

Perception of Brazilian Citizens about Darwinism and the (Non) Influence of God in the Evolutionary Process

Hesley machado Silva^{1,a*}, Elaine Sandra Nicolini Nabuco de Araújo^{2,b},
Paloma Rodrigues da Silva^{3,c}

¹ University Center of Formiga e University of Itaúna, Minas Gerais, Brasil

² College of Technology Jahu, São Paulo, Brasil

³ University of State Paulista Júlio de Mesquita Filho, Faculty of Sciences, Bauru, Brasil

^ahesley@uniforng.edu.br, ^benabuco@netsite.com.br, ^cpaloma.bio@hotmail.com

*Corresponding author

Keywords: Darwinism, Evolution, God, Creationism

Abstract. The current context is unique in relation to the teaching of evolution in Brazil and the population's perception of evolution. On the one hand, it is said often about Darwinism in various media, especially due to the relatively recent commemoration of the two hundred years of the birth of Charles Darwin and one hundred and fifty years of the launch of the book *The Origin of Species*. On the other hand, it is clear, in recent years, a timid movement, more worryingly, in favor of equitable approach of creationist and evolutionist theories in the classroom. This article is a part of a research whose goal is to raise the design that Brazilian respondents have about the Darwinian view (which disregards the divine influence in the evolution of the species). The instrument used for data collection is a questionnaire, type Likert scale, which consists of a series of statements in which respondents must express their degree of agreement or disagreement with each statement. In this study, we present the results of the statement "The thought of Darwin, which does not consider God as a participant in the process of evolution, is...". Analysis correlated with data on religion and education of the respondents are also held. The results point to a tendency of respondents not to accept the Darwinian view that disregards God's interference in the evolutionary process. The data also show that respondents' choices are influenced by religion and education. The frequency of responses that tend to accept the Darwinian view (which disregards the divine participation in the evolution of the species) is higher among respondents with higher levels of education. Adherents to religions "evangelical" tend to deny this view more often than followers of other religions. Given the potential risks of inserting creationist approaches in school education, it is necessary a discussion of the possible impacts of this rejection of Darwin's thinking (which does not consider God as a participant in the evolutionary process), indicated here, in the teaching of evolution. This work was supported by FAPEMIG.

1. Introduction

The current context is unique in relation to the teaching of evolution in Brazil and thus the perception of the population in relation to this issue. On the one hand there is a lot of talking about Darwinism, whether in science magazines, television and media in general, especially given the relatively recent

commemoration of the two hundred years of the birth of Charles Darwin and one hundred and fifty years of the launch of the book *The origin of Species*. On the other hand, it is seen, in recent years, a movement, still small, but vocal favorable fairness teaching of creationist and evolutionist theories in science classes and biology.

The resurgence of creationist ideas, as outlined Oro [1] also has implications in the political field, these impact on many fields of society. A possible dogmatic and political influences on the population generates the possibilities of religious intervention in formal education, both in the public policy [2,3,4,5], as in the preparation of curriculum and teacher training [6,4,7,8,9,10,11,12,13].

Tidon and Lewotin [14] detect the relevance of the creationist movement by the emergence of a Brazilian Creationist Society, which has provided a large increase in publications and antievolutionists campaigns in the country, with translations of books with distorted views on evolutionary theory.

In Brazil, the official secular education became the Magna Carta 1891, at any level of government and education, unlike the empire that compulsory religious education was present [8]. Martins [2], to discuss the introduction of creationism in public schools in Rio de Janeiro, mentions the motivations of these taxes, especially on the acceptance of religious explanations for natural phenomena. Silva and Prado [15] suggest that this religious influences in Brazilian education, and Colonetti and Sanches [16] indicate a large number of schools in Brazil, addressing the religious perspective in science classes, and in some colleges in the state of São Paulo even have the science curriculum religious notions about the origin of life. Since there is no understanding between the two interpretations of the world, some scientists have an aggressive stance toward religion, emphasizing its harmful aspect [17,18,19], as well as some religious prefer to attack the scientific worldview. The relevance can be seen when in the analysis the Supreme Court or if such action would be unconstitutional [3].

