

Students, science and scientism: a story about resistance

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Abstract

The article takes a worldview perspective and discusses students, science and scientism with the starting point in empirical data. The aim is to shed light on the kinds of worldviews students associate with science, and how these worldviews are related to the worldviews of the students. Data consist of answers to a questionnaire (N=47) and interviews (N=26) with upper secondary students. The results show that it is common that students associate science with scientism. A possible consequence if science teaching communicate an image of science which the students interpret as science being connected to scientism, is that the teaching of science functions as a way to socialize/indoctrinate students into scientism. However the results show that many students are resisting indoctrination into scientism. These students describe their own views in ways that differ from the ones they associate with science. E.g. students frequently associate science with scientism, but state that they themselves do not agree with these kinds of views. The results are also discussed in relation to students' identity and inclusion/exclusion in relation to science teaching.

Keywords: *Scientism, worldview, students, indoctrination, resistance*

Introduction

This article is part of a line of research aiming at shedding light on how students view upon science. Here the focus is on discussing students, science and scientism with the starting point in empirical data. The aim is to shed light on the kinds of worldviews students associate with science, and how these worldviews are related to the worldviews of the students.

Scientism can be defined in different ways (see Stenmark, 2001). The definition used here follows Poole (1998) who states that scientism but not science “Denies that anything other than the natural world exists”, states that “Scientific accounts are all there are”, “Denies that there are *first* causes or *final* causes”, and “Denies that there could ever be behavior other than law like (anti-miraculous)” (Poole, 1998). This definition is similar to what Stenmark calls ontological scientism (Stenmark, 2001). When such views are claimed “in the name of science” (Stenmark, 2001; Nordén, 1999) this is what we in this article mean by scientism.

The question of how science is related to worldview has been discussed by scholars with different disciplinary backgrounds (see a special issue in *Science & Education* edited by Matthews (2009)). There are scholars who state that science has no worldview, while others state that science has a specific worldview. There are also scholars (e.g. Gauch (2009) and Lacey (2009)) who state that science is worldview independent, even though it can have worldview import. Among those who state that science has a worldview there are those who argue that the worldview of science is in conflict with religious views, while others argue that science does not exclude religion. What views concerning this one ends up in depend on the individual's views of religion, but also how she/he looks upon the nature of science (Glennan 2009). That scholars have different views concerning science and worldview is therefore in line with scholars having different views on other nature-of-science related issues. For example Alters (1997) states that “no one agreed-on NOS exists” (p. 48).

In this article we take as a starting point that science builds on some fundamental worldview presuppositions that are taken for granted ground for reasoning in science (Collingwood, 1940; Aikenhead & Michell, 2011; Hansson & Redfors, 2007b, Hansson, 2014). This is not an uncontroversial standpoint. From a positivistic or strict empiristic point of view, science has no presuppositions. This is also a rather frequent view among scientists (Gauch, 2003; Margenau, 1950) who sometimes deny that there are “metaphysical elements” in science (Margenau, 1950). However, the viewpoint that science has no presuppositions has been questioned by both philosophical and cultural studies of science (for a short overview see Hansson, 2014). It is instead argued that science has worldview presuppositions, such as that nature/the universe is comprehensible, ordered, and uniform, that are taken for granted in science. However these worldview presuppositions are not by themselves constituting a worldview (Cobern, 2000). Instead these presuppositions, by for example different science researchers, are combined with other presuppositions together forming the individual's worldview. It is in this way possible to understand science from the starting point of different kinds of worldviews (Cobern, 2000) – both naturalistic and religious ones. Taber (2013) shows examples of this. In line with this the relationship between science and religion can be viewed upon in different ways (see e.g. Reiss, 2008). Here we take as a starting point that scientism is not a necessary part of science (Poole, 1998; Stenmark, 2001), but instead only one worldview possible to combine with science.

