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Can One Accept The Theory Of Evolution And Believe In God As Well?

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Abstract

This work is part of a broader research project entitled "Rescuing Darwin", which was inspired in a British report, and seeks to investigate how Brazilian understand this statement: "It is impossible to believe in biological evolution and in God simultaneously". Results revealed that the majority of respondents did not agree with the statement. The analysis of results revealed two answers categories, education and religion. Having higher education tended to be a factor in rejecting the claim, although it was not statistically significant. Spiritualists and Catholics showed lower acceptance of this statement (20.0% and 31.7%, respectively), whereas Evangelicals and atheists had higher acceptance (59.5% and 62.5%, respectively). Considering that the latter two groups are growing in the Brazilian population, it is possible to foresee an increase of this acceptance in the future. In general the respondents rejected the statement, which shows that they believe that it is possible to accommodate two conflicting ideas. The results indicate that it is possible to implement science education on evolution in an environment of high religiosity, as individuals with previous dogmatic conceptions can accommodate a theory that contradicts their fundamental beliefs.

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1. Introduction

Nowadays there is a resurgence of the creationist ideas, transposing the borders and creating a myriad of variations, more or less radical (Salzano, 2005; Martins, 2013; Silva & Mortimer, 2014) increasing the debate

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between science and religion, which is widespread in forums, in the blogosphere and other social media. This debate has been increased by radical positions from both sides, the atheists consider absurd to believe in a divine entity (Dawkins, 2007), on the other hand groups of literal creationists underlie intervention proposals in secular education, especially in science and biology classes, with the inclusion of creationism with the same academic weight as biological evolution, or even by replacing the teaching of Evolution (Martins, 2001). For authors like Mayer and El-Hani (2013) there would not be a real debate between the two fields, because for this debate to become effective, it would require a field minimally known by each other and, more importantly, its opponent should be willing to reassess their views, which in fact usually does not happen in this kind of discussion. Caldeira, Araujo e Carvalho (2011) have found that anti-evolutionists have an opposite view of the origin of life and the humankind to that of the Theory of Evolution, therefore tend to refute it. Silva, Araujo e Silva (2014) have showed that when respondents are faced to the Darwinian perspective as antagonistic to the religious conception, they tend to reject it. The interference of religious views with the teaching of Evolution find greater impact in the United States, especially in the southern states of the country, but the phenomenon has resonance in traditionally secular countries, like The Netherlands, and the inclusion of creationism and intelligent design has been proposed by the Minister of Education recently as a way of peace and rapprochement between different religions (Numbers, 2009).

This phenomenon also affects Latin America, with implications for the political and educational field, as perceived by Oro (2008). An example was what happened in the previous Brazilian presidential election in 2010 when candidates discussed the issue abortion liberalization or not with a focus on religion. Furthermore, a President candidate with large insertion in the media and in various sectors of society gave an interview showing to be adept of creationism, which is acceptable in a environment of freedom of expression, but he also supports the teaching of the two views, creationist and evolutionist, leaving to the students the possibility to choose which would be the most appropriate for themselves. Brazil was then experiencing a relative state of secularism affected by the influence of religion in the State affairs and in educational policies (Cury, 2004). Another striking example of this process of dogmatic intervention in the political and educational field occurred in Rio de Janeiro, where the draft law no. 3459 (2000) established the confessional religious education in public schools of the Rio de Janeiro state (Machado and Mariz, 2004; Cavaliere, 2007). In this state, a governor has recently expressed his belief in creationism and the interest in their integration into mainstream education (Martins, 2001; Abrantes & Almeida, 2006; Silva & Mortimer, 2014). This type of positioning has found space in the development of curriculum and training of teachers in elementary school networks and university (Branch & Scott, 2009; Souza, Carvalho, Matsuo & Zaia, 2009).

The theme of biological evolution in Brasil is regarded as central to the teaching of Biology in the National Curriculum Guidelines for Secondary Education (PCNEM, 2006) and is a guideline for the teaching of this discipline, as even with this emphasis on the Brazilian curriculum, proposals for the teaching of creationism insertion can find its space. Santos and El-Hani (2013) have shown that the main concern is related to the insertion of the creationist view in textbooks in many religious schools throughout Brazil. Ginnobili (2013) argues that biology is fundamentally Darwinian, therefore if creationist views are acceptable in the teaching of biology, this field of science would be taken to a pre-Darwinian era, renouncing many postulates established by the modern science.