This study seeks to understand how the population perceives the issue of teaching evolution in a state should be secular but that, as indicated by Cury [8] ends up being influenced by religious demands on educational policies, generating conflicting debates between science and religion.

In Brazil, the Law of Guidelines and Bases of National Education - LDB - (Federal Law No. 9.394/96) refers to religious education as a constitutive subject of the curriculum, but optional enrollment. It is reasonable to assume that the study of religions can foster in students a greater tolerance among people with different beliefs, especially in the current world. Such an approach can be taken without the inserted character and doctrinal content in the discipline of history or even discipline entitled Religion. However, attempts are foolhardy previously mentioned to teach religion on an equal footing with scientific content.

2. Methodology

The research in its full amplitude was developed through qualitative and quantitative approaches. The data collection instrument was a questionnaire with eleven multiple-choice questions, as well as descriptive question.

To collect the views of survey participants, it was decided to use the questionnaire in a Likert scale format, which consists of a series of statements, in which the respondent should express their degree of agreement or disagreement with each statement. The scale presents a number of advantages, such as, for example, to provide directions regarding the design of the respondent for each item of the instrument.

The research took place in Itaúna-MG and Formiga-MG, surrounding cities, covering the downtown area west of Minas Gerais and the metropolitan region of Belo Horizonte/MG.

The complete questionnaire containing 11 questions was validated mathematically by applying the Cronbach alpha test, in which we obtained a value of 0.617. This value is considered satisfactory by many authors [20,21,22], since it is a questionnaire with a few assertions. The instrument was completed by 390 respondents, the majority (62.6%) were female. The average age of respondents was 30.7 years. Table 1 shows the percentages of respondents in relation to religion¹ and education.

Table 1: Percentage of respondents in relation to religion and education

		Sample	
		Number of respondents	Percentage (%)
SEX	Female	244	62,6
	Male	146	37,4
RELIGION	Catolichs	300	76,9
	Evangelicals	23	5,9
	Spiritualists	20	5,1
	Atheists	8	2,1
	No religion defined	28	7,2
	Others religions	11	2,8
EDUCATION	Primary	5	1,6
	Elementary education	40	10,2
	High school	107	27,4
	Incomplete Higher Education	106	27,2
	Higher Education	132	33,7
Total Number of Respondents		390	100

In this study, the results of the statement "The thought of Darwin, which does not consider God as a participant in the process of evolutionis..." are presented., Was chosen by the possible answers that could give the respondent a greater variability of choices "certainly true", "possibly true", "probably false", "certainly false" and "do not know". The reason for developing this issue is related to the perceived Seminary professor Princeton Theological, Charles Hodge, in his book *What is Darwinism?* written and published in 1874, which considered that accept the idea of Darwinism was adhering to atheism, as for this: "*What is Darwinism? Is atheism. This does not mean (...), Mr. Darwin and all who adopt his views are atheists, but it means that his theory is atheistic, that the exclusion (of God) the nature of the project (...) tantamount to atheism.*" [23]

To establish correlations between the responses of the subjects to the question indicated, with data on the declared religious and educational level, it was decided by calculating the Pearson correlation coefficient (r) . The Pearson correlation coefficient (r) measures the degree of between two variables measuring scale. The coefficient r may vary from -1 to 1. The value r = 1 means a perfect linear correlation between two variables, r = -1 is perfect negative linear correlation, that is when one increases the other decreases for r = 0 and there is a linear correlation between variables. When the

¹Importantly, the sample studied is not consistent with the current Brazilian religious division. Emphasizes the relatively low percentage of evangelical respondents compared with recent data indicating rapid growth of this group in Brazil. A relatively high number of Spiritualists, which is not corroborated by recent data from the Brazilian Census was also detected. Finally, it was also possible to capture the recent significant increase in those who call themselves no-religion, having a low percentage of the sample in this group: (<http://censo2010.ibge.gov.br/noticias-censo?view=noticia&id=1&idnoticia=2170&t=censo-2010-numero-catolicos-cai-aumenta-evangelicos-espiritas-sem-religiao>).

value of r is greater than 0.70 have a strong correlation, r between 0.20 and 0.70 indicates a moderate correlation r between 0 and 0.20 shows a weak correlation [24]. For these analyzes we used the SPSS ® software (Statistical Packet for Social Sciences) version 19.

