
Making Good Use of Online Case Study Materials*

Matthew Wilks Keefer

Division of Educational Psychology, Research, and Evaluation, University of Missouri - St Louis

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ABSTRACT: *Web-based access to engaging instructional materials for SEE instruction represents an increasingly viable and attractive opportunity for educators. This paper will review research findings that demonstrate important differences in more experienced and novice ethical responses to engaging online materials, including authentic cases, codes, and commentaries. Results demonstrate that experienced ethical thinkers are more likely than novices to appeal to middle level principles that identify professional role-specific obligations (RSO); to make greater use of professional knowledge in order to recognize moral issues and relevant facts; and to employ more 'contextually sensitive' reasoning strategies when crafting resolutions to moral problems – e.g., identify alternative moral issues, assess the moral implications of actions, and provide alternative practical resolutions to conflicts. These findings suggest that when effectively integrated into SEE courses, authentic instructional materials have the potential to effectively challenge students and enhance student learning. However, there is evidence that the uses and benefits of these materials are not well understood. In the second part of this paper, five research-based instructional principles will be identified and discussed that can help SEE instructors better understand how to effectively integrate these materials into their courses.*

INTRODUCTION

Increasingly, science and engineering ethics (SEE) instructors are exposed to a vast array of accessible web-based resources, including authentic cases, codes, commentaries, and other potentially engaging instructional materials. Many of those responsible for collecting and creating these materials share a commitment to teaching ethics by challenging students to engage in moral decision-making in practical contexts, most often by using realistic case examples¹⁻⁷ and ethics texts such as that by

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Address for correspondence: Matthew Wilks Keefer, Division of Educational Psychology, Research, and Evaluation, University of Missouri-St Louis, One University Boul. MH 469, St. Louis, MO 63121, USA; Email: keefer@umsl.edu.

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Charles Harris, Michael Pritchard, and Michael Rabins or that be Caroline Whitbeck.^{8,9} These approaches require the presentation of authentic cases, experienced ethicists' analyses, case comparisons, and the willingness of students to work through many case examples.

While these materials have become more accessible and their use in SEE courses more frequent, there is little research available to indicate the effects of these materials on student learning. Furthermore, instructors who lack the pedagogical knowledge necessary to effectively integrate online curricular materials will not be likely to do so in ways that will maximize active student learning. Even the most engaging case problems and materials will be of limited value to students if instructors do not understand the research-based knowledge and principles of instructional design that can help make the best use of them. In order to address this problem this paper will (1) review research that provides insight into the potential benefits of using online case-based materials in SEE courses and (2), relate these insights and findings to theoretical advances in educational theory and research-based knowledge of instructional design.

WEB-BASED PRESENTATION OF CASE MATERIALS

A study comparing arguments about practical ethical cases by high school students with the arguments of more experienced graduate students enrolled in an ethics program¹⁰ revealed differences in complexity in the use of various components of ethical reasoning, in the content of strategy chosen, and in the overall quality of responses. From these and previous research¹¹ a model was developed of moral problem-solving comprised of seven basic components as listed in Table 1.

Table 1
Component Model of Moral Case-based Reasoning

- Component 1 Identify the moral issue at stake
- Component 2 Identify the relevant knowledge and unknown facts in a problem
- Component 3 Offer a resolution
- Component 4 Offer a moral justification
- Component 5 Consider alternative scenarios that argue for different conclusions
- Component 6 Identify and evaluate longer term moral consequences
- Component 7 Offer alternative resolutions using interactive planning

Component 1 and 4, dealing with the identification and justification of moral issues, were divided into three categories according to the justification. Principled (PRINC) justifications appeal to general middle-level principles, such as a norm or rule (e.g., do not steal), consequential justifications (CONS) appeal to simple consequences, and role-specific obligations (RSO) justify the decision in terms of specific obligations that attach to professional expertise and role.

The key to the PRINC Strategy is the application of a general principle or rule to determine a course of action.^{11; see also 12} Following Joseph Raz's account of practical rationality,¹³ rules deal with cases directly. If the conditions for the application of the rule are considered met, the action prescribed by the rule is carried out. Conversely, if

the action is carried out, the action may be justified by appeal to the rule. Secondly, rules function by excluding other considerations and thus can be considered “exclusionary reasons”.¹³ In their practical role principles and norms provide students’ with ready solutions to difficult moral problems yet also carry with them a middle or intermediate level of justification.¹³ An example of this strategy can be seen in the response of one of our graduate students to a question about whether a physician, who feels that an elderly Medicare patient with hypertension “needs more than three days away from her demanding family to rest and recuperate (three days being the maximum hospital stay reimbursable by Medicare), should “report that his patient has a more serious condition.” This graduate student’s response uses Components 3 & 4.

No. To do so is to cheat all of us who pay for the system. If the old lady has a problem family it is a matter for social services, at worst, or perhaps light personal intervention at best.

Such an “exclusionary” attitude can effectively eliminate consideration of conflicting reasons. In this example, the force of the overridden claim (her stress over family problems) is discounted as a medical concern, and viewed rather as a “matter for social services.”

