

Attitudes towards Science and Religion: Insights from a Questionnaire Validation with Secondary Education Students

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Abstract

The purpose of this study is to investigate the students' attitudes towards science and religion in the Portuguese Secondary Education. The sample consists of 308 students (110 males and 198 females), including 200 Catholics and 49 atheists, from two Portuguese schools (one private and one public). A questionnaire, based on previous instruments and on new items, was used. An exploratory factor analysis was conducted. For the first part of the questionnaire eight factors were retained, including items associated with (i) faith; (ii) scientists; (iii) perspectives of science on religion; (iv) science and religion classes; (v) laws of nature; (vi) trust in science; (vii) interest in science and religion dialogue; (viii) scientific proof of the existence of God. Students expressed great confidence on science and reported to accept science theories on evolution and world beginning. Students do not perceive science classes/ teachers neither religion classes/teachers to ignore their religious faith. The answers to the second part of the questionnaire indicated that students acknowledge that science and religion teachings often enter in conflict and, accordingly, they are not completely, compatible. Students think that scientists should be free to investigate without any interference and statistical significant differences were found between Catholics and atheists. Although the new items need further work and revision, they indicated that the source of the tension between science and religion is not in the Bible nor in the evolution theory. The current findings suggest that creationism might not be as relevant for science and religion dialogue in the Portuguese context as it might be in America or England and that the scientific perspective is dominant in many regards. Ethics may be an important avenue to link science and religion, but it remains unclear what the nature of religion is and how it affects students in their relation with science. Future studies must include a larger sample of students from Secondary Education public schools in order to understand the significance of these preliminary results and to clarify where the source of tension between science and religion lays.

1. Introduction

Science and religion are lens to look and interpret the world. Whereas to some people they conflict with each other (e.g., Bible Belt and Hawkins manuscripts), to other people they are compactible and to still to others they can entail a dialogue.

Given that great changes occur as adolescents, in particular, develop new cognitive structures and start asking themselves fundamental questions about the nature of the world and the meaning of life, one can also expect that their attitudes towards religion and science are challenged.

It is important, thus, to develop instruments to measure the attitudes towards science and religion during adolescence and this paper gives a step towards that direction. It is organized as follows: after a brief overview of the literature, methods are described; results are presented and discussed, bearing in mind the literature.

2. Literature review

It is possible to organize the relations between science and religion in three categories: (i) conflict; (ii) independence; and (iii) dialogue [1] [2]. Science and religion are perceived as conflicting whenever they are target at a given subject (e.g., world origin) but one prevails over the other [3].

The independence category includes social constructivist perspectives [4] according to which science and religion can coexist because they simply do not intersect ever, thus, excluding conflict as well as dialogue.

Subjects that are cause of conflict can be sources of dialogue, if a dynamic conception of science and religion is embraced [7] [8]. These areas of interception can foster dialogue and create opportunities to

what has been named *epistemic insight*, i.e., a reflection on the nature both of religion and science that set the ground for a better understanding of the relations between these fields [9].

The perceptions on the nature of science do not seem to be associated with the academic background [5] [6] but seem to be correlated with religious beliefs: the more orthodox one is, the more one is reluctant about the tentative nature of science and freedom of inquiry and the more one considers culture and society to be superior to science [5].

In order to start assessing the perceptions of the Portuguese adolescents, reliable instruments are necessary. Thus, the aim of this paper is to study the statistical qualities of a set of questionnaires in a sample of Portuguese secondary students.

3. Method

3.1. Subjects

The convenience sample consists of 308 secondary students (110 males and 198 females), from two Portuguese schools (one private and one public). Students' mean age was nearly 17 years-old (SD = 0.898). 31,8% was engaged in the 10th grade; 44,5% in the 11th grade and 23,7% in the 12th grade. Most students attended the Sciences and Technology course (67,9%), 12,3% Arts, 14,5% Economics and 4,5% Fine Arts. Most parents have at least the 9th grade. Approximately two thirds are Catholics while 49 students do not have a religious belief (Table 1).

Table 1. Religious belief by sex

	Catholic	Other religion	Believer without religion	Non-believer	None of the previous	Total
Male	67	0	9	26	8	110
Female	133	9	16	23	15	196
Total	200	9	25	49	23	306

Subjects visit sciences spaces at least one time per year; nearly half watches science programs more than one time per month (29 never watches), and one third reads a science text at least one time per month (69 never read). Few students are engaged in science clubs (9 students) or were engaged in the past (38 students) and the majority never was engaged.

One third do not participate in religious ceremonies (103 students), 71 report to participate less than one per month, 26 less than one time per week, 88 one time per week and 16 more than one time per week. In what concerns personal prayer, 112 students report not to pray, 53 to pray less than one time per month, 28 less than one time per week, 41 one time per week, 38 more than one time per week and 36 every day.

3.2. Instruments

Two questionnaires [8] [10] were used. The five point Likert scale ranged from entirely disagree to completely agree. Respondents were given the chance to answer that they did not understand the sentence. A socio-demographic set of questions ended the questionnaire.

4. Results

Chi-Square tests were conducted. Subsamples are equivalent except for age (and school year), course and previous or present participation in science clubs. As for sex, statistically significant differences were found in father's academic background (males have more educated father), religious belief, personal prayer, watching science programs, reading science texts and engagement in science clubs. Male students reported to be more engaged in science-related practices than female students while female students are more likely to believe and to pray than male students.

