Managing Ethical Thinking

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Abstract. The main set of reasoning tools needed for the Professional Ethics domain is metacognitive. Students need to be able not only to analyze case studies, commonly used in this kind of domain, but also be able to analyze their own analysis. We have developed a tool called Umka to implicitly support students in evaluating and regulating their ethical analysis. An experiment was carried out where computer science students studying professional ethics used Umka. Results of this experiment are shown, and further steps are discussed on how to make Umka's metacognitive support more explicit.

Keywords: ethical thinking, metacognition, case analysis

1 Introduction

Metacognition is defined as the ability to be aware of, monitor, and evaluate one's own thinking. In the context of Professional Ethics this translates into the learner's ability to be aware of, evaluate and, if necessary, regulate his or her own ethical thinking. Professional Ethics is commonly taught through the analysis of case studies, which present certain professional issues and dilemmas. Students are asked to provide solutions to resolve these dilemmas, and supply justifications for their judgment. The reasoning behind these justifications is a big part of what constitutes "ethical thinking".

Ethical thinking by itself involves many metacognitive activities such as recognizing the complexities of your circumstances, anticipating the consequences of actions, considering the effect of actions on others, the critical appraisal of message source, quality of appeal etc. The foundation researcher in metacognition Flavell [1] considered these activities to be metacognitive in nature, and important for making wise and thoughtful life decisions.

But besides these activities students also need to be evaluate and regulate their ethical thinking. Students have to be able to analyze their own arguments and motivations, to make sure they have covered all the facts, have not factored in their own beliefs or prejudices too strongly, have uncovered all the possible directions for analyzing the case, and have weighed their arguments against one another well in reaching their conclusion. Students need to have skills to articulately and consistently justify their moral judgements, skills for analysis and critique of others' and their own convictions, and skills for forming their own convictions. Developing all these skills in students are important goals of ethics education [2].

Several systems have been developed to support students in structuring their ethics case analysis. These systems walk students through the steps of ethical analysis by providing instructions and asking students to fill in predefined forms. Examples of such systems are Ethos [3] and the PETE system [4]. We have not found systems that support students beyond structuring their ethical analysis, and in particular there doesn't seem to be support for students learning the more complex processes of evaluating and regulating ethical analysis.

2 Umka as a Tool for Evaluating and Regulating Ethical Thinking

We have developed a computer tool Umka (screenshot in Figure 1) where students analyze a given case study both individually and through collaboration with one another by seeing each others' analyses and commenting on each others' arguments.

Umka also invites students to cognitively monitor their own ethical analysis, and adopt strategies for its improvement. This is done in Umka implicitly through an open group learner model of students' analysis. Bull and Kay [5] suggest that there is "potential to support metacognitive activity in a less explicit manner" though open learner models. And an important question that these researchers raise is "how to design and present a learner model that can best support reflection and particularly how to do it in ways that facilitate learning of the domain and of metacognitive skills".

If we consider the ethics domain, domain knowledge here is the formed convictions on important professional issues. Metacognitive skills are skills for evaluating one's own convictions, and strategies to form them such as looking at the issue from various points of view, exposure to the opinions of others, criticizing your own and others' convictions, overcoming criticism, or changing your convictions in response to the criticism.

The open learner model in Umka reflects how well-formed are learners' convictions or positions. The well-formedness of a learner position is determined by how broad it is in terms of different reasons the learner considered, and how well-argued it is in terms of how much the learner was able to persuade others in his or her reasoning. We have adopted the circle visualization for this (Figure 2). The size of the circle reflects the breadth of the student's position, which is determined by the number of different arguments the student has for and against a particular action in a case study. The darkness of the circle reflects the well-formedness of the student's position. The more the arguments and comments of the student are accepted by others, the more well-formed is the student's position, and the darker is the student's circle. [6] has more details on how the visualization is computed.

We expected that our open group learner model will trigger students to cognitively evaluate their convictions and adopt strategies for forming their convic-

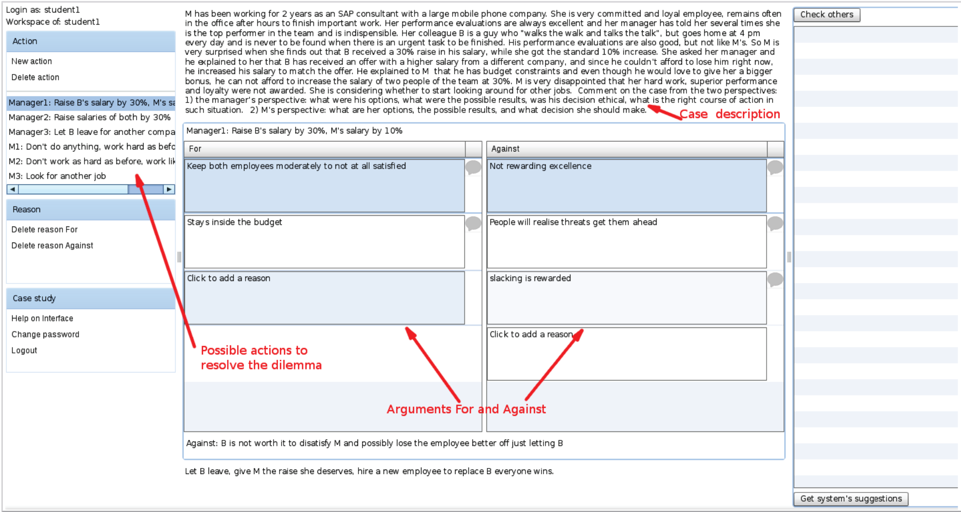

Fig. 1. A screenshot of the Umka system. Once logged in a student sees the case description in the top middle part, and possible actions to resolve the case dilemma in the left part. The student puts his/her arguments for and against every action in the middle.