3. Results and discussion

Figure1 shows the results obtained from the analysis of respondents' answers to the question: "Thinking of Darwin, which does not consider God as a participant in the process of evolution, is...". It is noticed that 63% of Brazilian respondents tend to reject the question under consideration, of these, 40% consider it as "false" and 23% as "certainly false". 32% of respondents tend to accept the challenge in the analysis of these, 14% consider it as "certainly true" and 18% as "probably false". 5% of respondents had no opinion.

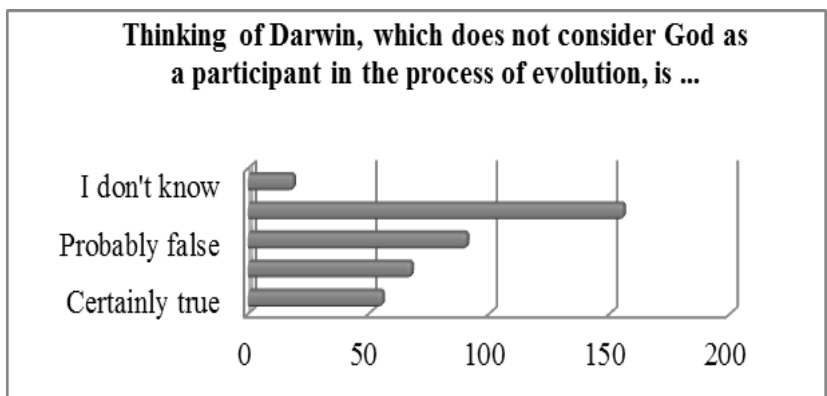


Figure 1: Comparison of the religious groups of respondents on the acceptance of Darwinian thinking, disregarding God's involvement. Source: Research data.

Figure 2 shows the results obtained from the analysis of correlation between the responses to the question analyzed the data regarding the religion of the respondents. Importantly, within the overall sample investigated, the largest number of respondents declared themselves Catholic, which can generate a perception highlighted in relation to their percentage. A comparative analysis of responses taking into account the variable " religion " shows that among respondents Catholics , Brazil's largest religious group , 16 % consider the Darwinian thinking as " certainly true " and 18 % as possibly true. Therefore , about one-third of respondents Catholics (34 %) accept the Darwinian thinking , as proposed in the statement , while 61 % of Catholics reject that thought , while 26 % consider it "probably false" and 35 % certainly false .

These data are consistent with the perception captured by Oro [25] that the religious imagery in Brazil is directly related to a "Catholic-Brazilian" culture that would be marked by a "biblical Catholic" influences. On the other hand, it is surprising percentage of those who call themselves Catholics who regard the statement as true, contradicting the tenets of religion.

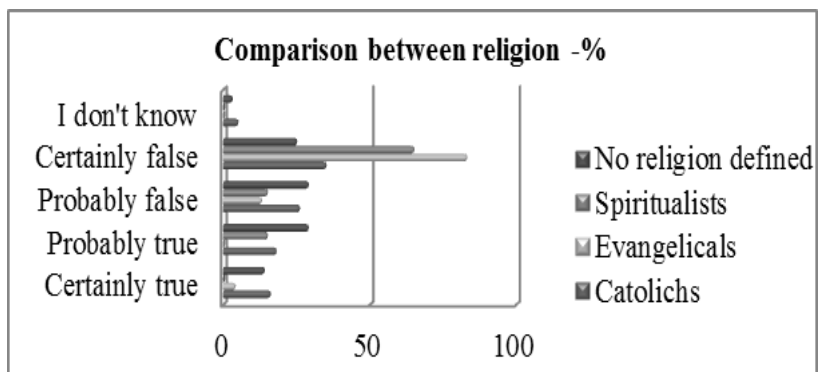


Figure 2: Comparison of the religious groups of respondents on the acceptance of Darwinian thinking, disregarding God's involvement. Source: Research data.