Some subjects’ employed a strategy similar in form to the PRINC, but rather than making appeal to principles or norms in defense of the solution chosen, these subjects made appeal to simple consequences. An example of the CONS strategy from a high school student uses Components 2, 3, and 4. In this case a resident physician must decide whether to inform the parents of an anorexic youth that she intends to leave the hospital to stay with a friend.

Yes, the resident should tell Jenny’s parents for two reasons. First, Jenny could starve herself to death while at her friend’s house. Second, if she leaves, her parents may sue the hospital and if the resident is found to have known the plot the resident could be reprimanded by the hospital.

A third cognitive strategy was identified that focuses on the identification of moral issues by analyzing the domain-specific features of the situation, and justifying actions on the basis of role-specific obligations (RSO) (e.g., “best medical interests of his patient”). The following is a graduate student’s RSO response to the first case. This response includes Components 2, 3, 4, 6, and 7:

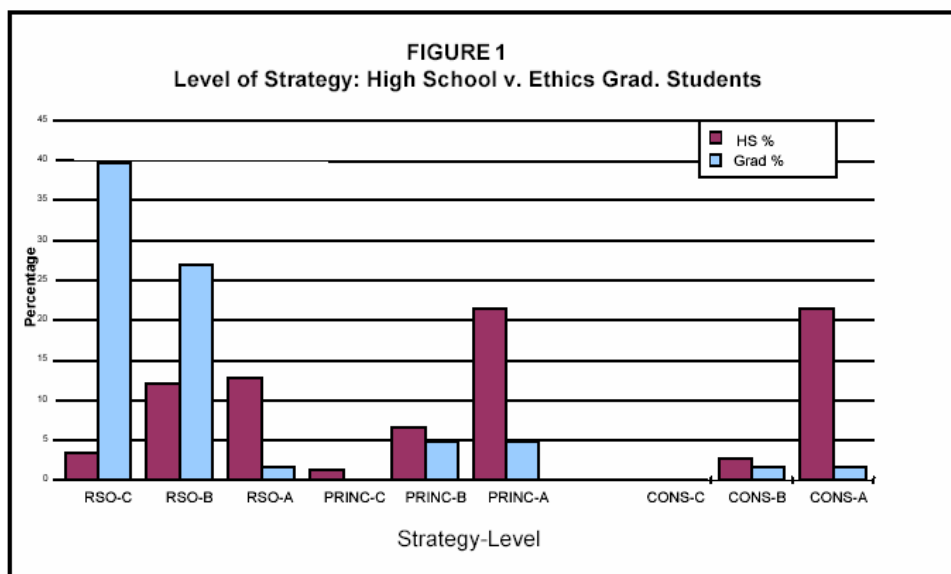
Dr. Lewis should not report a false diagnosis unless there is no other way to provide his patient with adequate care. He should investigate other possibilities (like a free care fund at hospital for a stay over three days, intermediate options such as independent living type nursing home away from her family, and alternative but correct diagnoses providing longer coverage), and failing other options, if he feels that it is in the best interests medically of his patient to remain hospitalized, he should report a more serious condition. Upon doing so, however, he should attempt to explain to his patient why he is doing this, so as to avoid future confusion about her health status.

In order to compare the complexity of graduate and high school student responses analyses of 212 protocols were classified into three mutually exclusive categories of increasing sophistication of Component use:

1. Level A - simple plan and moral justification;
2. Level B - any combination of two Components;
3. Level C - any combination of three Components (the second study added a Level D - any combination of four Components).

As one might predict, graduate students clearly employed more complex and more contextually sensitive ethical strategies than high school students. Most high school students provided a simple action and justification for their resolutions (Component 3 and 4). Whereas, graduate students were much more likely to specify conditions under which professional role obligations recommend actions and to consider their consequences in light of these conditions (Components 1 and 6) or, to appeal to hypothetical situations or extreme cases (Component 5) or generate creative middle way solutions to protect threatened values and honor obligations (Component 7).

Figure 1 shows the level of component sophistication (A to C) employed by high school and ethics graduates grouped according to the type of principle or justification applied - i.e., role-specific obligations (RSO); principled justifications (PRINC); and consequential justifications (CONS). As expected the Figure shows that only about 3% of the novice responses reached the C level (the most complex level) while, about 40% of the graduate student responses reached the C level. There were also clear differences between the high school and graduate students' choice of ethical strategy. Of the 63 graduate student responses, 68% evidenced a choice of the RSO strategy (Level A, B, or C). The 149 high school responses were more evenly distributed across the different strategies, with 30% preferring PRINC, 28% preferring RSO, and 24% preferring CONS, (others were coded as non-moral, unelaborated or mixed).¹⁰



Having empirically established some interesting differences in the quality of high school and graduate student's thinking, our efforts turned toward devising ways to structure online materials, cases, and commentaries in such a way as to maximize student learning. The specific goal was to present undergraduate students with authentic cases and case commentaries created by SEE instructors, using a format informed by previous research and principles of instructional design.^a Of particular interest in this study¹⁴ is the pedagogical rationale for the design of the web-based presentation of case materials. The basic idea was to present cases along with ethicists' commentaries on the cases, and then to structure the pedagogical environment to enable students to better understand and engage with the ethicists' commentaries on the cases. Various experimental conditions were created, ranging from a pedagogically very rich environment to less rich environments. In order to achieve this, an interactive website, <http://www.pitt.edu/~estudy/> was created where students experienced different organizational structures on different web pages depending on their experimental assignment.

