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How we changed from paper to online education: Teaching Immunization Delivery and Evaluation

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SUMMARY *This article discusses meeting the challenges encountered in changing a paper-based, interactive immunization delivery curriculum into an online, self-paced format. The program, TIDE (Teaching Immunization Delivery and Evaluation), was developed through collaborative efforts of medical educators and content experts with initial funding from the Centers for Disease Control and Prevention, the Ambulatory Pediatric Association and the Medical University of South Carolina. We summarize the efforts of the development team to create interactive case scenarios, provide ready access to resource materials and an audit tool for assessing the immunization rate of the learner's clinic or practice, and meet the rigorous requirements of awarding continuing education credit. Data based on more than 100 doctors' and nurses' evaluations indicate a trend toward higher overall ratings of the online version than the paper version (88% online vs. 76% paper reported module as very good or excellent). As the TIDE program is evaluated, the team's goal is to incorporate instructional methods to increase relevance and learners' opportunities for 'learning by doing.' Future plans include extending online office assessment tools to encourage use for continuous quality improvement, and providing a mechanism for learners to share their techniques for obtaining and maintaining high immunization rates.*

Introduction

'The impact of a vaccination on the health of the world's people would be hard to exaggerate. With the exception of safe water, no other modality, not even antibiotics, has had such a major effect on mortality reduction and population growth' (Plotkin & Plotkin, 2004).

Immunization of children is one of the great triumphs of public health in the United States and worldwide (Centers for Disease Control and Prevention, 1999a, b). For this success to continue, health care providers must understand the immunization process. In the past, face-to-face classes and paper-based materials were the most common methods of instruction. The Internet has brought new options, not only for instruction, but for learners who have the potential to increase their depth of understanding and improve application. An online instructional program, titled 'Teaching Immunization Delivery and Evaluation' (TIDE), was produced to assist health care professionals in the process of immunization delivery. With funding from the Medical University of South Carolina, the Centers for Disease Control and Prevention, and the Ambulatory Pediatric Association, TIDE (http://www.musc.edu/tide) was developed through a collaborative effort between medical educators and content experts throughout the United States. The predecessor of the current, web-based version of TIDE was a facilitator led, paper-based version (Darden *et al.*, 2000) to serve as guides for teaching pediatric residents or medical students. This initial version of TIDE used case studies, a chart audit, and a brainstorming session to consider ways to improve office routines for immunization delivery. The online version of TIDE includes case studies and a flexible tool to help measure and improve a practice's immunization rate with an added adolescent immunizations module.

TIDE paper version

In the paper version TIDE provided a proscribed way to deliver information by including all necessary learning aids for both the learner and the facilitator in a loose-leaf binder. Each module could be covered in a 45 to 60 minute time frame with a physician or other health care professional serving as a facilitator. The facilitator was provided with resources (e.g. slides, handouts), prompts, answer keys, and justifications for responses to assist in leading the group. In the first module, Childhood Immunizations, several clinical scenarios with questions designed to trigger problem solving and discussion were used to teach and reinforce immunizing the individual.

The second module, Assessing Immunization Rates, was designed to provide techniques and the rationale to measure the immunization rate of one's clinic or practice. This module highlighted the Consecutive Method (Darden *et al.*, 1996) of measuring office immunization rates and offered several patient cases to illustrate the proper way to complete the audit forms to analyse one's practice. Learners were offered the option to analyse 30 patient records from their own practices/clinics or complete the module based on results provided for a hypothetical practice.

The third module, Improving Immunization Rates, focused on strategies to improve office immunization routines. The module offered the option of using an imaginary practice or one's own practice as a trigger to brainstorm about ways for increasing immunization rates. The Pareto Principle was introduced as a method to choose the immunization problems (among many) to address.

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Taking TIDE online

As use of the Internet grew around the United States, the potential benefits of an online version of TIDE became evident. A Web-based version of TIDE would create an opportunity to reach a larger audience and provide access anytime from anywhere for a learner with a computer and an Internet connection. The content authors were brought together with a Web development team composed of a computer programmer, a graphic artist, and a person experienced in instructional technology. This group formed what will be referred to in this paper as the development team.

If TIDE was to be successful online, the development team decided that the following had to occur:

- content had to be relevant to the learner
- strategies for increasing motivation had to be planned and incorporated throughout the program
- feedback had to be immediate and useful
- learners should 'learn by doing'
- awarding Continuing Education (CE) credit would be used as motivation.

This article explains how the development team designed the online version of TIDE with an eye toward each of these interrelated issues. It also discusses learners' evaluations of the program and the development team's evaluation of the process. The article concludes with lessons learned and a discussion of future plans for the online version.

Making content relevant

According to usability expert, Jakob Nielsen (2000), a book will never work online. Learners want to control the scope and sequence of a program, not merely experience the online equivalent of a page-turning exercise or a program so rigid they are locked into a specific path. The challenge was to honor this concept yet provide effective pathways to progress through the content. Merely transferring the slides and text of the face-to-face version to a website would have been easy. However, to retain the dynamic aspects of the face-to-face experiences of the paper version of TIDE, the web version needed to continue to emphasize relevant content, interactivity, and 'learning by doing', concepts supported by models of adult learning (Knowles *et al.*, 1998; Merriam & Caffarella, 1999). This focus led to adapting strategies used in the paper version such as interactive case studies and self-evaluation into the web-based version of TIDE.

