Teaching Ethics and Technology with *Agora*, an Electronic Tool

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ABSTRACT: *Courses on ethics and technology have become compulsory for many students at the three Dutch technical universities during the past few years. During this time, teachers have faced a number of didactic problems, which are partly due to a growing number of students. In order to deal with these challenges, teachers in ethics at the three technical universities in the Netherlands – in Delft, Eindhoven and Twente – have developed a web-based computer program called Agora (see www.ethicsandtechnology.com). This program enables students to exercise their ethical understanding and skills extensively. The program makes it possible for students to participate actively in moral reflection and reasoning, and to develop the moral competencies that are needed in their later professional practice. The developers of the program have tried to avoid two traps. Firstly, they rejected, from the outset, a cookbook style of dealing with ethical problems that applied ethics is often taken to be and, secondly, they wanted to design a flexible program that respects the student's as well as the teacher's creativity, and that tries to engage students in moral reflection. Agora meets these requirements. The program offers possibilities that extend beyond the requirements that are usually accepted for case-exercises in applied ethics, and that have been realised in several other computer models for teaching ethics. In this article, we describe the main considerations in the development of Agora and the features of the resulting program.*

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Introduction

The main aim of courses in ethics and technology is to teach students how to deal with concrete moral problems that they will encounter in their future profession. They need to develop both their ethical understanding and several practical skills in order to learn how to reflect independently on moral questions, how to argue for their position, and come to a conclusion.

The acquisition of the competencies that are needed for dealing with moral problems have recently proved to be difficult at the three Dutch technical universities in Delft, Eindhoven and Twente. Fifteen years ago academic education in ethics and technology in the Netherlands consisted in voluntary courses on a small scale. Nowadays, large numbers of engineering students in Delft[1] and Eindhoven follow a compulsory ethics course. In Twente, some faculties demand that students follow a course in ethics.

Of course, the growing importance of courses in ethics and technology at the three technical universities is a fortunate development. But the increasing numbers of students who take the course also have made it difficult to provide an adequate training in ethics. Teachers have evaluated their own courses and have identified the following shortcomings in the competencies of the students that they would like to improve in the future:

1. Students often work in an unstructured way when they analyse moral cases, and they tend to jump to conclusions. The treatment of moral cases by students is therefore often superficial. Relevant facts or moral considerations are overlooked, or the reasoning skills of the students are lacking.
2. When they undertake exercises or write essays, students do not use – or to a lesser extent than desired – the ethical theories that are offered in class. If they use the theories at all, they do so mainly in an instrumental way: they apply them to the case at hand, in an unreflective way.
3. (Some) students consider a judgment about a moral case as an opinion about which no (rational) discussion is possible.

Along with the growing number of students who take a (compulsory) course in ethics and technology, the desire to improve the capacity of students to deal with moral problems has motivated the development of a web-based computer tool for teaching ethics: Agora. Moreover, by developing the tool together with philosophy lecturers from the three technical universities, the team of developers hoped that a basis for the further common development of teaching tools would be created.

In 2002, a proposal for the cooperative development of an electronic tool for education in ethics and technology – Agora – was written and awarded a grant from SURF. SURF is the higher education and research partnership organisation for network services and information and communications technology (ICT) in the Netherlands (see http://www.surf.nl/en/home/index.php). SURF has a funding program for initiatives in which ICT tools for teaching are developed. After the grant was awarded,

a team for the project was created. This team consisted of lecturers in ethics and technology from the three technical universities and didactic experts in case-based learning. Later, a lecturer from the Rijswijk School of Professional Technical Education joined the team, reflecting the growing interest in ethics at professional technical schools. The authors of this article are members of the Agora team. We like to stress, however, that the development of Agora is the result of a common effort of all team members.[a]

In this article we present the reflections on education in ethics and technology that shaped the development of the program, as well as the possibilities the program offers to teachers and students. We start with a description of the teaching goals for the program; we then describe how Agora relates to views on applied ethics. We argue that Agora is based on a broad understanding of applied ethics that differs from the way it is often conceived, and that it therefore adds something to already existing computer programs in applied ethics. We also discuss the requirements that were formulated for the computer program and that shaped its development, the main features of the program and the way it can be used in class.

Teaching Goals

Teachers at the three technical universities in The Netherlands have observed that many engineering students start their course in ethics and technology with a somewhat sceptical attitude towards ethics. Teachers have offered several possible explanations for this scepticism. First of all, many students seem to assume that morality cannot be a subject of rational discussion; they often talk as if they suspect that moral judgments only express the individual tastes or emotions of the speaker. Secondly, many students also appear to suppose that technology is a morally neutral instrument that can be put to good or bad use. This line of thinking would explain why students often say that ethics is not the business of engineers who design or develop technology, but that it should be studied by people who order certain technical artefacts – like managers or politicians – or by the people who use the artefacts.[1 (pp. 278-279)] Finally, a large group of students also seems to have limitless trust in the ethical decency of engineers, for they often remark that an ethics course is superfluous because engineers will act ethically anyway, if they just follow their conscience.

During a course of ethics, teachers encounter these assumptions, challenge them and, eventually, they often change. In order to achieve this, it is important to show in concrete cases how the decision to develop a technology, as well as the process of the design and production, is fraught with moral issues. The attention of the students should be drawn towards the specific moral choices that engineers face. In relation to these concrete choices, they encounter the different reasons an agent may have for them, and they will discover that these reasons are debatable. In this way, students

a. In addition to the authors, Agora team members include Anthonie Meijers, Simon Peerdeman, Mieke Boon, Christian Illies, Jenny Brakels, Paul van den Berg, Marianne Boenink and Sabine Roeser.

become aware of the moral dimensions of technology and acquire the reasoning capacities that are needed in moral debates.

The development team of Agora has started from the supposition that a course in ethics and technology has to focus primarily on the concrete moral problems that engineers encounter in their professional work. This will raise the students' moral awareness, and enable them to carry out their task in a responsible way. However, a course in ethics and technology should also make students aware of the broader societal responsibility that they have as professionals. This is important, for as engineers they have the knowledge that enables them to design bridges, houses or kitchen equipment, to program or operate computers, or to manage a technological company or function as technology policymakers. People who are not engineers lack this knowledge. This means that engineers have a special responsibility: they have a power on which non-engineers who use technology depend.

On the basis of such considerations, the developers have formulated *teaching goals* for courses on ethics and technology at the technical universities. Such courses should help to acquire the following moral competencies: [3,b]

- Moral sensibility: the ability to recognize social and ethical issues in technology;
- Moral analysis skills: the ability to analyse moral problems in terms of facts, values, stakeholders and their interests;
- Moral creativity: the ability to think out different options for action in the light of (conflicting) moral values and the relevant facts;
- Moral judgment skills: the ability to give a moral judgment on the basis of different ethical theories or frameworks including professional ethics and common sense morality;
- Moral decision-making skills: the ability to reflect on different ethical theories and frameworks and to make a decision based on that reflection;
- Moral argumentation skills: the ability to morally justify one's actions and to discuss and evaluate them together with other engineers and non-engineers.