In the most pedagogically rich environment, students were exposed to authentic cases, suggestions on moral problem-solving, case commentaries, and an explanatory structure. The explanatory structure provided a meta-cognitive scaffold to help students better grasp the rationale behind the strategies the ethicists apply in their varied responses. The scaffold was built by first coding the reasoning components for 10 different ethicists' resolutions of five cases, and then connecting each component of their commentaries, by hypertext links, to the meta-commentary descriptions. The meta-commentaries show how the linked portions of the commentaries relate to the suggestions on moral problem-solving and, hence, to the model (i.e., Components, 1-7 in Table 1, p. 414). Note that the students were exposed to several different or varied solutions to the problems by ethicists. Thus, pedagogical principles were employed that are based on advances in educational theory and problem-based learning, as discussed below. An example of how this environment was presented to students is provided in the screen on the following page.

In the Pre-test, the students were first presented with five cases. They were also provided with suggestions on moral problem-solving and were asked to prepare their analyses of each case and answer a set of questions. The suggestions that we recommended matched each of the components of the model in Table 1. Subjects were instructed to submit their answers by email.

After the Pre-test, the students were asked to spend between 40 and 60 minutes per case to review their responses to the five pre-test cases and to prepare answers to some additional questions. Students were assigned at random to one of three groups.

Group 1 – constructed alternative views for themselves and then responded to those views
Group 2 – read alternative views advanced in ethicists' commentaries and then responded to those views

a. Michael Pritchard, Charles Harris, and Michael Rabins collected the set of cases and commentaries used in our study (some of which ultimately appeared in their textbook, *Engineering Ethics*⁸).

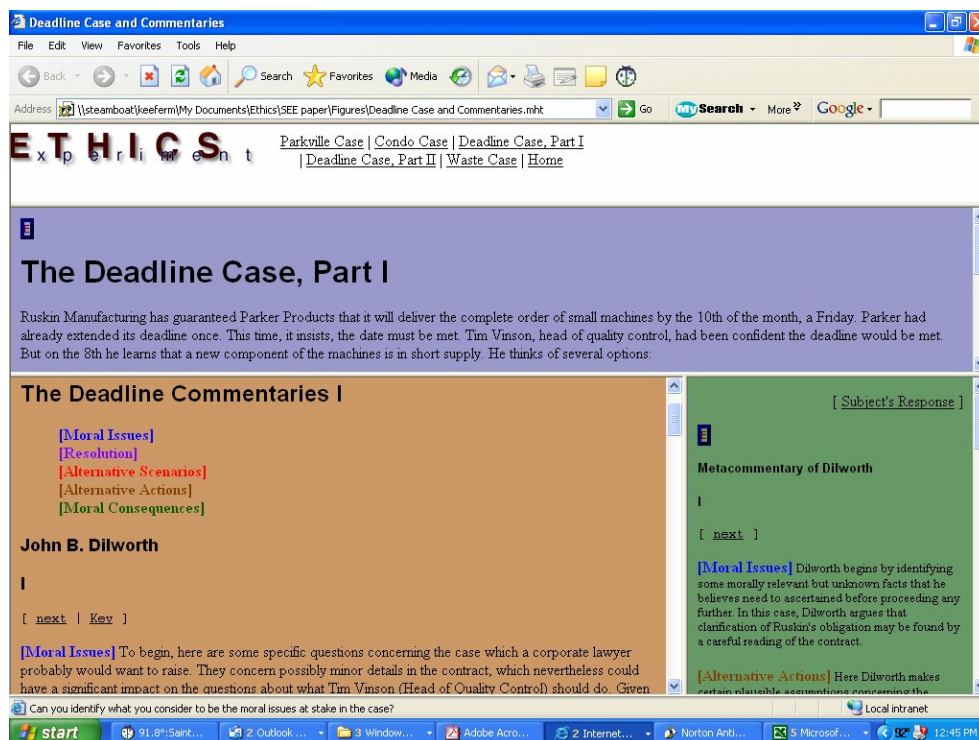
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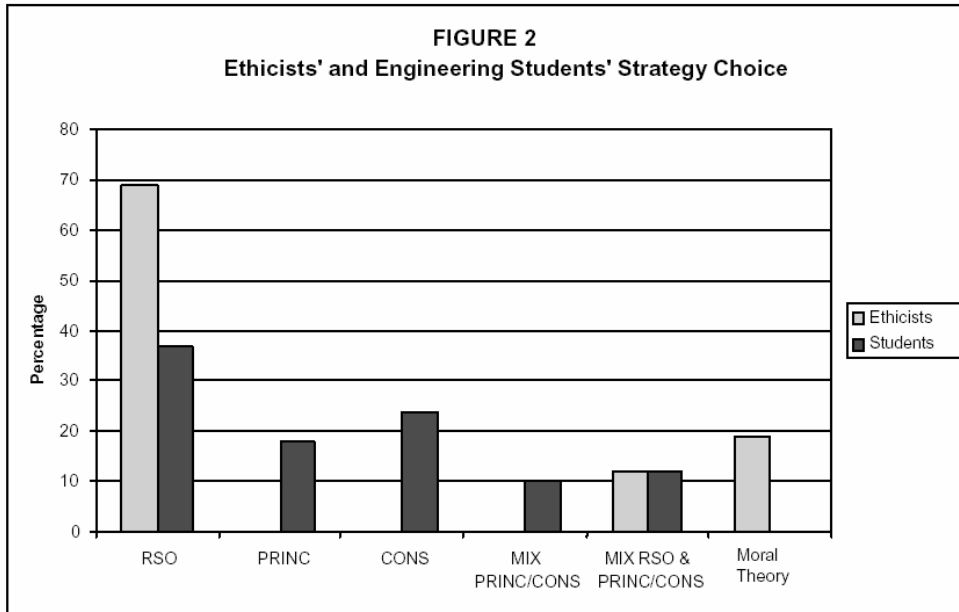
Group 3 – read alternative views advanced in ethicists' commentaries, read the meta-commentaries and links, and then responded to those views and the commentaries

