Acta Scientiarum 21(1):97-106, 1999.
ISSN 1415-6814.

Nature of Worldview Presuppositions among Science Teachers in Italy and Brazil

Milena Bandiera[1], Marcos Cesar Danhoni Neves[2]*, Matilde Vicentini[3]

*[1]Biology Department, "Roma Tre" University, Roma, Italy; [2]Physics Department, State University of Maringá, Brazil; [3]Physics Department "Enrico Fermi", "La Sapienza" University, Roma, Italy. *Author for correspondence.*

ABSTRACT. The paper re-employs the title of a previous article which reported the worldview presuppositions of Science teachers in Botswana, Indonesia, Japan, Nigeria and the Philippines. There was an interest to perform the same investigation in our countries, namely "Do science teachers in the western world similarly hold such a multiplicity of worldview presuppositions?" For comparison's sake the same questionnaire was used, although adapted to our cultural contexts. From our investigation two positive points have emerged, or rather, that science teachers in Italy and Brazil hold a multiplicity of worldviews which coexist with the scientific one and that there are some differences between the Italian sample and all the others. More Italian teachers seem to accept scientific (or pseudoscientific) statements and to reject (in this order) magic-mystery, religion and spiritism, and parapsychology-oriented statements. Is it feasible to assign this difference to cultural context?

Key words: worldviews, cultural differences, sciences and pseudosciences.

RESUMO. A natureza das pressuposições sobre concepções de mundo entre professores de ciência na Itália e no Brasil. O presente trabalho empresta seu título de um artigo anterior que relata as pressuposições sobre a visão de mundo de professores de ciências de Botswana, Indonésia, Japão, Nigéria e Filipinas. Propôs-se colocar a questão sob a mesma investigação na forma: "os professores do mundo ocidental mantêm similarmente as mesmas visões ou concepções de mundo que aqueles dos países citados?". Para que fosse possível a comparação, utilizou-se o mesmo questionário, embora com certas adaptações para os contextos italiano e brasileiro. Dois pontos positivos emergiram de nossa investigação: no primeiro, os professores de ciências na Itália e no Brasil mantêm uma multiplicidade de concepções de mundo que coexistem com aquelas consideradas científicas; no segundo ponto, emergiu o fato de que existem algumas diferenças entre a amostra italiana e a de todos os outros países citados: mais professores italianos aceitam asserções científicas (ou pseudocientíficas) e rejeitam asserções de origem mágico-mistérica, religiosa, espiritista e parapsicológica (nesta ordem). Poderíamos atribuir esta diferença ao contexto cultural?

Palavras-chave: concepções de mundo, diferenças culturais, ciências e pseudociências

This paper re-employs the title of a previous article which reported the worldview presuppositions of science teachers in Bostwana, Indonesia, Japan, Nigeria and the Philippines (Ogunniyi *et al.,* 1995, cited below as OJOYO from the initials of the authors).

In the article it has been shown that science teachers of the non-western world hold a multiplicity of worldviews about natural phenomena in agreement with anthropological (Cobern, 1993, Horton, 1982) and sociological (Geertz, 1973) theoretical frameworks.

In fact the interest in performing the same investigation in our countries was raised by one of the questions that concludes the OJOYO paper, namely "Do science teachers in the western world similarly hold such a multiplicity of worldview presuppositions?"

Besides our personal conviction that all human beings hold a multiplicity of worldviews (and therefore that the mastery of magic/spiritistic,

para/pseudoscientific and religious beliefs doesn't necessarily imply any contradictions with the acceptance of scientific knowledge), we were reading the OJOYO paper during the period in which the Italian public television was presenting a series of programs which, under the general title "Mysteries", raised the discussion among scientists, priests, supporters of alternative medicine (homeopathy, for instance) and believers in paranormality, about such issues as the existence of UFOs, the possibility of telepathy, the rationality of alternative cures and other similar topics.

The series had a reasonable success among viewers and demonstrated that in western culture non-scientific worldview presuppositions are largely accepted. Of course, scientists that appeared on TV were strongly supporting the point of view by which the acceptance of a scientific rationality would lead to the rejection of the paranormal. They also cast doubts on the efficacy of alternative medicine (albeit religion was considered a different case)[1].

The question required an answer since Science teachers may be placed midway between the general public with scanty knowledge of Science and researchers with highly specialized knowledge in one disciplinary sector.

We thus decided to carry out an investigation on a sample of Italian and Brazilian Science teachers and to compare our results with those of the OJOYO report.

