Ethical Analysis of Publisher and Faculty Roles in Building and Using Electronic Educational Products

Jay Shiro Tashiro, University of Ontario Institute of Technology, Canada

ABSTRACT

150 words or less.

Keywords: *educational ethics; electronic educational products; e-products for education; ethics and academic publishing; ethics and healthcare education*

ETHICAL ANALYSIS OF PUBLISHER AND FACULTY ROLES IN BUILDING AND USING ELECTRONIC EDUCATIONAL PRODUCTS.

Development and usage of electronic educational products has dramatically increased at all academic levels, as well as in professional development, continuing education, and industry training (Gibson, Aldrich, & Prensky, 2007; Selfe & Hawisher, 2007; Kapp, 2007). Publishers of electronic instructional materials have produced and marketed a diversity of educational products, including educational games, simulations, ebooks, course cartridges, and automated learning assessment tools. These products have been deployed by CD, DVD, on dedicated websites, and within learning management systems. However, there is still scant evidence documenting these products' effectiveness, especially in critical skills development areas such as undergraduate healthcare education.

The weak evidence base for effectiveness led us to apply an ethical analysis to the production and usage of electronic instructional materials developed for healthcare education.

Specifically, we asked the question, "What are the ethical implications that few instructional materials have an empirical foundation for their effectiveness?" This work began in 1996 when we explored an argument that the methods and materials of healthcare education should be held to standards analogous to those of evidence-based medicine. Such standards for healthcare education could reasonably be called a framework for *evidence-based learning*. Recently, Liberati and Vineis (2007) synthesized earlier definitions and described evidence-based medicine (EBM) as medical actions (diagnosis, therapeutic interventions, and prognosis) that are based on rigorous empirical foundations (also see earlier work by the Evidence Based Medicine Working Group, 1992). Over a decade ago Tashiro and Rowland (1997) argued educational methods and materials should be based on rigorous empirical foundations, at least sufficient to answer the confounded questions of what really works in education, for whom, how, when, and with what outcomes.

Of course, proponents of EBM believe it is possible to create and utilize empirical frameworks for medical practice. Practice is then based on quantitative data from rigorous clinical epidemiological research that utilizes randomized controlled trails (Liberati & Vineis, 2007). Analogous research for studying the efficacy of instructional methods and materials has not been well developed. The absence of such an empirical foundation raises questions about what ethical standards are used to evaluate publishers who create electronic instructional materials and faculty who use them.

Certainly, there are some evidence-based frameworks for education. The United States National Research Council (2000, 2001) reviewed a broad research literature and offered a streamlined list of critical issues in developing educational materials. These issues can be expressed as seven questions that set standards for any kind of instructional materials: (1) How do the instructional materials enhance predisposition to learn? (2) How do the materials provide multiple paths for learning? (3) How does an instructional package help students overcome limitations of prior knowledge? (4) When and how do the educational materials provide practice and feedback? (5) Can the instructional materials help students develop an ability to transfer knowledge acquired by extending knowledge and skills beyond the contexts in which they were gained? (6) How will the instructional package incorporate the role of social context? (7) How and why will the instructional materials address cultural norms and student beliefs?

The vast majority of instructional materials (electronic and non-electronic) do not address all of these issues. With the proliferation of electronic educational materials we have an opportunity to examine emerging product development strategies within an ethical framework related to whether or not an electronic instructional product actually works to improve the learning outcomes for which it was designed. For example, the Federation of American Scientists (FAS) explored development and usage of electronic educational materials, particularly the roles of videogames and gaming technologies for improving education. FAS described ten specific educational attributes for application in learning, which were derived from advances in cognitive and learning science (Federation of American Scientists, 2006; see pages 18-20). FAS argued that electronic educational materials should provide: (1) clear learning goals; (2) broad experiences and practice opportunities that continue to challenge the learner and reinforce expertise; (3) continuous monitoring of progress and use of this information to diagnose performance and adjust instruction to a learner's level of mastery (see also research on adaptive learning and teaching); (4) encouragement of inquiry and questions, and response with feedback appropriate to learner and context; (5) contextual bridging, which is closing the gap between what is to be learned and its usefulness to the learner; (6) engagement leading to an increased time on task within a learning

environment; (7) motivation and strong goal orientation; (8) scaffolding in the form of cues, prompts, hints, and partial solutions to keep learners progressing through the activities in a learning environment; (9) personalization that allows tailoring of learning to the individual learner; and (10) infinite patience inherent in an environment that literally does not tire of repetitive actions and so provides learners with innumerable opportunities to try a learning activity over and over.

Both the National Research Council and FAS recommendations have strong research foundations. We believed the reviews of the National Research Council and FAS provided sufficient evidence that instructional methods and materials could be constructed and evaluated within the empirical frameworks that led to these recommendations. Using these research frameworks, and with funding from the National Science Foundation (DUE CCLI-EMD 9950613), the National Institute of Nursing Research (1R43 NR05102-01), and grants from a publisher, our research and development team built and studied the effectiveness of computer-based learning environments that contained clinical simulations designed for undergraduate healthcare education. During this research, I was able to conduct a participant observer case study of student-faculty interactions and usage of instructional materials in 1998-1999. While building electronic educational materials during 1998-2007, our research-development team was able to study a publisher's processes for developing and reviewing instructional materials prior to distribution and sales. However, this decade of work led us to an ethical quandary that forced us to consider the complexity of building and evaluating educational methods and materials.

We had begun work in 1998 believing that careful attention to frameworks for evidence-based learning could lead to more rigorous foundations for educational theory and praxis. Although large-scale randomized controlled trials have been rare in educational research, there have been many substantive critical appraisals, meta-analyses, and systematic reviews that provide the kinds of empirical frameworks we delineated earlier as recommendations by the FAS and National Research Council. We did not anticipate the publishers' and undergraduate faculty members' limited understandings of how and why to use instructional methods and materials that are based on evidence for improving teaching, learning, and learning outcomes.