The Post-test was nearly the same as the Pre-test, except that five new cases were introduced.

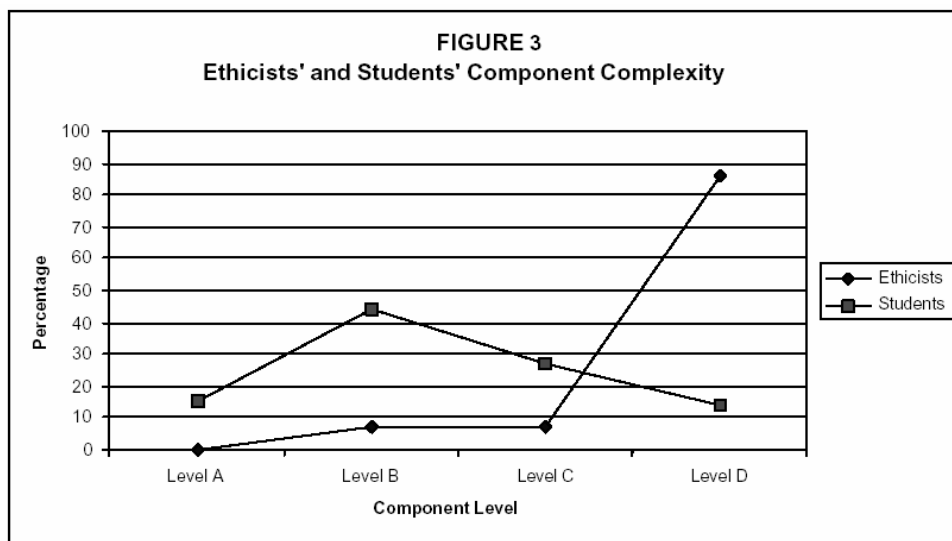
The findings from this study replicated those in the previous investigation.¹⁰ The experienced ethicists and some of the students who favored the RSO strategy (see Figure 2), use far more 'contextually sensitive' moral problem-solving components in their resolutions (see Figure 3). The ethicists also occasionally used a strategy that we labeled moral theory (MT) where they would appeal directly to justifications of a philosophical nature (e.g., categorical imperative, etc.).

In terms of reasoning, the ethicists (and some students) are more likely to identify different moral issues (Component 1), consider alternative scenarios that argue for different conclusions (Component 5), offer alternative resolutions that take into account divergent moral claims (Component 7), and identify and evaluate moral consequences of their responses (Component 6) than were those students who applied the more general strategies.





Legend: role-specific obligations (RSO); principled justifications (PRINC); consequential justifications (CONS)