It seemed obvious that in the case of such a comparison the choice of the instrument for our investigation was obligatory: we had to use the same questionnaire and to present data in the same way. We had therefore to explain our evaluation of the OJOYO methodology (see *Instrument and data presentation*) to adapt the questionnaire to our cultural contexts (see *Instrument and cultural adaptations*). While discussing the required adaptations, problems about the categorization of the answers were raised. *Categorization and instructions* will report these problems. *Composition of the sample* will report on the sample composition and on the results. A concluding section will follow.

In the appendix we report the translation of the Italian-Brazilian version and the OJOYO version of the questionnaire.

[1] In watching the program it was possible to see that the scientists were often less capable of dealing with arguments than their interlocutors. Some scientists seemed to behave in a very irrational way too.

Instrument and Data Presentation

The decision to conduct the inquiry as close as possible to the OJOYO one to guarantee a sensible comparison put certain contraints on our work.

Constraints will be explained and aspects of the results of our investigation not relevant for the comparison undertaken will be referred to.

First of all, we have to point out that presentation and analysis of OJOYO data are based on three important assumptions concerning the nature/structure of the fictitious stories (cases) on which the questionnaire was based, and that of the statements which had to represent different attitudes toward these cases, the categorization procedure.

The stories were considered equivalent or neutral according to the choice of the statements. This position may be questioned. We suggest case 6 as an example. Case 6 pivots on an experiment which refers to an undoubtedly scientific context and is described by scientifically connotated words (such as "magnetic field", "to germinate", "exposure"). Certainly this case induces the choice of pseudoscientific or scientific statements (in fact, the Italian-Brazilian sample item 29, which deals with supernatural forces, was not chosen).

Regarding Case 1, the case of "vanishing" ships which alludes directly to mystery, 25% of the samples agreed with "It is a typical example of mystery".

The structure of the text had to be taken into consideration too. In terms of complexity, it had to take into account, among other things, the number of actions (verbs), ranging from 2 (case 1) to 9 (case 2). No wonder the statements of case 2 show in general the highest frequencies of indecision/abstention (up to 40%); because of its vagueness the second statement shows agreement up to 80%.

The second assumption concerns the fact that the statements indicate only worldviews presuppositions. Besides these worldviews, we believe that any statement is also characterized by other features, such as direct (OJOYO version: case 5, item 3) or indirect (OJOYO version: case 5, item 2) explanation; inherent (OJOYO version, case 5, item 1) or generic (OJOYO version: case 5, item 5) commentary. Such features of these statements could influence choice much more than the implied worldview.

Finally, statement categorization should be considered reliable if judges were actually representative of a scientific community or of a wide "neutral" socio-cultural environment and if they agreed substantially. It may be noticed that in the

OJOYO work judges who did not share the field of Science but "the field of science education" did "validate the worldview presuppositions reflected by the items on the instrument". However, in our questionnaire the judges, who were university professors in the Sciences, never totally agreed on statement categorization.

We believe that this depends on the substantial subjectivity of the operation or on the compatibility between the practice of scientific research and various degrees of openness with respect to different worldviews.

Instrument and Cultural Adaptations

With the exception of case 5 all the stories could be used and could be translated into our mother languages in the most common style of Italian and Brazilian narrative communication.

Concerning case 5, in Italy we do not have "traditional healers", but simply people with particular natural characteristics which enable them to cure others (healers).

Moreover, in our countries it is unusual to attribute sickness to the influence of devils; more likely it is attributed to "malocchio"/"mau-olhado", a spell cast by bad people.

Further we dropped from the text the adjective "traditional" and the phrase on the influence of devils. We didn't mention "a Yoruba girl" but simply "a girl".

We confess that we had many problems with the translations or with the adaptations of statements.

In our context, it didn't make sense to suggest four alternatives with a fifth which declared all of them acceptable. We then decided to add, when necessary (cases 1, 2 and 7), a true fifth alternative, as in the other cases.

The alternatives chosen are reported in the Appendix. We shall just make some comments on the main decisions.

Case 1 - We changed the alternatives about pirates, since pirates suggest a fiction story. In their place we used "aliens or UFOs" because they attract a lot of interest. Further, we couldn't use an alternative with the "sea goddess and evil spirits"; so we suggested the possibility of a ritual malediction from the natives. We added the rational possibility of a phenomenon not yet explained.