Among the fastest growing in Brazil number of faithful religious group (<http://censo2010.ibge.gov.br/noticias-censo?view=noticia&id=1&idnoticia=2170&t=censo-2010-numero-catolicos-cai-aumenta-evangelicos-espiritas-sem-religiao>) and political influence [1, 26], the evangelicals, the percentage of those who reject Darwinian thinking has proved stronger than the other groups. 96% of evangelicals tend to reject the Darwinian thinking, and 83% consider it "certainly false" and 13% as likely false. While 4% of evangelicals consider "probably true" Darwinian thought and certainly true 0% (same percentage of those who had no opinion).

Spiritualists, important group in the Brazilian religious diversity spectrum showed high rejection of Darwinian thinking (80%), and 65% identified as "certainly false" and 15% as probably false. Among the Spiritualists, only 15% indicated that the Darwinian thought is "probably true" and none of the respondents considered this creed as "certainly true", as well as none of these revealed not know opine. These data contradict Colombo [27], who put forward the spiritualist religion of great penetration in Brazilian society, would be very tolerant of the Darwinist evolutionary theory.

Among those who were appointed without religion (among which may be included agnostics and atheists), 54 % tend to reject the Darwinian thinking , while 25 % identified it as " certainly false " and 29% as "probably false".43% of those without religion tend to accept the Darwinian thinking, while 29% indicated it with "probably true" and 14% as "certainly true", 3 % had no opinion. It is important to note that this group did not appear as sharply disbelievers in God. One can then consider that this group probably are both atheists and agnostics who believe in a supernatural force. Notably a considerable of this group argued against Darwinian evolutionary theory, the way it was presented, although not belonging to any religious creed. The movement of negation of religion and therefore acceptance of evolutionary theory [17,18,19] does not find support in the group that respondent was entitled without religion.

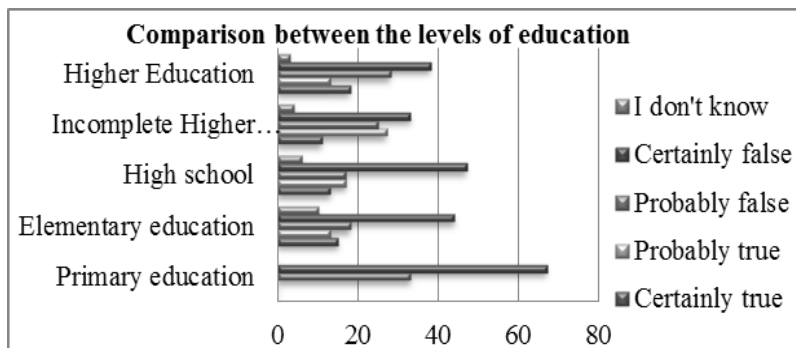


Figure 3: Comparative Analysis (in percent) of the respondents' answers to the question "5", taking into account the level of education of respondents.

Figure 3 shows the results of comparative analysis of responses to the question analyzed taking into account the level of education of respondents. You can see that, respondents who reported having attended only primary totally disproved Darwinian thought (100%), while 67% considered it "certainly false" and 33% "possibly false". Notably none of these indicated not know how to respond.

Among respondents who reported having completed primary education, 44% consider it a "definitely false" statement and 18% "probably false", amounting to a percentage of 62% to reject the question. Among those who tend to accept the Darwinian thought, as it was presented, it was noted that 13% consider it as "probably true" and 15% as "certainly true", so a total of 28% of acceptance 10% did not know.

Among respondents who reported having completed high school, 44 % marked "certainly false" and 17 % "probably false", with a total of 61 % of rejection of Darwinian thought. Among those who said they tend to accept the Darwinian thinking, 17 % interpret it as "probably true" and 13 % as "certainly

true, a total of 30 % of acceptance" and 6 % did not know.

It is likely that the majority of respondents please contact the academic theory of biological evolution only in high school. Here one can notice an increase in the acceptance of the statement under review as compared to respondents who reported having incomplete or complete elementary school. It is noteworthy that, however are high levels of rejection of the assertion. One possible explanation for this is the difficulty presented by teachers and high school students, dealing with conflict Evolution X Religion, discussed by Solcini Castilho and Junior [28], Trigo [29] Cerqueira [30], Falcão, Santos and Luiz [31], Fonseca [32] and Sepulveda, El-Hani and Reis [33] among others. Numbers [34] argues that even if a biology teacher point of evidence to corroborate the evolutionary process, the creationist will not abandon their beliefs.