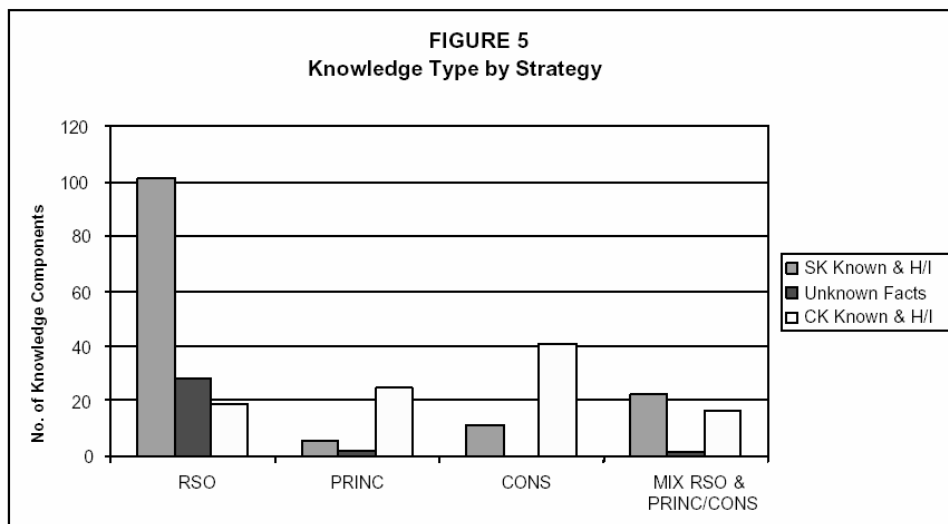
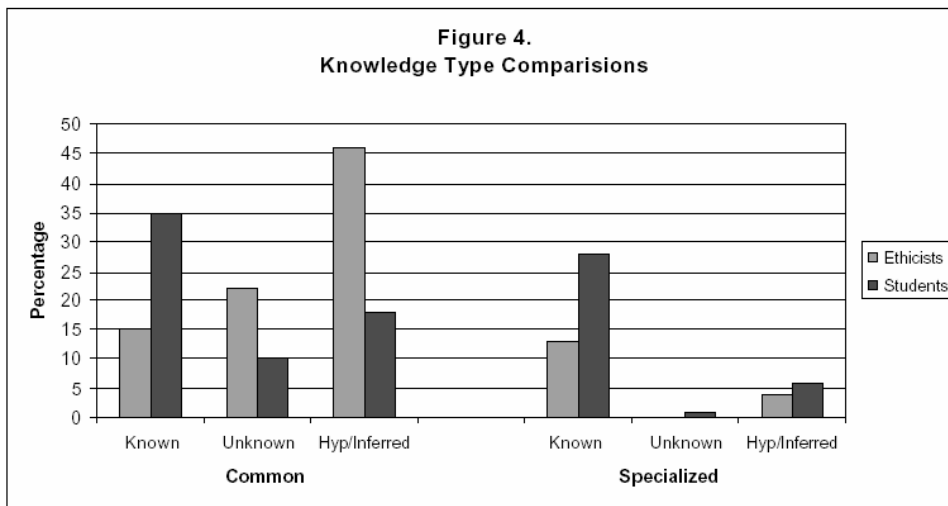
These analyses show that RSO resolutions reveal greater sophistication and complexity of component use. There also are significant differences in the application of specialized domain knowledge. Since acquiring a specialized body of knowledge is largely recognized as a defining feature of becoming a professional (e.g., see Whitbeck⁹) understanding how this knowledge is *used* in the resolution of cases became a top priority. Toward this end, the argument protocols were coded for the type of knowledge (Component 2) along two dimensions: (1) whether students invoke specialized knowledge (e.g., technical engineering knowledge) or common knowledge and, (2) whether relevant knowledge was previously known, unknown, or hypothetical

or inferred. Relevant knowledge is broken down into six sub-categories summarized in Table 2.

Table 2
Component 2: Identifying Relevant Knowledge

K (SK)	Specialized knowledge - Relevant known facts
U (SK)	Specialized knowledge - Relevant unknown facts
H/I (SK)	Specialized knowledge - Relevant hypothetical or inferred facts
K (CK)	Common knowledge - Relevant known facts
U (CK)	Common knowledge - Relevant unknown facts
H/I (CK)	Common knowledge - Relevant hypothetical or inferred facts

Figure 4 shows considerable differences between the ethicists and undergraduate students in the type of knowledge component they applied to the analysis of cases.



Legend: role-specific obligations (RSO); principled justifications (PRINC); consequential justifications (CONS)

How are these different types of knowledge used in different types of resolutions? Further analysis of the *use* of knowledge shows that more sophisticated types of knowledge and the choice of RSO moral principles are systematically associated with greater sophistication in use of ‘contextually sensitive’ reasoning components: – e.g., identifying alternative moral issues (Component 5), assessing the moral implications of actions (Component 6), and providing alternative practical resolutions to conflicts (Component 7) (see Figure 5).

For example, one of the case examples in the post-test describes a dilemma in which XYZ Company contracts ABC Company to supply custom parts for one of their products. After the agreement is signed, but before production of the part begins, an ABC scientist, Christine Carsten, determines that a much less expensive metal alloy can be used that only slightly compromises the integrity of the part. When Christine informs management, her boss asks her whether “anyone would know the difference”. When Christine answers that it would be unlikely the client could detect the switch, her boss decides to substitute the part without informing the client. The response of an undergraduate engineering student in the enriched Group 3 to the question “What should Christine do?” was:

