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AUTHOR Tirri, Kirsi; Pehkonen, Leila
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ABSTRACT

This study investigated the moral reasoning of 17 Finnish adolescents (ages 14,15) gifted in science. Students completed tests of their scientific and moral reasoning and wrote essays on moral dilemmas in science and everyday life. On the test of moral reasoning, the students' average score was that of the average 18-year-old. On the test of logical reasoning, students scored within the highest 10 percent of their age group. Students wrote essays on scientific moral issues of their choice. The theme most often written about dealt with archaeological research in graves. Students most often used a utilitarian argument in their scientific reasoning. Essays on moral dilemmas in daily life identified teachers' unjust behavior as the most commonly chosen theme. Students most often used a deontological argument (emphasizing the ethics of duties) in reasoning about everyday moral issues. Results suggest that gifted adolescents use different kinds of principles in solving moral dilemmas in science and everyday life. Results may explain the negative correlation found between scores on the tests of logical reasoning and moral reasoning. Contains 13 references. (DB)

The moral reasoning of adolescents gifted in science: a case study

Kirsi Tirri & Leila Pehkonen
University of Helsinki
P.O. Box 39
FIN-00014 University of Helsinki
Finland

Objectives of the study

The purpose of this study is to investigate the moral reasoning of Finnish adolescents who are gifted in science. The sample of students (N=17) selected for the study was taken from a gifted program at the University of Helsinki. Students were given tests to measure their scientific and moral reasoning. In addition to tests, the adolescents were asked to write essays on moral dilemmas in science and in their everyday life and to provide solutions to them. The main interest of the study was to explore the differences in moral reasoning and scientific reasoning. The test scores were used to measure the correlations between scientific and moral reasoning. The essays written by adolescents allowed us to qualitatively study the nature and context-specificity of moral reasoning. In the analysis, special attention was paid to the principles used in justifying the right moral judgment in science and in everyday life. The arguments used in justifying the right actions were analyzed with the help of technical terms developed by Toulmin (1958). The arguments used by adolescents allowed us to explore the ethical framework guiding the moral reasoning in these two fields.

Moral judgment and reasoning

Most of the studies in the area of moral development have based their theory on the cognitive-developmental theory identified by Lawrence Kohlberg (e.g., 1969). The Defining Issues Test (DIT) is a well-documented measure of moral judgment that has been used all over the world (Rest 1986). The index most frequently used is the "P-score," which reflects the principled reasoning (Stages 5 and 6 in Kohlberg's theory) of a person. Kohlberg's procedures have been criticized for lack of diversity in the moral dilemmas that have been used in the interviews (Yussen 1977). The hypothetical dilemmas can also be seen as too abstract and removed from the daily experiences of most people (Straughan 1975). Recognition of these aspects of hypothetical dilemmas has led educational researchers to study real-life moral problems which people identify (Walker et al. 1987).

The research conducted in this area shows that the adolescents formulate dilemmas which are very different from the hypothetical dilemmas used by Kohlberg and his colleagues to assess moral reasoning (Yussen 1977, Binfet 1995). Most of the dilemmas formulated by Kohlberg focus on issues of ownership, public welfare and life-and-death. In Yussen's (1977) study, the moral dilemma themes formulated by adolescents focused most frequently on interpersonal relations. Colangelo (1982) and Tirri (1996) found the same tendency with gifted adolescents.

The studies of moral judgment using DIT scores showed that gifted adolescents as a group scored higher than their peers (Tan-Willman & Gutteridge 1981, Narvaez 1993). However, the data with high-achieving adolescents indicated that the relationship between apparent academic talent and moral judgment scores is more complex. According to the study, high academic competence is necessary for an unusually high P-score but it does not necessarily predict it. The high achievers can have average to high moral judgment scores, whereas low achievers cannot be high scorers in moral judgment (Narvaez 1993).

Moral development includes other aspects besides moral judgment measured by DIT scores. The real-life moral dilemmas require moral sensitivity and moral motivation (Narvaez 1993). Before an individual can make responsible moral judgments, he/she needs to identify real-life moral dilemmas in different contexts.

In this paper, the main interest is in investigating the real-life moral dilemmas in science and everyday life as identified by gifted adolescents. A special emphasis is given to the principles used in solving these dilemmas in different contexts. The study aims to explore moral reasoning of adolescents further than DIT scores and the correlation between the moral judgement and academic achievement. In this study, the arguments used by adolescents to justify solutions to moral dilemmas are explored. Furthermore, the ethical frameworks behind their moral reasoning are investigated with an effort to identify the field-dependent nature of moral reasoning.

