Dilemmas with Dilemmas…

Exploring the suitability of dilemma stories as a way of addressing ethical issues in science education

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Abstract
Traditionally, many science educators have taught science without addressing ethical questions. The inclusion of moral discourse in science teaching helps educators to bring to the fore problematic social issues related to the application of science, and offers an opportunity for students to practice their future engagement in the public discourse about science. This paper presents the results of an interpretive case study of the appropriateness of dilemma stories as a standard tool for initiating moral discourse. The analysis was shaped by a critical constructivist perspective, and incorporated the multiple perspectives of the students, teachers, and the researcher. The study was conducted in a public senior high school, with one biology teacher and one mathematics/physics teacher and their classes. The results indicate that a dilemma teaching approach can lead students to self-examination, critical assessment of their assumptions, and perspective transformation, all of which form part of transformative learning. This type of teaching challenges teachers to develop the skills of facilitation, moderation, and self-restraint in order not to impose their opinion on the students. The study identified six potentially problematic aspects of a dilemma teaching approach are not addressed by the existing literature: student engagement with the stories, the (in)authenticity of student portfolio-notes, teachers’ good intention as potentially unethical imposition, the frequency of dilemma units, teacher skills, integration of ethics into existing learning areas, the effect of so-called problem students on the dilemma approach and vice versa, and time requirements.

Introduction
This paper presents the results of an interpretive case study within the 7th Moment of Qualitative Research (Lincoln & Denzin, 2000), that inquired into the experiences of teachers, students, and the researcher during a month-long project, called “Ethics in Science”, conducted at a co-educational, public senior high-school in Graz, Austria. The research reported here forms part of a doctoral thesis that investigated the efficacy of teaching ethical issues using a dilemma approach within a critical constructivist framework (Taylor, 1998). In this paper, I focus on the dilemmas with dilemmas – if we want to use dilemma-stories as a teaching method what do we need to be aware of?
**Background of the study**

The changing global society has made it necessary to change the education system, and thus to the national curriculum frameworks of many countries. When Austria joined the European Union in 1995 new challenges and requirements had to be met by the Austrian schooling system, such as multiculture and European integration (Bundesministerium fur Bildung, Wissenschaft & Kunst, 2000; Kirste, 2001). The result was a revised curriculum framework, the “Lehrplanreform 99” (Curriculum Reform 99) for the lower level of secondary schools (Years 5-8) which is now at the stage of implementation.

The new overarching curriculum statement is geared towards the development of self and social competencies as well as the development of the ability to make informed decisions. The new overarching curriculum statement also focuses on the development of key qualifications, such as team-competency and empathy, communication skills, self-security, organisational talent, the development of persistence, and the ability to include other people and to convince them of common goals (KU Eichstätt, n.d.). These competencies are mirrored by the new key features of the curriculum framework, such as an analysis of society and of values, which in the curriculum document is described as the ‘religious-ethical-philosophical’ dimension of ‘Bildung’. The term ‘Bildung’ (German = formation) can be translated as the ‘formation of a whole individual’, similar to the idea of ‘holistic education’ in English speaking countries. Bildung forms the philosophical foundation of Middle European educational thought. An important part of Bildung is formed by an analysis of values that is grounded in the rapid societal change in Europe, in European integration, in globalisation, in intercultural exchange, in democracy, in worldviews, and in an incorporation of moral and ethical values which enable the individual to approach ethical dilemmas in an informed manner.

When the new curriculum framework was about to be implemented, many Austrian teachers voiced concerns about how they were facing the dilemma of teaching moral issues without appropriate methodologies and pedagogical competency. Given this background, the Austrian Youth Red Cross initiated a study addressing how to improve moral and value education in Austrian classrooms (Gschweitl, Mattner-Begusch, Neumayr & Schwetz, 1998). As a member of the research team, I was directly involved in the initial planning, implementation and
evaluation stage of the project. The result of the project was a teaching approach adapted to meet the requirements of a social constructivist learning environment, using dilemma stories. The dilemma teaching approach, using dilemma stories, was based on the work of Lawrence Kohlberg (Kohlberg, 1984; Kohlberg, 1996). Drawing on my experience during the Red Cross Project, and taking into account insights gained through the study of additional literature on moral education, I subsequently focused my doctoral thesis on the evaluation of a dilemma teaching approach in the context of science education. According to Allchin (2001), many science teachers shy away from addressing values because of fear that values are outside the domain of science or, in the worst case, that values betray the very core of science. This fear is mirrored in the rather small number of publications within science education addressing issues of moral and ethical education.