Within this context of dogmatic influence, scientific circles celebrated in 2009 the anniversary of 200 years of the birth of Charles Darwin (1809-1882), considered as the "father" of the Theory of Evolution, and the 150th anniversary of his more expressive work, *The Origin of Species*. This fact was much emphasized in scientific media with reports and articles, but as pointed out by Bizzo, Gouw and Pereira (2013), the United Nations (UN) did not highlight the date on their scientific celebrations, but opting for the birthday of 400 years as the telescope development and dedicated the year to Galileo Galilei (1564-1642) and astronomy. By exposing Darwin's name and his ideas, there movement opposing to his theory, especially their teaching, has been reinforced.

Within this framework of Darwinian Theory, a British research on "Rescuing Darwin" was developed, which aimed to know how the Great Britain population realize the Theory of Evolution, Creationism, Intelligent Design and related issues (Spencer & Alexander, 2009). This report was drawn by institutes Theos (<http://theosthinktank.co.uk/about/theos-team>) and Faraday (<http://www.st.edmunds.cam.ac.uk/faraday/Institute.php>) that seek to investigate and discuss the role of religion in the modern

world, as well as issues relating to science and religion. Based on this report, in its conclusions and its dissemination in Brazil by the text of Colombo (2009), a similar research in Brazil was developed, seeking to present the vision of a sample of the Brazilian population about the Theory of Evolution, Creationism, Intelligent Design and related issues, associating it to the school context. Herein is presented part of the Brazilian study concerning the results of the 11th question: "It is impossible to believe in biological evolution and at the same time, believe in God. About this statement you: ...".

2. Methodology

Data collection was done through a questionnaire with eleven multiple-choice questions and one open question. The first five questions were direct translations of the British questionnaire (Colombo, 2009) but the others were developed specifically for this research, adapted to the Brazilian context, as shown in table 1.

Table 1. Questions used in the survey "Rescuing Darwin" (only the first five replicate the English research).

1. Intelligent design, "the idea that evolution alone is not enough to explain the complex structures of some living things, so the intervention of a designer is needed at key stages.	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
2. The theistic evolutionism, the idea that evolution is the means that God used for the creation of all living things on earth.	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
3. The atheistic evolution, the idea that evolution makes belief in God unnecessary and absurd.	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
4. Young Earth Creationism, the idea that God created the world sometime in the last 10,000 years,	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
5. The thought of Darwin, the idea that humans evolved by a process of evolution which removes any need for God	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
6. On the idea that science classes should only address creationism, the idea that God created all living beings and they have not changed since then, you ...	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
7. On the proposal that science classes should only address how the origin of species and the evolution in the vision of Darwin's theory, you ...	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
8. About a suggestion that science classes should give the same value and use the same time to teach creationism and the theory of evolution, you ...	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
9. Science and religion can have a peaceful coexistence, even in an environment where ideas are so contrary as biological evolution and creationism. About this statement ...	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
10. Some argue that the teaching of evolution can be beneficial to the scientific development of humanity and deleting it would be detrimental on these arguments you ...	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
11. It is impossible to believe in biological evolution and at the same time believe in God. About this statement you:	a) I totally agree partially agree disagree	d) I totally agree e) I don't know	b) I c) I partially
12. What is your opinion about the teaching of evolution and creationism in schools? How would you prefer that your child be educated regarding this issue?	(Open question)		