The methods used in the study

Seventeen eighth- and ninth-grade students (14-15 years of age) who participated in the gifted program at the University of Helsinki in Finland were given tests measuring their scientific and moral reasoning. The scientific reasoning of these students was measured with the Raven test. The moral reasoning was measured with the DIT instrument. The correlation of these tests was calculated to find the correlation between scientific and moral reasoning. In addition to these tests, the students wrote essays on moral dilemmas in science and in their everyday life and provided solutions to them. The method used to analyze the essays was a descriptive content analysis. The essays were analyzed by their themes. In each story only one theme was identified. A special emphasis in the study was on the differences in the principles used in solving moral dilemmas in different contexts. The principles used in solving moral dilemmas in science were compared with the principles used in solving dilemmas in everyday life. To further add reliability to the study, the students were interviewed about the principles used in their essays. In the interviews, the different principles used in solving moral dilemmas in science and in everyday life were discussed.

The arguments used by adolescents were analyzed using the technical terms of Toulmin (1958) to analyze arguments in different fields. Toulmin uses the term "warrant" to describe the general legitimacy of an argument. A warrant certifies the soundness of the argument used (Toulmin 1958, 100). The more abstract justification behind arguments is called "backing" (Toulmin 1958, 105). These abstract justifications include theories or values. A special interest of the study was to investigate the field-dependent nature of moral reasoning. The field-dependent

arguments in students' justifications for their solutions to moral dilemmas refer to the arguments that are different in science and in everyday life. The field-dependent warrants and backings in students' reasoning allowed us to explore the different ethical frameworks on which these justifications were based.

Findings

Moral judgment and logical reasoning

The subjects' performance was above average on all tests taken. In Table 1 the average scores of each test and the correlation between them can be seen. The average score in moral reasoning (DIT) was 38.6, which represents the score for eighteen-year-olds (Narvaez 1993). Compared to the earlier Finnish study measuring moral judgment, the DIT scores of gifted adolescents resembled the scores of 17- and 18-year-olds (Honkanen 1986). The big variance (SD 16.5) indicated that some of the test scores were very high and some were only average. This finding is in accord with Narvaez's study in which high achievers obtained average to very high scores in DIT (Narvaez 1993).

Scientific thinking requires skills in logic. The logical reasoning of gifted adolescents was measured with the Raven test, which is a well-known measure of general intellectual ability. The average score of 54.5 in the Raven test indicated that these adolescents scored within the highest ten percent in their own age group (Raven et al. 1983). The correlation between the DIT and the Raven test was quite surprisingly .03. Even though the sample of our study was quite limited (N=17), we expected these two tests to correlate with each other. These unexpected findings guided us to explore the nature of moral reasoning qualitatively. The purpose of the qualitative study was to investigate the nature of moral reasoning in different contexts. The essays dealing with moral dilemmas in science and everyday life allowed us to study the context-specificity of moral reasoning by gifted adolescents.

Test	Mean	SD	r (DIT & Raven)
DIT	38.6	16.5	
Raven	54.5	3.8	
			0.03

Table 1. The average scores of gifted adolescents in DIT and Raven.

The moral dilemmas identified in science

The gifted adolescents participated in an intensive, week-long science day camp. During this week, they were asked to write essays dealing with scientific moral issues which they had identified. The adolescents were allowed to use the topics discussed in the camp or any other scientific moral issue that came to mind. They were encouraged to write essays every day. The total number of essays written was 32. In each essay, one moral issue was identified. The moral issues discussed in the essays formed five main categories. These categories were:

1. Archeological research in graves (N=12)
2. Genome technology (N=7)
3. Environmental issues (N=5)
4. Nuclear war (N=4)
5. Medical issues (N=4)

The theme most often written about by the adolescents (twelve students out of thirteen) dealt with archeological research in graves. The moral dilemma identified in this context concerned the scientific knowledge gained from this research versus the rights of the dead to rest in peace. The moral issues in genome technology dealt with cloning and manipulating the genes of vegetables, animals and human beings in order to improve the species. The moral issues raised concerned the limits of this development. The environmental issues included the dilemma of protecting or destroying rain forests, the ways of controlling the greenhouse effect and the ways of treating the bodies of dead animals. Issues related to nuclear war dealt with the important aspects of responsibility and power. The medical issues identified were related to sterilization, abortion and plastic surgery.