School can communicate worldview through teaching in different ways, and two extreme cases could be seen (Proper et al. 1988). In one extreme school explicitly presents and discusses a large variety of worldviews, while in the other extreme only a narrow span of worldviews are presented, and implicitly. In the second case it is relevant to discuss worldview as part of the hidden curriculum (Kilbourn, 1980), often communicated implicitly as “companion meanings” (Roberts, 1998). Much points to that most teaching is closer to the second than the first case. This means that even though science could be understood from very different worldviews this is most often not communicated in the science classroom. Taber (2013) states: “there is much potential for the image of science

offered to pupils to be scientific” (p. 153). In addition to this scientific views are frequently put forward in media by scientists (Stenmark, 2001). In line with this also a few studies points directly to that students’ often associate science with scientism (Hansson & Redfors, 2007a, b). However also relevant to this are previous studies focusing on students’ views on the relation between science and religion (e.g. Billingsley et al. 2013, Hansson & Redfors, 2007a; Taber et al. 2011). However there is a need of more research focusing on students views of science in relation to scientism. The value of such studies focusing on what worldviews students associate with science is also pointed out by S  ther (2003). He states: “In the future it seems to be a task to find out more about how children interpret the world picture given in a science education framework in relation to religious and spiritual dimensions” (p. 253).

Students’ views of science and scientism and how the views they are associating with science are related to their own views, is especially important when realizing that learning science is not only about understanding specific concepts and models, but is also an identity issue (e.g. Archer et al., 2010; Brickhouse et al., 2000; Schreiner, 2006). Here questions about inclusion/exclusion in relation to science are relevant. E.g. a possible consequence of science teaching communicating scientism is that students’ with worldviews differing from this are excluded from science. Another possible consequence if science teaching communicate an image of science which the students interpret as science being connected to scientism, is that science teaching functions as a way to socialize/indoctrinate students into scientific ways of viewing the world. The aim of this article is to deepen our knowledge about students’ views concerning science and scientism, and about how the views they associate with science are related to students’ own worldviews (Kearney, 1991; Cobern, 1991; 2000).

Methodology applied in the investigation

This article builds on 47 upper secondary students’ (19y) answers to a written survey where they were asked to state whether they agree or not (on a four-point scale) with 30 statements (see Hansson & Lindahl, 2010). The statements include traditional religious statements, new religious statements, and naturalistic statements. Many of the statements have been used in a previous study by Hansson and Redfors (2007b), and were then developed with a starting point in the results from a survey and interview study (Hansson and Redfors 2007a), and were also inspired by Poole (1998).

In addition to stating their own view on the statements, the students were also asked to decide whether the same statements were a) supported by science, b) contradicted by science or c) neither supported nor contradicted by science. With this design, we are open for the possibility that students’ own views could differ from the view they associate with science. In this article the focus in on the naturalistic statements which when stated in the name of science could be viewed as scientism. There will also be some mentioning of results concerning religious statements. For a full list of the statements used see Hansson & Lindahl (2010), where also case studies of single students have been published. In addition

to the written survey 26 students were interviewed with the aim of gaining deeper and broader knowledge of their views and reasoning. In the analysis of the interviews we look for how students reason concerning the different statements (whether they themselves agree/disagree, together with the view on the statements that the students associate with science). Here the focus is on the results from the questionnaires, but transcripts from the interviews are shown to illustrate students' reasoning. For in depth descriptions of the results from the interviews, see forthcoming publications.

Results and discussion

The results from the questionnaire show that students characteristically associate science with scientism, see table 1.

Table 1. Students' answers to statements in the questionnaire – the view of science

Statement	The view of science (%)			No answer
	Support	Contradict	Neither nor	
Everything has or will have a scientific explanation	70	4	19	7
Only science can tell us what is really true about the world	70	2	21	7
The scientific view of existence describes the reality that exists	79	4	11	6
One should only believe in things that have been proven	62	11	19	8
The universe came to be without a reason – by chance	62	19	8	11
The universe looks the way it does today solely because of chance and the laws of nature	68	15	11	6
Love is solely chemical reactions	51	2	41	6
Humans are nothing but atoms and chemical processes	81	4	9	6

For example 70% associate the statement “Everything has or will have a scientific explanation” with science, and equally frequent students associate “Only science can tell us what is really true about the world” with science. Also ontological reductionistic statements (Poole, 1985) such as “Humans are nothing but atoms and chemical processes” and “The universe looks the way it does today solely because of chance and the laws of nature” are associated with science by the students. These results from the questionnaire are also strengthened by the interview data. For example Hedda describes the view of science on the statement “Everything has or will have a scientific explanation” like this:

Hedda: /.../ I think they support that, because they want to have explanations to everything. Even though they actually don't know they probably try to find some explanation /.../. Everything has an explanation, I think they believe.

