

## **CREATIONIST AND EVOLUTIONARY CONCEPTIONS IN TEACHER TRAINING IN TWO REGIONS OF BRAZIL**

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### **ABSTRACT**

This study aims to analyze conceptions of creationism and evolutionism among educators-in-training in the city of Formiga in the Brazilian state of Minas Gerais. Data collection was conducted based on a questionnaire developed by the European research project BIOHEAD-CITIZEN. To explore possible regional influences, the data obtained in Formiga, MG, were compared with data collected in São Paulo state, in Brazil. The results show a greater prevalence of creationist ideas among students of the Faculty of Education in Formiga, MG, compared to the results for the state of São Paulo. This prevalence arises due to the influence of religious, cultural and social values, which may be related to deficiencies in how evolution is taught throughout elementary school. The influence that these educators-in-training will have on children in the future may cause difficulties in the latter's acquisition of scientific knowledge. This work is being funded by FAPEMIG.

**Keywords:** Biological evolution. Creationism. Teachers in training.

## CONCEPÇÕES CRIACIONISTAS E EVOLUCIONISTAS DE PROFESSORES EM FORMAÇÃO EM DIFERENTES REGIÕES DO BRASIL

### RESUMO

O presente estudo tem como objetivo analisar concepções criacionistas e evolucionistas de pedagogos em formação, oriundos do interior do estado brasileiro de Minas Gerais (município de Formiga). A coleta de dados foi realizada tendo como base um questionário elaborado no âmbito do projeto europeu de investigação BIOHEAD-CITIZEN (Educação em Biologia, Saúde e Ambiente para uma melhor Cidadania - FP6, CIT2-CT2004-506015). Para explorar possíveis influências regionais, os dados obtidos em Formiga -MG foram comparados com dados coletados no interior de São Paulo - Brasil. Os resultados apontam para um elevado número de concepções criacionistas entre os alunos do curso de Pedagogia do município de Formiga -MG, sendo superior a dos alunos do interior do estado de São Paulo (cujas concepções criacionistas também aparecem em maior número do que as evolucionistas). Tais concepções são decorrentes da influência de valores religiosos, culturais e sociais e podem estar relacionadas a deficiências na abordagem do conteúdo sobre Evolução ao longo da Educação Básica. Posteriormente a influência que esses pedagogos exercerão sobre as crianças, poderá gerar dificuldades na construção do conhecimento científico. Torna-se necessário investigar como esses futuros professores lidarão com o tema em sala de aula. Este trabalho é financiado pela FAPEMIG.

**Palavras-chaves:** Evolução biológica. Criacionismo. Professores em formação.

### 1 INTRODUCTION

The question of how to approach human evolution in science and biology classes is not a simple task, since it involves issues relating to the values and religious beliefs of teachers and students, which are often in conflict with evolutionary ideas.

According to Meadows, Doster and Jackson (2000, p. 102),

[...] Biology teachers face the demanding challenge of crafting a learning environment that mediates colliding agendas. They want students to deepen their understanding of biological evolution in order to become scientifically literate citizens. At the same time, they also want to support, rather than undermine, the values of students, parents and communities whose worldviews can oppose the teaching of evolution. On a private and often unspoken level, many biology teachers themselves must face their own unresolved conflicts between biological evolution and their personal worldviews.

The survey of teachers' conceptions about evolution is an important step in understanding how they deal with issues related to the debate between religion and science in class. To investigate this subject, we performed a study based on the European project "Biology, Health

and Environmental Education for Better Citizenship” (BIOHEAD-CITIZEN; CIT2-CT2004-506015), which aims to explore multiculturalism in the teaching of controversial and important topics related to biology, especially the origin humankind.

According to Carvalho and Clément (2007), the BIOHEAD-CITIZEN project intends to analyze differences between countries. To this end, European countries which exhibit geographical, historical, political and sociocultural differences were selected, as well as countries outside Europe. The group of countries consists of 13 in Europe: Portugal, France, UK, Italy, Malta, Germany, Poland, Hungary, Romania, Lithuania, Estonia, Cyprus and Finland; five in Africa: Senegal, Morocco, Algeria, Tunisia and Mozambique; and one in the Middle East: Lebanon. A questionnaire containing 144 questions was designed for this purpose. Responses to the questionnaire were collected from biology, language arts and pedagogy college students, as well as from teachers of biology and language arts and elementary school homeroom teachers (1<sup>st</sup> through 5<sup>th</sup> grade) from the 19 countries in 2006 and 2007.

In Brazil, Araujo, Caldeira, Caluzi and Carvalho (2009) wrote a paper on creationist and evolutionary conceptions among elementary school teachers and pedagogy students, using the BIOHEAD-CITIZEN questionnaire as an instrument of data collection. This study was conducted in the state of São Paulo (SP), specifically in the region of Bauru.

Considering the extent and diversity of beliefs in Brazil, we have developed a similar study in the city of Formiga, in the state of Minas Gerais (MG) with the goal of analyzing regional differences. With this objective, we compared creationist and evolutionary conceptions among pedagogy students of Formiga with those found in Bauru. Some of the results are shown in this paper.