Among respondents who reported not having completed college degree, 33% consider it "certainly false" and 25% "probably false", with a total of 58 % of refusal to the idea. At this level of education, 27% indicated "probably true" and 11% "certainly true", 4% of this group could not answer.

Among those who reported having completed a university degree, 66% to refute Darwinian thought, and of these 38% consider it "certainly false" and 28% "probably false." 31% of respondents with college degrees tend to accept the darwianian thought, and of these, 13% indicated "probably true", 18% "certainly true". 3% said do not know. Similar perceptions were discussed by Sepulveda and El-Hani [35,36], Nicolini, Falcão and Faria [37] and Souza et al. [5]. Sepulveda and El-Hani [35] and Souza et al. [5] highlight that even among students of Biological Sciences rejection is high and according to first authors, the commitment to the religious beliefs of students would have precedence when these students are presented an alternative model of scientific explanation.

Several factors can build a framework that helps to explain the denial of independent school years. One is the applicant religiosity of the population and its role in the daily pointed out by Oro [25,38]. Another aspect pointed out by several authors [6,7,11,12,39] is related to a number of misconceptions derived from personal placements of science teachers and biology, as well as previous conceptions and inadequate understandings of students, related to inadequate training of teachers themselves. This whole situation would lead to little or no impact at all levels of schooling acceptance of Darwinian evolutionary theory [40].

Caldeira, Araujo and Carvalho [41] , in order to investigate the conceptions of groups of teachers (in training and exercise) Brazilian Portuguese about the biology and evolution creationism X , identified among Brazilians, on the one hand , a large number of creationist ideas and, secondly , a high credit to the theory of natural selection and random. This conflictual vision (accept creationism and the theory of natural selection) of the teachers interviewed, according to these authors, may not necessarily be an obstacle to the teaching of evolution. One possible explanation, given by Caldeira, Araujo and Carvalho [41] is in the conceptual profiles [42], which explains that people do not necessarily abandon or replace their previous/alternative conceptions to understand a scientific concept. In other words, it is possible to model two or more understandings of the same concept coexist in one person, to be evoked in the proper context. The work of Sepulveda and El - Hani [35] deepens this discussion, distinguishing between teachers who are consistent, in other words, seek to profess their beliefs even when involved with the teaching of evolution , and those who hold these views , uttering the belief in appropriate contexts , but when talking about evolution have to teach the subject to learn. Thus, it is possible that people understand the ideas of evolution without abandoning their worldviews [43].

Conversely, Mahner and Bunge [44] point out that one has to choose between religious and scientific perspective, that would be inconsistent due to methodological, doctrinal and attitudinal differences. Is there a defense of waiver of preconceptions, as if it were a condition for learning science, namely conceptual change [45], as would be required for the incorporation and scientific understanding.

Therefore, students and future teachers would have to renounce previous explanations. Cerqueira [30] considers this approach undesirable and analysis in an environment of religious freedom and difficult to perform.

As mentioned in the Methodology item, the statement in question was correlated with religion declared by the respondents, and also with the educational level of the same. The calculation of Pearson's correlation coefficient was performed to obtain these data.

According to the data obtained, it was found that the assertion in the study shows no significant correlation with religion declared by the respondents ($r = 0.048$), in others words, we can not state that the agreement or disagreement of the respondents with the statement in question is necessarily more or less according to their religion. The same statement can be made in relation to schooling. According to the Pearson correlation coefficient, no significant correlation between assertive is the education level of respondents ($r = -0.10$). This may have occurred because there are respondents who consider the statement as true or false in all groups related to education. In other words, the increase in the education level of the respondents is not influencing the acceptance or denial of the assertion directly.

4. Final Thoughts

The results presented here point to a wide spread rejection of the theory of evolution as it relates to the denial of divine participation in the group investigated, permeating all religious beliefs and education levels among respondents. These findings are particularly worrisome because of proposals to teach the creationist theory in equal condition with the theory of evolution, which could count on popular support in its implementation and the perception that the correlations between responses support this popular appeal. The school site is to teach scientific knowledge, with other institutions in society responsible for the religious education who are interested, as expected in a society that assumes a secular state.