Case 2 - We had problems with the story which didn't seem as interesting as the others. However, a reasonable translation of the text was prepared. To the other four we added the alternative that only the people who were on the trains were able to explain the event.

Case 3 - We substituted the rational possibility of an extraordinary coincidence for the phrase "Mind seeing farther than the eyes". We also changed the explanation involving the mysterious world with the possibility of a forgotten appointment.

Case 4 - In the text we substituted "visions and sensations" for "stories". Since there is no difference in Italian between "soul" and "spirit", we substituted the statement about the spirit for one in which visions and sensations are attributed to the "guardian angel", a figure present in a Catholic culture. In another statement we also replaced the originating home of the soul with an original universal energy.

Case 5 - Apart from the simplifications already mentioned, the text corresponds closely to the original one. The statements are adaptations of the changed text.

Case 6 - The main change lies in the substitution of the scientific statement about the insufficiency of experimental data[2] for the statement about the farm god.

Case 7 - The main changes concern the substitution of the statement about telepathy for that on animal spirits (animal spirits are absent from the Italian culture); the substitution of the statement about the comparison between humans and animal perceptions for the statement about the instinct. We also introduced a statement about Creation.

Case 8 - A pseudoscientific statement mentioning the force of gravity substituted the statement about humans as the only living beings in the universe.

Categorization and Instructions

Consonant to OJOYO report we grouped the responses of the subjects in large, related categories which were presented to the judges with the following definitions:

a) magic and mystery: non-natural, "science fiction" events (or causes);
b) parapsychology: unexplained human abilities;

[2] It is possible that we were influenced by the fact that one of the author (Vicentini) had investigated the effect of a magnetic field on plant growth (Cerdonio, 1979).

c) pseudoscience: use of "scientific" words and explanations in a vague, ambiguous or dogmatic context;
d) religion and spiritism: existence of another world, "the beyond" (gods, spirits, devils, ancestors);
e) rationalism and science: appeal to reason, to scientific methods and explanations.

With the help of the judges (chosen among university professors in Experimental Science with an interest in Education), we were able to carry out some reliable assignments: magic and mystery/items 2, 5, 7 and 29; parapsychology/items 11 and 13; pseudoscience/items 26, 27, 28, 37 and 39; religion and spiritism/items 16, 18, 19, 23 and 35; rationalism and science/items 4, 12, 15, 17, 25, 30 and 31.

In some cases the opinions of the judges were so disparate or divergent that we decided not to include these statements in the analysis (items 1, 3, 6, 8, 9, 10, 14, 20, 21, 22, 24, 32, 33, 34, 36, 38, 40).

Composition of the Sample

We handed out the questionnaire to a total of 217 Italian and 23 Brazilian teachers. The Italian Science teachers worked in different towns: Udine, in the North-East (47 teachers), Potenza, in the South (20 teachers) and the capital, downtown Rome. In Rome it was possible to contact a sample of 52 non-Science (NS) teachers (Roma NS) and 98 Science teachers (Roma S).

The choice of the three Science samples was partially dictated by the fact that one of the author (Bandiera) was conducting inservice activities in Udine and Potenza and inservice courses were taking place in Roma. This was a lucky coincidence as the cultural context of the three towns could show some differences with regard to non-scientific worldviews.

The Brazilian sample was restricted to a group of teachers from the state of Paraná.

Teachers' age ranged between 24 and 48. They were all practicing teachers with 0 to 20 years in the exercise of their professional.

Participant was asked to read each fictitious story carefully and, regardless of its nature (real or invented case), to indicate whether he/she would (A) or would not (B) adopt each commentary or explanation. Indecision was also foreseen (C).

Results

Absolute frequencies of answers are shown in Table 1 for the five categories of statements.

From these data one may make comparisons among the three samples of Italian Science teachers, a comparison between Science and non-Science teachers in the Rome sample and a comparison between the Italian samples and the Brazilian ones. We will discuss the three comparisons separately:

a) Italian Science teachers. Table 1 shows that an appreciable number of teachers in Udine (approx. 5%) and Potenza (approx. 11%) were not willing to commit themselves even to alternative C (unable to decide) and simply didn't give any answer to some statements. Of course, the different commitment of the Roma sample might be explained by the fact that in Rome the teachers felt an obligation to give a complete answer after participating in a course directed by the interviewers. However, this non-commitment might also explain a high degree of perplexity concerning the statements classified as "other than rationalism and science". Anyway, the teachers of the North (Udine) seemed to commit themselves more than the teachers of the South (Potenza), which might explain the agreement on magic/religious and parapsychological. In all samples the majority favored the scientific statements, albeit with small differences among the three samples; nevertheless, there were appreciable disagreements and indecision.