The moral reasoning in science

Moral reasoning is always concerned with principles used in justifying the right action. We have analyzed the moral reasoning of adolescents by analyzing their justifications in solving scientific moral dilemmas. In the justification process, the arguments used provide a tool to analyze the reasoning behind the arguments. We have used the technical terms developed by Toulmin (1958) to analyze the arguments presented in the essays and interviews. In this paper, we analyze the most popular scientific moral issue identified by gifted adolescents in more detail than the other issues. Twelve adolescents out of thirteen chose the archeological research in graves as a theme. The principles used to solve this dilemma concerned the profits gained from this research which can be of great benefit to our generation by adding new knowledge to science. The arguments used to oppose the research in graves included religious principles and perspectives related to the rights of the relatives of the dead to make the decision concerning research in graves. In the context of science, the principles used in the moral reasoning of gifted adolescents were closely tied to utilitarian ethics, which advocates the greatest happiness for the greatest number of people. In science the adolescents were in favor of making personal sacrifices for the benefit of mankind. In the personal interviews, the adolescents were asked to tell about the principles they used in judging the moral issue of archeological research in graves. The following quote illustrates the principle of scientific profit used in justifying this research:

"If the research in graves brings real scientific profit, new knowledge in science, I think it is justified. I don't think it is justified only for the profit of a single person or for making money. (Larry)

The adolescents acknowledged the negative consequences of archeological research. The main negative consequence mentioned was the hurt this kind of research can cause to the relatives or friends of the dead. Some adolescents used religious principles and

the sacred nature of graves as reasons for opposing this kind of research. The adolescents identified conditions that would make the decision to do the research more justified. The most important condition was that the relatives of the dead were also dead. The age of a grave could be identified as the most important criterion in making decisions. The following quotes illustrate this criterion well:

"There are situations in which it is not right to do research in the graves. The most important things to consider are the relatives. If they are alive (especially the children), I don't think you are allowed to go to the graves without permission." (Sam)

"If the grave is more than 1000 years old, the dead cannot have any living relatives. Then it is OK to do the research. However, if the age of the grave is 50 or 70 years, the dead have relatives and friends who are still alive." (Tina)

"I wouldn't care if somebody would dig in my grave, but I could not tolerate somebody digging in my mother's grave." (Laura)

The arguments used to solve scientific moral issues

We have analyzed students' arguments with the help of technical terms developed by Toulmin (1958). As Figure 1 shows, the data (D) provided by the student essays can be formulated thus: "Archeological research in graves is a moral dilemma in science." In our analysis, a majority of the students advocated this kind of scientific research and made a conclusion (C): "The research is morally justified." The students justified their solution to this dilemma by the warrant (W): "It brings scientific profit." In Larry's reasoning a more abstract principle can be seen behind his argument. He uses "New scientific knowledge" as a backing (B) in his argument. However, there are exceptional circumstances in which the conclusion needs a qualifier (Q). The task of the qualifier is to qualify the conclusion of the argument. The rebuttal (R) indicates circumstances in which the general authority of the warrant would have to be set aside. In our data the living relatives represent the rebuttal in students' arguments. As the interviews indicate, the students reason that archeological research in graves is morally justified unless the relatives of the dead are still living.

In Figure 1 a typical layout of a utilitarian argument can be seen. The utilitarian ethical principles are reflected in the warrant and the backing used in justifying the argument. The scientific profit and new knowledge in science are the ethical principles that are used to justify the archeological research in graves. However, in some circumstances the utilitarian argument needs exceptions to the rule. In our example, these exceptions indicate that archeological research in graves is not morally justified if the relatives of the dead are still living.