## **2 CREATIONISM AND EVOLUTIONISM**

Debates between creationists and evolutionists have recently received a great deal of attention worldwide, with the demand for teaching creationism in United State schools, although limited by Supreme Court, standing as a salient example.

Sepúlveda (2008, p. 1) discusses the creationist movement in a paper titled “Movimento criacionista: um risco à formação científica e cultural dos alunos da rede pública carioca” (Creationist movement: a threat to the scientific and cultural education of public schools students

in Rio). According to him, although creationism in Brazil doesn't seem to constitute a real political movement as it does in the United States, it has gained strength after Rio de Janeiro state governor Rosinha Matheus, in an interview with the newspaper O Globo, expressed her belief in creationism. Subsequently, 31 teachers of religion in the northern region of Rio de Janeiro state decided to include the teaching of creationist theory in the school curriculum.

According to Ruse (2005), in creationist point of view, God alone created the world through miraculous mechanisms. In fact, creationists claim that the first chapters of Genesis are a literal guide to the history of the universe, to the history of life on Earth and to human development.

Numbers (1986, p. 391) separates creationists into two main groups: "strict creationists", who interpret the days of Genesis literally; and "progressive creationists", who interpret the Mosaic days as long periods of time. Additionally, according to Numbers, some progressive creationists believe in many distinct acts of creation, while others limit God's intervention to the creation of life and, possibly, the human soul. This last kind of creationism is virtually indistinguishable from theistic evolution. This category of evolutionists claims that God created life forms through evolution. They believe in the scientific evidence, but also that the sustainer or causal agent is God (CARVALHO, 2010, p. 37).

Among various types of creationists, we find supporters of intelligent design. This version of creationism, according to Ávila (2008, p. 593), was suggested by Michael J. Behe, a biochemist and professor at Lehigh University in Pennsylvania, United States, with the publication of *Darwin's Black Box* in 1996. In his book, he tries to prove that certain biochemical structures present in some cells are too complex to be explained by random mutation. This theory, also according to Ávila (2008, p. 593), argues that Darwinism, despite being fairly consistent and credible, is insufficient to understand life and evolution: life on Earth could not have reached this advanced stage based only on random processes.

In its broadest aspect, the theory of biological evolution, which opposes the creationist theory, refers to changes that living beings have undergone over long periods of time, allowing the existence of the significant current biological diversity.

According to Futuyma (1992, p. 16), Darwin's evolution at first held the status of a hypothesis, but it has been supported by so much evidence that it has become a well established 'fact'. It has, indeed, become so powerful that no person devoid of prejudice and armed with

knowledge can deny its reality. The idea that evolution is a fact, although widespread, is challenged by El-Hani and Pereira (2001, p. 157):

[...] a hypothesis widely supported, like evolution, cannot, regardless of their degree of corroboration, be treated as a "fact" or a "reality" that is easily understood by an observer devoid of prejudice and provided with knowledge.

In order to discuss the status of evolution, El-Hani and Pereira (2001, p. 157) refer to Levins and Lewontin (1985, p. 14), who argue that “evolution is not a fact or a theory, but a way to organize knowledge about the world”.

On this topic, Futuyma (1992, p. 3) says that, as all important concepts, evolutionary biology generates controversy and, as all important concepts, it has been used as basis or intellectual foundation for different philosophical, ethical and social viewpoints. In its broadest sense, Evolutionary Biology is merely change and, for this reason, it is far greater than any other field – galaxies, languages and political systems evolve. Evolutionary Biology is changing in the properties of group of organisms over the course of generations.

Distorted concepts like the idea of human superiority over other species hamper the understanding of evolutionary theory. They make it difficult for students to understand that the diversity of life happens randomly.

According to Goedert (2004, p. 53), biological evolution is misunderstood as “progress” of lower life forms to higher because the concept of what is “higher” is always defined by arbitrary criteria. The word “progress” implies direction, while no direction or objective are given for the mechanisms of evolutionary biology,

Nowadays, we can identify a movement in favor of teaching creationism at school. A 2005 study realized by the Brazilian Institute of Public Opinion and Statistics (IBOPE), released in *Época* magazine, issue 346, by the journalist Elaine Brum, shows that 89% of respondents agree that creationism should be taught in schools and 75% think that this conception should replace evolution. The teaching of the creationist theory as an alternative to evolution, validating both theories, would force students to deal unnecessarily with conflicting information.

### 3 METHODOLOGY

In order to realize our goal, we invited students of pedagogy of the University Center of Formiga, MG, to respond a questionnaire, developed by the BIOHEAD-CITIZEN project and translated into Portuguese. The questionnaire, composed of 144 questions, was administered in October 2012. The 50 participants selected were kept anonymous.

In the following paragraphs, we present the questions about evolution, whose responses were compared with the data collect in Bauru, SP, in 2008, as reported by Araujo et al. (2009).

**A64. Which of the following four statements do you most agree with?**

- It is certain that the origin of life resulted from natural phenomena.
- The origin of life may be explained by natural phenomena without considering the hypothesis that God created life.
- The origin of life may be explained by natural phenomena that are governed by God.
- It is certain that God created life.