For each statement the respondents expresses their degree of agreement or disagreement. The questionnaire is the most common way for data collection, giving the possibility of generating more accurate data and facilitate its

analysis (Cervo, Bervian and Silva, 2007). The set of questions was related to a central theme, which was the conception of the population about Darwinian evolution, creationism and the teaching of these theories. The Likert scale was used to analyze the respondents' conceptions in the same way as it was used by the British researchers (Spencer & Alexander, 2009) in order to avoid simplistic view of agreement or disagreement on the issue "*It is impossible to believe in biological evolution and at the same time, believe in God. About this statement you: ...*". Therefore, the respondents had five options: "I totally agree", "I partially agree", "I partially disagree", "I totally disagree" and "I don't know". Thus, it was intended to have a wider range of responses, seeking to assess the degree of denial and acceptance regarding the proposed statement. To Cervo et al. (2007) another advantage of the questionnaire is the standardization of the responses, which facilitates the coding and analysis of responses. The Hypothesis Testing-Proportion Two Samples test was used for statistical analysis. The data were calculated at 5% significance level by using the Statdisk 9.1 software.

The participants of this study were students of the Biological Sciences of the University of Itauna and Formiga (both in the Midwest region of Minas Gerais state), and the metropolitan region of Belo Horizonte (the capital of the Minas Gerais state). Since many of the students of Itauna and Formiga universities come from neighboring towns, the area of coverage is very large and achieve greater heterogeneity of participants. The large number of individuals filling in the questionnaire is also relevant to make the analysis more meaningful (Goode e Hatt, 1977). The total number of respondents was 390 and the characterization of the sample is shown in Table 2, regarding sex, religion and level of education.

Table 2. Results of the research "Rescuing Darwin". Numbers and percentages.

		Sample	
		Number of respondents	Percentage (%)
SEX	Female	244	62,60
	Male	146	37,40
	<i>Total Number of Respondents</i>	<i>390</i>	<i>100</i>
RELIGION	Catholics	300	76,92
	Evangelicals	23	5,90
	Spiritualists	20	5,13
	Atheists	8	2,05
	No defined religion	28	7,18
	Others religions	11	2,82
	<i>Total Number of Respondents</i>	<i>390</i>	<i>100</i>
EDUCATION	Primary Education	6	1,54
	Elementary Education	39	10,00
	High School	105	26,92
	Incomplete Higher Education	104	26,67
	Higher Education	129	33,08

Not answered	7	1,79
<i>Total Number of Respondents</i>	<i>390</i>	<i>100</i>

3. Results and Discussion

As shown on Figure 1, of all respondents, more than half (64%) tended to disagree with the statement *"It is impossible to believe in biological evolution and at the same time, believe in God. About this statement you: ..."*: 52% disagreeing totally and 12% disagreeing partially. A total of 34% showed some degree of agreement: 21% agreed totally and 12% agreed partially. A small group of 2% did not answer.

Results indicated that among the questioned group there was a majority that rejected the collision between science and religion, regarding the acceptance of Evolution Theory and belief in a divine entity. This result shows that for this group two or more understandings on the same topic can coexist as explained by Caldeira, Araujo and Carvalho (2011) and based on the model of conceptual profiles (Mortimer, 1995), in which the individual does not need to abandon previous or alternative conceptions to assimilate a new scientific concept. Table 2 shows that the majority of respondents profess a religion and this did not stop the respondents to understand evolutionary theory as something tangible. Cobern (1996) discusses that even in contexts with strong religious domination, people can develop an analysis in which science can fit. Following the same line of thinking, El-Hani and Bizzo (1999) assume that it is possible to deal with impasses when the person crosses cultural boundaries since contradictory beliefs can coexist in the person's cognitive structure.