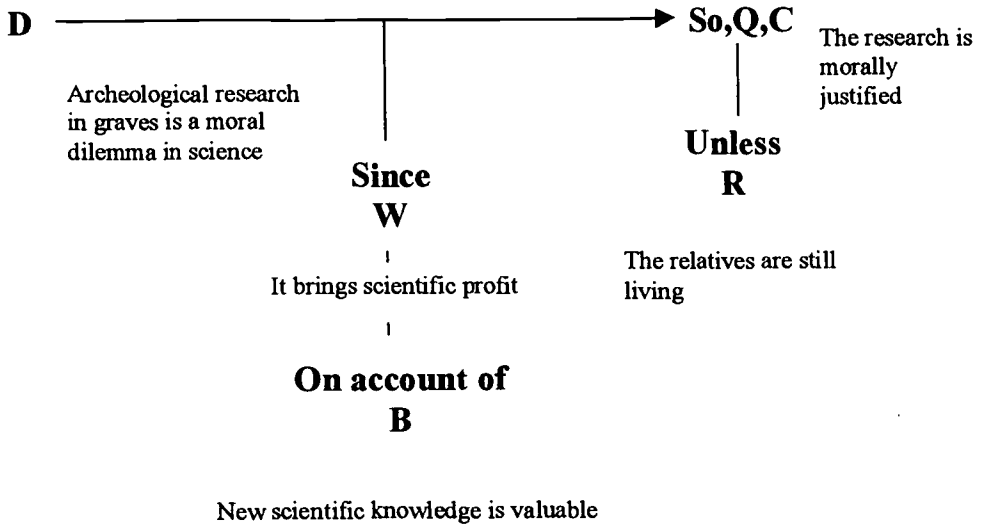

Figure 1. The layout of a utilitarian argument

The moral reasoning in everyday life

During the semester when the adolescents wrote essays on scientific moral issues, they were also asked to reflect on moral dilemmas in their everyday life. A school was chosen to represent the mutual context of the story. The adolescents received instructions to write an essay describing a situation in which they or their friends had been treated unfairly. They were asked to describe the moral dilemma in detail and to provide all the necessary information concerning the situation, including the consequences. They were also encouraged to provide a just solution to the dilemma identified, along with the principles guiding their judgment. The essays were analyzed by their themes and the principles used in justifying the action. Ten essays out of thirteen concerned issues related to the unjust behavior of a teacher. These cases included inequality of chances given to the students, unfair punishments, grading policy and ignorance and lack of empathy. Three cases concerning students dealt with psychological and physical harassment between the students. The principles used in solving these interpersonal issues differed from the principles used in solving the moral dilemmas related to science. In interpersonal relations, the students were able to identify the duties of a person who is responsible for a conflict. The students advocated deontological ethics of categorical duties, which allows no exceptions. In the context of the school community, the students identified duties that belong to teachers' professional conduct. These duties included equal treatment of all the students, empathy on all occasions (even with aggressive students) and willingness to discuss the principles underlying teachers' grading and homework policies. The duties of students concerned the right to protect oneself, the duty to get help if needed and the duty to be fair to other students.

In the essays, the adolescents identified teachers' unjust behavior as the most common moral dilemma. A quote from an essay describes an unjust situation in the following way:

"I answered the teacher's questions without raising my hand, and the teacher admonished me for my behavior. During the next lesson, two ballet dancers in my class shouted their answers without raising their hands, and the teacher praised them for their right answers. I think it was unjust for the teacher to treat us unequally. The teacher should have admonished those students as well." (Laura)

The arguments used to solve everyday moral issues

In the interview, students were asked to clarify their principles concerning the solution to teachers' unjust behavior. A majority of the students emphasized the duties of a teacher to act according to just rules. As Figure 2 shows, the data (D) provided by the students' essays can be formulated as: "Teachers treat students unequally." Based on their observations, the students made the conclusion (C) that: "Teachers' behavior is not morally justified." The students expressed their idea of an ideal teacher as one who acts according to the duties of a teacher. Justice was identified as an important duty of a teacher. The warrant (W) used to justify the demands on a teacher was expressed as "The duties of a teacher." The more abstract principle backing (B) behind their reasoning was stated as "Ethical conduct of a profession." The adolescents emphasized the duties as the guiding principles in solving everyday moral dilemmas. In Figure 2 a typical deontological argument in the context of everyday moral issues can be seen. The layout of the deontological argument differs from the utilitarian argument in science. A deontological argument does not need a qualifier (Q), which the utilitarian one does. In deontological ethics, the rules do not make an exception. The rebuttal (R) is unnecessary, too, because the warrant and the backing are valid on all occasions.