In order for students to acquire these competencies, they need to do many case-based exercises: the careful analysis and ethical evaluation of a case will demand all of these skills. In addition, students will have to engage in debates with their fellow students. This will give them the opportunity to express and argue for their own judgment, and to react to counter-examples and criticism of others; or to judge the quality of the arguments that others use.

In order to teach students the desired competencies, teachers would ideally have to give students *personal guidance*. This guidance aims at teaching students to *think for themselves* about morality. The type of guidance is comparable to what Mike McNulty has written about guidance: a guiding teacher "(..) demonstrates how to solve moral problems systematically and rationally, but makes no ironclad presumptions about

b. In the original proposal, the teaching goals were formulated in a different way. Here we have chosen to formulate the teaching goals in terms of competencies instead of the acquisition of knowledge.

moral truth." [4(p.362)] Teachers, according to McNulty, have to show how a moral problem may be solved with the help of a theory, but they should not provide or suggest any easy answers. The understanding of 'guidance' that was developed in the Agora project, however, demands more of a teacher. According to the Agora team, the primary goal of guidance is to make students think for themselves about ethical issues. This demands not only that teachers show how moral problems can be solved on the basis of a theory, but also that they try to make students think for themselves by engaging in conversation with them, asking them questions in order to activate their reflection, challenging their overly simple solutions and helping them think about the adequacy of the various ethical theories. This last task can be fulfilled by comparing the theories to the student's own initial (intuitive) solutions to the problem and help them to find out whether the theory helps them to express their intuitions or shows that their initial intuitions were flawed. According to the Agora team, students should understand the line of thought that is followed in a method, and try to articulate why they think it is useful or good, or what is lacking in it.

Given this type of desired guidance, the Agora team did not aim at a computer program that solely provides a systematic and rational guide towards a solution of a moral problem. The team wanted a program that is also able to engage students in personal reflection. To this end, a program was developed that does not only offer the possibility to analyse cases with the help of a systematic and rational method that is based on a specific kind of theory, but which also (1) offers the possibility to distinguish different lines of thought that belong to different ethical theories, in order to allow students to reflect on the differences between these theories, and (2) asks students to give their own view and think critically about the possible discrepancies between their view and the result of the application of a rational method, or to think about the differences between the results that the application of different rational methods provide.

Applied Ethics and Agora

Agora has many functions, but the main part of the program is dedicated to exercises in which the analysis of cases and the application of ethical theories is central. Therefore, Agora is a tool suitable for courses in applied ethics. However, the lecturers who developed Agora are aware of the limitations of the methods of applied ethics, which have been discussed in debates during the past two decades.[e.g. 5, 6] The methods that applied ethicists offer to solve cases often reduce a complex ethical theory to the application of a simple principle to a case. This doesn't do justice either to the theory or to the activity that is subsequently demanded from the student. These methods claim to offer a 'rational' method for solving a case; yet, ethical theories offer competing views on what rationality is, how it can be developed, and how agents can distinguish their rational thinking from non-rational dreams, wishes or emotions. Claiming that the method used is 'rational' is therefore begging the question; for, what view of rationality is therewith chosen? To what theory does it belong?

Ideally, rational methods that are meant to solve cases should reflect the differences between those views on rationality in their structure. This is of course difficult to realise in simple exercises. But at the very least, the rational methods that are used in case-exercises should not be inconsistent with explanations of competing views on moral rationality. For Agora this meant that the role of an ethical theory in a case-exercise cannot be reduced to the application of a principle, which is but one step in the sequence of the rational method: the whole sequence of steps should be able to reflect different structures of rational thinking.

This is important for several reasons. Firstly, it is important to do justice to the complexity and the richness of ethical theories. Secondly, it prevents students from oversimplifying their ethical evaluation of a case. Engineering students have a strong tendency to do so, because the emphasis of almost all of their (course-)work is placed on making and doing – which involves instrumental reason – rather than on understanding and reflecting, and they tend to approach ethics in the same manner.[1(p.278)] This means that they tend to reduce ethical evaluation to the straightforward application of ethical principles or theories. Once they have come to a solution of a moral problem, the students often stop thinking. In an ethics course, the main challenge is to make students aware of the fact that they can follow different strands of thought in order to get to a moral conclusion, and that they have to reflect carefully on the question regarding which strand is most adequate or applicable.

A similar criticism holds for some of the current computer programs for the analysis of moral cases. At the start of the development of Agora, the team investigated two such programs. One was a Dutch computer program for applied ethics called Socrates 2. This program was developed by the Van Hall Institute (www.pgsim.nl). In this program, students are asked to think about a moral problem mainly by investigating the relevant moral criteria. They are then confronted with different opinions on these criteria, given by different stakeholders, and they can indicate with whom they agree most. Finally, an ethical evaluation takes place by a kind of multiple criteria analysis.

The other program that was studied was the Ethos System that is included in the textbook *Engineering ethics: Concepts and Cases* (second edition), by Harris, Pritchard and Rabbins and that has been developed by Donald Searing of Taknosys Software Corporation.[7] This program is based on concepts and ethical tests that are explained in the mentioned textbook. Figure 1 shows an overview of the steps in this program.

Of these two programs, the Ethos System has been an especially important source of inspiration, although the kind of program the Agora team eventually developed differs substantially from the Ethos System.

First of all, the Agora team found it important not to introduce just one, but several ways to analyse a case and therewith show different notions of rationality. Different analyses demand not only the application of different principles, but also a different selection of information in the case. In a Kantian evaluation, for example, different factual information about the case will be relevant compared to a utilitarian analysis. In a utilitarian analysis the interests of the different stakeholders are crucial for an

understanding of the moral problem and for the determination of the morally desirable action. In a Kantian analysis, conversely, the interests of the stakeholders are morally irrelevant. This means that if one wants to do an ethical evaluation in Kantian style, one has to look for different facts in the case description than in a utilitarian analysis. This difference is relevant even before the application of ethical principles. According to the developers of Agora, a rational method of ethical analysis should therefore teach the student that if one adopts the view of a specific ethical theory, this also means that one has to look at the situation in a different way and is required to select specific information.