The overall picture is that students frequently state that science supports these kinds of statements – that is they associate science with scientism.

The scientific views above imply that the existence of a god is not possible, and consequently, students associate atheism with science. For example, 60% states that science contradicts the existence of a god or supreme power. In the interview Ingrid says like this about the view of science on the statement “A god or supreme power exists”

Ingrid: They definitely say that there is nothing, they contradict it totally.

Interviewer: Why do you think?

Ingrid: because it is unrealistic and it cannot be proven with some formulas or things, so they don't like it. That is, it should be able to prove.

Even more frequently students state that science contradicts statements in which a god or supreme power is active in any way. This could be exemplified with the statements “A god or a supreme power can intervene here on earth, for example, through miracles or wondrous events” (83% state that science contradicts), and “A god or supreme power created the universe” (85% state that science contradicts). These are traditional religious statements. Poole (1998) discusses how also such views could be possible to combine with science, depending on how the nature of science, e.g. how scientific laws, is viewed upon. These are however not possibilities known by the students in this study. We will look closer into students' reasoning concerning religious statements and science in forthcoming publications.

While the scientific statements are associated with science by many of the students (see above), most students personally disagree with them, see table 2. For example, 77% disagree with the statement, “Everything has or will have a scientific explanation”, and 66% disagree with the statement, “Humans are nothing but atoms and chemical processes”.

Table 2. Students' answers (N=46) to statements in the questionnaire – students' own views

Statement	Own view (%)		No answer
	Agree	Disagree	
Everything has or will have a scientific explanation	23	77	0
Only science can tell us what is really true about the world	28	68	4
The scientific view of existence describes the reality that exists	36	53	11
One should only believe in things that have been proven	34	62	4
The universe came to be without a reason – by chance	43	53	4
The universe looks the way it does today solely because of chance and the laws of nature	43	49	8
Love is solely chemical reactions	17	74	9
Humans are nothing but atoms and chemical processes	30	66	4

It is also obvious that many youths do not view the material world as the only existing dimension of reality. For example, 77% of the students state that their own view is that Humans have a soul, and 51% that “A god or a supreme power exists”. One example of a student who associate science with scientism and atheism, but who herself disagree with such views is Camilla. Camilla agrees with many of the religious statements, but states that science disagree with them. In the same way she associate science with scientism. She states that science agree with statements such as “Everything has or will have a scientific explanation”, and that science only believe in logical things—in things that one can “see and feel and hear”. Camilla herself contrary to this view is open for the existence of other aspects of the world than the material one, and she does not believe that everything will be possible to explain scientifically.

Final considerations

Taber (2013) shows how science is possible to understand with a starting point in different worldviews. There are examples of students that knows this. For example Kerstin says like this:

It's hard to speak about science as a whole, because I think it is single individuals who think in different ways about things. So because of that I think it is hard. Sure there are things that very many agree on /.../ but I think they are after all humans, so they have also different viewpoints.

However, these different approaches to science do not seem available for most students. Instead, as the results from the questionnaire show, it is common that students associate scientism with science. In a forthcoming article we will discuss students' reasoning in respect to this in more detail, building on the interview data. That students frequently associate science with scientism has possible consequences for the possibilities for students with non-scientistic worldviews, such as Camilla above, to identify themselves with science. That differences between students' own views and the worldview they associate with science could be a factor when to explain students' interest/non-interest in science has been discussed in Hansson & Lindahl (2010).

A possible consequence if science teaching (together with e.g. media) communicate (explicitly and/or implicitly) an image of science which the students interpret as science being connected to scientism, is that the teaching of science functions as a way to socialize/indoctrinate students into scientistic ways of viewing the world. From the results in this study it is possible to argue that students are indoctrinated into associating science with scientism. However the results do not strengthen a hypothesis that science teaching, through communicating scientistic views of the world (Taber, 2013), functions as a way to socialized/indoctrinated students into *themselves* adopting scientistic views. Instead students in this study frequently describe their own views as different, in respect of scientism, from the views they associate with science. So it seems that most students in different ways resist scientistic views. However this could, as shown in a previous article (Hansson & Lindahl, 2010), for some students also be associated with resisting science.

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