Research problem

In the literature on moral education, dilemma stories are often suggested as ‘the’ tool to achieve ethical discourse in a classroom and critical reflection in the students since Kohlberg trialled dilemmas over thirty years ago. According to Kohlberg’s theory, the suitability of dilemmas is supposedly grounded in the concept of values clarification, whereby students explore their own values (critical reflection) and compare and discuss those values with their peers, leading to a cognitive disequilibrium which leads to moral learning. However, browsing the literature, I found that there seems to be a lack of critical appreciation with regard to the appropriateness and suitability of dilemmas for the use in moral education. Given that many science teachers lament the lack of suitable materials for the use of teaching ethical issues within science education, the question arose for me as to what these materials should look like and what we can expect of the use of dilemmas, leading to the following research problem: How suitable are dilemma stories as a pedagogical tool for initiating moral discourse? What are the shortcomings we have to take into consideration if we, as curriculum developers, suggest the use of dilemma stories to practitioners in the classroom?

Research questions

A research study was designed to address the following research objectives all of which are addressed in this paper:
1. to examine the efficiency of using dilemmas in order to engage students in moral discourse within science teaching
2. to explore possible topic areas for dilemmas
3. to examine ways of ensuring the appropriateness of dilemmas for particular groups of students
4. to investigate teachers’ and students’ experiences with the use of dilemmas in science education
5. to explore the skills teachers need in order to use this type of teaching successfully

*Significance*

Traditionally, through the influence of scientism, science has been taught as if science could and should be value-free (Allchin, 1998; Allchin, 2001). References with regard to ethical education within science education, apart from papers on bioethics (e.g., Iozzi, 1982; Macer, 1994b) are scarce (e.g., Degenhart, 1986; Frazer & Kornhauser, 1986; Johnston, 1995; Michael, 1986; Poole, 1995; Zeidler, 1984; Witz, 1996; Mattox, 1975; Patry, 2000). Addressing ethical issues in science education through dilemmas is a way of teaching about the nature of science by enabling students to practice participation in the public discourse about science in a critical informed manner and in a “safe” environment. It may contribute not only to scientific literacy but also to the development of social and emotional skills (Settelmaier, 2002).

*Theoretical underpinnings*

The use of dilemma stories in this study can be traced back to one of the pioneers of moral development research and moral education, Kohlberg (1984; 1996), who developed a cognitive-developmental theory of moral development consisting of six stages, based on Piaget’s work on moral development (Piaget, 1977). However, Kohlberg’s theory became the focus of feminist critique, primarily through the work of Carol Gilligan who criticised Kohlberg’s claim that women’s “Ethic of Care” represented a lower stage of morality than men’s “morality of justice” (Gilligan, 1982; Gilligan, Ward, Taylor & Bardige, 1988). Contrary to Kohlberg’s dilemmas, which were hypothetical in their nature, Gilligan preferred to draw from participants’ lives (Tronto, 1994). Nevertheless, Gilligan’s work has also become the target of criticisms by, for example, Tronto (1994) and (Hoff Sommers, 2000).
Towards the end of the study, I discovered that the Theory of Transformative Learning was very useful for understanding the results of the data analysis. This theory was developed by Jack Mezirow and represents a combination of constructivist thought with the Critical Theory of Jurgen Habermas (Mezirow, 1991). Although it was originally developed for adult education, I am convinced that ultimately ethical education at all ages has a transformative intent. If implemented successfully, this type of education results in transformative learning whereby a learner critically assesses their own assumptions (beliefs, values etc.) leading to a perspective transformation, and in the case of ethics education, (hopefully) to moral learning.

In this study, I chose to adopt a critical stance towards the (often uncritically adopted) tool of dilemma stories, thereby evaluating the efficacy of a dilemma teaching approach to moral learning. I deliberately did not engage in any type of measurement of moralities of the participants for two reasons: 1) my research within this interpretive study was focused on understanding, and 2) because I am convinced that “measuring” of others’ moralities is judgmental and ultimately incommensurable with taking seriously an Ethic of Care.

**Design and procedures**

This interpretive case study was designed as a ‘bricolage’ situated in the 7th Moment of Qualitative Research. I drew on ethnography, phenomenology, feminism, and biographical research (e.g., Denzin, 1989; Lincoln & Denzin, 2000; Moustakas, 1994). The use of multiple methods of data-generation was a form of crystallisation in which participants’ voices were maintained as often as possible in order to establish ‘polyvocality’ (Richardson, 2000).