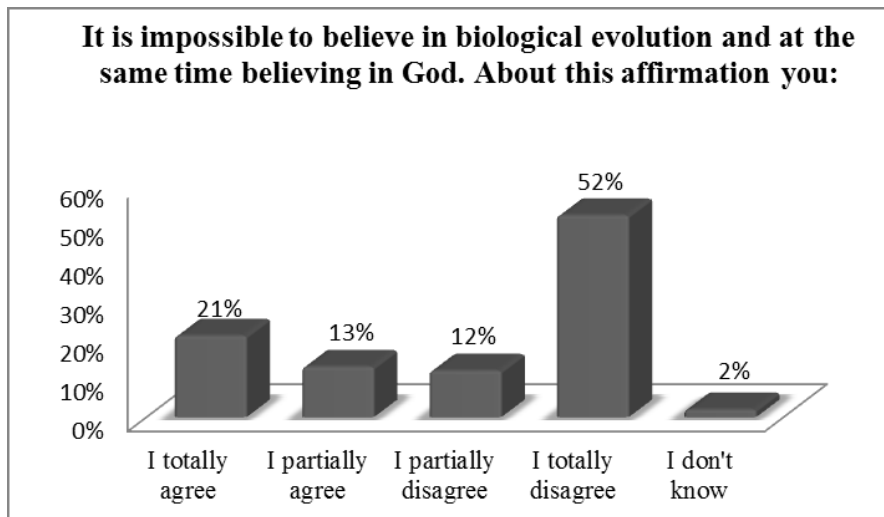


Fig. 1. Percentage of answers about *"It is impossible to believe in biological evolution and at the same time, believe in God"*.

For the analysis of the answers the four categories of relationship between science and religion, presented by Barbour (1990) were endorsed. The four categories are the following: conflict, independence, dialogue and integration. For most respondents (64%) the thesis of the conflict does not appear to prevail; in contrast, it seems the dialogue and integration between the two fields (science and religion) tend to prevail. The category of independence can also prevail, having in mind that the fields do not interfere with each other as Coutinho and Silva (2013)

suggest, that it is possible that they have different methods, themes and languages that do not overlap nor compete between them, as they are separate areas.

On the other hand, for 34% of respondents, the scientific and dogmatic views are incompatible as they somehow agreed with the statement. Authors such as Mahner and Bunge (1996) have the same perception, when they say that one has to decide between religious and scientific perspective. For these authors the religious doctrine could be harmful to science education. It seems that for these 34% respondents that agreed (totally or partially) with the statement prevails the Baubour’s (1990) thesis of conflict, in which the dogmatic field creates an impasse with scientific discoveries.

Figure 2 shows the results regarding the answers to the statement *"It is impossible to believe in biological evolution and at the same time, believe in God. About this statement you: ..."* in relation to the education level. These data on were tested for statistical significance, which results are presented in Table 3.

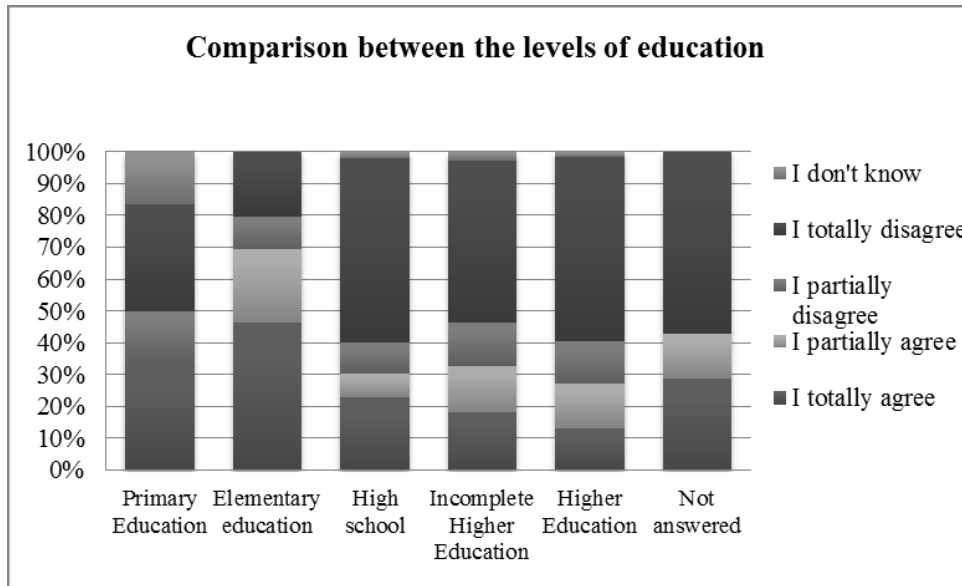


Fig. 2. Percentage of answers about *"It is impossible to believe in biological evolution and at the same time, believe in God"* by level of education.