The Cronbach α for the 39 items was .60 for the questionnaire I [9]. An unweighted extraction with varimax rotation was conducted and items with saturation below .45 were deleted. Single items were deleted as well as items that saturated only in two factors. Eight factors were retained: faith (e.g., I believe God created the universe); good scientists (e.g., A good scientist can't believe that life was

created by God or some transcendent being); laws of nature (e.g., Science defends that the laws of nature dictate everything that happens in the universe), trust in science (e.g., I accept the scientific theory that the whole universe was created by the Big Bang); science and religion classes (e.g., In our science classes, the teacher doesn't like to answer religion-related questions); science and religion dialogue (e.g., I would like to know more about the possibility of science and religion being compatible); perspectives of science on religion (e.g., The scientific and the religious version of how the universe was created cannot be both true); scientific proof of the existence of God (e.g., One day science will prove God exists). Mean results are presented in Table 2.

Table 2. Questionnaire I

Factor	M	SD	Cronbach α
Faith (items 14,16, 20, 21, 24, 25)	2.87	0.911	.86
Good scientists (items 10, 36, 37)	2.72	0.976	.78
Laws of nature (items 33, 34)	3.24	0.815	.73
Trust in science (items 11, 29)	3.81	0.735	.51
Science and religion classes (items 5, 6, 23)	2.34	0.823	.60
Science and religion dialogue (items 8, 35)	3.40	0.937	.53
Perspectives of science on religion (3, 26, 30)	3.43	0.741	.57
Scientific proof of the existence of God (item 38,39)	2.73	0.802	.31

Students highly agree that the teachings of science and religion often conflict with each other (M=4.05) and, accordingly, they disagree that findings of science and the religion teaching are compatible (M=2.30). It is not clear to say that science has or has not strengthen their views about religion (M=2.85). Students moderately think that scientists should be free to do any research (M=3.32) (Table 3).

Table 3. Questionnaire II

Question	M	SD
Science and religion conflict	4.05	0.728
Science strengthens religious views	2.85	1.041
Science and teachings of religion are compatible	2.30	0.946
Scientists should be free	3.32	1.274

Subjects think that the Bible can't be read by the letter, the theory of species can be accepted by the believers and also that many believers have obsolete worldviews (Table 4).

Table 4. Questionnaire III

Selected questions	M	SD
Bible can't be read literally	3.80	1.151
Theory of the evolution can be accepted by believers	3.83	.930
Many believers have a worldview as if Galileo and Darwin did not have existed	3.47	1.093

Prayer and participation in religious celebrations are positively correlated with faith and interest in dialogue; negatively correlated with laws of nature and perspectives of science on religion (Table 5). Personal prayer is also positively correlated the factor science strengthens religion and negatively correlated with trust in science. Participating in religious celebrations is negatively associated with the assumption that scientist should be free to research with limitations. Science practices are negatively correlated with faith. Visiting science spaces and watching science programs are positively correlated

with trust in science. Reading science text is positively correlated with laws of science and negatively correlated with the assumption that scientist should be free to research. Visiting science spaces is positively correlated with the perspectives of science on religion. No statistically significant correlations were found with items of questionnaire III.

Table 5. Correlations

Questions/Factors	Personal prayer	Religious celebrations	Visiting science spaces	Watching science programs	Reading science texts
Faith	.536**	.355**	-.146*	-.202**	-.156**
Good scientists	-.091	-.050	.026	.050	-.017
Laws of nature	-.217**	-.148**	.109	.089	.131*
Trust in science	-.191**	-.085	.170**	.187**	.112
Science and religion classes	.014	.043	-.046	-.045	-.032
Science and religion dialogue	.250**	.234**	.073	.088	.105
Perspectives of science on religion	-.215**	-.170**	.159**	.109	.046
Scientific proof of God	-.060	-.104	.093	.085	.085
Science and religion conflict	-.019	.017	.081	.074	.020
Science strengthens religious	.149**	.018	-.078	-.053	-.059
Science and religion are compatible	.077	.009	-.104	-.054	-.074
Scientists should be free	-.094	-.130*	-.103	-.081	-.114*
Bible can't be read literally	-.083	.049	.124*	.049	.053
Theory of the evolution can be accepted...	.083	.032	.070	.004	-.047
Many believers have a worldview as if...	-.034	-.046	.107	.014	.085

* $p < .05$; ** $p < .01$

5. Discussion

This paper presented and discussed the results of an empirical study about the attitudes of secondary students on science and religion. Results suggest that these attitudes are still associated with gender roles, according to which boys are more suitable for science than girls and girls more involved in religious affairs [11].

Relations between science and religion seem to be ruled by conflict [8]. Those who believe are more unenthusiastic in what respects science and those who are more interested in science are more reluctant in what respects religion. Despite this tension, creationism or literal readings of the Bible does not seem to be an issue. What, thus, are the causes of the conflict?

Freedom of inquiry, as reported by Aflalo [5], seems to be more challenged by those who reported more religious practices, namely, more participation in celebrations, but also by those with more science related practices, namely, reading more science texts. Ethics can set the ground for the dialogue between science and religion.

Current results must be analysed with cautious since the reliability of the questionnaire I is not entirely satisfactory. As such, more data is being collected and after new analyses, if an improved version of the instrument will be developed and administered to a representative sample of secondary students in Oporto.

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