Certainly, such limited understanding can be rationalized for faculty at all academic levels in the context that they receive little training in educational research. Undergraduate faculty members in particular, and with the exception of faculty in education, are trained in their disciplines but not in how to make decisions about teaching their disciplines with the same rigorous peer-reviewed criteria that characterize their discipline-specific scholarship and research. Publishers are businesses, and while they can claim peer-reviewed and rigorously researched instructional materials they seldom have conducted any research on the actual effectiveness of the materials in improving educational outcomes.

Based on a body of work in science education, Tashiro and Rowland (1997) argued that there were six factors that constrain improvements of education in undergraduate settings and so lead to serious obstacles to educational reform in the sciences that might provide more inclusive educational practices and improve student learning outcomes. These factors were: (1) limited kinds of faculty professional development in research related to teaching and learning; (2) lack of communication and collaboration within and between departments, colleges, and universities; (3) lack of faculty training in pedagogy and curriculum development; (4) faculty unfamiliarity with methods of student learning assessment or of course and program evaluation; (5) faculty unfamiliarity with important models of K-12 and undergraduate interdisciplinary, research-oriented, and instrumentation-rich science courses; and (6) departmental and institutional difficulties in developing and maintaining inclusive, viable communities of learning (described in terms of

enhancing the education of minority students within the literature of the Quality Education for Minorities Network, 1992; also see Sullins, Hernandez, Fuller, & Tashiro, 1995).

We began to explore the ethical issues emerging from publishers' and instructors' limited understanding of how and why to use electronic instructional materials that have evidence for effectiveness in improving learning outcomes. Quite opportunistically, a one-year observer-participant case study of undergraduate Nursing education evolved into a series of research and development projects focused on building electronic educational materials for healthcare students. The case study examined faculty and student usage patterns of educational materials in a baccalaureate Nursing program, while the research and development efforts allowed a detailed study of working with publishers to produce and market electronic educational materials for training undergraduate Nursing, medical assistant, and emergency medical services students. We continued to follow our interest in evidence-based learning and evidence-based medicine as the case study and work with publishers evolved. In 2007, we began a retrospective ethical analysis of the data from the case study and work with publishers. The model for the ethical analysis was derived from the medical ethics literature, especially in regards to finding suitable analytical frameworks for evaluating the ethical issues of publishers' and faculty members' actions in production and use of healthcare educational materials.

We limited the scope of the ethical analysis by focusing on electronic educational materials and the recommendations proposed by the Federation of American Scientists (2005). We also stipulated that, as much as possible, we would select methods of ethical analysis that would provide an accessible and culturally neutral approach and that would not be constrained by "personal philosophy, politics, religion, moral theory, or life stance" (c.f. Gillon, 1994; see page 194). Finally, we worked within analytical frameworks that had been used to examine ethical issues in healthcare and that provided

opportunities to explore relationships between evidence-based learning of healthcare students and evidence-based practice of healthcare providers.

METHODS

We conducted a retrospective analysis of data from two research projects that were implemented back-to-back beginning in 1998 and ending in 2007. These data then became the focus of an ethical analysis of publishers' and faculty members' actions in production and use of healthcare educational materials. The retrospective analyses of the two research projects are presented in separate subsections below, followed by the methods of the ethical analysis.

Faculty and Student Usage of Instructional Materials

In 1996, I left a tenured position as a departmental chair at a state university and entered a baccalaureate Nursing program, to become a nurse and focus on developing healthcare services for communities that were underprivileged in terms of healthcare access and quality. Entering a BSN program in Fall 1997, I completed the coursework and clinical rotations, receiving a degree, passing the NCLEX-RN, and receiving the RN license in 1999. During the period of being a full-time Nursing student, I studied the processes of education I was experiencing.

The research was conducted as a participant-observer study of baccalaureate Nursing education using a method I called "*nursing verstehen*," modeled after Ferrell's *verstehen* methodology for field research in sociology (Ferrell, 1998; Ferrell & Hamm, 1998). The *verstehen* approach derived from work initially described by Max Weber and explicated by Outhwaite (1976) and Truzzi (1974) prior to Ferrell (1998; Ferrell & Hamm, 1998). I implemented the study beginning in Fall 1998 and continued the study through the Spring of 1999. The research was approved by the Institutional Review

Board of Northern Arizona University.

The research was developed as a phenomenological approach, examining the lived experiences of Nursing students through observations of and interviews with classmates. Data collection was unstructured in the sense that I did not establish a set of predetermined experiences to record, but described and recorded the lived experiences of students as I worked with them while attending classes and clinical rotations, as well as socializing with them during meals, studying, and attending social events. I was a full-time student throughout the period of the research, completing all of the academic requirements imposed on any student in the Nursing program.

In parallel to work with students, I was a Research Associate providing support in research activities to Nursing faculty. During 1998-1997, my work included helping with grant proposal writing, research design, and generalized support in the area of educational theory and praxis. Data records for interactions with both students and faculty were maintained in journals as well as in notes from post-clinical debriefings and notes on interviews with classmates and faculty. Assigned collaborative course projects provided additional sources of data related to how, why, and to what end faculty chose educational objectives and students worked to achieve these objectives. The retrospective analysis of this earlier research included the following research perspectives and their data collection methods.