Issues related to the teaching of evolution and in view of the world views that contrast with the evolution, it is important to investigate how biology teachers deal with issues related to evolution in the classroom, that is, their views on world influence the treatment given to the teaching of evolution, being part of a society that privileges the dogmatic thinking at the expense of scientific knowledge.

References

- [1] A. P. Oro. "Religião, Coesão Social e Sistema Político na América Latina." *Religion, Social Cohesion and Political System in Latin America*. IFHC / CIEPLAN. 2008. Sao Paulo, Brazil, and Santiago de Chile. Available at: <<http://creativecommons.org/licenses/by-nc-nd/2.5/br/>>.
- [2] M. V. Martins. "De Darwin, de caixas-pretas e do surpreendente retorno do "criacionismo"". Darwin, the black boxes and the amazing return of "creationism." In: *History, Science, Health - Manguinhos*, vol. 13, No. 3, p.739-56, Set-dez. 2001.
- [3] P. Abrantes and F. P. L. de Almeida. "Criacionismo e darwinismo confrontam-se nos tribunais... Da razão e do direito." Creationism and Darwinism are confronted in court ... Of reason and law. *Episteme*, Porto Alegre, vol. 11, no. 24, p. 357-401, July / December 2006.
- [4] G. Branch and E. C. Scott. "Manobras mais Recentes do Criacionismo." Recent maneuvers over Creationism. *Scientific American*, p. 82-89, February, 2009.
- [5] R. F. Souza et al. "Evolucionismo X Criacionismo." Evolutionism X Creationism. *Science Today Magazine*, vol. 43, No. 256, p. 36-45, January / February 2009.
- [6] N.M.V. Bizzo. "Ensino de Evolução e História do Darwinismo." *Teaching Evolution and History*

- of *Darwinism*. Thesis (Doctor of Education). Faculty of Education: University of São Paulo, 1991.
- [7] A. P. N. Carneiro. “A Evolução Biológica aos olhos de professores não-licenciados.” *The Biological Evolution in the eyes of non-licensed teachers*. 136 f. Dissertation in Science and Technology Education. Center for Physical Sciences and Mathematics - Federal University of Santa Catarina, Florianópolis, 2004.
- [8] C. R. J. Cury. “Ensino religioso na escola pública: o retorno de uma polêmica recorrente.” Religious education in public schools: the return of a recurring controversy. *Brazilian Journal of Education*. National Association of Graduate Studies and Research in Education. Sao Paulo, Brazil, No. 27, p.183-191, 2004.
- [9] E. Giumbelli and S. De Sá Carneiro. “Religião nas escolas públicas: questões nacionais e a situação no Rio de Janeiro.” Religion in public schools: national issues and the situation in Rio de Janeiro. In: *Journal of Contemporary Education*, vol. 2, December 2006.
- [10] L. Goedert. “A Formação do Professor de Biologia na UFSC e o Ensino da Evolução Biológica.” *The Formation of Professor of Biology at UFSC and the Teaching of Biological Evolution*. Dissertation (Master in Science and Technology Education). Florianópolis: Federal University of Santa Catarina. Year of defense, 2004.
- [11] V. L. Rosa et al. “O tema evolução entre professores de biologia não-licenciados - dificuldades e perspectivas.” The topic evolution between unlicensed biology teachers - problems and prospects. In: *Perspectives VIII Meeting of the Teaching of Biology*. Annals. London: Faculty of Education, University of São Paulo, 2002.
- [12] S. Santos and N.M.V. Bizzo. “O ensino e a aprendizagem de Evolução Biológica no cotidiano da sala de aula”. The teaching and learning of Evolutionary Biology in everyday classroom. In: *Perspectives VII Meeting of the Teaching of Biology*. Annals. London: Faculty of Education, University of São Paulo, 2000.
- [13] V. B. E. Villa-Branco Júnior. “Prática e Teoria de Evolução para professores do ensino médio.” Practice and Theory of Evolution for high school teachers. In: *VII Meeting of Biology Education Perspective*. Annals. Sao Paulo: FEUSP, 2000.
- [14] R. Tidon and R.C. Lewontin. *Teaching Evolutionary Biology*. Genetics and Molecular Biology, 2004.
- [15] H. M. Silva and I. G. O. Prado. Creationism and intelligent design: Presence in the Brazilian educational policy. *Procedia Social and Behavioral Sciences* 2, p.5260-5264, 2010.
- [16] M. Colonetti and M. A. Sanches. “Evolução e criação: uma relação possível por meio do diálogo entre ciência e religião.” *Evolution and creation: a possible relationship through dialogue between science and religion*. Meeting of bioethics Paraná - Bioethics early life in focus. 1, 2009 Curitiba. Electronic proceedings ... Curitiba: Champagnat, 2009. Available at: <<http://www.pucpr.br/congressobioetica2009/>>
- [17] S. Harris. “Carta a uma nação cristã.” *Letter to a Christian Nation*. Sao Paulo: Companhia das Letras: São Paulo, 2008.
- [18] C. Hitchens. “Deus não é grande: como a religião envenena tudo.” *God is not Great: How religion poisons everything*. Rio de Janeiro: Twelve Books, 2007.
- [19] R. Dawkins. “Deus, um delírio.” *The God Delusion*. Sao Paulo: Companhia das Letras, 2007.
- [20] A. Bowling. *Measuring health*. A review of quality of life measurement scales. 3rd ed.