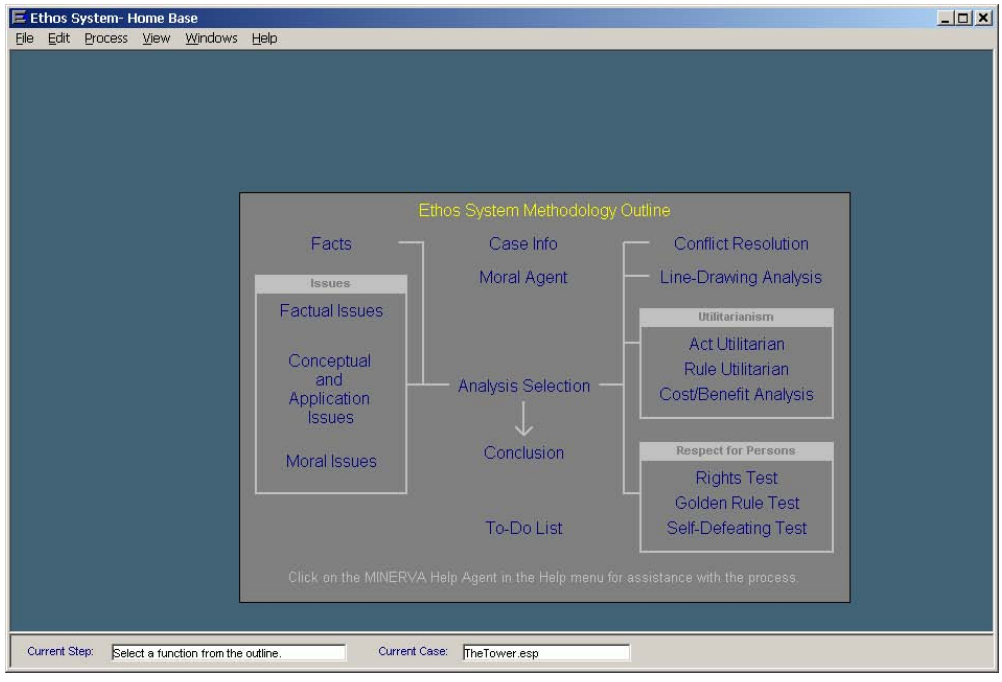

***Figure 1**: The Ethos System*

This is the first way in which Agora differs from existing computerized models: it does not offer a fixed sequence of steps, but allows for different sequences, depending on the kind of analysis one carries out. But the team of Agora-developers has also chosen to deviate from the existing computer models in a second way. In the models that are offered in the Ethos System and in Socrates 2, the individual reflection of the student is introduced at a very late stage; namely, after the whole evaluation has been completed. There the student is asked to argue for his or her own view on the case. But according to the Agora team, this does not offer students enough opportunity to articulate what they think, and to develop their own thoughts. If students are only asked for their opinion at the very end of the ethical evaluation, they will often simply agree with the theory, without trying to offer any substantive supplementary arguments. The Agora team thinks students should be asked to think for themselves much earlier in the

analysis. Since students almost always have immediate intuitions about the moral worth of different actions in a case, it is important to allow them to articulate these right away. This reduces the students' tendency to treat the ethical evaluation in an instrumental way, for it engages them right away in a substantive evaluation about the issue and triggers their motivation to see what the quality of their views would be in the light of the theories. It also allows them to notice more discrepancies between their own views and those provided by the theories, because their own initial thoughts will have been formulated at a stage before the theory was introduced into the evaluation. This is also important to trigger reflection on ethical theories.

Requirements for Agora

The Agora team has started from the supposition that a course in ethics and technology could never be taught well if it were fully computerized. Although the program is a useful tool, teaching remains indispensable for several reasons. First of all, guidance and feedback by teachers can never be fully automated. The exercises that are most appropriate to develop the students' abilities to think and argue for their moral standpoint require coaching by a teacher. Agora does not make this coaching superfluous; it merely offers a more efficient and less time-consuming way to give feedback to students, by offering a ready-made structure for the creation of exercises and an easy opportunity to provide classical – instead of individual – feedback.

There were also other reasons not to strive for a completely computerized course. Lectures often inspire students, which are initially not eager to take ethics classes. A good lecturer is able to remove a lot of the prejudices against ethics by showing the moral relevance of questions that students may encounter in daily life, and which they never recognized as such. A classroom – even if it is packed with 100 students – is a place in which arguments can be raised and refuted, so offering a place where the capacity to discuss can be trained orally.

In order to serve the various purposes, the program had to satisfy a number of requirements. For students it had to offer the opportunity to do case-exercises in order to practice their skills in distinguishing and conceptualising moral problems, structuring and analysing moral cases, understanding the basics of the ethical theories and to reflect and argue for their moral standpoints. For teachers the program also had to offer several possibilities, such as the opportunity:

- To make a rich variety of exercises in a quick and effective way, which train the different required moral competencies;
- To gain insight into the shortcomings of student's competencies, so that they can focus on that during their lectures;
- To give comments on students' work in a way that is not too labour intensive;
- To score student's work in an effective way.

Apart from these functional requirements, a very important requirement for Agora was flexibility. The need for flexibility derived from the variety of didactic situations in which the program should be usable. It also derived from the competing views on

moral rationality that the exercises should be able to accommodate, and that were discussed in the preceding section. In fact, the possibility of the program to offer a variety of rational methods, turned out to be a good solution to discussions within the Agora team. As professional ethicists, the members of the Agora-team are involved in meta-ethical debates about what morality is, and how it can be known. They had different views of the ethical theories that are used for ethical evaluation. The team agreed that it would be natural if such differences in philosophical viewpoint would also be manifest in the classroom. The developers thought that teachers should be at liberty to teach according to their best insights, which means that they should not have to hide their philosophical position. This demanded a very flexible program that may change with the theory that is taught, or the interests of the teacher. This was also a reason why the Agora team abandoned the idea of a fixed model for case analysis with an unchangeable sequence of steps, such as other computerized models provide. Instead, the team developed a flexible program that offers each teacher the opportunity to fashion the exercises as they think is best in their didactic situation, or for the purposes they want to achieve. The result is a program that offers the opportunity to make a rich variety of exercises.

Case-exercises

The central unit in the Agora program is the case-exercise. These exercises consist of a combination of a case and particular analysis – a rational method – used to analyse that case. The teacher can build case-exercises by combining a case description with an analysis model. The latter is called an OSS-model in the terminology of Agora, where OSS stands for *Only Some Steps*. This terminology refers to the fact that the Agora team first built a kind of superstructure of all possible analysis steps, called *All Possible Steps* (APS). This can be seen as a container full of steps from which teachers can choose some as building blocks for the models of analysis that they want the students to carry out. Such a selection is called an OSS-model. Each OSS-model offers a structured and rational way of analysing and evaluating a case, which suits the type of theory that the teacher wants to explain, or his or her personal teaching goals.

