Welcome to Epiville: Building a Web-Based Learning Environment for Graduate Education in Health

Abstract:

Internet technologies provide opportunities to improve teaching and learning of the principal competencies in a graduate-level, professional education. Epidemiology is a core area of public health education. We designed Epiville as a set of interactive web-based exercises employed as weekly homework assignments at Columbia University’s Mailman School of Public Health. Its four key components, namely instantaneous answers to multiple-choice questions, innovative use of interactive maps and visuals, assessment tools to evaluate student learning, and a tiered approach to content, contribute to Epiville’s significant value as a novel educational tool. Detailed class evaluations over the past three years show that students prefer Epiville to traditional paper-based assignments, and increased learning. Beyond the field of Epidemiology, these new teaching tools and strategies have application to many professional education programs.

Summary:

a. Objectives

The main objective of this session is to explore the benefits of new technologies in graduate-level professional education. We use Epiville to demonstrate how innovative media technologies can be employed to improve learning by supplementing traditional instructional methods such as lectures and homework with self-education, self-assessment and performance-evaluation tools. We examine the effectiveness of four of Epiville’s key components, namely instantaneous answers to multiple-choice questions, innovative use of online interactive maps and visuals, an assessment tool allowing instructors to continuously evaluate student comprehension, and a tiered approach to tailor content to meet a variety of student needs, and explore the feasibility of their integration into the curriculum of a large graduate-level course.

b. Educational or scientific importance

Epidemiology is the study of the distribution and determinants of disease in human populations. It is regarded as the basic science of public health, and is also considered an important part of training in other health professions such as medicine, dentistry, and nursing. Columbia University’s Mailman School of Public Health’s (MSPH) core course in Epidemiology has been highlighted both within and outside the school as a “best practice example” of rigorous curriculum enhancement and innovative use of new educational technologies (Lapp and Herman 2002, Oblinger, 2003). The basic design of the course is a series of weekly lectures on key content areas, delivered by senior faculty. After each lecture, students meet in small group seminar sections that are led by junior faculty and advanced doctoral students.

The course presents a number of significant educational challenges. First, it has a large enrollment, approximately 260 students per semester. Second, as with all professional educational programs, the student body is extremely diverse, both in the level of prior exposure to Epidemiology and in the level of interest and motivation in this area, since many students will continue further coursework in the field, although most will not. Finally, because Epidemiology is an applied discipline, it is crucial that students learn to integrate the conceptual and theoretical material with practical knowledge.

The course developers from the Department of Epidemiology of MSPH teamed with educational technologists from the Columbia Center for New Media Teaching and Learning (CCNMTL) to create Epiville. This collaborative approach to the development of curriculum between educators and media technologists serves as an example of educational innovation. At present, the project has evolved into a set of related interactive web-based exercises that students are required to complete as homework assignments. In these exercises, students investigate a series of public health problems by assuming the role of an intern at the Department of Health in the fictional town of
Epiville. Students gather relevant information (via audio, video, and on-line text) from various linked web-pages including: simulated TV news reports, public radio announcements, material supplied by the Epiville Department of Health, and interviews with local residents, officials, managers and other figures. Students then use the data they have collected to address key analytic and theoretical questions. Each week during the semester, students are assigned a different research task relevant to epidemiological concepts as they are being covered in course lectures. Our work has been cited as an innovative approach to helping students understand complex systems and new environments (Oblinger, 2003).

Epiville has now become an integral part of the core course. Furthermore, its flexible design features have allowed it to be adapted for use in other basic Epidemiology classes. Several of its features, especially assessment tools that allow teachers to adjust course content to more effectively address critical areas of student educational need, have the potential for greater use in other graduate-level classes. Finally, the complete integration of Epiville in the core Epidemiology course is a model of how new media content, paper based textbooks and assignments, lectures can be used in professional education.

c. Individual presentations

A. Innovative Use of Epiville’s Teaching Tools to Promote Effective Learning

Careful assessment of the changing needs of a large introductory-level core curriculum course led this team in 2001 to begin a process of refining and redesigning the syllabus, development of structured learning objectives for each lecture and each homework assignment, enhancement of lecture delivery, and on re-structuring of seminar sections. Within this process, our primary focus was to enhance outside-of-class learning through the development of case-based homework exercises utilizing innovative internet and media technologies.