Philadelphia: Open University Press; 2005.

- [21] R. F. DeVellis. *Scale development: Theory and applications*. Newbury Park, CA: SAGE Publications. 1991.
- [22] N. K. Malhotra. "Pesquisa de marketing: uma orientação aplicada." *Marketing research: an applied orientation*. Bookman, 3rd Ed Porto Alegre, 2001.
- [23] C. Hodge. What is Darwinism? *New Yorker: Scribner, Armstrong e Company*, p.117, 1874.
- [24] P. R. Silva. "Análise das concepções de professores de biologia em formação inicial acerca da relação entre ciência e valores." *Analysis of the concepts of biology teachers in initial training on the relationship between science and values*. 138f. Dissertação (Masters in Science Education) - Faculty of Science-University Estadual Paulista, Bauru, 2012.
- [25] A. P. Oro. "Imaginários Religiosos e Políticos na América Latina: que relações existem entre eles?" *Religious and Political Imagination in Latin America: what relationships exist between them? Religión y Sociales / Social Sciences and Religion*, Porto Alegre, n ° 11, p. 93-106, September 2009.
- [26] M. D. C. Machado and C. L. Mariz. "Conflitos Religiosos na Arena Política: o caso do Rio de Janeiro." *Religious Conflicts in Policy Arena: the case of Rio de Janeiro. Sciences Sociales y Religion / Religion & Social Sciences*, Porto Alegre, n. 6, p.31-49, October 2004.
- [27] S. Colombo. "Darwin nas mãos de Deus:" Darwin in the hands of God: *Folha de São Paulo*. Sao Paulo, February 8, 2009, Notebook More, p. 4.
- [28] M. I. Soncini and M. Castilho Junior, "Biologia." *Biology*. Sao Paulo: Cortez (Magisterium Collection 2nd degree Series General Training.), 1991.
- [29] E. D. de F. Trigo. "Ciência - um convidado especial na sala de aula de Biologia: um encontro cultural entre ciência e religião no Ensino Médio." *Science - a special guest in the biology class room: a cultural encounter between science and religion in high school*. Master's thesis submitted to the Graduate Program in Educational Technology for Health NUTES - UFRJ, 2005.
- [30] A. V. Cerqueira. "Representações sociais de dois grupos de professores de biologia sobre o ensino de Origem da Vida e Evolução Biológica: aspirações, ambigüidades e demandas." *Social representations of two groups of teachers about teaching biology Origin of Life and Evolutionary Biology: aspirations, ambiguities and professional demands*. Dissertation (Master of Education in Science and Health) - Educational Technology Center for Health, Federal University of Rio de Janeiro, Rio de Janeiro, 2009.
- [31] E. B. M. Falcão; A. G. Santos and R. R. Luiz. "Conhecendo o mundo social dos estudantes: encontrando a ciência e a religião." *Knowing the social world of students: finding science and religion. Journal of Electronics Enseñanza de las Ciencias*, vol. 7, No. 2, 2008.
- [32] L. C. de S. Fonseca. "Você quer o fato científico ou o que eu realmente acredito?" O conflito entre religião e ciência nas escolas municipais do Rio de Janeiro. 'You want the scientific fact or what I really believe?' The conflict between religion and science in the public schools of Rio de Janeiro. In: *Proceedings of the 29th Annual Meeting of the Association of Postgraduate Studies and Research in Education*, 2006.
- [33] C. Sepúlveda; C.N. El-Hani and V. P. G. S. Reis. "Análise de uma seqüência didática para o ensino de evolução sob uma perspectiva sócio-histórica." *Analysis of didactics for teaching evolution from a socio-historical perspective sequence. VII ENPEC National Meeting of Science Research*. Florianópolis, November 8, 2009.