1. Student usage of instructional materials: Observations of students, interviews with them, and participation in collaborative assignments provided data on student usage patterns and perceptions of instructional materials.
2. Normative values of students for academic work: Notes from post-clinical debriefings, journals on students' perceptions of academic work, and participation in study groups provided data for probing normative values of students.
3. Student learning outcomes: Data on learning outcomes came from my own analyses of their knowledge within areas that I had taught (physiology, anatomy and physiology, reading and evaluating research papers, and statistics). However, many of my classmates also shared their grades and since I had studied with them I could contextualize their outcomes within their situated learning experiences.
4. Faculty selection of instructional materials: Working as a Research Associate I had unusual access to faculty discussions about how and why they choose instructional materials. As a student, I also heard faculty reasons for their choices of course materials.
5. Normative values of faculty teaching: I evaluated faculty teaching in the context of my research in the theory and praxis of education. My class notes and interviews with faculty also provided probes of faculty normative values in teaching.
6. Faculty familiarity with research on teaching, learning, and assessment: As a Research Associate and in the process of writing grants and designing research, I gathered information on faculty knowledge of educational research.

The *verstehen* methodology requires that the researcher be submerged in the situated logic and emotion of the activities that are the focus of the research (Ferrell & Hamm, 1998). I was completely involved in being a student, subject to the potentials for success and failure that other students experienced. I also had abandoned, at least in part, the securities of previously existing personal and professional identities. The research biases most relevant to the *nursing verstehen* that I conducted were: (1) my set of values as a committed life-long student; and (2) my conclusions from earlier studies of six factors shaping systematic constraints in undergraduate science and mathematics education (Tashiro & Rowland, 1997). The first bias was my perspective as a faculty member for 20 years prior to the research, and I may have been more critical

of my classmates than they deserved (e.g., not being sympathetic to students' complaints about workload). My second bias came from studies of factors shaping constraints in education and may have brought out harsher evaluations of some faculty than they deserved (e.g., a lecture was poorly conceived and badly delivered, the assignments were not very coherent, the choice of readings was not particularly related to the lecture or the examinations, and so on).

Publisher Evaluation of Instructional Materials

The research conducted as a participant-observer in Nursing education allowed me to propose and secure funding for a series of projects building new models of electronic educational materials for Nursing, medical assistant, and emergency medical services students. The basic learning environment was a simulation model developed into virtual worlds of clinical scenarios with complex patients. The early work and research during 1998-2000 was supported by funding from National Science Foundation (DUE CCLI-EMD 9950613 and RED 9254398) and the National Institute of Nursing Research (1R43 NR05102-01). The rules and skin of the simulations (Bogost, 2007) were extensively studied during 1998-2000 and the Nursing simulation model we built was revised through research to provide learning environments that improved clinical judgment of baccalaureate Nursing students. Three publishers were very interested in the use of such evidence-based, computer-delivered simulations for health sciences educational materials. The research-development team negotiated and implemented a series of contracts during 2000-2007, building electronic educational materials with one publisher.

During implementation of these contracts, I led a research-development team that built electronic educational materials for the publisher and studied the processes of the publisher's evaluation of these materials prior to release to faculty and students. The data collection and analyses fell into four categories.

1. Implementation of a software development protocol: We had designed a software development protocol from the industrial and research literature. During the research period we revisited this protocol numerous times with the publisher, recording areas of disagreement in a Web-accessed database.
2. Status reports to the publisher: Routine status reports to the publisher provided a rich source of data on areas of convergence and divergence of opinion about how and why to build educational materials.
3. Ongoing research on usability of and market receptivity to products: We conducted numerous studies of software usability and also probes of market readiness for the types of simulations we were building. Records of these studies provided data on sources of agreement and disagreement between the research-development team and the publisher.
4. Quality assurance and quality control studies: Ongoing work related to the quality of the educational materials provided data on factors shaping our and the publisher's choices for product design and functionality.

The retrospective analysis of the data focused on the differences in perspectives of the simulation research-development team and the publisher's perceptions of how to build evidence-based educational materials. Specific themes within this analysis were: (1) sampling of the users' (faculty members and students) perceptions of the product in the educational market, (2) evidence used as criteria for revising products, and (3) quality assurance and quality control criteria during the product development process.

Selection of Framework for Reflecting on Ethical Issues in Production and Usage of Instructional Materials

We examined a number of ethical frameworks that might serve as a lens for examining ethical issues faced by publishers and faculty in the development and usage of educational materials. In our opinion, there were two promising options for our analysis. The first option evolved from an interdisciplinary team known as the Tavistock Group, which identified five principles and promoted these as a set of shared ethical principles that could bring all healthcare stakeholders into a more consistent moral framework (Smith, Hiatt, & Berwick, 1999). The second option was a set of four principles that was originally described by Beauchamp and Childress (2001) and developed more completely by Beauchamp (2003) and Gillon (1994, 2003; see also the symposium of papers in the *Journal of Medical Ethics*, volume 29). We used the "four principles plus attention to scope" approach as described by Gillon (1994).

Gillon (1994) argued that the four principles of respect for autonomy, beneficence, non-maleficence, and justice could be applied as a "simple, accessible, and culturally neutral (page 184)" approach to studying ethical issues in healthcare. Gillon qualified the four principles by adding "attention to scope" because of the need to examine the scope of the application of the principles. Furthermore, he argued that these principles were common, basic prima facie moral commitments that could provide an ethical analytical framework as well as a basic moral language for studying ethical issues in healthcare. We used these four principles to evaluate a publisher's approach to developing educational materials and faculty members' approaches to usage of instructional materials.

Our analysis used the following specifications of the four principles and attention to scope, based on Gillon (1994; with some clarification from Gillon, 2003, and Beauchamp, 2003).

Autonomy. Autonomy as a principle is the requirement for obtaining consent from people before we do something to them. In healthcare, autonomy manifests as informed consent of patients prior to medical interventions. In education, autonomy is informed participation of students in the teacher-student dynamics that constitute the educational processes of a course, curriculum, or program of study.

Beneficence. Beneficence as a principle in healthcare planning, delivery, and evaluation requires a commitment to providing the benefits healthcare providers profess that they are able to provide. In education, the principle of beneficence requires commitment to providing the benefits that publishers and faculty members profess they are able to provide, namely respectively building and using effective educational methods and materials in the planning and delivery of educational practices as well as in evaluation of learning outcomes.