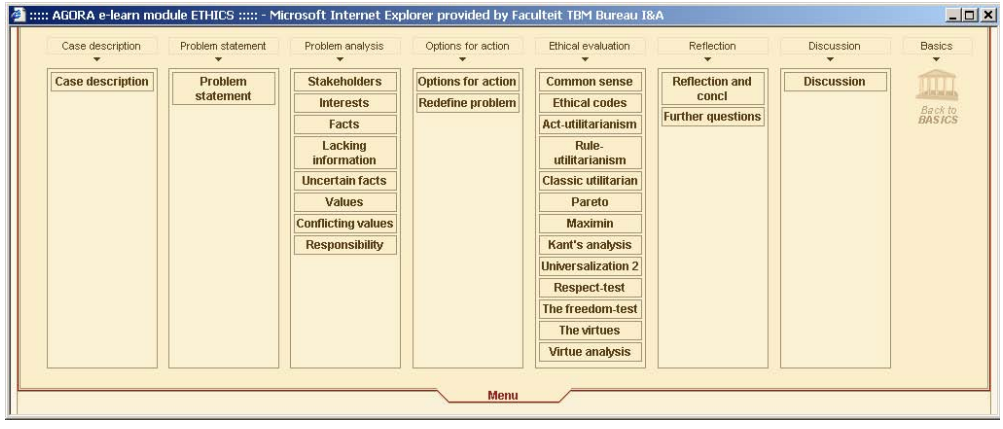

***Figure 2**: All APS steps*

The APS Steps

Figure 2 gives an overview of all the APS steps. As can be seen, these steps are categorized in seven main categories:

1. Case description
2. Problem statement
3. Problem analysis
4. Options for action
5. Ethical evaluation
6. Reflection
7. Discussion

The first two steps are rather straightforward. In the step called 'case description', the student has to give a brief description of the case at hand. If this step is not included, the teacher will have to provide a case description, as will usually be the case. The second step, called 'problem statement', asks students to make an initial formulation of the problem.

The third step, called 'problem analysis', consists of various sub-steps that are intended to help students to get a good overview of the case and the moral problem at hand. The first sub-step requires students to list the all the relevant stakeholders, the second and third demands them respectively to select all the relevant moral values and all relevant facts. All of these steps are optional, and may be combined with other sub-steps such as one that asks to distinguish the interests of the stakeholders, or to mark the values that might conflict. These sub-steps may serve different teaching goals. Their inclusion or exclusion will depend on the ethical theory that is taught. In a utilitarian evaluation, for example, it is important to include the sub-step about the interests of the stakeholders because these interests are crucial in deciding what action is morally the most desirable. If one wants to do a type of analysis that is called 'common sense', which in Agora involves a weighing of values, the step about values has to be included.

It is also possible to include the sub-step 'responsibility' in the problem analysis. This step requires the stakeholder step to be carried out first and asks students to select the responsible agents from the list of stakeholders that are only passively involved in the case. In addition, this step also requires students to choose the agent whose perspective they will adopt in their further *ethical* analysis of the case. The responsibility step has to be chosen if one wants to focus the ethical evaluation, which follows upon the problem analysis, on a specific choice that an agent has to make; such as, 'Is it permissible to tell a lie if I therewith save lives?' or 'Should I report the pollution even if it means that I may loose my job?' The agent that is chosen as the central figure of ethical evaluation may be an individual agent, a group or an organisation. In technological cases it may be useful to focus on the responsibility of a group of people – such as NASA in case of the Columbia accident.

The fourth step, 'options for action', demands that the student give an overview of the possible ways in which the central agent in the case may act. In applied ethics, there

is a tendency to present moral problems as multiple choice problems.[8] This presentation suggests that the options are more or less given and that the moral problem consists in choosing the right option. In real life, however, options are almost never given but have to be thought out or "invented" by the agent. In fact, by thinking out new options for action, a seemingly irresolvable moral dilemma can sometimes be resolved or made less dramatic. It is therefore important that students are motivated to think of a range of options. The step 'options for action' also includes a sub-step in which students are asked to limit this range of options to two or three options that they want to analyse later in the ethical evaluation. This sub-step also asks them to articulate their intuitive answer to the moral problem.

The fifth step, 'ethical evaluation', refers to a large variety of sub-steps that the APS-reservoir offers for ethical evaluation (see Figure 2). Different evaluations may demand the choice of different preliminary steps during the problem analysis, as has already been explained. The steps are related to five types of ethical theoretical backgrounds:

- Common sense. Here students are asked to weigh the available options in the light of the relevant moral values.
- Professional ethics. Students are asked to evaluate the options in the light of the engineering codes of ethics.
- Utilitarianism. Several utilitarian evaluations are provided. Not only act- and rule utilitarianism, but also utilitarian-like analyses that use criteria that depart from the classical criterion of the "greatest good for the greatest number", like a Pareto test and a Rawlsian maximin test.
- Kantian ethics. Three variations of tests are offered, which correspond to the three formulations of the categorical imperative.
- Virtue ethics. Two variants are provided. The first evaluation is done on the basis of a reflection on virtues, the second follows a reflection on the good life, understood in an Aristotelian way.[c]

The sixth step, 'reflection', is intended to stimulate ethical reflection after having carried out the ethical evaluation. This is not the first time in the analysis that students are asked to reflect; they are also required to articulate their own intuitive answer when they identified the moral problem. However, at this point the reflection is broader and more systematic. The reflection step asks students to think about the discrepancies between their intuitive answer and the answers they have given on the basis of the ethical analyses they have carried out. The reflection step contains questions like: 'did

c. It is unusual to include virtue ethics in a method of case-analysis because virtues are considered part of someone's character, and these are hard to cover in a procedural method such as courses in applied ethics usually offer. We decided anyway to construe a kind of procedure on the basis of Aristotle's ethics, in order to allow students to encounter an alternative way of thinking about moral questions. Since a reflection on the virtues one may develop, or the ingredients of the good life, engages one in another type of reflection about technology than a utilitarian or Kantian method will allow, we thought it important to include it.

you change opinion because of the ethical evaluation that you have done?', 'What type of ethical evaluation do you think provides the best result?', and 'Did any evaluation help you articulate your initial intuitions in a better way?' These kinds of reflections are meant to trigger the student's reflection into what he or she has done, and how this is related to his or her intuitive view.

The last step, called 'discussion', may be used in several ways. It can be inserted at the end of a sequence of steps, for example for discussing the conclusion of the ethical evaluation. But it can also be used in isolation from other steps; for example, when the teacher requires students to discuss a specific statement or question. The discussion step requires students to build up a tree of argumentation, ordered in arguments in favour and against the statement (see Figure 3). It offers students the possibility to argue only in favour or against the statement, but it is also possible to discuss things in small groups. The discussion step always requires a basic ordering of the arguments: it is not a chatbox in which anything goes.

