

## **The Impact of Web Technology on Nurse Education: A Case Study**

**Robert L. Sedlmeyer**  
**Department of Computer Science**

[sedlmey@ipfw.edu](mailto:sedlmey@ipfw.edu)

**260-481-6187**

**Linda Meyer**

**Department of Nursing**

[meyer@ipfw.edu](mailto:meyer@ipfw.edu)

**260-481-6276**

**Indiana University Purdue University at Fort Wayne**  
**2101 Coliseum Boulevard East**  
**Fort Wayne, Indiana 46815**

### **Abstract.**

In 2002, IPFW adopted a web application to enhance the recording and reporting of clinical education experiences of nursing students. This web application, known as the Essential Clinical Behaviors (ECB) system, is an on-going, joint effort between the Computer Science and Nursing Departments. It replaced a tedious and error-prone method, based on printed forms and informal reports, for tracking the practice of nursing skills. Since Fall 2005, the ECB has been a mandated part of every clinical nursing course. The goals of the ECB are three-fold: (1) To foster more self-directed learning; (2) To enable clinical instructors to increase the diversity of clinical experiences for their students; and (3) To facilitate the collection and analysis of data for accreditation reviews. In this paper we discuss the progress made in—and some surprising obstacles to—achieving these goals. We also discuss the evolution of the ECB in the last four years to increase its usability, and the impact it has made on the nurse education process itself.

### **Introduction.**

A primary focus in nursing education is to provide the student with a diverse range of clinical experiences. Historically, the collection and assessment of data from the student's clinical experiences has been a paper-and-pencil task that was arduous for both the student and nursing faculty. The volume of collected information made it difficult to produce statistical reports without additional intensive manual labor. But without such reports, it was impossible to accurately assess the frequency and diversity of student clinical experiences. Automation of the storage and reporting of clinical data became a necessity.

Additional impetus for introducing computer technology into the nursing curriculum is the recognition that the technology revolution, with computers at its center, has had a significant impact on health care education, research, and service. The profession of nursing has not been immune to the accelerated changes occurring with this technology. Computers have influenced the profession of nursing by becoming essential tools in hospitals, community health settings, educational institutions, research centers, and all other areas where nurses practice. From computer-generated lab results to computer-controlled monitors and delivery systems to computer-managed patient charting, 21<sup>st</sup> century nurses are confronted with sophisticated technology in the daily care of patients. It is imperative that nursing students are prepared to enter this technology-rich environment.

Research in nurse education has found that first year bachelor degree nursing students were not as computer literate as they needed to be to succeed in the academic environment. Without additional training in computer technology, this may translate into nurses being less capable in the workplace. The intentional integration of computer technology, especially in the clinical environment, is now identified as essential to nurse education.

In 1999 the Computer Science and Nursing Departments at IPFW began a joint project to develop a web application, named the Essential Clinical Behaviors (ECB) system, to enhance the recording and reporting of clinical education experiences of nursing students. The ECB was aimed at meeting three pedagogic goals: (1) To foster more self-directed learning; (2) To enable clinical instructors to increase the diversity of clinical experiences for their students; and (3) To facilitate the collection and analysis of data for accreditation reviews. In addition, the ECB would provide extensive experience with computer technology similar to that utilized in modern clinical settings. After several prototypes were developed, the ECB was formally released in 2002, and is now utilized in all clinical nursing courses.

The introduction of this technology represented a major change in IPFW's clinical education process by altering how students record clinical experiences in a nursing course. To meet the pedagogic goals it was imperative that both students and faculty accepted the technology and integrated it into their current clinical education process. *Over the past three years progress toward these goals has been steady, but slower than we anticipated.* To gain insights into the reasons for this, we carried out a usability evaluation of the ECB. In the following sections we discuss what we found out and how we are using the results to ensure further progress in meeting our goals.

### **The Clinical Experience Process.**

A touchstone of the IPFW nursing program is the integration of formal education with experiential learning. Students complete weekly clinical activities at local health care organizations such as the Parkview Medical Center. They receive hands-on experience in nursing skills while working with patients under the guidance of clinical instructors. The clinical experience process has been standardized across the curriculum. From the student's perspective, each experience consists of four broad activities.

1. **Preclinical Preparation.** A student receives a clinical assignment from the instructor. This may be done anytime from one day to one hour before the clinical. The instructor supplies information such as the patient's medical diagnosis, age, lab results, and medications. Using this information the student fills out a nursing care plan and clinical preparation form. These forms document the expected problems the patient may be experiencing and the anticipated nursing care need to address those problems. Just prior to the scheduled start of the clinical experience, the instructor reports on the patient's current status. The student uses this report to make any changes to the nursing care plan.

