “The creationists and evolutionists options are distributed statistically equally between the groups”, being the groups: Biological Sciences students and Pedagogy students. Significant differences were assumed at the level of 95%.

Results and Discussions

Table 1 shows the results obtained from the 168 Biological Sciences students in the three semesters.

When answering the question “A.62: In the list below, tick the THREE expressions that you think are the most strongly associated with the origins of humankind” the students enrolled in the second and the fourth semester of Biological Sciences marked preferentially the option “God”, 25% and 27%, respectively. In contrast, most students of the sixth semester selected option “Evolution” (27%). This increase in the option of “Evolution” at the last semester may be related to changes in perception caused by contact with this specific subject during the course. This is a positive achievement, as these students at the end of their training seem to be in better conditions to teach the topic Evolution and origin of humans in secondary school.

Table 1. Biology pre-service teachers’ answers in 3 semesters of their Biological Sciences teachers’ training

Biology	2 nd semester	%	4 th semester	%	6 th semester	%	Total	%
<i>Australopithecus</i>	4	7 %	4	8 %	7	11 %	15	9 %
Evolution	11	19 %	12	25 %	17	27 %	40	24 %
Natural selection	10	18 %	11	23 %	16	25 %	37	22 %
Adam and Eve	7	12 %	2	4 %	3	5 %	12	7 %
Creation	11	19 %	6	13 %	8	13 %	25	15 %
God	14	25 %	13	27 %	12	19 %	39	23 %
Total	57		48		63		168	

In all three semesters together, 45% of the Biological Sciences students scored with alternative religious views: “Adam and Eve” (7%), “Creation” (15%) and “God” (23%) options. The other 55% students selected Evolution ideas: “*Australopithecus*” (9%), “Evolution” (24%) and “Natural Selection” (22%).

Using a different questionnaire, Oleques et al (2011) have shown that 70% in-service Biology teachers have little or no knowledge about human evolution. This is a larger number than the 45% found in the pre-service biology teachers of the present study. This indicates that the new future teachers may be in better conditions than the present in-service teachers to teach Evolution and the origin of humans in secondary school.

Table 2 shows the results obtained from the 150 Pedagogy students in the three semesters. The students of all the three semesters of the Pedagogy course selected preferentially the alternative religious conceptions (71%): “God” (31%), “Creation” (25%) and “Adam and Eve” (15%). The other 29% students selected Evolution ideas: “Evolution” (17%), “Natural Selection” (11%) and “*Australopithecus*” (1%).

Table 2. Primary School pre-service teachers’ answers in 3 semesters of their Pedagogy teachers’ training

Pedagogy	2 nd semester	%	4 th semester	%	6 th semester	%	Total	%
<i>Australopithecus</i>	1	2 %	1	1 %	0	0 %	2	1 %
Evolution	9	18 %	15	19 %	2	11 %	26	17 %
Natural selection	5	10 %	9	11 %	3	17 %	17	11 %

Adam and Eve	9	18 %	12	15 %	1	6 %	22	15 %
Creation	10	20 %	21	26 %	6	33 %	37	25 %
God	17	33 %	23	28 %	6	33 %	46	31 %
Total	51		81		18		150	

Using the same BIOHEAD-CITIZEN questionnaire applied to Brazilian Primary School in-service teachers and pre-service teachers, Araujo et al (2009), found that 79% of teachers and 78% of pre-teachers have creationist ideas about the origin of humans. The present results, with 71% of religious views (Table 2), confirm the high values of Primary School teachers' creationist conceptions about the human origin.

Figure 1 shows the comparison between the answers given by Biology and Primary School pre-teachers to the question A.62. As analysed above, the majority of pre-Biology teachers tended to answer more frequently to Evolutionary answers (55%: "Evolution", "Natural selection" and "Australopithecus" together) whereas the majority of pre-Primary School teachers tended to answer to religious answers (71%: "God", "Creation" and "Adam and Eve" together).