**B28. Which of the following four statements do you most agree with?**

- It is certain that the origin of the humankind results from evolutionary processes.
- Human origin can be explained by evolutionary processes without considering the hypothesis that God created humankind.
- Human origin can be explained by evolutionary processes that are governed by God.
- It is certain that God created humankind

**B29. Choose “Yes” or “No” for each question:**

- The theory of evolution contradicts my own beliefs
  - Yes  No
- Creationism (including the creation of human beings by God) contradicts my own beliefs
  - Yes  No

**P12. Choose ONE option for EACH question:**

I believe in God	<input type="checkbox"/>	I don't believe in God				
I practice religion	<input type="checkbox"/>	I do not practice religion				

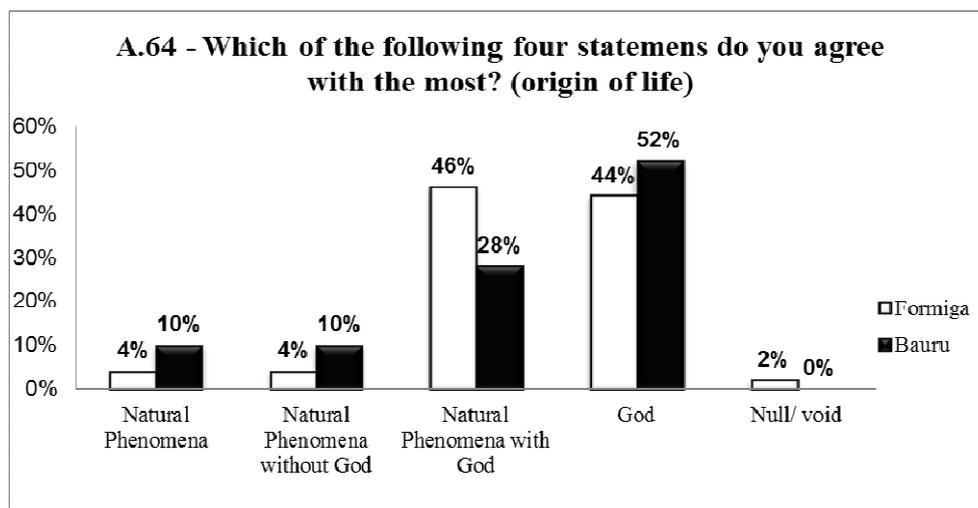
**P13. You are:** Agnostic/ AtheistChristian:  Catholic  Protestant  Orthodox  Other (specify): \_\_\_\_\_Muslin:  Sunni  Shiite  Druze  Other (specify): \_\_\_\_\_ Jew Other religion/belief (specify): \_\_\_\_\_ I do not want to answer

To analyze the teachers' responses, we used the statistical analysis software SPSS (Statistical Packet for Social Sciences) for Windows, version 20. For better visualization of the data, we chose to use bar graphs that plotted the frequencies of responses to the questions. We also sought to identify whether there is any correlation between the answers given and religious affiliation (P13), belief in God (P12a) and degree of religious practice (P12b) of respondents. For this, we calculated the Pearson correlation coefficient.

**4 RESULTS AND DISCUSSION**

In this section, we show the analysis of the responses of the Formiga students in comparison to the responses of the Bauru students to the questions A64 and B28:

Graph 1 - Responses of Pedagogy students from Formiga, MG and Bauru, SP to A64



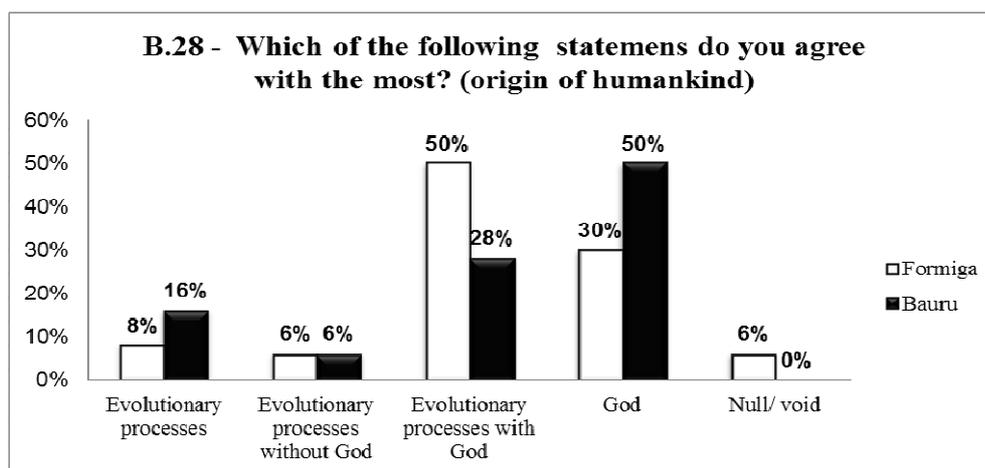
Notes: The results of the answer options – Natural Phenomenon, Natural Phenomena / without God, or Natural Phenomena / with God and God – refer respectively to the options: 1 – It is certain that the origin of life resulted from natural phenomena; 2 - The origin of life can be explained by natural phenomena without considering the hypothesis that God created life.; 3 - The origin of life can be explained by natural phenomena that are governed by God; 4 – It is certain that God created life. Null /void refers to ‘no answer’ and ‘more than one answer’.