With regard to the other four categories much disagreement seemed to follow the order magic/mystery, religion/spiritism, parapsychology/ pseudoscience. It may be observed that the categories magic/mystery and religion/spiritism show two opposing worldviews with respect to the scientific one, whereas the pseudoscientific and the parapsychological are worldviews that may coexist with the scientific one. It may also be noted that there is a great difference concerning the agreement on the scientific worldview; there is also a difference in agreement between the pseudoscientific and the paranormal.

b) Science and non-Science teachers. The two Rome samples show a higher degree of disagreement in non-scientific worldviews by Science teachers (from 58% to 81%) when compared with non-Science teachers (from 38% to 76%). However, the degree of agreement on the scientific worldview is high in both cases (63% and 60%). A different situation in other cultural contexts cannot be excluded on the basis of the differences

already mentioned between Udine and Potenza.

c) Italy versus Brazil. The Brazilian sample is definitely different from all Italian samples and comprises a higher agreement in all non-scientific statements and a lower agreement in scientific ones.

Table 1. Frequency of answers for the five categories (A = would adopt; B = would not adopt; C = undecided, - = no answer)

Magic/mystery

	Udine (North)	Roma (S.)	Potenza (South)	Roma (N.S.)	Brazil
A	17	16	1	22	17
B	125	229	53	158	61
C	34	37	8	28	14
-	12	0	10	0	0
Total	188	282	72	208	92

Parapsychology

	Udine (North)	Roma (S.)	Potenza (South)	Roma (N.S.)	Brazil
A	13	17	1	25	15
B	53	102	26	66	21
C	23	24	4	13	10
-	5	0	5	0	0
Total	94	143	36	104	46

Pseudoscience

	Udine (North)	Roma (S.)	Potenza (South)	Roma (N.S.)	Brazil
A	26	54	12	64	25
B	108	199	34	100	48
C	85	91	32	96	41
-	16	0	12	0	0
Total	235	344	90	260	114

Religion and spiritism

	Udine (North)	Roma (S.)	Potenza (South)	Roma (N.S.)	Brazil
A	16	19	2	45	22
B	152	264	62	165	71
C	53	54	13	50	22
-	14	0	13	0	0
Total	235	337	90	260	115

Rationalism and Science

	Udine (North)	Roma (S.)	Potenza (South)	Roma (N.S.)	Brazil
A	227	279	90	231	86
B	38	84	13	80	49
C	55	71	19	53	27
-	9	0	4	0	0
Total	329	434	126	363	162

Comparing our results with those of the OJOYO report it was necessary to join the categories Parapsychology and Pseudoscience.

Data are shown in percentages and in graph form (Fig.1). We cannot overlook the large diffusion of the scientific worldviews and the high degree of indecision on the Para/Pseudo.

Numerical comparison is reported in Table 2.

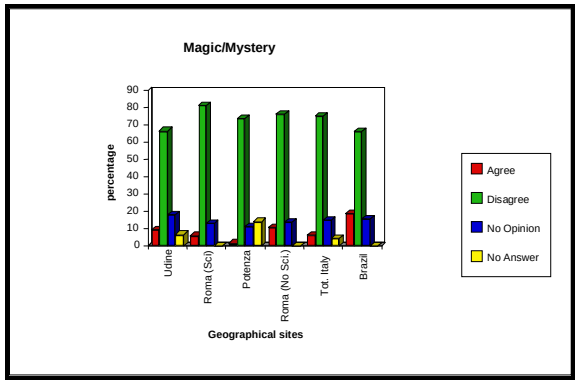
Table 2. Comparison (in percentages) between the OJOYO, Italian (only Science teachers) and Brazilian samples (A = agreement; B = disagreement; C = indecision)

Categories		OJOYO*	Italy	Brazil
Magic and Mystery	A	17 - 27	6	18
	B	47 - 61	66	75
	C	14 - 27	15	15
Parapsychology/ Pseudoscience	A	28 - 60	13	25
	B	20 - 54	55	53
	C	18 - 36	27	32
Religion and Spiritism	A	15 - 30	6	19
	B	44 - 61	62	72
	C	17 - 24	18	19
Rationalism and Science	A	34 - 37	53	67
	B	33 – 49	15	30
	C	17 – 33	16	17

* The numbers give the range of the five countries participating in the research.