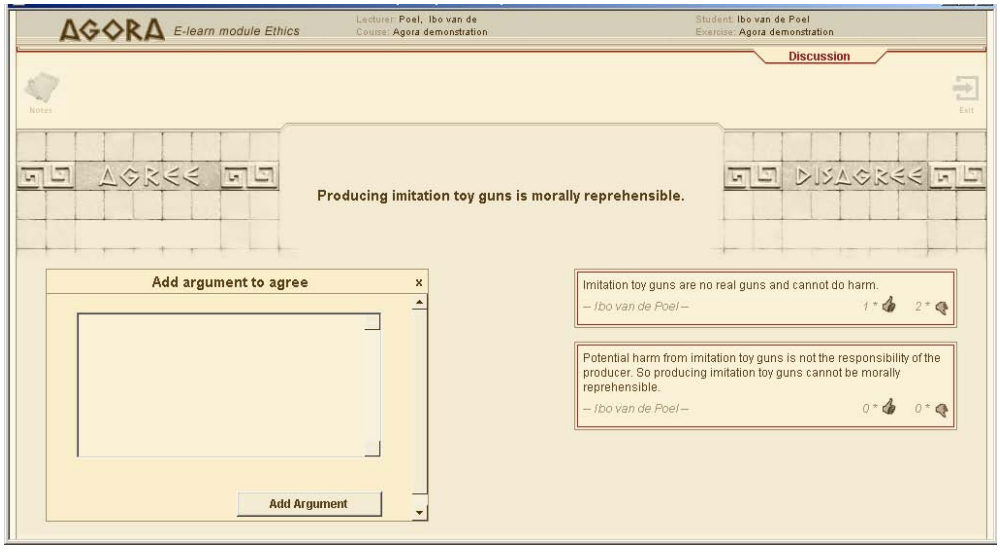

***Figure 3**: In the discussion step students can be asked to formulate arguments for or against a certain statement and are able to comment on statements made by other students.*

OSS-models

With the help of the APS-steps – which have been explained above – a large variation of OSS-models can be built. Each OSS-model amounts to a certain analysis model that can be applied to a case. Also, OSS-models can be built that exercise more limited skills or competencies than carrying out a complete ethical analysis. Figures 4 and 5 give examples of such OSS-models. The OSS-model in Figure 4 trains the student's capacity to distinguish facts from values, which is often difficult for students.

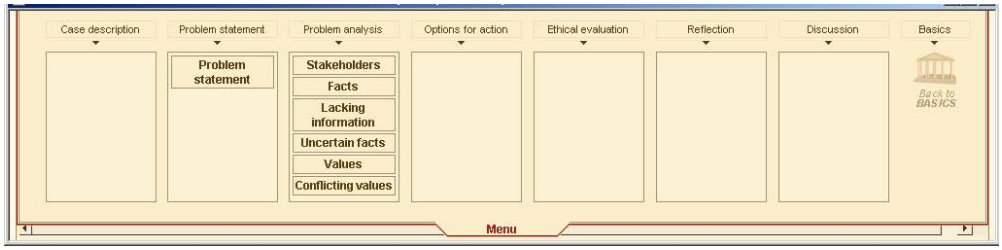

***Figure 4**: The OSS-model "Facts and values"*

Figure 5 shows an OSS-model that focuses on a more complicated competency. Students often find it difficult to formulate a moral problem, and this OSS-model focuses on that issue. Students are required to identify the stakeholders and their interests, the facts and the values, and on this basis they can distinguish the moral conflict that is at stake in the case. On the basis of these preliminary steps, students are able to better formulate the moral problem.

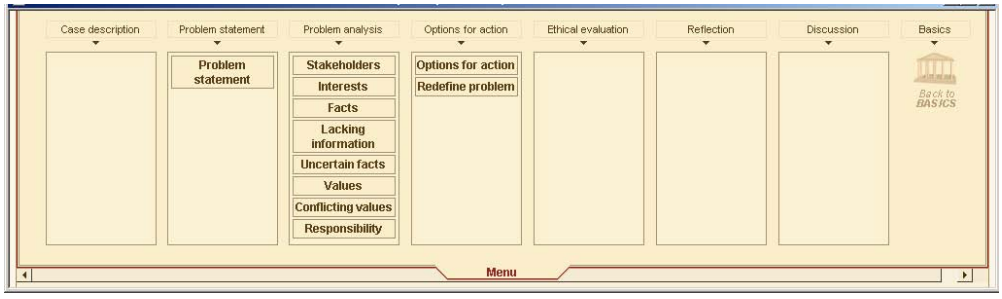

***Figure 5**: The OSS-model "Articulating a moral problem"*

It is also possible to build more extensive OSS-models that place the emphasis on different ethical evaluations of a case. Figure 6 shows an OSS-model for the act-utilitarian analysis. As the figure shows, the act-utilitarian evaluation requires also the choice of some preliminary steps. For example, the interests of the stakeholders must be understood, and the problem statement has to be formulated. These are necessary ingredients for the evaluation. One may also extend the analysis with other steps; for example, with a reflection on the values that are at stake in the case. A teacher might choose to do this, in order to make students more aware of the difference between interests and values.

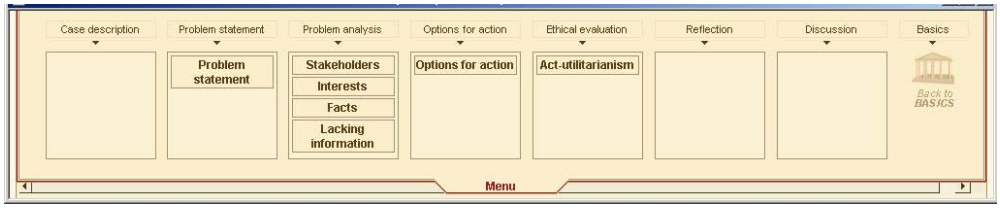

***Figure 6**: The OSS-model for a basic act-utilitarian analysis*

Figure 7 shows a more extensive example of an OSS-model combining a common sense, an act-utilitarian, a Kantian respect-for-persons and a virtue ethics ethical evaluation. It also includes some preliminary steps of problem analysis, and – at the end – a reflection step, which requires students to use the ethical theories to reflect on the intuitive answer that they have formulated after their problem statement, and demands them to compare the different evaluations that they have made and form their own opinion about them. The OSS-model is concluded with a discussion step.

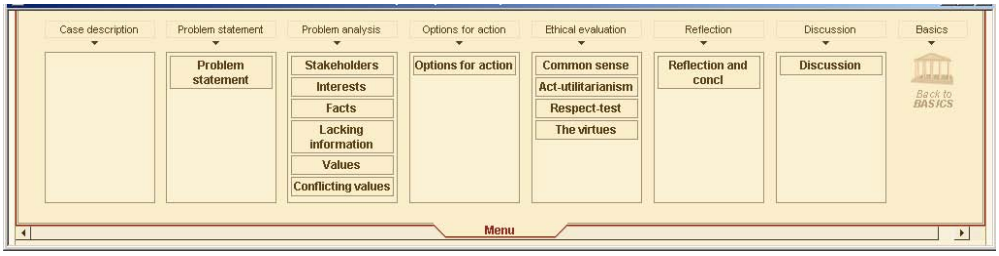

***Figure** 7: An OSS-model combining different ethical analyses*

Flexibility

The possibility of selecting steps from a preset reservoir makes Agora a flexible tool to use. But there is also a second source of flexibility: teachers may use the standard questions that are included in each APS step, but they may also add additional questions (see Figure 8). This may be useful, for example, when the teacher wants students to focus on a specific issue in a case. With a specific question it is easier to direct the student's attention. Adding questions is also useful if one wants to adapt an exercise to the specific literature that is treated in class.