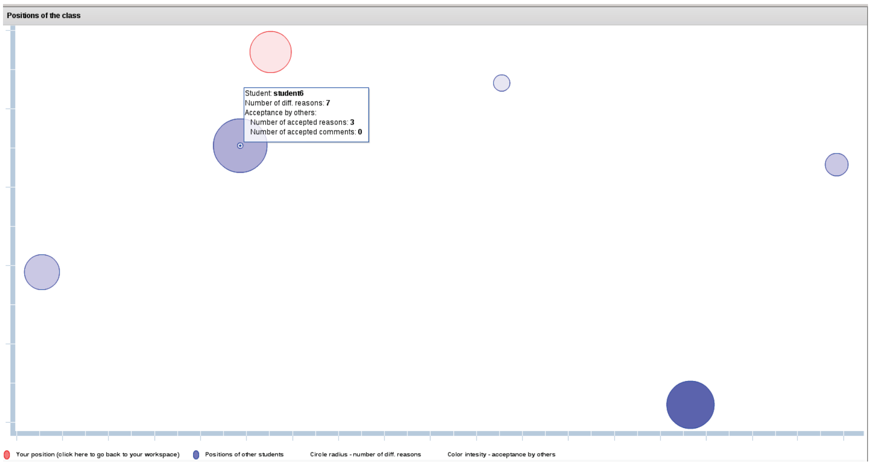

Fig. 2. Umka's visualization. A student sees his/her position as a red circle, and positions of others - as blue circles. The distance between the circles reflects the semantic distance between the corresponding positions.

tions. Our experiment described in the next section was designed to evaluate how effective was the proposed learner modeling in stimulating positive metacognitive behaviors in students, and how much students' own evaluation of their positions corresponds with the evaluation of their positions in our learner model.

3 Experiment and Results

In our two previous studies [6] we investigated the effect of Umka's support on students' behavior and the quality of students' analysis, and evaluated the accuracy of the learner modelling. The specific goal of our third experiment was more qualitative than the other two, essentially to probe more deeply into the effect of Umka on the cognition and metacognition of the students. In the third experiment we used the Umka tool for one of the assignments in an undergraduate course called "Ethics in Computer Science" at the University of Saskatchewan. Six students taking this class were analyzing a case study in the Umka tool concerning issues that may arise in the workplace. With only six students, the experiment is, of course, at best illuminative, not definitive, and there was no point in doing statistical analysis.

We were interested what students will do when they see their own learner models, and learner models of their classmates. The open learner model in Umka provoked in students certain behaviors for regulating their ethical thinking. After seeing the visualization of their learner models, students visited analyses of other students, commenting on the arguments of others, and revisited their personal analyses by adding more arguments into them. Thus, 54% of all students' arguments are arguments that have been added after seeing the visualization or analyses of other students. 55% of these added arguments were found to be good arguments by the instructor. All students except one were visiting analyses of others, and all students except one added new arguments after seeing their learner models or analyses of other students. There were 12 comments of the students on each others' arguments.

We compared these results with the results from the Wiki system that the students used for ethical analysis of another case study before they used the Umka system. In comparison, in the Wiki system the students didn't exchange any comments with each other, and the students didn't revise their own arguments.

In the post-study questionnaire we asked students to evaluate their ethical thinking and compare it with the Umka visualization, specifically asking how much the visualization was able to reflect the breadth and well-formedness of their positions. Unfortunately only one student out of six filled in the questionnaire. This student stated that the visualization didn't reflect much about his position because as he said ".. I feel that my 2 reasons were more detailed then 5 one sentance [sic] details that other students gave. Although if they expanded their reasons more I feel I would try [to] increase my position".

4 Conclusion and Future Directions

One of the goals behind Umka's development was to support students in managing their ethical analysis. This support is organized implicitly through Umka's interface, visual feedback on the breadth and depth of students' arguments, and encouragement to look at others' arguments. While our study was a small one, making definitive conclusions premature, the results were positive. Using Umka, students were motivated to actually argue and discuss with one another and to examine their own arguments; they were able to regulate their ethical analysis. There was not enough data to judge how well students were able to evaluate their ethical thinking and the degree they agreed with Umka's evaluation. A possible future direction is to organize Umka's visualization as an open negotiated learner model [7] to further stimulate metacognitive behaviors in students. Another possible direction is the introduction of explicit learner centered system suggestions on structuring and regulating ethical case analysis.

Metacognition plays an important role in learning Professional Ethics. The ability not just to analyze a case, but to analyze the analysis is fundamental to the ethics domain. Thus, the ethics domain is a perfect domain to explore metacognition, and further research is required to understand how it can be best supported by a computer environment.

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