The research was performed at a co-educational, public senior high-school in Austria. The participants included two female teachers: Irene, a biology teacher and her Year 9 students, and Sandra, a mathematics/physics teacher and her Year 10 students. Both teachers were subject- as well as form-teachers. The dilemma teaching approach was based on the approach developed by (Gschweitl et al, 1998) during the Red Cross Project. Within the “Ethics in Science Project” in 2000, the dilemma stories were co-created by the teachers and me to fit the curriculum and reduce potential imposition of “artificial” topics. Three dilemma stories were developed and evaluated. During the fieldwork inquiry, I took on the role of a participant-observer. Semi-structured single and group interviews, feedback sessions with the teachers, and
video- and audio-recordings enabled me to explore the participants’ experiences with the dilemma teaching approach. Students’ submitted portfolios that included notes about their own reflections on the dilemma situations. Analysis of the interview data and portfolio notes was performed using QSR NVivo and was supported by video-analysis and field-notes. I obtained permission to conduct the research from the education authorities. Letters of consent were signed by the participants and their parents. I reassured students and teachers of their right to withdraw from participation at any time. I also reassured them that their anonymity would be protected. Names have been altered to ensure confidentiality. Interview references state the interview code, e.g., ‘M8p12’ (M=initial of student’s code name, reference number, paragraph number).

Abstracts of the dilemma stories

The ‘Tree Dilemma’ tells the story of a man whose ‘birth-tree’ is about to be cut down in favour of a campervan his parents bought. He rejects this plan and tries to save his tree. However, the man is faced with a decision as to whether he wants to cut down the tree himself or leave this task to professional tree-lopers. The ultimate question is: do plants have the same right to life as animals or humans? Why do we attach different value to plant lives on the one hand, and animal or human lives on the other?

The ‘Rainforest Dilemma’ is about a young female scientist who is sent to the Amazon Rainforest to find a cure for a mysterious disease that has caused many casualties in the so-called developed world. With the help of local indigenous tribes she and her research-partner find a plant that provides a cure. However, the drug needs to be manufactured without delay after the harvest of the plant which means that the necessary infrastructure has to be built in the middle of the rainforest, thereby affecting the locals lives. The underlying dilemma questions are: Is it warranted to affect negatively some people’s lives (in this case the local tribes) if it is for the common good of all (in this case) the Western world? Does searching for cures for ‘our’ Western diseases justify that we potentially transfer ‘our’ germs to other areas of the world where people might not be immune to them?

The Rocket Dilemma raises questions about research ethics and how far scientific research should be allowed to go. A young rocket-researcher finds himself confronted with a number of dilemmas such as collaboration with a totalitarian regime
or flight, human experiments or failure of the research. His knowledge makes him very valuable especially for nations striving for dominance in space. For this reason, his biography is whitewashed in his later life which makes him acceptable to our modern society. This story has a real life background – the biography of Wernher von Braun, a famous rocket scientist, who had been involved in unethical research involving concentration camp prisoners during the Nazi Regime in Germany. Given that almost all of the students in Sandra’s class were of Austrian origin and thus had grown up in post-war Austria like me, I was interested in the level of critical awareness these young people brought with them.

Both, the Tree and the Rainforest dilemma, were implemented in Irene’s class whereas the Rocket Dilemma was conducted in Sandra’s class (Settelmaier, 2003).

**Findings**

The results presented in this paper identify six pedagogical dilemmas associated with the use of dilemma stories. ‘Pedagogical’ because they are related to the teaching and learning of ethical issues and ‘dilemmas’ because ultimately teachers will need to decide whether or not to use a dilemma approach to teaching ethics in the light of these findings. The six pedagogical dilemmas are:

1. (In)appropriateness of stories
2. (In)authenticity of ‘individual reflection’
3. (A)moral discourse
4. (In)frequency of dilemma-units
5. Teacher skills
6. Time