Non-maleficence. Non-maleficence as a principle imposes the requirement that we avoid causing harm (Beauchamp, 2003). In healthcare, this principle requires that providers carefully weigh the risks and manifestations of harm as they select and implement care that is likely to yield net benefits to a patient. Educational non-maleficence similarly requires attention to the risks and potential harm of educational methods and materials developed, selected, and implemented to help students achieve learning outcomes.

Justice. The principle of justice imposes a moral obligation to use fair decision-making processes to select among competing claims. Beauchamp (2003) argues that justice as a principle in healthcare requires "obligations of fairness in the distribution of benefits and risks (page 269)." Within educational settings, and using the framework of Gillon (1994) for healthcare, distribution of educational benefits and risks requires attention to fair allocation of scarce resources, respect for individuals' rights, and respect for morally acceptable laws.

In terms of "attention to scope," we limited the scope of the analysis to undergraduate healthcare courses that faculty members teach and to the students enrolled in such courses. For publishers, we limited the scope to un-

dergraduate electronic healthcare educational materials that they develop, distribute, and sell in educational markets.

We then applied these principles and attention to scope as a framework to understand ethical issues emerging from the studies of faculty and student usage patterns of educational materials and the roles of publishers in developing, promoting, and selling educational materials to faculty and students.

RESULTS

Faculty and Student Usage of Instructional Materials

Sifting through the lived experience of being an "undergraduate" student led to delineation of four student themes important to selection and usage of educational materials. In addition, three themes related to faculty were identified that were important to selection and effective implementation of instructional materials. I note that I was certainly different from my classmates in a number of ways. However, I was readily accepted and spent many, many hours with classmates. The following student themes emerged during these academic and social interactions and were consistent throughout the period of study.

1. Students had tremendous potential for rigorous coursework but experienced educational methods and materials that promoted rote learning.
2. Students had underdeveloped knowledge and skills in key areas of healthcare.
3. Students' normative values favored underachievement.
4. Students did not have the knowledge and skills to evaluate the adequacy of educational methods and materials.

On the faculty side, discussions with faculty and subsequent discussions with faculty from other institutions convinced me that the Nursing program I attended was fairly typical of BSN programs in the United States. Based on NCLEX-RN pass rates, the program was a bit above average compared to regional and nationwide pass rates during the period I was enrolled. The themes related to faculty are consistent with the factors identified by Tashiro and Rowland (1997).

1. Very few faculty members had training in pedagogy, instructional design, or in course and curriculum development.
2. Very few faculty members had training in methods of course and program assessment, or in authentic assessment of learning outcomes.
3. The university and department provided very limited kinds of Nursing faculty professional development in research related to teaching and learning.

These four student and three faculty themes are confounded. Lack of faculty training in the theory and praxis of education contributed to implementation of learning environments that did little more than promote rote learning, not pushing students more deeply and broadly into course work to overcome weaknesses in key areas of healthcare. Among these key areas, I identified underdeveloped knowledge in basic science, low quantitative skills, weak technological literacy, inadequate training in health informatics, little knowledge of cross-cultural perspectives, and inadequate training in evaluating research and technical literature.

Interestingly, my classmates had a high potential for learning and rigorous coursework. I was convinced the top 25% could have been successful at the graduate level and successfully completed masters or doctoral work. This conclusion was based on working with classmates through a variety of academic tasks and from my work with graduate students. I would have accepted any of these 25% as my own graduate students, but would have recommended additional work for most of these students in quantitative and qualitative reasoning as well as in the basic sciences and cross-cultural training.

The normative values of both faculty and students interact in ways that inhibit innovation in and effective use of educational methods and materials. At the university in which I completed my Nursing degree, I rated most of the university's curricula as less rigorous and demanding than I had developed and implemented as a faculty member in two well-respected American liberal arts colleges and recently developed in a research-intensive university in Ontario, Canada. However, during my experience as a Nursing student and Research Associate in Nursing, I was able to probe the normative values held by my classmates and instructors related to teaching and learning.

On the student side, my classmates expressed that they had to work too hard and they resisted increased coursework. Students also overestimated the quality of the educational methods and materials they encountered. Most of my classmates believed Nursing at this university was a rigorous professional program, probably because of their experiences with the types of learning environments they encountered in their other university courses. On the faculty side, instructors believed they were pushing students to their limits, perhaps even asking too much of them at times. Yet, the faculty had limited experience working in other institutions, they received very little professional development related to teaching and learning, and received scant professional development in research on teaching and learning. Of course, why should they have had such training? Very few faculty members in any university department receive such training, except those in colleges of education. In brief, the normative values of students, important impacts from student evaluations, and the Nursing program's promotion and tenure processes often interacted to reduce the rigor of the educational program.

During the participant-observer research as a Nursing student, I did not find faculty or students made significant progress towards understanding educational methods and materials that really worked to improve learning outcomes. This research has severe constraints in that my observations were limited to one program in one university. However, while not generalizable in and of itself, this research is consistent with a broad literature from which it can be concluded that teaching-learning environments are weaker than they could be across all academic levels and that there needs to be significant improvements in both educational methods and materials (National Research Council, 2000, 2001). Importantly, publishers of educational materials rely on market analyses of students' and faculty members' perceptions of their needs, which generally do not evolve from an understanding of what really works in education.

Publisher Evaluation of Instructional Materials

We report results that apply to one publisher during the time we built educational software for that publisher. However, our meetings with five different publishers provided evidence that the following points are generally applicable to many publishers of educational materials. We found that most publishers have a market research group and strategic planners who assess market readiness and potential of various types of electronic educational products to penetrate different market niches. In addition, major publishers usually have editorial and electronic product development units (or integrated editorial and e-product groups). These publisher units are responsible for acquisition of product ideas from authors and software developers as well as responsible for recommending purchase of finished products. Such teams also guide development of products into a marketable version. When authors and software developers form partnerships with a publisher to build a product, a publisher usually will assign a team to work with the respective author or software developer. Usually these teams have members from both editorial and e-product units. Contractual agreements delineate specific product technical specifications, development timelines, and deliverables. Publishers also have advisor teams composed of instructional designers, e-

product specialists, and content experts (often some of the publisher's authors) who provide recommendations for and assistance in planning for a product, ongoing review of deliverables, and final review before a product is released into an educational market.