This second source of flexibility makes it possible to build exercises that are not related to a specific case. For example, teachers can make an exercise consisting of multiple-choice questions about the distinction between descriptive and prescriptive statements, or an exercise that trains the capacity to distinguish the different classes of virtues, such as social virtues, emotional virtues or virtues concerned with external goods.

These two sources of flexibility are meant to give teachers the maximum freedom to design exercises according to their own insight. It is also possible to use Agora in a less flexible way, however. Agora provides a rich stock of already prepared OSS models with standard questions, from which teachers can make their personal selection. Teachers are therefore not *obliged* to build their own exercises: the program also offers a rich variety of sequences of steps, which form ready-made exercises in combination with a case. Lecturers may also use the standard multiple-choice questions to set exercises that are not case-related. It is therefore possible, but not necessary to be a creative user of the program. In addition to these standard cases and exercises, the program offers the possibility to reuse cases and case-exercises developed by other teachers. Teachers can browse the cases and case-exercises designed by other teachers and add to these their favourite cases or case-exercises so that they become available for use.

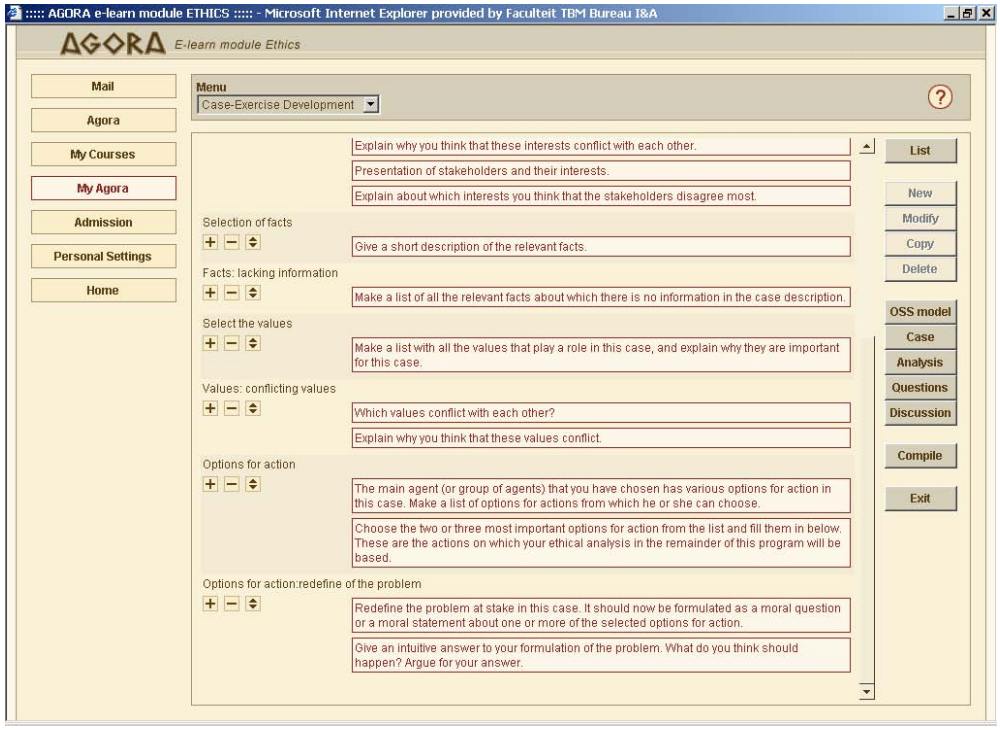

***Figure 8**: Teachers can add additional questions to the standards question in Agora by clicking on the + button.*

The Theory Chambers

The theory chambers are another important function of Agora. The chambers offer a playful representation of the theories that are used for ethical evaluation, and can be used as a source of background information and more profound study. The chambers can be accessed at any moment during the exercises, by pressing the 'to the chambers' button, which gives entrance to a marketplace – an *Agora* – and an elevator which transports the visitor up into a high building to the private rooms of Aristotle, John Stuart Mill or Immanuel Kant and to a number of thematic rooms such as the professional ethics room (see Figure 9).

The decoration of the rooms gives an impression of the historical context in which the theory has been developed; so Aristotle stands in the court-yard of his Athenian house of the fourth century B.C., while Kant is located in a German eighteenth century house with a view over Königsberg, where he spent all of his life, and John Stuart Mill sits with Harriet Taylor by the fire in his nineteenth century British apartment.

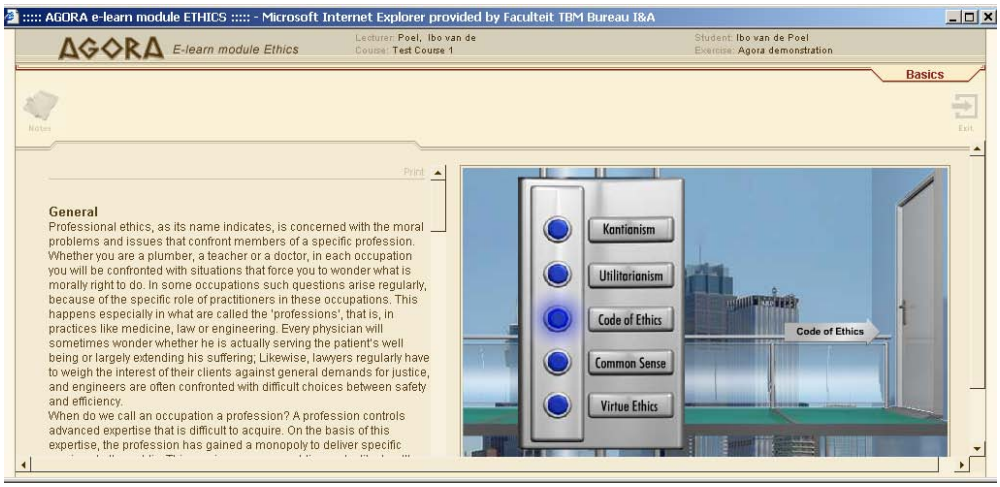

***Figure 9**: The elevator by which the students can go to the various theory chambers.*

In the corridor, before entering the room, students encounter a text with an introduction to the kind of theory that they will find behind the door. When entering the room, the philosopher that is the central figure in the chamber gives a short oral introduction of the main characteristics of his theory (see Figure 10). After that, students can navigate through the room, clicking different icons, such as bookshelves, a painting, a waste-paper basket, a window and a clock. Each icon links to a source of information. The bookcase gives access to original texts that are written by the author. In the waste bin one finds the most important criticisms against the author's theory. The painting connects to a portrait gallery of philosophers who have interpreted and commented on central aspects of the theory. Here students can find explanations of the theory by important authors who are working in the field, but they are also introduced into contemporary discussions about this theory.