**Dilemma 1: (In)appropriateness of stories**

The dilemma units in Irene’s and in Sandra’s classes have illustrated a potential pedagogical dilemma with dilemma stories: on the one hand, a teacher may choose a particular story because s/he regards it as presenting an engaging dilemma for the students but it might not actually engage them. On the other hand, students may sometimes experience a dilemma story as engaging whereas the teacher may consider it to be too simplistic, as in Irene’s case: initially, she had been skeptical about the
first dilemma story because she thought it might be too simplistic, “I was skeptical because I thought because of the simplicity of the story it might be difficult to get the dilemma across. You know, it can’t be taken for granted at this age that they still listen to you!” (FS1p13). One of her students said about the same story, “I was thinking this was a really interesting topic because it is about humans and about how humans really are.” (I-Ulrike, 2000). The research indicated furthermore that, amongst students of the same age-group, some may ‘see’ the dilemma in a story whilst others may not. In dilemma teaching, non-engagement of students at the outset can have important repercussions for subsequent stages of the dilemma unit, especially for individual reflection, group-discourse, poster-presentations, plenary discussions, etc. Engaging as many students as early as possible may be vital for the success of these aspects of the dilemma learning process.

**Dilemma 2: (In)authenticity of ‘individual reflection’**

Some students expressed concerns about the authenticity of the comments of some of their colleagues during the discussion. These suspicions seemed to have their foundations in group-work. Paul, for example, said, “I find that in a group one’s opinion often does not come across because opinions get suppressed if one is in a group… if there is someone there who has ‘more to say’. I think that group leaders often simply push through their own opinions and this does not show what individual people are thinking!” (I-Paul, 2000). This is also apparently supported through Julian’s opinion, “If someone has an opinion he will bring it in [to the discussion] and if he doesn’t then he will just write down something anyway!” (I-Julian, 2000). Emma was also quite critical about group-work in general, suggesting that opinions should be written down anonymously because then people might actually write down their personal opinions (I-Emma, 2000). This is a very important observation for the evaluation of the dilemma approach and poses an important question – Does it make sense to engage the students in a values clarification process which forms the backbone of the dilemma approach in Kohlberg’s sense, if the students’ opinions do not always reflect the ‘authentic’ voice of an individual student?
Dilemma 3: (A)moral discourse

Many students reported that they enjoyed the dilemma approach because it gave them an opportunity to hear other people’s opinions, as well as to learn more about their colleagues, like Julian, “I really liked the ‘pros and cons’. (I-Julian, 2000) Daniela stressed that she really “…liked the discussion round, the ideas and how they came into being and we were all talking with each other and so…” (I-Daniela, 2000). Ulrike, on the other hand, thought, “I believe you can keep things in mind much better [like this] than learning everything only theoretically. Through discussing and listening to others it is certain that something is learned much faster than if you only quickly touch an issue during a lesson. If different topics were packed into those dilemma stories one could recall much more! Animal protection, for example, …don’t only say, “Let’s protect the animals!”… I think that normally teaching is often much too slack in its organisation. There are some positive changes noticeable but school is for many first and foremost stress, pressure – if you do something like that, like these dilemma stories I mean, there is also fun involved! Not in terms of making fun but that you are not only required to sit still and being talked to … not enough like that is being done at school!” (I-Ulrike, 2000). On the other hand, as might be expected discourse-based learning is not always easy as Ulli, for example, reported, “…[our collaboration] worked well apart from the fact that the group did not work well because Johnny more or less saw the whole thing as a joke and he was making fun of those in prison cells… to use them for experiments and so!” (U31p5). Paul who was in a different group criticized a different aspect, “In a group one’s opinion often does not come across because opinions get suppressed if one is in a group, if there is someone in the group who has ‘more to say’…I think group-leaders often simply push their opinions through and this then does not show what individual people are thinking” (P15p22).

However, there were also some concerns with regard to class community and aspects of privacy: Values are usually regarded as a “private issue”, thus some students apparently felt intimidated about being required to report their opinions publicly, “I do not really like to speak about myself in public!” (I-Ulrike, 2000). This to me as a researcher, is a very important point for consideration for future research: How ethical and how ‘caring’ (in terms of an Ethic of Care) is it to require students to speak about themselves when they are not fully prepared to do so? Are we not
potentially exerting unethical pressure due to our authority as teachers, well-meaning as it might be?

**Dilemma 4: (In)frequency of dilemma-units**

Given that the demand for an ethics education within all subject areas is clearly stated in the overarching curriculum statement of the new Austrian Curriculum document, and given that a high number of theorists suggest that ethics should also form part of the science education curriculum, I wanted to know from students, how often (if at all) they would like to have dilemma units as part of their curriculum. There appeared to be differences of opinion about the desired length and the number of dilemma units during the school year, ranging from once a month to once every three months intervals. Students raised the issue of ‘saturation with dilemma units’ by implying that teachers should avoid dilemma overload. Concluding, we might say that including ethics classes on a regular basis within science education seemed to be regarded worthwhile by the students, however, it may be important for teachers to be cautious about the frequency. This dilemma leaves us with the question: how often is too often? It appears from the findings that once per month might be a good option. Ultimately this is a dilemma the educator will have to reflect on. Deciding on the frequency, however, appears to be an important issue if we want to keep students interested and engaged and avoid dilemma-overload. The findings seem to indicate also that a separate ethics course outside the context of science education or other subjects is not on the students’ wish-list.