In relation to statement A64, which refers to the participants’ beliefs about the origin of life, we realized that a significant portion of respondents from Formiga, MG and from Bauru, SP, 44% and 52% respectively, attributed the origin of life to God. A large number of respondents, 46% from Minas Gerais and 28% from São Paulo, asserted their belief that the origin of life may be explained by natural phenomena or God as well. The other options exhibited low frequency: Natural Phenomena – 4% in Minas Gerais and 10% in São Paulo; Natural Phenomena without considering the hypothesis that God created life – 4% in MG and 10% in SP; Null and Void – 2% in MG and 0% in SP.

It is now recognized that the belief in God’s creation of life has been decreasing and, consequently, so has the number of people who assign the origin of life to natural phenomena been increasing. However, belief in creationism is still high. If we take into account creationism as a general idea, we found in this survey a high number of individuals that believe in the role of a "creator" in the species’ emergence. This last finding conflicts with Numbers (2009), for whom today, unlike 50 years ago, creationists do not claim that God created all species. On the other hand, Numbers could be referring to the most traditional forms of creationism, like young earth

creationism, a radical strain that claims that Earth and all life on it was created by direct acts of God over a relatively short period around six thousand years ago.

Graph 2 - Shows the responses of the pedagogy students from Formiga, MG, and Bauru, SP, to question B28



Notes: The results of the answer options – evolutionary processes, evolutionary processes / without God, evolutionary processes / with God and God – refers to 1 – It is certain that the origin of humankind resulted from evolutionary processes; 2 – Human origin can be explained by evolutionary processes without considering the hypothesis that God created humankind.; 3 – Human origin can be explained by evolutionary processes that are governed by God; 4 – It is certain that God created humankind. Null and void refers to ‘no answer’ and ‘more than one answer’.

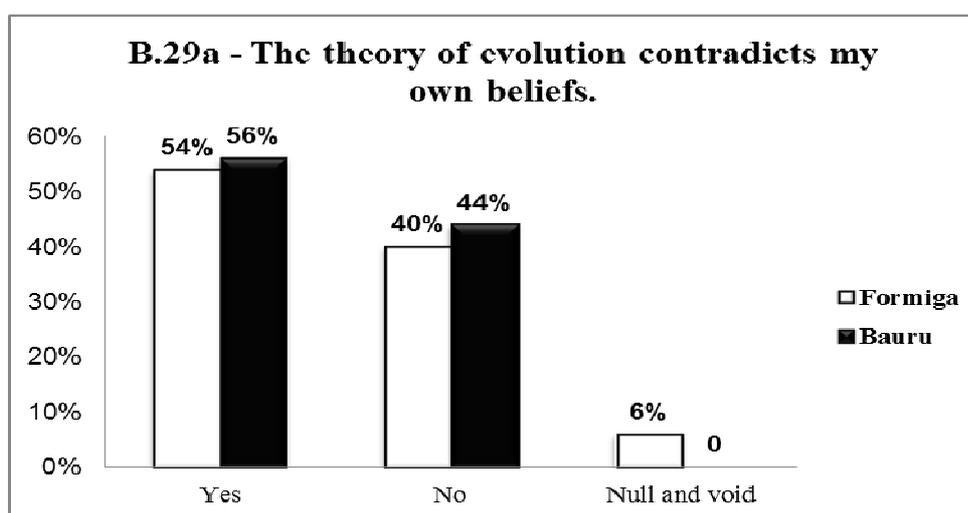
Considering the answers to question B28, which refers to the respondents’ beliefs about the origin of humankind, we observed that 50% of the respondents from Bauru attributed to God the origin of humankind, while 28% believes that the origin of the humankind results from evolutionary processes. In Formiga, MG, this pattern is reversed: 50% attributed the origin of humankind to evolutionary processes or to God, while 30% believes that God created humankind. Taking into account that the first two answer options are more related to the evolution, and that the second option, apart from being evolutionary, has a character contrary to religion, the rate of evolutionist students was low in both regions (evolutionary processes: 8% in Minas Gerais and 16% in São Paulo; evolutionary processes without God: 6% in Minas Gerais and also in São Paulo). In Formiga, a small number of responses (6%) were null and void.

Many authors, such as Carvalho (2010), Carneiro and Rosa (2003), and Meadows et al. (2000), discuss the difficulties faced by teachers in teaching evolutionary biology. This difficulty may be related to values and cultural beliefs of students, parents and the community. Our data

show that teachers may generate uncertainty on this subject due to the distance between their beliefs and the scientific view. A problem arises when they convey this insecurity to their students, since these future teachers will be responsible for the first concepts of evolution of a student. Additionally, it is possible to imagine a scenario in which misconceptions will remain throughout a student's education.