Next to these sources of information, the chambers offer a series of fixed exercises, which can be used by students to check whether they have understood the central aspects of the theory, or as a study-guide. There are two difficulty levels. The first level contains multiple-choice questions. The second level contains questions that require students to read parts of the original texts, or compare these with the comments of authors in the portrait gallery. This may function as a reading guide. Finally, the chambers give access to relevant links on the world-wide-web through its window, and the clock links to an extensive timetable where students can find more information about the historical period in which the theory was developed.

Lecturers can use these chambers in several ways in their classes. They can use them simply as a reading resource, as an introduction to the theory, or as a source of background information to a case-exercise. They may also assign a specific exercise that requires students to go to a chamber and look up a specific piece of information, contrast the opinion of the main author with one of his commentators, or set an exercise which demands students to discuss a specific theme on which they can find information in the chamber.

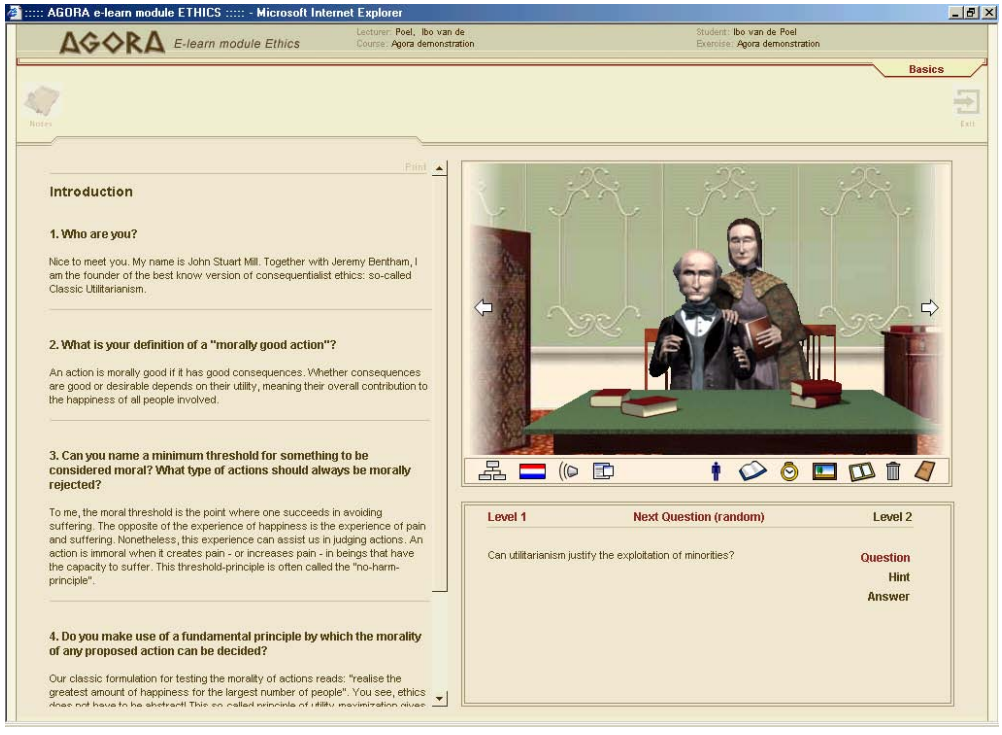

***Figure 10**: After entering a chamber, an oral introduction is provided by a central figure from the ethical tradition. Below the figure are a number of icons that give access to further information. These icons are also encountered if one scrolls the chamber.*

The Use of the Program in Class

In developing the program, various scenarios for using the program in class were considered. Teaching contexts, of course, may differ widely. In the Dutch technological universities sometimes a course consists of lectures given by one teacher to a large group of students, while at other times a number of teachers work together which allows for lectures as well as for tutorials in smaller working groups. Sometimes, a course lasts only 4 weeks with 8 teaching hours, while other classes take up a whole semester with 18 teaching hours. To cope with these differences, different didactical scenarios were developed. The following scenarios were discussed with lecturers in ethics and technology at the three technical universities:[d]

1. Students do case-exercises and get individual feedback from their teacher through the program;
2. Students do case-exercises as a preparation for a tutorial;
3. Students do case-exercises in order to learn the possibilities and shortcoming of different ethical theories and approaches;

d. Initially, we had more didactic scenarios but these were prioritised by the lecturers in ethics and technology.

4. Students discuss cases with each other on which they prepared a case-exercise in Agora;
5. Students do case-exercises and get collective feedback during a lecture;
6. Students do case-exercises as an exam;
7. Students do case-exercises a preparation for a course.

Below we explain the first two scenarios in somewhat more detail because these were awarded the highest priority by the lecturers in ethics and technology at the three technical universities.

The first scenario implies the use of Agora as a tool to prepare lectures. In this scenario, the teacher sets a number of case-exercises in Agora. The students are asked to do these exercises before the next lecture. The lecturer can then start the lecture with feedback in class on the exercises that the students have done in the previous week, using examples of the most commonly made mistakes or outstandingly good answers as an introduction to the topic of the lecture of that week.

In the second scenario, the exercises may be used as a preparation for a discussion during a tutorial. In some courses, lectures for large groups are combined with tutorials in smaller groups, in which cases are discussed. As a preparation for these discussions, Agora can offer a case-exercise that demands students to read the case, distinguish all the relevant facts, values and interests, and formulate their own view on the moral problem in the case. In class these views can be expressed and the teacher can help to distinguish between good and bad arguments.

It is also possible to divide the group into two smaller groups, and ask each group to formulate arguments from a different standpoint. For example, the teacher may ask students to take up the role of different agents in the case, and think of arguments that a particular agent would put forward for his or her actions in that particular situation. In the classroom the two parties can then confront each other, and the students can judge who gives the better arguments and why. Alternatively, one may require one group of students to evaluate the case in a utilitarian way, and ask others to approach it in a Kantian way. During the tutorial these two types of arguments can confront each other, and their strengths and weaknesses can be discussed.

These scenarios illustrate that the Agora program can be used in different didactic situations. Teachers may pick and choose what they consider to be the most appropriate uses for their purposes, the level of their students, or the type of moral competencies they want to focus on. Agora is intended to serve teachers in these different circumstances in a quick and effective way. In this way it should offer the possibility to teach ethics well, but also to prevent it from becoming too labor intensive for teachers

Feedback

Teachers can give feedback to students in different ways using the Agora program. In a tutorial setting, teachers can ask students to analyse a case as a preparation for the tutorial. During the tutorial, the teacher can give feedback on what the students did in Agora and a discussion in class may follow.