**Dilemma 5: Teacher skills**

Both teachers were quite enthusiastic about their participation and both received a short introduction into the teaching of dilemma units. However, both experienced some problems with the management of groups in particular and the moderation of the discussion. Irene experienced the organization of the groups as difficult at first until she had figured out a system in order to mix students who do not normally work together, “In my experience, groups that go together voluntarily end up in doing nonsense and a lot of small-scale discussions. They know each other so well but also they don’t want to hurt their friends if there might be a potential counter-argument. I believe that this problem ceases to exist in ‘artificial groups’. ” Overall, Irene’s
experiences with regard to teaching the unit were manifold, “I really tried deliberately to ask further questions such as, “Are there any other ideas? What have you found out collaboratively etc…. and I tried not to make value-judgments such, ‘Good!’ I mean as a teacher you’re so happy if someone says something that if somebody says something you usually say, ‘Good!’ …I found myself reflecting after I had made a comment, whether or not this had been a value-statement… I realised that it requires a deliberate effort to maintain an awareness otherwise you’re immediately in a judging role! (FS1p215) Irene’s statements indicate that despite years of teaching – experience this type of teaching required her full attention with regard to her moderation skills. In Sandra’s class the moderation of the unit(s) worked well until Sandra experienced problems with a video-recorder and posters that had been lost between lessons:

Sandra: I was lost for words several times.
Lily: When was that?
Sandra: When they started up this discussion about organ-donations, this really was too far off the topic for my taste. Although I have to admit it was me who started this discussion…I did not know whether or not to intervene.

Sandra who did well with facilitating the unit, virtually stopped moderating the plenary discussion. It was as if she hoped the discussion would take off by itself. Ultimately, she told a very personal story which finally sparked off a discussion. My observations and field-notes indicate that both teachers hesitated occasionally to intervene with group-work. Coming from an adult education background, I myself am constantly ‘scanning’ a large group and smaller sub-groups for any disturbances and perhaps I automatically expected the teachers to do this as well. I did not observe situations that indicated to me that the teachers were also engaged in ‘group-scanning’. Summarising, I can say that despite the enthusiasm teachers may bring to this type of teaching, there is still some insecurity left as to when to intervene, what to ask, what to say, and when. I believe that teachers can be introduced to this type of teaching and learning in professional development courses which might also benefit their teaching in general.
**Dilemma 6: Problem students**

Irene admitted to having focused beforehand on two potential troublemakers, “…One of the weak points was that I had figured out beforehand who might potentially ‘freak out’ with this teaching style and I focused my attention on Alois and Alex” (FS1p139). There were a number of students in both classes who during the storytelling phase and individual reflection phase did not fully participate but instead displayed disturbing behaviour. In Irene’s class, Alex and Alois (as expected?) in particular, disrupted the flow frequently with unproductive comments or questions to the teacher that were not really related to the story and that indicated that they did not take the story seriously. However, during the final discussion, these two students were amongst the best discussants: Whilst Alex contributed many valuable statements, Alois kept the discussion going by making provocative comments that ‘set off’ the other class-members. It was interesting to see that Alex apparently swapped sides during the discussion and moved onto the side of the serious discussants. This example has been drawn from a discussion during the first dilemma unit Irene taught in her class:

*Alois: They [the parents] could have done it without Jack noticing…*

*Irene: How would you have felt about this if you were Jack and you would find out that your parents did something like that behind your back?*

*Alois: Kamikaze. I would cause a massacre, I would blow up the campervan … this is the strategic counter attack!*

*Irene (ignoring the last comment): You are right, this is a question of strategy. Manuel what do you think about this?*

*(No answer) Irene reprimands Manuel…*

*Irene: You haven’t listened Manuel – Alex can you summarise because Alex HAS listened carefully*  

*Alex gives a short description, gets really wound up whilst repeating Alois’ comments and ends with: …a massacre, HE SAID, he would commit a massacre!*  