As we began working more closely with the publisher to develop educational software, we encountered a variety of clashes in the working cultures of our research-development team and the publisher's team assigned to our educational materials product. Over six years of close work for the same publisher, we built four electronic educational products. Each product had a different publisher team and all were commercial successes for the publisher. During this work, we identified five themes that are important in the creation and evaluation of educational materials that have empirical support for improving leaning.

1. The educational market was not sampled with sufficient breadth and depth: The publishing teams we worked with did not sample a representative transect of faculty and students. In general, publishers seldom use rigorous quantitative and qualitative research methods to assess educational needs of students, teaching needs of faculty, and effectiveness of instructional materials.

2. Priorities were set by faculty choices rather than educational needs: Not unrelated to the undersampling described in the first theme, faculty and student focus groups as well as input from the publisher's advisor groups result in disproportionate weight being given to faculty choices for instructional materials. However, faculty members seldom know whether a set of educational materials is likely to work or, once implemented, seldom know how to assess effectiveness.

3. The publishing teams were not familiar with the complexity of learning environments and instructional design in educational software: Publisher teams producing a product often have one or more instructional designers, but the designers may

not be current in the research related to instructional design, especially during the transition we now see from hardcopy educational materials to electronic educational materials. In addition, publishing teams were not familiar with the complexities of building educational software. That was not their usual responsibility, rather these teams worked on guiding electronic products to completion but not actually organizing and completing programming and graphics for an educational software product.

4. Content review processes for instructional software were underdeveloped: Publishers have rigorous review processes for the content of educational materials that they produce. Such reviews are conducted by the publisher's advisory groups of authors and experts in the field of an instructional package. Even so, the transition from hardcopy materials to electronic educational materials has introduced some problems in the review process. The essential problem is sampling within the situated learning of a particular electronic educational product such as an educational software application. A hardcopy textbook can be read chapter by chapter without missing content. In an educational software system like a clinical simulation, the number of possible interactions within the simulation is enormous and content will be located in a variety of compartments and may be relevant to specific interactions within the simulation. Reviewers have to know that they must sample enough of the possible interactions and associated content compartments to be assured that the educational materials have no errors. Many content reviewers familiar with reviewing textbooks have not learned the kinds of transect sampling necessary for evaluating some types of educational software.

5. Processes of software quality assurance and quality control (QA/QC) were underdeveloped: Not unrelated to themes 3 and 4, QA/QC processes require a review and

revision cycle that is driven by experts in software design and assessment of the validity of content in compartments within software as well as the validity of content and interactions within simulations. Undersampling occurs when reviewers do not sufficiently sample and evaluate enough of the compartments and interactions within an educational software system or computer-based simulation.

Reflecting on Ethical Issues in the Production and Usage of Instructional Materials

As mentioned in the Methods, in terms of "attention to scope" the scope of the analysis was defined by undergraduate health sciences courses, the respective faculty members teaching the courses, and the students enrolled in those courses. Furthermore, for publishers the scope was the electronic educational materials that they develop, distribute, and sell in undergraduate healthcare educational markets. The ethical analysis utilized the findings from the case studies of students and faculty as well as the case study of a publisher's partnership in building four undergraduate healthcare educational software systems. Each of the four principles was examined in the context of how well publishers and faculty meet the requirements of the respective principle.

Autonomy. In regards to autonomy, in healthcare education we argue that autonomy would be realized as: (1) students informed consent for participation in the teacher-student dynamics that constitute the educational processes of a course, and (2) informed consent of students in the use of a particular educational materials package. Since faculty choose instructional materials they are principally responsible for student autonomy. A course syllabus is often treated as a kind of contract between faculty members and their students. The ethical principle of autonomy could only be met when a faculty member outlines why and how a set of instructional materials have been chosen for a course and when students decide to enroll and stay in that course. However, students' autonomy is reduced by limitations in their choices for courses (e.g., those required for a major must be taken) as well as their limitations in choices of instructional methods and materials.

For publishers, the principle of student autonomy is made problematic by both the undersampling of students' and faculty members' needs as well as by lack of empirical evidence that a set of instructional materials work. Furthermore, while students may be the end users of instructional materials, faculty members are actually the purchasers because they decide what materials are required for a course even though students pay the costs of the materials. In some respects, the burden of the autonomy principle is shifted to faculty, perhaps unfairly, because faculty perceptions of value dictate purchase and usage of an instructional package.

Beneficence. In education, the principle of beneficence requires commitment to providing the benefits that faculty and publishers profess they are able to provide. Faculty members profess to provide benefits to students in the planning and delivery of educational practices as well as in actually improving students' knowledge and skills. Publishers profess to provide benefits to students in the quality of educational material and the potential of these materials to improve students' knowledge and skills. For the principle of beneficence to be achieved, we would need evidence that a set of instructional materials improves students' knowledge and skills in ways that are beneficial to students.

If we could trust faculty members' assessments of students' learning we almost certainly would conclude that most students learn something in the courses they take. However, a diverse literature suggests that in many undergraduate courses retention of knowledge is relatively short-lived and we do not really know what misconceptions students have learned. So, what are faculty members professing to do in using a set of instructional materials and what are publishers professing their instructional materials can accomplish, even in the hands of instructors who are using the materials as they were designed to be used? We do not

feel either faculty members or publishers can make the generalized claim that they achieve the principle of beneficence.