In the following, we show GRAPHS 3, 4 and 5 which plot the responses to questions B29a, B29b, P12 and P13:

Graph 3 - Responses of the pedagogy students from Formiga, MG and Bauru, SP to question B29a



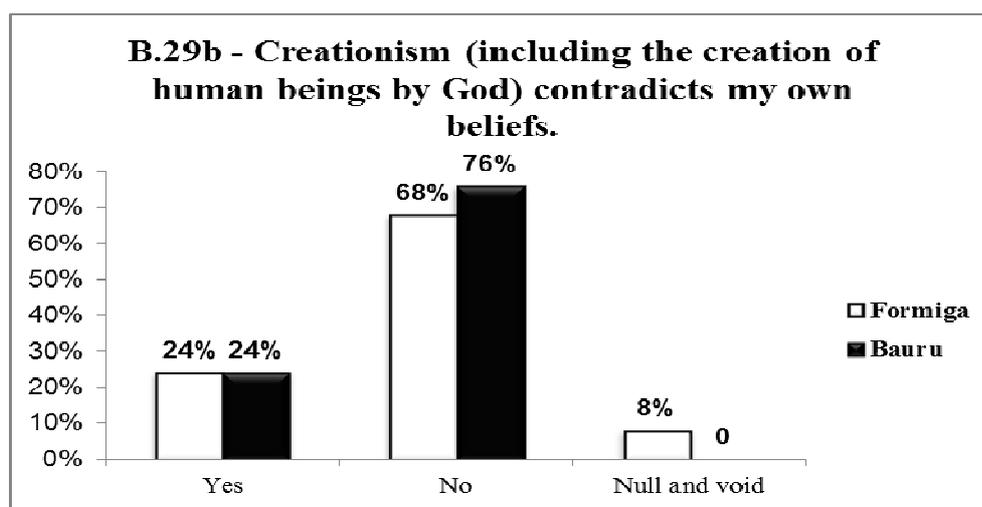
Note: The answers 'yes' and 'no' were made in response to the statement "*The Theory of Evolution contradicts your own beliefs*". "Null and void" refers to 'no answer' and 'more than one answer'.

In relation to question B29a, we observed similarities between Formiga, MG and Bauru, SP. In both cases, the respondents can be separated into two almost equal groups: those who agree that the theory of evolution contradicts their own beliefs (54% for MG, 56% for SP) and the ones who disagree (40% for MG, 44% for SP). Also regarding this question, a small number of responses in Formiga, MG (6%) were null and void.

Despite the sizable portion of students who accept the theory of evolution, we can say that this acceptance does not mean that their beliefs do not address the existence of a creator. This concept is comparable to theistic evolutionism. Adherents of this theory, according to Carvalho (2010), are mainly Catholics.

In general, theistic evolutionists agree with creation and the theory of evolution. For them, the origin of species occurred slowly and steadily - uniformly - for millions of years: God creates within the uniform framework (ENGLER, 2007, p. 94).

Graph 4 - Responses of the pedagogy students from Formiga, MG and Bauru, SP to question B29b

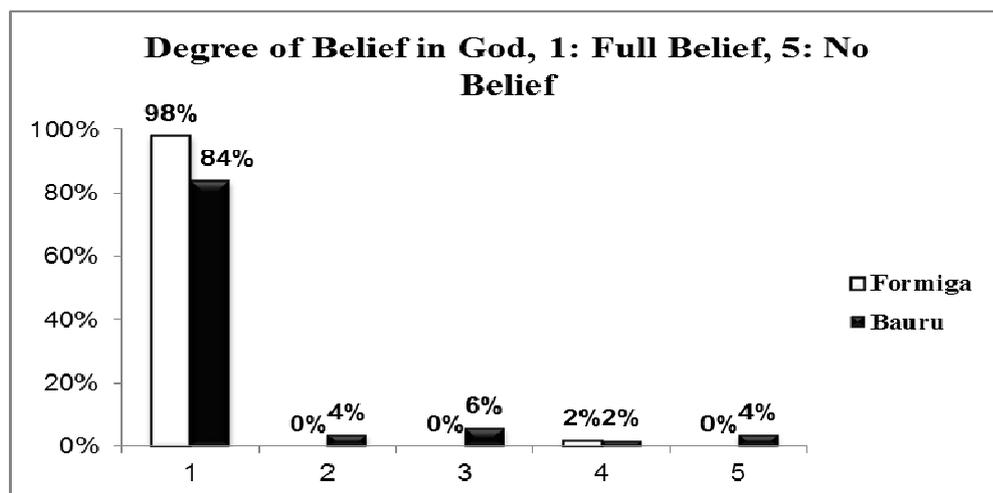


Note: The results correspond to the 'yes' and 'no' responses to the statement: „*Creationism (including the creation of living being by God) contradicts my own beliefs*”. Null and void refers to 'no answer' and 'more than one answer'

We also identified similarities in the responses of the subjects from Formiga, MG and Bauru, SP to question B29b. In both cases, the majority (68% for MG, 76% for SP) stated that creationism (including the creation of living beings by God) does not contradict their own beliefs. This suggests that these students hold conceptions contrary to scientific ideas, because usually this means that they understand biological evolution as growth and improvement that occurred after creation (CARNEIRO, 2004). In both cities, 24% agreed with the statement in B.29b and this cannot be considered a contradiction of a belief in God, because both groups were evenly religious. Taking this data into account, our hypothesis is that the respondents consider evolution to be a fact, and therefore creationism (and not the existence of God) ends up clashing with these respondents' beliefs. According to Sepúlveda (2003), although creationism and evolution can be considerate antagonistic, students with strong religious convictions can believe in both evolution and creationism, either by reconciling the two beliefs or by abstaining from thought about this subject. These data corroborate our own work, since both beliefs are accepted

by most of the respondents of this study. In Formiga, MG, there was still a low rate (6%) of null and void responses.