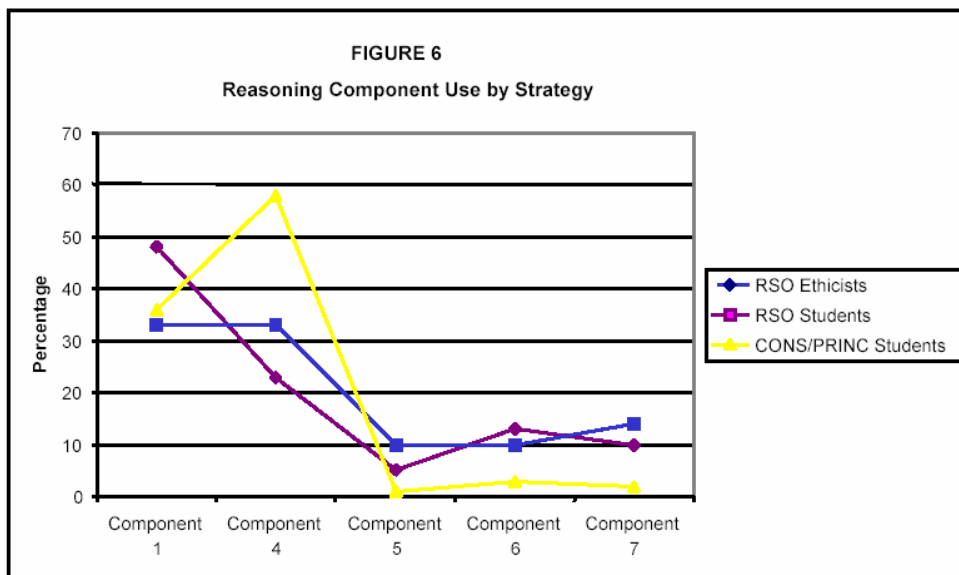
Christine’s actions should be based on the exact effect of using the less expensive alloy. If it would alter the product sufficiently to in any way violate the specifications given when XYZ signed the contract, then her best course of action would be to press for XYZ to be informed of this. If they receive parts which do not last as long as they expected them to, not only could they investigate more fully and discover the changed alloy, they could also cease to do business with ABC. If the specifications will not be met, the customer must be informed and allowed to make a decision on the matter. On the other hand, if it can be shown that the change in alloy will not deviate from specifications, then there is no absolute need to inform XYZ. It would however, in the interest of professional business practices, probably be a good idea to let them know (and perhaps save them some money). This way, everyone wins, and it will most likely enhance the relationship between the two companies.

This resolution shows a developing sensitivity on the part of this undergraduate student to context and the importance of professional knowledge, despite her lack of practical experience. In particular, it shows the importance of considering specialized professional knowledge in order to recognize moral issues, and this often includes identifying the knowledge that is not provided but nonetheless bears on a correct understanding of moral claims and the assessment of moral responsibility.

EDUCATIONAL IMPLICATIONS

Most students who applied general (non-role related) ethical principles or appealed to consequences in their resolutions (i.e., PRINC or CONS) also made more use of common rather than specialized knowledge (see Figure 5). These protocols exhibited what we termed a “justificatory mind-set” as students were more likely to recommend simple actions or simple plans as solutions and to adduce rules, principles, or simple

consequences in their defense. This trend did not hold for the students using the RSO principles. This contrast is shown clearly in Figure 6 with strong differences in the relative distribution of component use by strategy with RSO using more of Components 5, 6, and 7, and PRINC/CONS using more Component 4 (justification).



Legend: role-specific obligations (RSO); principled justifications (PRINC); consequential justifications (CONS)

One of the practical ‘costs’ that characterizes PRINC/CONS resolutions is that students appear to approach moral problem-solving as an attempt to find the best justification for choosing one action *over another*; a conception that may produce an “exclusionary” attitude or mind-set likely to reduce the motive to search for creative alternatives. Whitbeck makes this point when she cautions against providing cases that encourage moral agents to treat complex moral problems as “dilemmas”. That approach reduces moral thinking to a choice between horns of a “forced choice” dilemma, while ignoring complexities and conditions that might otherwise encourage students to treat the problem from a “design” perspective.^{6,7,9,15} Whitbeck’s “design” perspective would appear to be very similar to RSO moral thinking.

These findings highlight limitations of models of ethical decision-making that focus on identifying moral principles and/or on the justification for moral decisions.^{16,17} In particular, these findings caution against approaches that equate the moral reasoning component of an ethical response with moral justification. For example, James Rest’s model¹⁷ identifies four components: (1) moral sensitivity, (2) moral judgment, (3) moral motivation, and (4) moral action. However, a great deal of Neo-Kohlbergian research focuses solely on moral judgment and perhaps conceives this component too narrowly (i.e., as only component 4 in our model or component 2 in Rest’s model). In Stuart Hampshire’s terms,¹⁸ this research conceives moral problems engaged from the perspective of the moral *judge* or *critic*, and not from the perspective

of moral *actor* or *agent*. In contrast, the findings reported here suggest that several reasoning components in addition to justification are integral to mature ethical decision-making. These include the identification of moral issues, the use of relevant known and unknown professional knowledge, the consideration of alternate scenarios identifying alternate issues and actions, the search for creative alternatives, and the attention to the long term moral and practical consequences of actions.^b