Non-maleficence. The principle of non-maleficence requires that we avoid causing harm (Beauchamp, 2003). Educational non-maleficence requires faculty members and publishers to know and minimize the risks and potential harm of educational methods and materials to students. Again, neither faculty members nor publishers have much evidence that educational methods and materials do good and scant evidence that they do harm. Harm to students could result from not learning what they needed in order to be successful in subsequent courses or in a profession. Students also could be harmed by learning misconceptions that become problematic in learning what they need in order to be successful in subsequent courses or in a profession. In the health sciences, misconceptions and inadequate mastery of knowledge and skills could lead to injury or death of patients that students later encounter when they work as healthcare providers.

Faculty members try to reduce the harm they might cause by carefully choosing educational methods and materials. Publishers try to reduce harm by developing educational materials in cooperation with authors and advisory groups who are experts in the domains of the materials, using experts to review products, and moving instructional materials through revision and update cycles. Even with faculty and publishers believing they have minimized harm to students, the evidence for non-maleficence is not easily gathered and certainly not available in the educational research literature.

Justice. Justice as an ethical principle imposes a moral obligation to use fair decision-making processes to select among competing claims. Within educational settings, and using the framework of Gillon (1994) for healthcare, faculty and publishers must demonstrate that they fairly allocate scarce resources, respect individuals' rights, and respect morally acceptable laws within the scope of selecting and implementing educational methods and materials. Faculty and publishers may fail in justice when they make choices that lead to institutional classism and racism. For example faculty choices and publisher production of expensive educational materials disadvantage poorer students. When faculty members do not use and publishers do not develop cross-cultural instructional materials, there is increased potential for healthcare disparities to develop across ethnic lines. Such disparities are well documented in the United States (Institute of Medicine, 2003a, 2003b, 2002, 2001a, 2001b, 2000).

Publisher and faculty confounding. Faculty choices for course materials drive publishers' sales of educational materials. Publishers' offerings of instructional materials establish the limits of what products are available to faculty and ultimately to students. When both faculty and publishers lack a deeper understanding of what really works to improve educational outcomes, the confounding of publishers' offerings of educational materials and faculty choices of these materials become confounded. This confounding can perpetuate development and usage of instructional methods and materials that do not really work to improve educational outcomes.

DISCUSSION

The education of healthcare providers is a crucial step in the development of healthcare systems that try to sustain the wellness of individuals and communities. At the undergraduate level, some types of professional healthcare providers are trained for direct entry into practice including nurses, physical therapists, dieticians, pharmacist technicians, and medical technologists. In addition, groups of undergraduate students are trained for entry into post-baccalaureate professional programs, such as dentistry and medicine. Other undergraduate students choose pathways towards graduate programs that develop the workforce of researchers in the health sciences. Interestingly, the focus on evidence-based practice in healthcare planning and delivery does not yet have an analogue

of evidence-based practice in planning and delivery of education for undergraduate health sciences students. We have called such practice evidence-based learning (Coiro, Knobel, Lankshear, & Leu, 2008).

Educational materials are developed by publishers while educational methods utilizing these instructional materials are selected and implemented by faculty members. In this article, we have used an ethical framework called "the four principles with attention to scope" in order to examine the extent to which publishers and faculty achieve the four ethical principles of autonomy, beneficence, non-maleficence, and justice. The results of our study suggest that both publishers and faculty members do not achieve what is required by these four principles. However, the story is not a simple one because of the confounding of publishers' and faculty members' activities.

Publishers of educational materials rely to some extent on faculty and, occasionally, student input to make choices about potentially viable product lines in the instructional materials markets. However, business decisions to pursue a product line are usually made with input from or approval by the publishers' strategic planners. Such input or approval shapes decisions to develop a particular set of educational materials, with final decision to proceed to production driven by business algorithms that estimate return on investment and, sometimes, with modeling of risks or failure of a product to achieve expected returns.

Publishers generally also have advisors such as educators and content experts who have credentials in educational research. These advisors may work with a publisher's strategic planners, editors, and electronic product teams to define electronic educational materials lines. A publisher's sales representatives, editors, and other personnel may also probe faculty members' and students' needs through both informal discussions and a variety of qualitative and quantitative assessments of the needs of an educational product market. Final decisions about whether or not to build, market, distribute, and sell an educational materials product

line would seem to have a sound foundation when these market data are combined with the expertise of advisors, strategic planners, editors, and electronic product teams. Our results suggest otherwise and that publishing of electronic educational products in the healthcare markets is fraught with ethical problems.

Publishers and their advisory groups have or could recruit the expertise to build evidence-based learning electronic instructional materials. These materials could be based on the ten attributes for electronic educational materials recommended by the Federation of American Scientists (FAS). Like evidence-based practice in medicine that is founded on current accepted research findings, such educational materials would be based on the state-of-knowledge provided by a broad research base already endorsed by FAS and the National Research Council. However, a review of diverse electronic educational products has not revealed any that have all of the ten attributes recommended by FAS (2005) or that address the seven criteria set by the National Research Council (2001). Furthermore, and despite a diverse array of efforts to develop electronic educational products, few are easily customizable to the idiosyncrasies of educational needs in academic programs or for staff training in clinical setting.

Four major problems in electronic educational materials and simulation design for undergraduate healthcare impede widespread development of educational games and simulations, especially electronic educational materials that have evidence-based usage in academic healthcare programs as well as in clinical settings. These problems inhibit development of electronic educational materials that meet the FAS and National Research Council recommendations (Tashiro and Dunlap, 2007):

1. Instructional designers seldom conduct the research necessary to demonstrate their products actually improve learning or skills. In healthcare, an empirically-driven approach becomes especially critical in the context of the Institute of Medicine's call for broadly based core competencies

(AACN, 2003; Institute of Medicine, 2003a). Similar deficiencies in research foundations for effectiveness exist throughout the educational games and simulations available at the K-12 and undergraduate levels.