In order to overcome the limitations we encountered with traditional paper-based homework and lecture-based learning, we developed a set of exercises using interactive tools that provide students with an enhanced web-based learning environment, namely instantaneous answers to multiple-choice questions, innovative use of interactive maps and visuals, a self-assessment tool allowing instructors to tailor their class plans to more effectively address critical misconceptions, and a tiered approach to content. We believed that these tools would improve learning by allowing students to receive immediate feedback on self-assessed exercises, learn how to collect and analyze the data, help them to identify learning needs by communicating directly with instructors. Several studies suggest that using an authentic case-based learning approach in medical education could help students to learn not only the content knowledge but also required real-world problem-solving skills simultaneously (Williams, 1992; Hmelo, 1998). In addition, research suggests that this approach also increases active engagement in learning and facilitates class discussion (Williams, 1992; Hmelo, 1995; & Hmelo & Day, 1999).

Each exercise can be used as a stand-alone module and their order can be changed according to curriculum needs without sacrificing educational impact. Exercises are highly structured so as to provide students with the predictable pattern of learning of new concepts. Each exercise opens with a set of explicit learning objectives, clearly defined teaching goals that guide students through the exercise. These learning objectives are also emphasized in the classroom lectures that coincide with the week’s exercise.

Research has shown that the best way to explain basic principles and concepts in Epidemiology and other areas of applied study is to provide multiple examples and materials on the investigation of real-life situations (Murray 1983). The most advanced and hard-to-understand concepts in Epiville, therefore, are explained by two, instead of one, practical examples, which work in unison to deepen students’ understanding of the material. Traditional textbooks and newer interactive computer exercises follow this principle, yet we believe it is particularly effective to have one constant scenario (Epiville) in which to explain various epidemiologic concepts as exemplified in weekly homework assignments.

In the course of each module, students answer multiple-choice questions that are complemented by detailed explanations of both the correct and incorrect answers. This provides immediate feedback to students, which has been recognized as adding a significant value to improving the learning and assessment of competencies (Van Der Vleuten 1996). Yet another example of a built-in educational tool is the interactive device that allows students to
manipulate the data in order to understand the intricacies of data analysis. This was accomplished by developing interactive maps and graphs to provide visual illustrations of the often abstract concepts of Epidemiology.

Despite being an out-of-classroom tool, Epiville is closely integrated into the everyday activities of the course. For example, each concept in Epiville is accompanied by the references to the course textbook. In order to better integrate students’ experiences in these exercises with their classroom experiences, we included “Discussion Questions” at the end of each exercise which are then used by classroom instructors to further explore concepts and methods introduced in the exercises. We also provide an additional set of multiple-choice questions to assess student knowledge of the topic, the responses to which are submitted to their seminar leader via the internet. Their responses are used by seminar section leaders to tailor their teaching to the specific needs of their students. Thus, the web-base activities provide a means of integrating the out-of-class exercise with in-class discussion. The tiered approach to content is promoted by including sections called “For the Intellectually Curious,” which provide an opportunity for students to be introduced to material that extends well beyond the scope of this introductory class.

In our experience, Epiville improved students’ understanding of the main concepts and principles of Epidemiology, as well as increased their interest in learning. In particular, four of Epiville’s components proved to be invaluable to both the instructors and the students. First, instantaneous answers to multiple-choice questions guided students through the new material and supplemented the textbook and lecture materials. Second, innovative use of interactive maps and visuals provide students an array of explanations of concepts that are simply not possible with paper-based exercises. Third, the assessment tool of the exercises provided teachers with valuable information about the level of understanding that students have for each of the topics. Thus, they were able to adjust the content of their classes to more effectively address misconceptions about the course material which in turn helped students meet the learning goals for the class. Fourth, the tiered approach to content allowed us to offer optional material to advanced students who sought to learn beyond the requirements of the course. Detailed class evaluations for the past three years show that students prefer these interactive web-based exercises to the traditional paper-based ones, and that they appreciate the innovative use of internet-based technology.