1) Magic and mystery

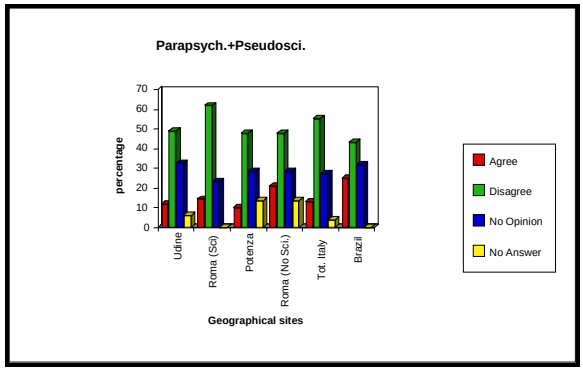
	Udine	Roma (Sci)	Potenza	Roma (No Sci.)	Tot. Italy	Brazil
Agree	9	5.7	1.4	10.5	6.3	18.5
Disagree	66.5	81.2	73.6	76	75.1	66.3
No Opinion	18.1	13.1	11.1	13.5	14.6	15.2
No Answer	6.4	0	13.9	0	4	0



(a)

2) Parapsychology and Pseudoscience

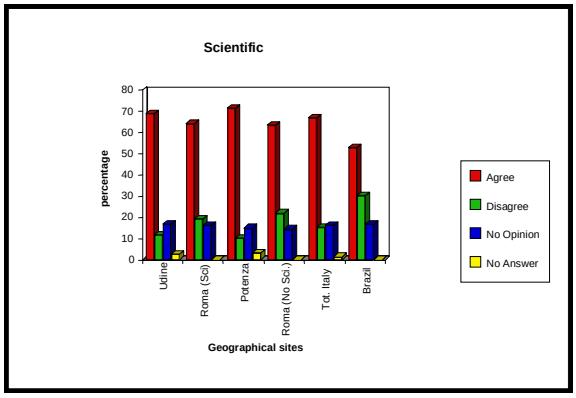
	Udine	Roma (6)	Potenza	Roma (NS.)	Tot. Italy	Brazil
Agree	11.9	14.6	10.3	21	13.1	25
Disagree	48.9	61.8	47.6	47.6	55.4	43.1
No Opinion	32.8	23.6	28.6	28.6	27.5	31.9
No Answer	6.4	0	13.5	13.5	4	0



(b)

3) Religion and Spritism

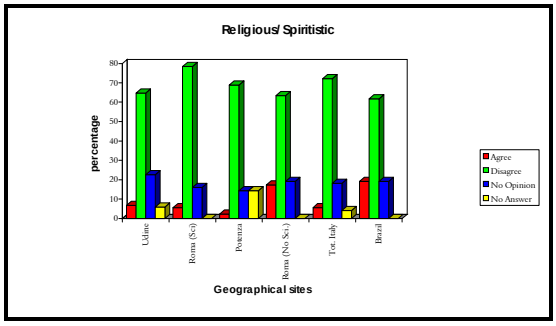
	Udine	Roma (S)	Potenza	Roma (NS.)	Tot. Italy	Brazil
Agree	69	64.2	71.4	63.5	67	53.1
Disagree	11.7	19.4	10.3	22	15.2	30.2
No Opinion	16.7	16.4	15.1	14.5	16.3	16.7
No Answer	2.7	0	3.2	0	1.5	0



(c)

4) Rationalism and Science

	Udine	Roma (S)	Potenza	Roma (NS)	Tot. Italy	Brazil
Agree	6.8	5.6	2.3	17.3	5.6	19.1
Disagree	64.7	78.4	68.9	63.5	72.2	61.8
No Opinion	22.6	16	14.4	19.2	18.1	19.1
No Answer	5.9	0	14.4	0	4.1	0



(d)

Figures (a), (b), (c) and (d). Frequency of answers in percentages and in graph form

As far as agreement/disagreement is concerned it is evident that the Italian sample is always outside the range of OJOYO results. The Brazilian sample shows a higher comparability.

Conclusions

The question of the OJOYO paper that raised our interest to undertake the research was: "Do science teachers in the western world similarly hold such a multiplicity of worldview presuppositions?"