*Irene: Well this is sounds really like a logical strategy.*  

*Manuel: I think it is simply stupid!*  

*Susan: Not quite normal…*

After the unit, Fatima mentioned to me that she was very surprised about the ‘changed’ behaviour of her class-mate, Alex, “Alex, he is not normally like that…so interested…I found this great! F75p37). Alex himself supported Fatima’s observation,
“I think it [teaching with dilemma stories] is very useful… because normally I never do any work because I am not interested but this I found very interesting and this why I engaged!” (A8p50). Alois was a students who seemingly ‘refused’ to participate in a positive manner, and it was not easy for Irene to manage Alois in the classroom. During the discussion, his contributions were valuable provocations. Alex, on the other hand, was a student who does not usually participate in classroom discourse in a productive manner either, participated very positively during the discussion phase. It seemed that the dilemma story approach, especially the discussion part, provided an arena for him to participate.

Summarising, I can say that it appears that the dilemma story approach to teaching ethics can perhaps get students on board who normally would not contribute positively to the classroom discourse. It might open up an avenue for those students to engage with science in a positive manner.

**Dilemma 7: Time**

Julian: *It was too long drawn out…*(J20p4-8).

Depending on the size of the class, the teacher needs to plan for at least two hours for a dilemma unit containing up to three dilemma situations. However in this study, the duration of a dilemma unit varied between the different classes. Given that the Ethics in Science Project had to fit in with the usual time-abling, we had to adhere to double-periods at the most (90minutes). This proved to be a major problem for the project as a whole, as we could not finish the dilemma units completely in one piece which was experienced as disturbing by teachers and students. Emma, for example one of Irene’s students, complained that, “We should have continued talking….it was pretty unsettling that the unit was interrupted so often. We would have needed more time, much more time in order to think ourselves back into it [the dilemma story]” (E17p3). The units were interrupted and continued on another day which meant that the memory of the last unit had to be refreshed before we could start any new activities. Later she added, “Perhaps we should have taken the whole morning, enough time for everybody to get back into it…” (E18p6). This statement was supported also by Amanda, Sandra’s student. She said she liked the story but, “…I did not really like the interruptions and the distribution of the dilemma unit on several
days” (FG6Ap6). Edward, on the other hand, also of Sandra’s class, found that the interruptions were not really a bad thing because, “…like this you could engage with the topic for much longer and you could reflect about it” (FG6Ap8). As mentioned before, the classes varied with regard to their time-requirements: Irene’s multicultural class needed (much) more time than Sandra’s ‘native’ Austrian class. In Irene’s class, I noticed many ‘unsolicited’ discussions at times when the students were actually required to work individually. This quote is drawn from a conversation with Irene after one of her units:

Lily: …I noted that students were not really working individually when they should have done! These ‘premature’ discussions helped draw out the whole process endlessly.
Irene: Yes that’s right, this is where we lost much time!…(FS1p113-117)

The organisation of groups in Irene’s class used up a lot of time which caused Irene to develop a sophisticated plan to organise the group-constellations. Sandra’s class, on the other hand, was very task-oriented and followed instructions without delays.

Summarising we can say, dilemma units take time - if a teacher still wants to use dilemma stories he/she needs to plan well in advance with regard to time-tabling, integration with other subjects, and with regard to the topic of the story, in order for the dilemma unit to work out. Adapting the number of dilemma situations in a particular story might also be a possibility to adjust the units to the circumstances.

Summary and Implications

The results indicate that the use of dilemmas as a teaching tool for addressing controversial issues challenged students’ rational, social, and emotional skills, and led to critical self-reflexivity about themselves and about the nature of science. In some cases, students revised their original opinions and adopted new ethical perspectives. Teachers found that they needed to step back and guide rather than impose their opinions on students.

This research underscores the potential benefit of dilemmas as a means of leading to transformative learning, resulting from self-examination and critical assessment of assumptions, thereby contributing to a perspective transformation.
However, there are a number of potentially problematic issues that have not been
addressed openly in the literature about dilemma-based approaches to the teaching of
ethics. These pedagogical dilemmas are related to teaching and learning and require
the teacher to make a decision about whether or not he/she will engage in dilemma-
based ethics teaching despite the potential flaws of the pedagogy. These dilemmas
raise a number of questions for the critical educator. Seeing that Kohlberg’s dilemma
approach is still by far the most commonly used approach to teaching ethics, it is
worthwhile to question its widespread use if there are potential ethical implications
with regard to the pedagogy itself.

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