2. With few exceptions, commercially available electronic educational materials have not been shown to improve what some call critical thinking of users (including the important higher levels of declarative, procedural, and also metacognitive knowledge) while also improving disposition to engage in higher order thinking (Anderson & Krathwohl, 2001; Alessi & Trollip, 2001; Sadowski & Gülöz, 1996; see also Cacioppo, Petty, Feinstein, & Jarvis, 1996). Such materials have remained elusive, despite many different types of simulations that are being evaluated, and principally because designers do not use empirical approaches to build components into educational materials that enhance disposition to improve critical thinking.

3. Few commercially available electronic educational materials have been developed to mesh sensibly with the strategic needs of K-12 and undergraduate curricula or with professional development, continuing education, and training programs.

4. There are no commercially available products related to improving learning outcomes or skills competencies that are designed to become part of an evidence-based education framework as well as an evidence-based practice framework that improves students' and practitioners' learning-training outcomes.

These four basic problems are exacerbated by the complexity of studying the impact of realism and engagement on educational game and simulation design as well as on student learning (Tashiro and Dunlap, 2007). However, the role of faculty members adds another layer of complexity to these four problems. The faculty members and other experts providing input to a publisher's business decision may not reflect the normative values of the majority of faculty in a discipline area. This is because most faculty members are not well grounded in the research related to what really works to improve education. On the other hand, while perhaps reflecting a larger percentage of faculty members in a content domain, advances in educational materials and methods are not likely to evolve from input of educators who are not well versed in educational research on methods and materials that really work. A publisher's strategic planners and business algorithms may be based on success of sales and market exploitation rather than on whether or not a product actually improves educational outcomes, since there are so few studies of product-outcomes coupling.

Another layer of complexity, and one of the oddities of undergraduate educational materials, is that faculty members are generally the purchasers of most instructional materials but students are the end users of the materials. Faculty members are the purchasers because they select materials, order them, and set the required usage in a course. Even though students actually pay for the materials, faculty members dictate the conditions and objects of purchase. In discussions with both faculty and students, there was considerable dissonance in what each group felt they needed, faculty to teach and students to learn. One of the most striking features of this dissonance was noted during my case study of classmates in a Nursing program. Most students in my Nursing courses purchased large textbooks but very few actually read the textbook assignments the faculty member required for a course, unless a faculty member's lectures differed from the textbook and tests covered both the lecture and textbook materials.

Finally, faculty members select and implement the educational materials for their course. It is possible that some electronic educational products actually could improve learning, but only if properly implemented in a course. What responsibility does a publisher have? What responsibility does a faculty member have in selecting and implementing a set of educational

materials. Certainly, there is a very large and diverse literature that converges on the idea that there are educational benefits to electronic educational materials that use simulations and gaming technology. These benefits include: involving students in complex practice skills without risk, improved psychomotor skills, enhanced retention of knowledge as well as enhanced decision-making skills, interactive learning, opportunities for replay at a particular step in a sequela as well as repeated practice of a sequela, options for immediate feedback, and retention of knowledge related to procedures. Some of this literature was reviewed in the report on the recent Summit on Educational Games sponsored by the Federation of American Scientists Federation (2006). Additional literature reviews and syntheses have also been provided by Bogost (2007), Gee (2007, 2004, 2003), Shaffer (2006), and Aldrich (2005, 2004). Work in healthcare has been reviewed by Feingold, Calaluce, and Kallen (2004), while the United States National Research Council (2000, 2001) presented summaries of research covering topics in the areas of how people learn and the science and design of educational assessment.

These works extend a very large and diverse research literature from artificial intelligence, simulation, education, and psychology. More recent work on cognitive taxonomies (Anderson & Krathwohl, 2001) also holds promise for informing how and why to build electronic educational materials. While the evidence for the benefits of electronic educational materials is accumulating, the development and usage of such materials still lacks a sensible evidence-based approach for improving learning. Publishers and faculty members share responsibility in the lack of evidence-based approaches to building and using electronic educational materials.

Gillon (1994) points out that the "four principles plus attention to scope" approach does not provide a method for choosing between alternative actions. In the ethical analysis of publishers and faculty members we have presented, we do not offer a set of recommendations for what publishers and faculty should do. The "principles plus scope" approach does offer a common set of moral commitments, perhaps also a common moral language and a common set of moral issues for publishers and faculty members to consider. Autonomy, beneficence, non-maleficence, and justice provide a set of principles that allow us to focus on the impacts of electronic instructional materials on students. Publishers and faculty members can focus on these impacts and contextualize them in the broad and deep research literature on methods and materials that improve educational outcomes.

Our analysis suggests there are important ethical issues that must be explored in the development and usage of electronic instructional materials. In particular, we argue it would be worthwhile to examine more closely the processes by which publishers decide to build educational materials for undergraduate healthcare students and how faculty members decide to use such materials. We hope this article provokes some deeper thinking and further ethical analyses of publishers' and faculty members' roles in developing and using electronic educational materials for undergraduate healthcare students. Indeed, we would like to see a broader approach that goes beyond undergraduate healthcare education into other disciplines and also reaches into other academic levels. We feel that an ethical analysis coupled to an evidence-based learning framework may lead to educational frameworks that define educational materials development frameworks and evidence-base learning praxis frameworks for building, choosing, evaluating, and using instructional materials.

REFERENCES

AACN - American Association of Colleges of Nurses. (2003). *The Role of the Clinical Nurse Leader*. Washington, DC: American Association of Colleges of Nursing.

Agich, G. J. (2001). Ethics and innovation in medicine. *Journal of Medical Ethics*, *27*, 295-296.

Aldrich, Clark (2005). *Learning by doing*. San Francisco, CA: Pfeiffer.

Aldrich, Clark (2004). *Simulations and the future of learning*. San Francisco, CA: Pfeiffer.