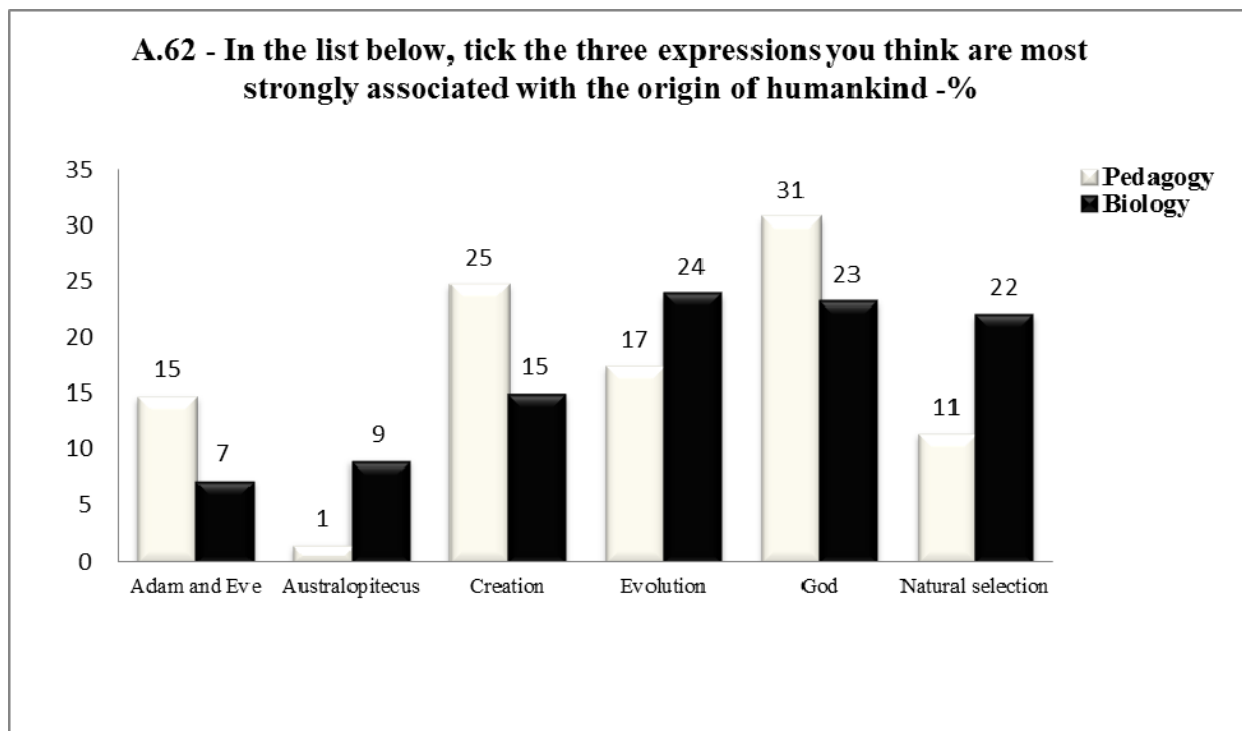


Figure 1. Comparison between the students' answers of both Biological Sciences and Pedagogy courses.

The hypothesis "The creationists and evolutionists options are distributed statistically equally between the groups" was rejected, i.e. the statistical analysis of the χ^2 showed that there are significant differences ($p < 0.05$) between the Biological Sciences students ($n=318$) and Pedagogical Students ($n=150$) about their views of the human origin, being the former more Evolutionists and the latter more Creationists.

Table 3. Chi-square test with a significance level of 5%

Sample	Adam and Eve	Australopitecus	Criation	Evolution	God	Natural selection	Total
Biology	12	15	25	40	39	37	168
Expected	17,9623	8,9811	32,7547	34,8679	56	28,5283	
χ^2_{partial}	1,9791	4,0337	1,8359	0,7554	5,1607	2,5157	
Pedagogy	22	2	37	26	46	17	150
Expected	16,0377	8,0189	29,2453	31,1321	50	25,4717	
χ^2_{partial}	2,2166	4,5177	2,0563	0,8460	0,32	2,8176	
Total	34	17	62	66	106	54	318

$\chi^2_{\text{calculated}}$ 29,054 Hypothesis Rejected

The creationists and evolutionists options are distributed statistically equally between groups

G.L. 5

$\chi^2_{\text{tabulated}}$ 7,815

Final Considerations

It can be concluded that being enrolled in the Biological Sciences course improves the students' conceptions about human origin towards the Evolution Theory, whereas the Pedagogy students do not change their human origin conceptions.

It is important highlighting that these future teachers, either Biology teachers of secondary school or Primary school teachers, have to teach the topic Evolution and the origin of humans in their classes. Therefore, their religious views may influence negatively their teaching due to their religious beliefs that contrast with the scientific assumptions. Results obtained from Primary School pre-teachers is even of more concern, not only by the high percentage of their religious views (71%) about the human origin but also because they are the first educational professionals that introduce the topic Evolution to pupils of elementary school, which can generate or keep misconceptions (Meglhioratti, Bortolozzi and Caldeira (2005) regarding an issue as relevant to biology as it is the Evolution Theory.

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