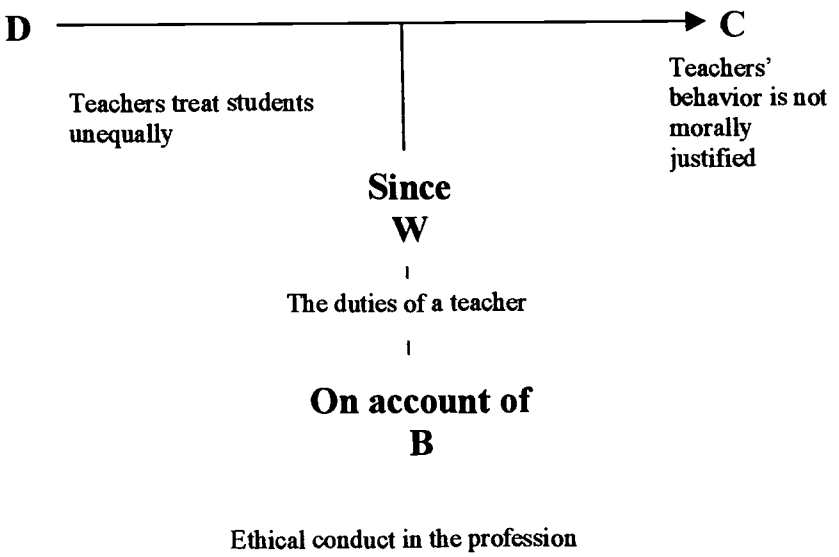

Figure 2. The layout of a deontological argument

The context-specificity of moral reasoning of adolescents gifted in science

Concerning our findings, the gifted adolescents used different kinds of principles in solving moral dilemmas in science and moral dilemmas in everyday life. These differences can be seen in the uses of arguments in solving moral dilemmas in these different contexts. According to our findings, the arguments used by gifted adolescents in judging moral issues are very field-dependent (Toulmin 1958). In the context of science, the arguments were based on utilitarian ethics. The new knowledge in science was identified as the leading value that brings the greatest profit to people. However, in science the students acknowledged the need to provide some exceptions to this rule. Even in science the researchers should pay attention to the feelings of those people who are affected by the research. In our study, archeological research in graves was advocated, with the exception of those graves that are so new that the relatives of the dead could still be alive.

In the context of real-life moral dilemmas, the arguments used were based on deontological ethics of duties. The adolescents identified duties in the interpersonal relations at school that everybody in the community should observe. The teacher, in particular, was expected to act according to the ethical standards guiding his/her profession. The arguments used to justify these judgments did not provide any exceptions to the rule. The students' value base was guided by a very strict Kantian tradition.

The results of our study might explain some of the reasons for the negative correlation between tests of moral reasoning and scientific reasoning. According to our study, moral reasoning is very content- and context-specific. The arguments used in justifying the moral judgment were shown to be very field-dependent. The same person can use different principles and different kinds of ethical backgrounds in backing his/her moral reasoning depending on the moral dilemma in question.

Importance of the Study

This study adds new knowledge on the moral reasoning of gifted adolescents. Gifted adolescents were shown to perform above their peers in tests measuring moral reasoning and scientific reasoning. However, the tests did not correlate positively with each other. The essays written on the moral dilemmas in different contexts gave information about the possible differences of moral reasoning in different contexts. The argument analysis showed different patterns to justify arguments in science and everyday life. Based on the findings, it seems that the moral reasoning in science is qualitatively different from the moral reasoning in everyday life. The differences can be partly explained by the different ethical frameworks that guided gifted students in their justification process. Scientific reasoning was shown to be based on utilitarian ethics with some exceptions to the general rules. The everyday moral reasoning was shown to be based on deontological ethics of duties. Especially in the moral dilemmas related

to teachers' behavior, the students expected the teachers to observe these duties in their professional conduct.

The qualitative findings can help to interpret the negative correlation between the tests in moral reasoning and scientific reasoning. Even though the sample used in this study was quite limited, the use of methodological triangulation yielded information about the moral reasoning of gifted adolescents from many perspectives. These preliminary results can guide future research on gifted students. In the future studies, the quantitative results of this study can be validated with larger samples of gifted students. The future study can include students gifted in domains other than science to further explore the context-specificity of moral reasoning. Educators and teachers can profit from these results by directing the topics of their moral discussions to the areas that have been proven to be the main concerns of students. An important part of this education is to foster the argumentation skills of gifted adolescents.

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Signature: Kirsi Tirri

Printed Name/Position/Title: KIRSI TIRRI / PhD.

Organization/Address: P.O. BOX 39 FIN-00014 University of Helsinki FINLAND

Telephone: +358 9 191 8060

FAX: +358 9 191 8073

E-Mail Address: Kirsi.Tirri@helsinki.fi

Date: 2/25/1999

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