Agora also contains some built-in feedback functionalities. One is the so-called review function. Teachers can use the review function to present in class several typical answers to a question and discuss the strong and weak points of these answers. On the teacher's screen, he/she is able to review the students' answers to the exercises anonymously and compare answers to questions. This review function can also be used during a lecture or tutorial. Using a beamer, teachers can project the student answers. For this purpose, the students' answers in the review mode are presented in a large font. The teacher can also select certain students' answers beforehand. The teacher could for example select particularly good or particularly bad answers (anonymously; so that the others students do not know who gave these answers). In this way, teachers are able to give feedback to the whole class at once by identifying mistakes that are commonly made and showing what is wrong with them with the help of examples from students' work. This feedback is a useful way to guide the students' reflections, while not having to talk to every person separately.

Apart from the review function, teachers can use the so-called correction function. The correction function offers the possibility to give personal feedback to students. It allows teachers to write a comment on each answer that a student has formulated, to give scores, and send the corrected work back to the students. After the teacher has pressed the "corrected" button, the student will be able to see the feedback of the teacher in a separate box called "feedback" that is available in each step filled in by the student (see Figure 11 overleaf). Of course, this is a labour-intensive process, and it will probably only be used in small groups of students, or in order to correct the work that students have done in groups. However, personal correction may be useful in some circumstances, e.g. when required by the type of exercise that the students have to do.

The program also offers possibilities for automatic feedback. When compiling a case-exercise, teachers can fill in the "correct" answers to the different questions posed in the exercise and, moreover, give an explanation to these answers. These correct answers with explanations become available to the student once the student has finished the case-exercise (see Figure 11 overleaf). When giving personal feedback, the teacher sees the "correct" answer and so can adjust his or her feedback to this. The teacher can also choose not to give personal feedback and only use the automatic feedback. In that case the box "feedback" will not be visible. In many cases, it will only be possible to give some minimal requirements for a good answer, which facilitates the feedback process. For some case-exercises, it might therefore be better not to fill in the correct answers when doing the case-exercise. In that case the boxes "correct answer" and "explanation" will not appear. Nevertheless, for some more preliminary exercise, this function might be useful.

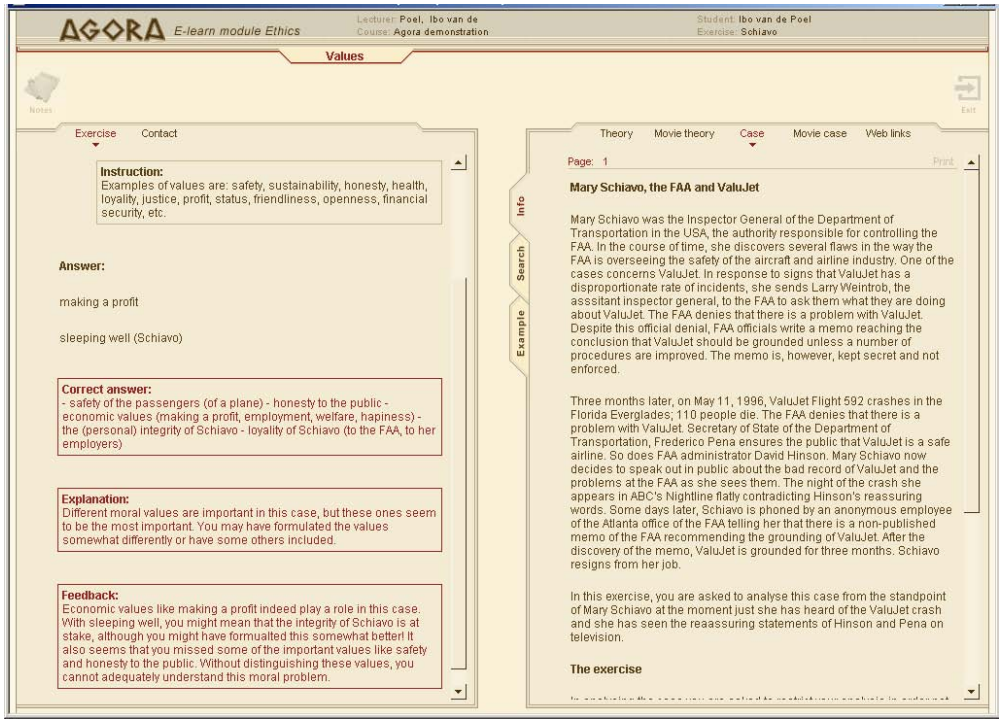

***Figure 11**: After sending in a case-exercise, students get back the corrected case-exercise. The teacher can fill in the "correct answer" and the "explanation" of a particular case-exercise. (The teacher can also choose not to fill in these boxes). The "feedback" box contains the personal feedback given by the teacher to the answer of this particular student.*

Conclusions

Agora was developed in response to a number of didactic shortcomings in the existing teaching of ethics and technology at the Dutch technical universities and in response to growing number of students following a course on ethics and technology. During the development several challenges were encountered. A main challenge was how to deal with competing views on moral rationality. Another challenge was to cope with different teaching contexts. A main way to deal with both challenges was to build a very flexible program which allows for the creation of different analytical models and different case-exercises, reflecting varying views on moral rationality, didactic situations, teaching goals and preferences of teachers. The result is a program that is not only more suitable than existing computerized programs but that also – we think – will be more easily accepted by teachers due to the possibilities of adapting the program to their own needs.

Developing Agora has also been a learning process for the people involved. Since the development team had to build a computer program together, the developers had to find a way to deal with conflicting views on ethics, teaching styles and preferences. The result of this has not only been the development of the Agora program, but also the

creation of a platform for the further common development of teaching materials. The way Agora is shaped will enable further cooperation, we believe. This is not only due to the flexibility that has been built into Agora but also to two further characteristics of the program. One is that the database structure of Agora offers various possibilities for sharing cases and case-exercises. Each teacher cannot only build his or her own cases and case-exercises but also use cases and case-exercises from a common pool that will be maintained by a future Agora team of lecturers from the three technical universities. Teachers can browse and reuse the case and case-exercises of other teachers.

Another feature of Agora is that it can easily be extended. The Agora team can add new APS steps relatively easily. Given the general structure of the APS steps this also means that the model can relatively easily be made fit for courses in applied ethics in other fields such as, for example, medicine.[e] Also the content and the number of theory chambers can be extended, although this will imply changes in the basic software of the program. All in all, we believe that Agora can become an important platform for the further development and improvement of courses in ethics and technology, both within and outside the Netherlands.

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e. In fact, lecturers from the University of Groningen in the Netherlands who are teaching a course in medical ethics have shown interest in the program.