Data confirm our initial thinking. Although they prefer, more than all other samples, the rational and scientific explanation, Science teachers in Italy hold a multiplicity of worldviews that coexist with the scientific one. However, there are some differences as may be shown in Table 2. To comment on these differences we will select another question from OJOYO: "Does scientific and technological advancement really affect people's worldviews?"

Italy is a country of the West placed in the core of the geographic area that witnessed the beginning of scientific inquiry. It has a long history of important contributions to the development of science: Galileo, Volta, Galvani are but a few names.

While we may complain that the main focus of our culture is on the humanities and that there are difficulties for scientific knowledge to penetrate the cultural frame of the average citizen, we may recognize from our data, when compared with those of countries like Bostwana, Indonesia, etc. with less historical scientific background, that people with an interest in Science, like the Science teachers, adhere, by and large, to a scientific worldview. From the non-Science teachers' answers, we may also say that a scientific worldview is also shared by people with an interest in the non-science oriented transmission of culture.

However the acceptance of a scientific worldview does not imply the rejection of other worldviews.

In first place the acceptance of pseudoscientific statements implies a possible inadequacy in the scientific education within our society. Secondly, Italy is, historically, a Catholic country and this explains the relevance of the religious worldview. However, Italy is also a country where the pre-Roman and Roman civilizations nurtured beliefs in gods and mysteries.

It is interesting to note the position of the Brazilian teachers as somewhere between the Italian position and that of other countries'. Of course, from the single sample from Brazil we cannot exclude the possibility of greater variability analogous to that of Italy if more samples had been taken. One may recognize that Brazil's cultural background may have been influenced by the Latin origin of many of its inhabitants since the Spanish-Portuguese conquest of the Americas.

Notwithstanding, we do not have answers to other questions raised by OJOYO. However, we will explain our position concerning one of them. "Should Science education aim at replacing worldviews held by Science teachers and their students ?"

In our opinion, Science education should give information on scientific worldviews and perhaps it

should replace the pseudoscientific ones. On the other hand, a multiplicity of worldviews constitute a wealth in cultural aspects if their boundaries are fairly well defined and if dogmatic positions are avoided. Nevertheless, in the context of a constructivist model of learning, in which each person is the active subject of his/her knowledge development (Science & Education, 1997), there is no need of worry.

One thing to worry about, however, is the idea on the nature of Science (or the "image" of Science) held by Science teachers. We disagree with OJOYO that the findings of this kind of study gives information about the adequacy/inadequacy of the teachers' ideas with regard to the correct viewpoint about the nature of science and of their understanding of it. This problem is certainly so important that there is a debate in the international community about the definition of scientific work [as witnessed in the series of conferences on Science and Philosophy for Education, (Mills, 1992; Finley *et al.*, 1995)] among Science educators, philosophers and scientists (Giere, 1995).

At the same time research on teachers' ideas is being carried out in several countries (Aikenhead, 1987; Solomon, 1994; Ruggieri, 1993) and suggestions for didactical communication are being studied.

Consequently, we strongly support the position that research on teachers' image of science should be complemented by research on the multiplicity of their worldviews. This integration may be useful in describing how far a Science teacher might expand the limit of the scientific worldview in his/her explanations on natural phenomena.

References

Aikenhead G.S.; Fleming R.W.; Ryan A.G. High School Graduates' Beliefs about Science-Technology-Society, *Science Education*, *71*(1):145-161, 1987.

Cerdonio, M.; Mazzoncini, S.; Morante, S.; Vicentini Missoni M. Polar Growth Response of Pisum Arvense L. Seeds to Weak Magnetic Fields. *Journal of Plants Science., 30*(11):883-885, 1979.

Cobern, W.W. *Contextual Constructivism:* the impact of culture on the learning and teaching of science. New York: Plenum, 1993.

Finley, F. *et al.* (Ed.) Proceedings of the 3rd. International History, Philosophy and Science Teaching Conference, 1995, Minneapolis.

Geertz, C. *The Interpretation of Cultures.* New York: Basic Book, 1973.

Giere, R. *Explaining Science:* a cognitive approach. Chicago Univ. Press, 1988.

Horton R. *Tradition and Modernity Revisited in Rationality and Relativism*. Oxford: Blackwell, 1982.

Mills, S. (Ed.) Proceedings of the 2nd. International History, Philosophy and Science Teaching Conference, 1992, Kingston.

Ogunniyi M.B.; Jegede O.J.; Ogawa M.; Yandila C.D.; Oladele F.K. Nature of Worldview Presuppositions among science teachers in Botswana, Indonesia, Japan, Nigeria, and the Philippines. *Journal of Research in Science Teaching*, *32*(8):817-831, 1995.