Alessi, S. M., & Trollip, S. R. (2001). *Multimedia for Learning: Methods and Development*. Boston: Allyn and Bacon.

Anderson, L., & Krathwohl, D. (2001). *A taxonomy for learning, teaching, and assessing*. New York, NY: Longman.

Beauchamp, T. (2003). Methods and principles in biomedical ethics. *Journal of Medical Ethics*, *29*, 269-274.

Beauchamp, T. & Childress, J. (2001). *Principles of biomedical ethic* (5th Edition). New York: Oxford University Press.

Bogost, I. (2007) *Persuasive Games – the expressive power of videogames*. Cambridge, MA: MIT Press.

Cacioppo, J. T., Petty, R. E., Feinstein, J. A., & Jarvis, W. B. G. (1996). Dispositional differences in cognitive motivation: The life and times of individuals varying in need for cognition. *Psychological Bulletin, 19, 2*, 197-253.

Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (Eds.). (2008) *Handbook of research on new literacies.* New York, NY: Lawrence Erlbaum Associates.

Evidence Based Medicine Working Group (1992). Evidence-based medicine: a new approach to the teaching of medicine. *Journal of the American Medical Association*, *268*, 2420-2425.

Federation of American Scientists. (2006) *Summit on Educational Games – Harnessing the power of video games for learning.* Washington, DC: Federation of American Scientists.

Ferrell, J. (1998). Criminological Verstehen: Inside the immediacy of crime. In J. Ferrell and M. S. Hamm (Eds.), *Ethnography at the Edge* (pp. 20-42). Boston, MA: Northeastern University Press.

Ferrell, J., & Hamm, M. S. (1998). True confessions: Crime, deviance, and field research. Inside the immediacy of crime. In J. Ferrell and M. S. Hamm (Eds.), *Ethnography at the Edge* (pp. 2-19). Boston, MA: Northeastern University Press.

Feingold, C., Calaluce, M., and Kallen, M. (2004). Computerized patient model and simulated clinical experiences: Evaluation with baccalaureate nursing students. *Journal of Nursing Education, 43, 2*, 156-163.

Gee, J. P. (2007). *Good video games + good learning – Collected essays on video games, leaning, and literacy*. New York: Peter Lang.

Gee, J. P. (2004). *Situated language and learning: A critique of traditional schooling*. London: Routledge

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*? New York: Palgrave MacMillan.

Gibson, D., Aldrich, C., & Prensky, M. (2007). *Games and simulations in online learning*. Hershey, PA: Information Science Publishing.

Gillon, R. (1994). Medical ethics: four principles plus attention to scope. *British Medical Journal*, *309*, 184

Gillon, R. (2003) Ethics needs principles – four can encompass the rest – and respect for autonomy should be "first among equals." *Journal of Medical Ethics, 29*, 307—312.

Institute of Medicine (2000) *To err is human – Building a safer health care system*. Washington, DC: National Academy Press.

Institute of Medicine (2001a). *Crossing the quality chasm: A new health system for the 21st century*. Washington, DC: National Academy Press.

Institute of Medicine (2001b). *The right thing to do, the smart thing to do – Enhancing diversity in health professions*. Washington, DC: National Academy Press.

Institute of Medicine (2002). *Guidance for the National Healthcare Disparities Report*. Washington, DC: National Academy Press.

Institute of Medicine (2003a). *Health professions education – A bridge to quality*. Washington, DC: National Academy Press.

Institute of Medicine (2003b). *Unequal treatment – Confronting racial and ethnic disparities in healthcare*. Washington, DC: National Academy Press.

Kapp, K. M. (2007). *Gadgets, games, and gizmos for learning*. San Francisco, CA: Pfeiffer.

Liberati, A. & Vineis, P. (2007). Introduction to the symposium: what evidence based medicine is and what it is not. *Journal of Medical Ethics, 30*, 120-121.

National Research Council (2000). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academy Press.

National Research Council. (2001). *Knowing what students know: The science and design of educational assessment.* Washington, DC: National Academy Press.

Outhwaite, W. (1976). *Understanding social life: The method called verstehen.* New York: Homes and Meier.

Quality Education for Minorities Network (1992). *Together we can make it work: A national agenda to provide quality education for minorities in mathematics, science, and engineering.* Washington, D.C.: QEM Network.

Sadowski, C. J. & Gülöz, S. (1996). Elaborative Processing mediates the relationship between need for cognition and academic performance. *Journal of Psychology, 130, 3*, 303-307.

Selfe, C. L., Hawisher, G. E. (2007). *Gaming lives in the twenty-first century – Literate connections.* New York, NY: Palgrave Macmillan.

Shaffer, D. W. (2006). *How computer games help children learn.* New York, NY: Palgrave Macmillan.

Smith, R., Hiatt, H., & Berwick, D. (1999). Shared ethical principles for everybody in health care: a working draft from the Tavistock Group. *British Medical Journal, 318*, 248-251.

Sullins, E. S., Hernandez, D., Fuller, C. & Tashiro, J. S. (1995). Predicting who will major in a science discipline: Expectancy-value theory as part of an ecological model for studying academic communities. *Journal of Research in Science Teaching, 32(1)*, 99-119.

Tashiro, J. & Rowland, P. McD. (1997). What works: Empirical approaches to restructuring courses in biology and environmental sciences. In A. McNeal and C. D'Avanzo (Eds.) *Student-active science: Models of innovation in college science teaching* (pp. 163-187). Orlando, Fl: Harcourt Brace and Company.

Tashiro, J. & Dunlap, D. (2007). The Impact of Realism on Learning Engagement in Educational Games. *Proceedings of FuturePlay 2007.* ACM digital Library 978-1-59593-943-2/07/0011

Truzzi, M. (1974). *Verstehen: Subjective understanding in the social sciences.* Reading, MA: Addison-Wesley.