2. **Initial Assessment.** The student performs a head to toe assessment of the patient. After leaving the patient's room, the student examines the patient's chart to check medications, orders regarding specific treatments, new lab results, and incorporates this information into the plan of care.

3. Nursing Care. After the initial assessment is completed, the student administers nursing care guided by the nursing care plan. This may involve many different skills (e.g., taking vital signs, changing wound dressings, or administering oral medications) performed once or multiple times over the remaining duration of the clinical experience.

4. Clinical Experience Report. At the end of the clinical experience the student updates the patient's chart and reports to the staff nurse. The clinical instructor meets with the student to discuss any observations made concerning patient care. The student then completes a report that assembles information from the clinical prep sheet, nursing care plan, patient chart and other notes taken during the clinical experience.

The ECB supports the collection of patient demographic information, medical and nursing diagnoses, and nursing skills practiced during each clinical experience. This information is gathered from the clinical prep sheet, nursing care plan, patient chart and student notes. Once recorded, a variety of reports may be generated containing individual and aggregate data across clinicals, patients, courses, and students.

### **Student Profile and ECB Satisfaction Survey.**

We conducted a survey of student users of the ECB. The survey was administered to students in all clinical courses that utilize the ECB. The first part of the survey assessed computer technology experience and attitude in a variety of ways. Though there was a wide age range, 18-45, there was no significant difference in responses due to age. Over 80% of respondents said that they had a moderate or high level of experience with computers. 88% and 75% indicated that they were very comfortable using word processors and search engines respectively. Students also indicated a positive attitude toward working with computers: 65% said they enjoyed while only 5% said they disliked working with computers, and 79% felt that computers made their education easier. About 2/3 had computers at home with an internet connection.

The overall picture that emerged was that a typical nursing student was comfortable with computers, used them in a variety of ways, and believed that computers made their lives easier.

The second part of the survey addressed satisfaction with the ECB system itself. The results were in stark contrast to those associated with computer technology in general. Since all students were required to use the ECB, it was not surprising that over 75% of them accessed it at least once a week. This corresponded with their weekly clinical experiences. Even though only 23% felt it was difficult to use the ECB, more than half expressed a dislike for it. When asked what they liked least about the ECB, the most frequent response (28%) was that it took too much time. When asked what they liked most about the ECB, more than half of those surveyed said "Nothing" or gave no response. Only 22% pointed out that recording of information was valuable to them.

### **Discussion.**

These results were clearly disconcerting and revealed a serious disconnect between the promise of the ECB and the reality. So, what when wrong, and how could it be fixed? To gain more detailed information, several students were invited in for in-depth interviews about their ECB ex-

periences. Their responses exposed a fundamental problem: The need to better align the ECB with the clinical experience process.

The focus of the ECB is data recording and reporting. As expressed in the original requirements documents, the need was to identify the breadth and depth of clinical experiences: what students were treating what kinds of patients, what nursing skills were they practicing, and where and how often were they practicing them. Little attention was given to the context in which these data arose. The resulting application well-addressed these requirements. The data are solicited from the user in a rational, progressive manner, proceeding from patient demographics to diagnoses to nursing care. Furthermore, great care was taken to incorporate two user-interface design principles: Ease-of-use and ease-of-learning. These principles were embodied by uncluttered screen layout, point and click data entry, familiar vocabulary and phrasing, step-by-step task sequencing, and context-sensitive help.

The main fault of the ECB was that the underlying process model did not mesh with the actual clinical experience process. In the latter, the data required by the ECB is dispersed among the four steps of the clinical experience process and among the various associated forms. Students were still required to complete these forms to satisfy clinical requirements and also had to enter their data into the ECB. Furthermore, the forms were strictly paper-based; there was no capability for transferring information from them to the ECB. The ECB also was limited in enabling the student to complete the required clinical report since both the needed data and specified format were not part of the ECB's reporting facilities. These deficits resulted in redundant, time-consuming transcription, leading to the disenchantment expressed in the student survey.

The ECB is a web application, making it widely accessible. The usability survey indicated that almost 2/3 of the students used the ECB at home. While working at home is generally considered a plus, it was not so viewed by these students. Again, the problem was the need to first record the necessary information at the clinical site.

### **Evolution.**

The ECB provided a powerful tool built on the latest web technology, but it was not a usable tool. Changes had to be made. The first of those changes was implemented this semester. The ECB user-interface was ported to a Blackberry. This allows nursing students to record ECB data at the point-of-care rather than at home or in the computer lab. While not eliminating redundant data entry, it does reduce some of the additional note taking and entry time. A more ambitious effort is an overhaul of the ECB design to reflect the clinical experience process. This will lead to an elimination of the current paper forms and a more effective, efficient and satisfying experience for the user.