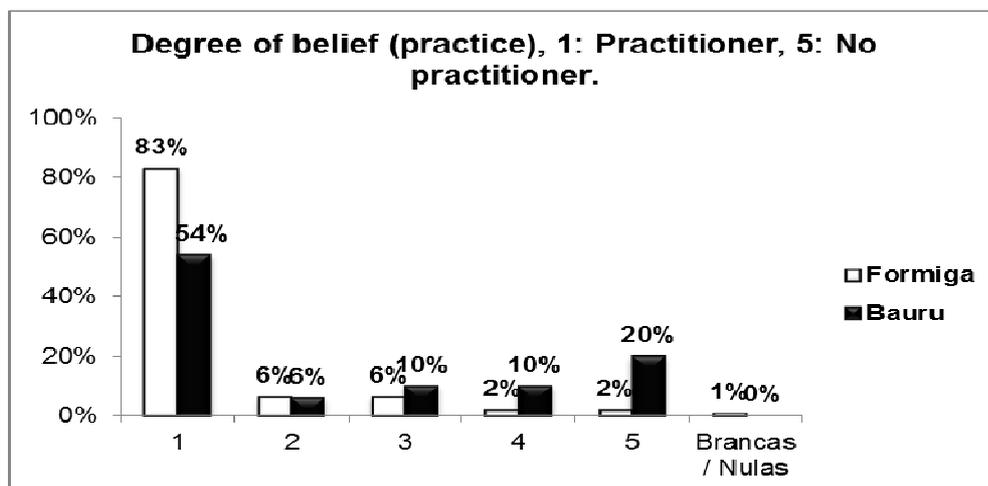
Graph 5 - Responses of the pedagogy students from Formiga, MG and Bauru, SP to question P12a



Note: The numbers on the X axis show, on a 1-5 scale, the degree of belief in God.

Similarities between Formiga, MG and Bauru, SP were also observed in relation to belief in God (P12a). On a 1-5 scale, where 1 represents faithful, the majority of participants from both cities (98% for MG, 84% for SP) claimed to have a strong belief in God. With respect to option 5 in the scale (no belief), no respondent from Formiga, MG claimed not to believe in God; those respondents were mainly creationist. In Bauru, SP, we observed a small number of respondents who do not believe in God, exactly 4%. The other answers occurred at a low rate (2: 0% for MG, 4% for SP; 3: 0% for MG, 6% for SP; 4: 2% for MG, 2% for SP).

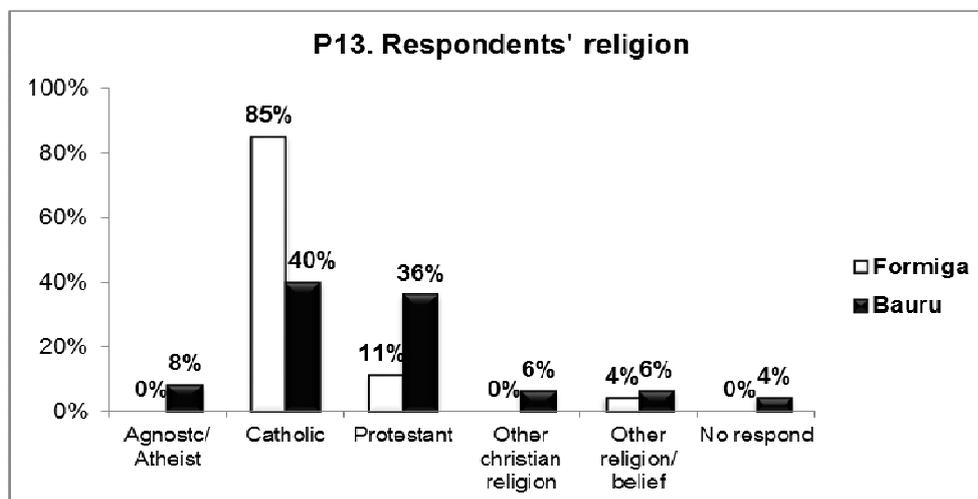
Graph 6 - Responses of pedagogy students from Formiga, MG and Bauru, SP to question P12b



Note: The numbers on the X axis show, on a 1-5 scale, the degree of religious practice.

With respect to level of religious practice (P12b), the responses were evenly distributed among the respondents from Bauru, SP. On a 1-5 scale, where 1 means heavy practitioner, the majority of respondents from both cities claimed to be practitioners (83% MG, 54% SP). However, in Bauru, SP, a significant number of respondents (20%) identified themselves as being non-practicing, especially if we compare with the results for Formiga, MG, which were only 2%. The other answers occurred at a low frequency (2: 6% for MG, 6% for SP; 3: 6% for MG, 10% for SP; 4: 2% for MG, 2% for SP; 5: 0% for MG, 4% for SP).