B. Evaluating Epiville: From Building the City to Measuring Its Impact on Learning
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Since its origins in 2001 as a “city blueprint” with many possibilities for improving learning in public health and other health professions, Epiville’s foundation and its continued growth is built on theories of how people learn. Even with the best intentions of the development team to implement these theories in the construction of Epiville, the team thought it was essential to building into the development process an ongoing evaluation of the students’ learning experience. Critically concerned with the question of whether implementing these web-based modules is an efficient and effective way for improving learning we collected, over a three years period, data from student and faculty evaluation data. Overall, the data demonstrate that this initiative has been of significant success based on student perceptions of their learning experienced compared to traditional exercises used in this course and other public health courses. The data also provides valuable insights into the strengths and weaknesses of various type of new media teaching tools for promoting learning for graduate students in professional education programs as well as how a blended approach of using technology outside that classroom can improve face-to-face learning. Epiville has grown from one to seven modules and has been used by over 750 students at Columbia University’s Mailman School of Public Health. The development team has attempted to redefined each year the limits of this simulated city to improve learning by building modules informed by the data collected from paper-based and web-based evaluations. The data from evaluation has informed decisions in a number of areas including the development of interactive modules, choices of streaming-media, and how Epiville is integrated into the face to face meeting of the class. This presentation: 1) outlines the challenges of assessing learning in professional education and how we addressed these issues; 2) summarizes the results of this evaluation of student learning; and 3) provides a model for how evaluation can play a key role in the ongoing quality improvements to web-based and classroom learning in public health and other professional degree programs.

C. Designing Epiville: the Process of Applying New Media Technology to a Public Health Curriculum
This presentation outlines the process that faculty members of the Department of Epidemiology and CCNMTL used to create Epiville, for the core Epidemiology course. Our efforts are motivated by an important question: when new media are added to a course, do our students learn better, more, or differently?

In order to insure that students benefit from new media, CCNTML created a unique design environment where CCNMTL staff work closely with faculty partners throughout the design process. Educational technologists and faculty partners engage in pedagogical discussions as they work together within a design research methodology that entails the following stages: Initial Understanding of Curriculum, Problematic/Questions, Hypothesis/Anticipations, Design of Educational Experience, Educational Experience, and Research Report/Evaluation. Through consultations early in the process, educational goals were defined and appropriate technologies were identified. This process seeks to overcome the common pitfall of separating curriculum development from the technical production.

CCNMTL strives to build purposeful new media, through a process that begins and ends with the student. We began with identifying epidemiology student needs and instructor's teaching goals. Only then did we explore appropriate new media. Therefore, we investigated the specific needs of a student in a professional program. The successful use of new media in a curriculum relies on its integration into a curricular setting. Success is determined through student evaluations, which informs future iterations of Epiville.

In the case of "Epiville," we chose basic web technologies to fit the project requirements. However, we ensured that they met education goals in a pedagogically sound manner. The resulting project, Epiville is the product of a collaborative design process which can inform the inclusion of new media in profession education across many disciplines.

d. Discussion of how the session will be structured

The session begins with a live demonstration of the Epiville Case Study Environment, which provides an overview of the website's content and exercises. Four individual presentations include: Innovative Use of Epiville’s Teaching Tools to Promote Effective Learning; Evaluating Epiville: From Building the City to Measuring Its Impact on Learning; Designing Epiville: the Process of Applying New Media Technology to a Public Health Curriculum; NOTE MUST ADD FINAL TITLE. The session concludes with questions and discussion with session audience members. Session leaders provide handouts and presentation materials. The session duration will be ninety minutes.
References