- [34] R. L. Numbers. "Mitos e verdades em ciência e religião: uma perspectiva histórica." Myths and truths in science and religion: a historical perspective. *Psiqu Rev Clin*. Vol. 36, No. 6, p. 246-251, 2009.
- [35] C. Sepúlveda and C.N. El-Hani. "Quando visões de mundo se encontram: religião e ciência na trajetória de formação de alunos protestantes de uma licenciatura em Ciências Biológicas." When worldviews are: religion and science in the course of formation of Protestant students a degree in Biological Sciences. *Research in Science Teaching*. vol 2, n.9, 2004.
- [36] C. Sepúlveda and C.N. El-Hani. "Apropriação do discurso científico por alunos protestantes de Biologia: uma análise à luz da teoria da Linguagem de Bakhtin." Appropriation of scientific discourse by Protestant students of Biology: an analysis in the light of Bakhtin's theory of language. *Research in Science Teaching*, vol.1 No. 11, p. 29-51, 2006.
- [37] L. B. Nicolini; E. B. M. Falcão and F. S. Faria, "Origem da vida: como licenciandos em Ciências Biológicas lidam com este tema?" Origin of life: as undergraduates in biological sciences deal with this issue? *Ciênc educ.* (Bauru) vol.16, No. 2, 2010.
- [38] A. P. Oro and M. Ureta. "Religião e política na América Latina: uma análise da legislação dos países." Religion and politics in Latin America: an analysis of the legislation of the countries. *Horiz. Antropol.*, Vol. 13 nº 27 Porto Alegre Jan. / June 2007. Available at: <<http://dx.doi.org/10.1590/S0104-71832007000100013>>
- [39] S. Santos. "Evolução Biológica: ensino e aprendizagem no cotidiano da sala de aula." *Biological Evolution: teaching and learning in everyday classroom*. Sao Paulo: Annablume: FAPESP: Dean of Research, 2002.
- [40] A. V. Cerqueira; G. S. Costa and E. B. M. Falcão. "Origem do ser humano: visões e conflitos de um grupo de estudantes do ensino médio." Human origins: visions and conflicts of a group of high school students. Seropédica: *Proceedings of the IV EREBIO*, 2007.
- [41] A. M. de A. Caldeira; E. S. N. N. Araujo and G. S. Carvalho. Creationism and Evolution Views of Brazilian Teachers and Teachers-to-Be. *Journal of Life Sciences*, vol. 6, p. 99-109, 2012.
- [42] E. F. Mortimer. "Construtivismo, mudança conceitual e ensino de ciências: para onde vamos?" Constructivism, conceptual change, and science education: where are we going? *Research in Science Teaching*, vol. 1, No. 1, 1996.
- [43] C. N. El-Hani and N. M. V. Bizzo. "Formas de construtivismo: mudança conceitual e construtivismo contextual." Forms of constructivism: conceptual change and contextual constructivism. *Assay*. Vol 4, No 1, 2002.
- [44] M. Mahner and M. Bunge. Is religious Education Compatible with Science Education? *Science & Education* vol. 5, nº 2, p. 101-123, 1996.
- [45] G. J. Posner et al. Accomodation of a scientific conception: toward a theory of conceptual change. *Science Education*, vol. 2, nº66, p.221-227, 1982.