The psychological issue of whether some moral problem-solvers are disposed *generally* to produce either a “justificatory” or more practical “design” strategy is a more difficult question. Famously, Carol Gilligan¹⁹ argued that these (and similar) strategies are indicators of different orientations of moral thinking characteristic of moral agents (i.e., Gilligan’s Justice and Care Orientations). Alternately, but along similar lines, strategies like these might be the manifestation of other enduring dispositional characteristics, e.g., tendencies to appeal to either rational or emotional psychological resources in moral thinking.²⁰ Pedagogically, this would suggest that, at least for some students, a pervasive ‘bias’ or preference toward a justificatory mind-set might indeed present a reasonable remedial target for SEE instruction. However there are both theoretical and empirical considerations that argue against pushing the separate orientation or dual disposition view too far. For example, it is argued above and elsewhere (see Keefer^{11,12}, see also Raz¹³) that these very different practical strategies can be understood within a unified theory of practical reason and, so, there is no need for appeal to distinct psychological orientations of moral thinking to explain observed differences. In addition, research has shown that students will often change strategies or “orientations” when presented with different moral contexts and challenges. In some cases, when deeply cherished values are perceived to be at risk in “hard” moral dilemmas, moral agents may choose to opt out of the “hard-choice” decision mode and adopt more practical “design” strategies (i.e., what Harris and colleagues call “creative middle-way” solutions).⁸ More specifically, the choice of orientation may be a function of the different values the individual or gender prioritizes when faced with “hard” moral choices.^{11,12,21} Under certain conditions, the same persons and genders can be enticed to switch strategies depending on which values are at stake in which circumstances.¹¹

Finally, with regard to the pedagogical effectiveness of the scaffold and intervention described here, while improvements in the students’ ethical thinking were in the right direction (comparing Groups 2 and 3 with the experimental Group 1), the results were not statistically significant. Perhaps this was due to the limited exposure to case commentaries and scaffolds in the intervention phase (five cases). It is interesting to speculate about what effect might be produced if the “intervention” phase described here were used in a complete SEE course. What follows is a discussion of some relevant recent advances in educational theory and instructional design, particularly in the area of problem-based learning, followed by some examples of how these principles might be applied to SEE instruction.

b. Nor should this list be interpreted as exhaustive.

EDUCATIONAL THEORY AND PRINCIPLES OF INSTRUCTIONAL DESIGN

Following Jean Piaget it is now a commonplace that the acquisition of knowledge is considered a constructive process.²² It should be noted however, that Piaget's constructivism was more epistemological than ontological. Learners must come to know the world through their own activity; yet, the knowledge structures acquired contain formal and logical properties that Piaget considered universal (e.g., hypothetico-deductive thought). In contrast, Lev Vygotsky's prioritizing of socio-cultural mediating forces in the development of higher-level mental functions means that socio-historical factors condition knowledge itself and, so, the structures of higher order thinking are conceived as a social as opposed to an individual construction. In Vygotsky's view, knowledge and thinking emerge first from social and institutional contexts, and understanding the structure and purposes of knowledge is not possible without considering its role in the contexts that produce it.²³ Prioritizing of the *social* and the *situated* aspects of thinking (over universal formal or logical aspects) provides an understanding of knowledge as distributed, between both individuals and social-institutional contexts.^{24,c} Understanding knowledge as socially constructed, situated and distributed has radical implications for instruction in education. Recent research in problem or inquiry-based learning owes much to this philosophical view and many have attempted to translate these views into guiding principles for inquiry or problem-based learning programs.²⁵⁻³¹

These theoretical advances suggest useful instructional principles that may prove handy when using case study materials and other online ethical resources. Here is a summary of five key pedagogical principles followed by brief illustrations of their implementation in SEE courses:

1. Anchor curriculum and instruction within contexts that include authentic problems and case examples^{27,29,32}
2. Help students to appreciate and respond to complex problems that require multiple steps with different possible solutions^{26,27,33}
3. Challenge students to assess, revise and reflect on their own thinking and provide them with multiple opportunities to have their thinking challenged by other students, ethicists, professionals, or other outside resources³⁴⁻³⁶
4. Connect learning outcomes to relevant problems or cases that require realistic products or performances and that demonstrate knowledge^{34,37,38}
5. Use collaborative learning activities that provide opportunities for students to experience "distributed expertise" and shared social responsibility^{25,33; 39-42}

c. For a cognitive analysis of the distributed functions of collective informal argumentation; see reference 22.

Use of Principles 1, 2, 3, and, to some extent, 4 are indicated in the online educational intervention described above. Additional exemplars for SEE courses are evident in some practices Caroline Whitbeck employs in her SEE courses.^d

Characteristic of a course Whitbeck teaches are various structured opportunities to work with realistic resources that provide students with supports for ethical problem-solving. The resources, mostly accessible through <http://www.onlineethics.org>, provide students with innumerable links to cases, commentaries, ethics codes, and other online supports (including those used in the study described above).

In one project (<http://onlineethics.org/edu/see/index.html>), Whitbeck asks students to identify a problem of professional responsibility that combines “ethical reflection with investigation of sources of ethical support”. The students proceed by first familiarizing themselves with materials (beyond those found in libraries) in order to specify professional norms and problems characteristic of the profession (Principle 1). The goal is to create conditions most likely to challenge students with what she terms “a design problem”, the kind of everyday problems students are likely to encounter in their professional practice. That is, one that suggests multiple possible courses of action offering different possible resolutions (Principle 2). Whitbeck provides students with detailed suggestions and strategies for creating these scenarios.