Graph 7 - Percentage numbers of responses of pedagogy students from Formiga, MG and Bauru, SP in relation to their religion (P13)



Finally, we tried to establish the respondents' religious affiliation with question P13. In Bauru, SP, the respondents were evenly divided into Catholic (40%) and Protestant (36%). In Formiga, MG, unlike in Bauru, Catholics were the majority, comprising 85% of respondents, whereas the Protestant respondents were only 11%. The other answers occurred in lower frequency (Agnostic / Atheist: 0% for MG, 8% for SP; other Christian religion: 0% for MG, 6% for SP; other religion / belief: 4% for MG, 6% for SP; No response: 0% for MG, 6% for SP).

The percentages of religious affiliation notwithstanding, we observe a greater influence of religious concepts on the students' worldviews, which compromises the understanding of evolutionary processes. (CARNEIRO, 2004).

## 5 CORRELATION ANALYSIS

We computed the Pearson correlation coefficient<sup>1</sup> to examine the relation between the participants' responses and their religion (P13). The results show no significant correlation between the participants' responses and their religion in Bauru, SP. However, in Formiga, MG, we identified a moderate negative correlation ( $r = -0.379$ ) between religion and agreement with statement A64. This means that the Catholic respondents seem to be more creationist than the respondents from other religious affiliations.

In Bauru, SP as well as in Formiga, MG, item A64 exhibited a moderate negative correlation (SP:  $r = -0.543$ , MG:  $r = -0.300$ ) with the item P12a, which means the greater the degree of religiosity, the greater the degree of certainty that God created life. Analyzing questions A64 and P12b, we observed a strong negative correlation in Bauru, SP ( $r = -0.739$ ), and a moderate negative correlation in Formiga, MG ( $r = -0.440$ ), meaning that the most avid practitioners are those who agree the most with the idea of the origin of life as God's creation.

The correlations between P12a - P12b and B28 were similar in Bauru, SP. In both cases, the correlations were moderate and negative ( $r = -0.494$  e  $r = -0.649$ ), meaning that the greater the religiosity and degree of religious practice, the greater certainty that God created the humankind, hence the more disagreement with the idea that humankind originated as a result of evolutionary processes. In Formiga, MG, the results were different. According to the analysis, there was no significant correlation between P12a ( $r = -0.196$ ) - P12b ( $r = -0.205$ ) and B28. This means that there is no correlation between the belief that God created humankind and belief in God or degree of religious practice among the respondents from Formiga, MG.

With respect to the analysis of the correlation between P12a and B29a, we did not observe any significant correlation in Bauru, SP ( $r = 0.232$ ) or in Formiga, MG ( $r = 0.201$ ). However, in Bauru the correlation between B29a and P12b was moderate and positive ( $r = 0.540$ ), meaning that most practitioners responded that the theory of evolution contradicts their own beliefs. As mentioned, in Formiga, MG there was no significant correlation either between P12a and B29a or between P12b and B29a ( $r = 0.123$ ). This shows that, to the respondents from Formiga, MG,

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<sup>1</sup> According to Silva (2012), the Pearson Correlation Coefficient ( $r$ ) measures the degree of correlation between two variables on a measured scale. The coefficient  $r$  ranges from -1 to 1. The coefficient  $r = 1$  means a perfect linear correlation between the two variables, while  $r = -1$  means a perfect negative correlation; that is, as one increases, the other decreases. The value  $r = 0$  means that there is no linear correlation between the variables. Then  $r$  is greater than 0.70 there is a strong correlation; when  $r$  is between 0.30 and 0.70, there is a moderate correlation; when  $r$  is between 0 and 0.30, there is a weak correlation.

belief in evolution or creationism is not related to belief in God or to the degree of religious practice of the respondent.

Lastly, analyzing P12a - P12b and B29b, we observed a moderate negative correlation in Bauru ( $r = -0.452$  and  $r = -0.617$ ). This means that the most faithful respondents and adherents of a religious practice tended to answer that creationism (including the creation of living beings by God) does not contradict their own beliefs, i.e., they believe in a specific type of creationism. Again, in Formiga, there was no correlation between religious practice and belief in God with the belief in creationism since both correlations were weak and negative ( $r = -0.264$  and  $r = -0.281$ ).

## **6 FINAL REMARKS**

This study confirms what Araujo et al. (2009) observed in Bauru, SP. Despite the higher numbers in Formiga, MG, the analysis of responses to questions A64 and B28 of the two groups showed that a quite high amount of future teachers are creationists. The correlation analysis of P12a, P12b and B28 and B29a showed that the belief or not in the creation of humanity by God, or in the theory of evolution and in creationism, is not related to the belief in God or religious practice. However, it is not possible to reach a definitive conclusion on this non-correlation. Hypothetically, we can suppose that these results could have been skewed by little interest on the subject in a questionnaire so extensive, or difficulty understanding some of the approaches to the issues, or even little reflection on questions regarding their personal beliefs.

It is important to highlight that the respondents are future elementary school teachers (1st to 5<sup>th</sup> grade). It is possible then that their knowledge of biological evolution is derived from biology lessons from their basic education. We cannot say that the education of these future teachers has been deficient (in relation to biological evolution), since the goal of the issues discussed was not assessing how much respondents knew about the content, but rather to capture their perceptions on certain issues. Conceptions like evolution or creationism are influenced by values, beliefs, knowledge, etc. However, the significant percentage of creationist conceptions in the two regions investigated is worrisome, since the respondents, as generalist teachers, will be responsible for the first notions of evolution among students in their early years of education.