The answers to the option “I totally agree” tend to decrease as the level of education increases from Primary Education to Higher Education (Figure 2) and the statistical analysis shows a significant change between respondents with low levels of education (Primary and Elementary Education) and those with Higher Education (complete and incomplete Higher Education) ($p < 0.05$). These data indicate that schooling influences the acceptance of the Evolution Theory.

Table 3. Proportion Hypothesis Testing- Two Samples. Significance level of 5%.

	Sample	
	In accordance	In disagreement
P	0.3525	0.6259
P ₁	0.1967	-0.4992
P ₂	0.5000	-0.1989

The decrease of agreement with the statement shown in Figure 2 can also be analyzed from the perspective of the evolution of conceptual profile proposed by Mortimer (1996). For this author, two types of concepts can coexist as antagonistic issues, as presented in the statement, without the need for a conceptual change. Sepulveda and El-Hani (2001) have found elements that support this thesis, that in the educational context, there could be a fundamentalist conception to shift to a more liberal one, allowing the person to accommodate the scientific knowledge with religious. Likewise, Bizzo, Gouw and Pereira (2013) obtained similar results in an extensive research with students, showing that many students can establish a harmonious coexistence between the two forms of conceptions, knowledge and beliefs. The present results also agree with those found by Caldeira, Araujo and Carvalho (2011) in a work with future and in service biology teachers that recognize the evolution and natural selection as participating in the process, but most responders maintain the hypothesis that the Creator rules the process. Similar results were also found by Silva et al. (2014) where respondents enrolled in Biological Sciences course accommodate scientific knowledge and the dogmatic view during the course. They found a growing acceptance of the Theory of Evolution, as the common ancestry, including humans. In this context, no loss of religious view was found, but an adaptation to the new knowledge. The influence of education on the acceptance of Evolution Theory was also detected in the work of Silva Araujo e Silva (2014).

Despite this tendency of decreasing "I totally agree" as education increases, a significant percentage of the respondents seems to continue with the vision of Baubour conflict (1990), even after the school years. The same has been perceived by Posner, Strike, Hewson and Gertzog (1982) saying that when a new conception causes conflict with a previous conception, there must be a refusal, i.e. a conceptual change occurs by replacement to accommodate the new concept. Also Mahner and Bunge (1996) assume that there is a change in doctrinal incompatibility between religion and science, related to the literal interpretation of religious doctrines and especially of the Holy Scriptures, which could explain the percentage still relatively high of subjects that keep the conflicting perception. Another perspective that can explain this resistance to the Theory of Evolution is related to the short time that teachers of science and biology could be devoted to the teaching of Evolution (Berkman and Plutzer, 2011). For Rutledge and Mitchell (2002) one must question what the background of teachers to teach evolution is, their number of hours of teaching the subject, its acceptance and its reflection on how to teach such content, which and can generate a neglect in the teaching of this subject. Berkman and Plutzer (2011) argue that even working with the theme, many teachers do not believe in the Theory of Evolution and that this view ends by affecting its teaching.

Figure 3 shows the answers to the statement "*It is impossible to believe in biological evolution and at the same time, believe in God. About this statement you: ...*" in relation to religion.