Ruggieri R.; Tarsitani C.; Vicentini M. The Image of Science of Teachers in the Latin Countries, *International Journal of Science Education, 15*(4):383-393, 1993.

Solomon J.; Duveen J.; Scott L. Pupils' Images of Scientific Epistemology. *International Journal of Science Education, 16*(4):361-373, 1994.

Science & Education. Philosophy and constructivism in science education. *6*(1/2), 1997.

Appendix: translation of the Italian-Brazilian version of the questionnaire (right side) compared with the OJOYO version (left side).

The items of the Italian-Brazilian version are quoted in the text according to the numbers in italics on the extreme right(⋆).

Case 1

OJOYO Version

The notorious Bermuda Triangle (a string of islands) in the Atlantic Ocean has been described as the most dangerous zone for both air and sea transport. Many planes and ships have vanished in the zone without any trace of wreckage or whereabouts.

Italian-Brazilian version ⋆

The notorious Bermuda Triangle (a string of islands) in the Atlantic Ocean has been described as the most dangerous zone for both air and sea transport. Many planes and ships have vanished in the zone without any trace of wreckage or whereabouts.

1. The planes and ships are caught up to the other world.
2. Pirates are responsible for the disasters.
3. The sea goddess and evil spirits are responsible.
4. It is one of those unsolved mysteries.
5. Explanations 1 to 4 are absolutely acceptable to me.

1. The Bermuda Triangle is a passage to another world. 1
2. The phenomenon has to be related to the visit of aliens that have been reported in that zone. 2
3. The place has been the object of a ritual malediction from the natives. 3
4. The phenomenon has not yet been explained. 4
5. It is a typical example of mystery. 5

Case 2

A group of people on a hill observed a blue train going down the eastern side of a deep valley. After a while they saw a red train coming out on the western side of the same valley. Later, the red train reversed into the valley and then the original blue train emerged on the eastern side of the valley. Since there was only one track in the valley and no sound of stopping, collision, interlocking, or exchange of wagons was heard, the people suspected that:

A group of people standing on a hill cannot see the bottom of the valley below. They see the railway track which is visible only on the eastern and western sides, thus appearing discontinuous. A red train is seen coming out of the western side of the valley. Later, the red train reversed into the valley and then the original blue train emerged on the eastern side of the valley. Since there was only one track in the valley and no sound of stopping, collision, interlocking, or exchange of wagons was heard, the people deduced that:

1. A red train was hidden on the western side of the valley.
2. The whole affair is mysterious and difficult to explain.
3. There were two trains, each with magnetic terminals which repel or push without touching each other.
4. The observers were under some magical influence.
5. Explanations 1 to 4 are absolutely acceptable to me.

1. A red train was hidden on the western side of the valley. 6
2. The whole affair is mysterious and difficult to explain. 7
3. There were two trains, each with magnetic terminals which repel or push without touching each other. 8
4. The observers were under some magical influence. 9
5. Only the people on the trains can give an explanation. 10

Case 3

You had not seen a friend for several years. Suddenly, you began to think about him. About an hour later he paid you a visit. This is an instance of:

You had not seen a friend for several years. Suddenly, you began to think of him. About an hour later he paid you a visit.

1. Extrasensory perception.
2. Mind seeing farther than the eyes.
3. A vision or foreknowledge.
4. Mind acting as a magnetic field or electrochemical computer.
5. The mysterious world we live in.

1.You have had an experience of extrasensory perception. 11
2.It was an extraordinary coincidence. 12
3.It was a vision or foreknowledge. 13
4.The mind, acting as a magnet, attracted the person. 14
5.In fact, you had simply forgotten that you had an appointment with him. 15

Case 4

People who fall into a coma or die temporarily often come up with interesting stories about their experience in the afterlife. Express your view about the explanation below:

One often hears of people who revive after a period of coma and tell about interesting visions and sensations. Express your view about the explanation below:

1. When a man dies his soul lives.
2. The brain does not stop immediately the heart stops, hence afterlife experience is a form of dream stored up in the brain before stopping.
3. This is an evidence that a human's spirit does not die with the body.
4. People who have died and revived have merely visited the other world.
5. The soul of the deceased having no body to enter in the world beyond returns to its original home.