## REFERENCES

ABRANTES, P.; ALMEIDA, F. P. L. Criacionismo e Darwinismo confrontam-se nos tribunais ... da razão e do direito. **Episteme**, Porto Alegre, v. 11, n. 24, jul./dez. 2006.

ARAUJO, E. S. N. N. et al. Concepções criacionistas e evolucionistas de professores em formação e em exercício. In: ENCONTRO NACIONAL DE PESQUISA EM CIÊNCIAS, 7., 2009, Florianópolis. **Anais...** Florianópolis: ENPEC, 2009.

CARNEIRO, A. P. N. **A evolução biológica aos olhos de professores não-licenciados**. 2004. 136 f. Dissertação (Mestrado em Educação Científica e Tecnológica)-Universidade Federal de Santa Catarina-Centro de Ciências Físicas e Matemáticas, Florianópolis, 2004.

CARNEIRO, A. P. N.; ROSA, V. L. Três aspectos da evolução: concepções sobre Evolução Biológica em textos produzidos por professores a partir de um artigo de Stephen Jay Gould. In: ENCONTRO NACIONAL DE PESQUISA EM EDUCAÇÃO EM CIÊNCIAS, 4., 2003, Florianópolis. **Anais...** Florianópolis: UFSC, 2003. Disponível em: <<http://fep.if.usp.br/~profis/arquivos/ivenpec/Arquivos/Orais/ORAL169.pdf>> Acesso em: 23 nov. 2013.

CARVALHO, G. S.; CLÉMENT, P. Projecto 'Educação em biologia, educação para a saúde e educação ambiental para uma melhor cidadania': análise de manuais escolares e concepções de professores de 19 países (europeus, africanos e do próximo oriente). **Revista Brasileira de Pesquisa em Educação em Ciências**, São Paulo, v. 7, n. 2, 2007.

CARVALHO, R. **Avaliação dos futuros professores em Ciências Biológicas sobre a polêmica Criacionismo e Evolucionismo**. 2010. 115 p. Dissertação (Mestrado)-Universidade Federal de Goiás, Goiânia, 2010.

CERQUEIRA, A. V. **Representações sociais de dois grupos de professores de biologia sobre o ensino de Origem da Vida e Evolução Biológica**: aspirações, ambiguidades e demandas profissionais. Dissertação (Mestrado em Educação em Ciências e Saúde)-Universidade Federal do Rio de Janeiro-Núcleo de Tecnologia Educacional para a Saúde, Rio de Janeiro, 2009.

CLEMENT, P. Didactic transposition and KVP model: conceptions as interactions between scientific knowledge, values and social practices. **ESERA Summer School**, Braga, Portugal, Universidade do Minho, July 2006,

CLEMENT, P. Représentations, conceptions, connaissances. In: GIORDAN, A.; GIRAULT, Y.; CLEMENT, P. **Conceptions et connaissances**. Berne: Ed. Peter Lang, 1994.

DOBZHANSKY, T. Nothing in Biology makes sense except in light of evolution. **American Biology Teacher**, v. 35, n. 125, 1973.

FUTUYMA, D. J. **Biologia evolutiva**. Tradução de Mário de Vivo e Fábio de Melo Sene. 2. ed. Ribeirão Preto: Sociedade Brasileira de Genética/CNPq, 1992.

GOEDERT, L. **A formação do professor de Biologia na UFSC e o ensino de evolução biológica**. 2004. Dissertação (Mestrado em Educação Científica e Tecnológica)-Universidade Federal de Santa Catarina, Florianópolis, 2004.

MEADOWS, L.; DOSTER, E.; JACKSON, D. F. Managing the conflict between evolution and religion. **The American Biology Teacher**, v. 62, n. 2, p. 102-107, 2000.

MORIN, E. **A religião dos saberes**. Rio de Janeiro: Bertrand Brasil, 2001.

PAGAN, A. A. **Ser (animal) humano: evolucionismo e criacionismo nas concepções de alguns graduandos em Ciências Biológicas**. 2009. 228 f. Tese (Doutorado em Educação)-Universidade de São Paulo, São Paulo, 2009.

SILVA, R. P.; SANTOS, A. K. P.; PIAN, M. C. **Para pensar e ensinar a teoria da Evolução**. In: ENCONTRO NACIONAL DE PESQUISA EM EDUCAÇÃO EM CIÊNCIAS, 1., 1997, Águas de Lindóia. **Anais...** Águas de Lindóia: ENPEC, 1997.

SOUZA, A. C. L. **As concepções sobre Criacionismo e Evolucionismo de futuros professores de Ciências Biológicas do UNIFOR-MG**. 2012. Trabalho de Conclusão de Curso (Graduação em Ciências Biológicas)-Centro Universitário de Formiga-UNIFOR-MG, Formiga, 2012.

VALOTTA, L. A.; ANDRADE, S. T.; BORGES, O. F.; PETROLIO, C.; RENAULT, L. M. P. Frequência de genes em populações: subsídios para o ensino de Evolução e seleção natural. In: ENCONTRO PERSPECTIVAS DO ENSINO DE BIOLOGIA, 7., 2000, São Paulo. **Anais...** São Paulo: Faculdade de Educação-USP, 2000.