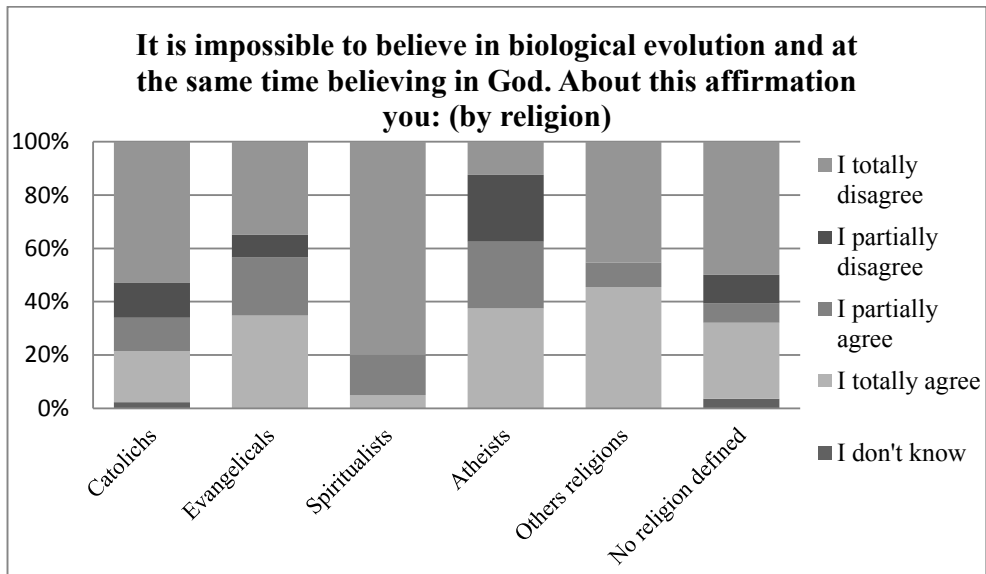


Fig. 3. Percentage of answers about "It is impossible to believe in biological evolution and at the same time, believe in God" by religion.

Among the three major religions, the Spiritualists were the least close to the Baubour's (1990) thesis of conflict, with a very low number of agreement with the statement, confirming what was reported by Colombo (2009), which indicated the religious aspect as more tolerant and less confrontational with the scientific view than the other religions. After the Spiritualists, the Catholics showed an intermediate position in the answers and Evangelicals showed greater affinity with the proposition of the question. These data agree with the work of Silva et al. (2013), when respondents are instigated in an issue that raises the question of atheism as being proper to evolutionism. Sanz (2013) refers that the logical and empirical evidences of the scientific community have very little or no impact in a fervent believer. However, in the case of the Brazilian Evangelicals that fall into this category of believers, it was found that a relatively large number of these religious can live together with Darwinian ideas.

An intriguing information emerged when analyzing the two groups that were more positive for the statement, by different reasons. Indeed, Evangelicals and atheists had more than 50% of respondents in agreement with the statement. Evangelicals are a growing group in Brazil, with a growing influence in politics and in various fields (Oro, 2008), on the other hand, there is also an increase in the number of Brazilians who declare having no religion, in which atheists and agnostics are included, as found in the last Brazilian census (<http://censo2010.ibge.gov.br/noticias-censo?view=noticia&id=1&idnoticia=2170&t=censo-2010-numero-catolicos-cai-aumenta-evangelicos-espiritas-sem-religiao>).

From these results, one can envisage an increase in the conflict between science and religion among Brazilians (Baubour, 1990). Perhaps some of this conflict is related to the literal vision of the Christian Bible. For many followers of religious aspects the Holy Book represents God's word, the message is intended as direct, so any information that contradicts this should be rejected and struggled (Bizzo, 2013). This author indicates that the dialogue problem with such a group is due to the fact that most fervent religious tend to interpret the Bible "word by word", which does not allow any interpretation, therefore the shock is unavoidable. Silva and Mortimer (2014) detected the growing polarization of the conflicting sides, with great acceptance of creationism, including its most radical action "Young Earth" and Intelligent Design. However, these data are taken from the same questionnaire that generated the data from this work. Crossing these data with the ones of this study (using the same questionnaire), one can see that many of these advocates of creationism and intelligent design recognize the importance of the study of evolution and its role in modern science, which opens a new strand that can be exploited for science education. Silva et al. (2014) have found a framework in which the accommodation of both

conceptions (scientific and dogmatic one) is difficult, but it is possible, and the respondents on this study consider important the separation of science and religion.

4. Conclusion

The majority of respondents showed to live well along with both dogmatic and scientific visions, rejecting the thesis of the conflict between the two fields. The education level seemed to influence the rejection of the statement "*It is impossible to believe in biological evolution and at the same time, believe in God. About this statement you: ...*". Spiritualists and Catholics were those who had greater rejection of the statement, and the atheists and evangelicals showed greater affinity with the conflicting vision between the two fields. It can be concluded that for the majority of respondents it is possible to understand the Theory of Evolution and maintain the convictions related to their religiosity, which may reveal an opportunity to increase the teaching of evolution in science and biology, even in contexts of consolidated dogmatism.

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