Once the problems or scenarios are developed students are encouraged to conduct interviews and collaborate with working professionals who are likely to have day-to-day experience with these sorts of situations and problems (Principle 1 and 3).^e Oral reports are then prepared, presented and discussed in class (Principle 3 and 5). Whitbeck’s goal is to enable students to acquire understanding of practical steps necessary to work through these “design problems” (Principle 4). The exercise therefore, also serves to help students identify possible actions and supports that they later, as professionals, might utilize when confronted with these or similar situations.

SUMMARY, CONCLUSIONS, AND FUTURE DIRECTIONS

Increasingly, SEE instructors are exposed to a vast array of accessible web-based resources that include authentic cases, codes, commentaries, and other potentially engaging instructional materials. When effectively integrated into SEE courses, these materials have the potential to be of great benefit to students. However, the mere existence of accessible online materials in no way guarantees improvement in the quality of SEE course offerings. If instructors lack conceptual knowledge of the benefits of web-based case materials, or the practical understanding of how best to

-
- d. I was very fortunate to be included in an NSF sponsored workshop addressing online ethics instruction conducted in the summer of 2002 hosted by Joan Sieber. There I was able to learn more about current instructional practices using online materials from participants such as Caroline Whitbeck, Michael Loui, etc. In addition, a few years back I had the opportunity to observe Rosa Pinkus teaching ethics to medical students at the University of Pittsburgh.
 - e. In her syllabus Whitbeck states that students should “consult sources written for scientists and engineers or the general public, such as codes or articles published by your professional society, the Online Ethics Center for Engineering and Science, or the news media.”

integrate their materials into their courses, then any assumed advantages of online delivery may prove illusory. Perhaps worse, if instructors lack the knowledge to utilize these engaging case study materials, they may be easily replaced with inferior methods and materials, and online course delivery, as Huff and Frey suggest, will only magnify rather than diminish inferior pedagogy.²⁰

For example, there are many questionnaires and simplified force-choice case-scenarios available that ‘funnel’ students through right, wrong, multiple-choice questions that stifle or eliminate more creative solutions (e.g., “design” solutions that consider ethically sound alternatives, preventive precautions, and long-term consequences). Another difficulty is that some instructors (and institutions) often choose to assess ethical instruction using measures that were not intended for this purpose. For example, in the search for reliable instructional or program evaluations some turn to assessments that were originally designed to evaluate theories of moral thinking and development (e.g., Defining Issues Test (D.I.T.)¹⁷). Putting aside any opinion regarding the value of these theories, the kinds of instruments used to validate them are unlikely to be those most useful in the assessment of problem-based approaches to SEE instruction.

In a current NSF funded project in collaboration with Caroline Whitbeck, we are developing a questionnaire designed specifically to measure ethical orientations of students’ taking SEE courses. We noticed that instructors of SEE courses often confront students with somewhat naïve or extreme ethical beliefs, characteristically of either an absolutist or relativist variety. Our scale distinguishes these beliefs and, in addition, identifies a design or problem-based ethical perspective identical to what these SEE courses are intended to promote.^f We are also developing annotated scoring guides of design or problem-based ethical reasoning and examining the relation between students’ scores on the scale and scoring guide. It is our intention to make these measures and materials available online when the development work is completed.

The research summarized here suggests that there are real benefits to presenting online cases and case analyses to support students’ ethics instruction. Courses using these principles and materials are also likely to prove of greater benefit to students when they enter their chosen profession. For example, they might help students understand how professional ethics’ codes apply and extend common morality to the special obligations (i.e., “middle-level” principles) that derive from specialized professional knowledge. Helping students recognize the important relation between

f. Thirty-six Likert-type items thought to encompass the three ethical orientations were generated and pilot tested with a sample of approximately 160 college students. Principal components analysis of these data showed that each of the three orientations was clearly represented by a distinct factor defined by 8-11 of the items. Analyses of the internal consistency of the items representing each of these scales indicated that two of the scales had good reliability (internal consistencies of approximately .79), while one scale had only adequate reliability (internal consistency of .63). Additional development work is being conducted to increase the reliability of the latter scale. The author would like to recognize the efforts of Val Turner and Victor Battistich in the development and testing of the scale.

professional knowledge and their associated role-specific principles is an important instructional goal. Evidence suggests that this goal is best accomplished when these obligations are embedded in curricula that challenge students with authentic problems and that provide authoritative instructional supports.

Recent trends in educational theory also suggest that instruction is most successful when integrated into realistic instructional contexts. These instructional contexts should provide students with the chance to construct diverse and meaningful resolutions along with opportunity for informed feedback and challenge. However, the design, implementation and assessment of these types of learning program are not easily accomplished. They require the careful development of online curricula that can generate authentic problem-based activities, and yet are capable of providing for serious assessment of various learning outcomes and consequences.

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