1. When a man dies his soul lives. 16
2. The brain does not stop immediately when the heart stops, hence afterlife experience is a form of dream stored. 17
3. The people in effect have started their voyage to the other world. 18
4. Visions and sensations are due to the intervention of the guardian angel. 19
5. The soul, having left the body, is striving to reach the universal energy from which it originated. 20

Case 5

Some diseases seem to defy modern medical practice and yet are cured quite easily by traditional healers. This is because modern medicine excluded the possible influence of devils in human affairs. A Yoruba girl was diagnosed by medical doctors as suffering from acute hysteria (excessive and uncontrollable fear) required lengthy treatment but was cured within 2 weeks by a traditional healer. This is because:

1. Traditional medicine is superior to modern medicine.
2. Treatment by the traditional healer agrees with the Yoruba view of cause and effect of such an illness.
3. Modern medicine does not have the means to confirm the influence or activities of devils as traditional medicine does.
4. Traditional medicine does not only deal with directly observable events but also unobservable events.
5. There is no justifiable reason why modern medicine cannot investigate the seemingly irrational procedure used by the traditional healer in curing the girl.

Some diseases seem to defy modern medical practice and yet are cured quite easily by healers. A girl was diagnosed by medical doctors as suffering from acute hysteria (excessive and uncontrollable fear) requiring lengthy treatment but was cured within two weeks by a healer.

1. The healer knows human nature better than a medical doctor 21
2. The healer shares with the patients ideas on causes and effects of sicknesses. 22
3. A medical doctor cannot diagnose and cure cases of demoniac possession. 23
4. The healer is able to evaluate symptoms that the medical doctor does not know, or even perceive. 24
5. It is time that medical research analyzed rationally the methods used by healers. 25

Case 6

Groundnut seeds passed through a magnetic field were found to germinate faster than seeds deprived of such an exposure. This because:

1. Magnetic field acts as a catalyst and speeds up chromosome arrangement and cell division.
2. Magnetic force is a vital force deposited into the seeds and causes them to germinate quickly.
3. Magnetic force acts like an impetus that is deposited into the seeds and hence stimulates early germination.
4. Magnetic force and other unnoticeable forces are responsible for the early germination of the seeds.
5. The farm god is responsible for early germination of the seeds.

Seeds passed through a magnetic field are found to germinate faster than seeds deprived of such an exposure. This is because:

1. Magnetic field activates the function of the chromosomes and cellular division. 26
2. The magnetic force is captured by the plant cells and acts as an impetus for germination. 27
3. Early germination is determined by magnetic forces and other forces like the lunar attraction. 28
4. The magnetic field is related to supernatural forces. 29
5. We do not yet have enough experimental data to formulate an explanation. 30

Case 7

Often animals perceive changes in the environment faster than we do. For example, animals start running for shelter before a strong wind, rain, or physical disasters. This is an indication that:

1. Animals have more sensitive organs than humans.
2. Animals are closer to nature than humans.
3. Animals' spirits provide them forewarnings about imminent events or dangers.
4. Slight changes in wind currents or earth movement are instinctively detected by animals.
5. Explanations 1 to 4 are totally acceptable to me.

Often animals perceive changes in the environment faster than we do. For example, animals start running for shelter before a strong wind, rain, or physical disasters. This is an indication that:

1. Animals have more sensitive organs than humans. 31
2. Animals are closer to nature than humans. 32
3. Animals have telepathic abilities. 33
4. The development of rationality deprived humans from other forms of perception. 34
5. The different perceptions of humans respect to animals were defined when the world was created. 35

Case 8

Reports of space probes have shown that certain material in space (thought to be insensitive to other matter) glow brightly at the approach of human beings. This confirm the belief that human beings:

1. Give rise to psychic emanations or force undetectable by scientific instruments.
2. Have substances in them that can attract or repel other things.
3. Have powerful personalities that can influence others for good or evil the same way as celestial bodies.
4. Are not the only beings living in the universe.
5. Can emit radiation like the sun, moon and stars.

Reports of space probes have shown that certain material in space (thought to be insensitive to other matter) glow brightly at the approach of human beings. Express your view about the statements below:

1. Human beings give rise to psychic emanations or force undetectable by scientific instruments. 36
2. In the human body there are substances, not yet identified, that may interact with external objects. 37
3. Astronauts are chosen on the basis of the force of their personality and it is this force that acts on object and other persons. 38
4. It is a phenomenon related to with the absence of gravity. 39
5. Human beings may emit radiation in the same way as celestial bodies. 40