In a self-evaluation exercise, learners are given an opportunity to perform an assessment of immunization delivery in their practice based on data from 30 consecutive patient visits. Learners are provided with specific suggestions for their practice.

Encouraging motivation

Throughout the development process, the team addressed methods for encouraging learners to complete modules and return to the web site. Research shows that '... users want more than just easy navigation and basic content. They want more personalized information and customizable sites that are relevant to their specific needs... regularly updated content [is] key to improving the user experience' (Taylor Nelson Sofres, 2002). These research results prompted the development team to craft opportunities for learners to use their own practice data for analysis. Following submission of these data, an estimate of the overall immunization rate is calculated. The learner is then provided with a list of suggested improvements to increase the practice's immunization rates paired with a summary of reasons for not immunizing at the visits.

The development team included links to the most current immunization schedules and research as well as many other resources because, as Seymour Papert said, '... you can't teach people everything they need to know. The best you can do is position them where they can find what they need to know when they need to know it' (e-Learning Centre, 2005). Establishing links offered an advantage compared to the paper version since the resources could be easily and efficiently kept up to date.

Immediate and useful feedback

Throughout all TIDE modules, the development team included ways to provide learners with immediate and useful feedback. One important goal was making the modules that dealt with the immunizations schedule interactive by offering something more than multiple-choice questions to test the learner's grasp of the concepts. The Childhood Immunizations and Adolescent Immunizations modules were built around clinical cases with accompanying questions. To go beyond simply giving feedback on whether responses to the questions were correct, the development team planned feedback for the case studies designed to compare the learner's thinking with that of an expert. This allowed open-ended questions to be included, while still providing helpful feedback.

In the online assessment module, practice audit results were presented as reasons for not immunizing at patient visits and summarized to provide quick feedback to the learner about his practice's immunization success. The paper-version exercise of brainstorming ways for a practice to improve its immunization rate was one of the biggest challenges to adapt to an online setting without a facilitator. For the online version, many possible interventions were listed, and learners were asked to choose the 'best' four. The feedback provided a rating of the effectiveness (or ineffectiveness) of each intervention, based on an extensive review of evidence from the literature.

Learning by doing

To promote 'learning by doing', the Assessing Immunization Rates module asks learners to conduct an online assessment of their practice by entering information about a series of patient visits. The learner-entered data are processed and analysed online to provide immediate feedback, including an estimate of the percentages of the learner's patients whose immunization status is up-to-date, not up-to-date, and unknown. Learners are given a summary of the reasons patients are either not up-to-date or have an unknown status,

grouped according to age. Lastly, immunization activity for all 30 patients is categorized by type of visit (i.e. well child, emergency, follow-up) to determine whether immunizations are being administered at all opportunities. This detailed summary offers practical information for office planning.

Criteria met for awarding Continuing Education credit

The development team worked closely with the Offices of Continuing Education in both the College of Medicine and College of Nursing at the Medical University of South Carolina. Certifying each module for Continuing Education (CE) credit required meeting detailed criteria including pilot testing by a specific number of physicians or nurses.

The development team held frequent meetings with representatives from the CE offices to ensure compliance with their guidelines. Detailed discussions focused on translating current guidelines for face-to-face or paper/pencil CE programs to an online environment.

To date, over 100 doctors and nurses have completed at least one module of TIDE. An analysis of evaluation results indicates a trend toward higher overall ratings of the online version than the paper version (88% online vs. 76% paper reported module as very good or excellent, $p = 0.16$). Through formative and summative evaluations, TIDE will continue to be refined, providing a tool to improve a practice's immunization rates.

Discussion

Continuous quality improvement

In order to measure outcomes of the program, the development team continues to meet every two weeks to discuss learner evaluations and ways to improve the program. For example, the feedback about the learner's online assessment of patient visits is currently presented as tables of numbers. To make this feedback more useful and easier to understand, the team is designing a method to present some results graphically. The chart, generated from data entered by the learner, will indicate the most frequent reasons that the learner's patients are not up-to-date on immunizations. The top reasons for not immunizing will be used to provide customized recommendations of evidence-based methods for increasing the immunization rate in the learner's practice.

When a health care provider is made aware of the root cause(s) of a low immunization rate, possible solutions become more evident. The development team knows good problem solvers look at a problem from many perspectives (Elearningpost, 2001). For example, is a practice's low immunization rate due to recordkeeping? Lack of knowledge? The process used for notifying parents? Providing information on major reasons for a low immunization rate will give learners opportunities to look at the problem from several directions and lead to effective solutions. As the TIDE modules are used and evaluated, the development team's goal is to continue to incorporate instructional methods that will increase relevance and learners' opportunities for 'learning by doing'.

Lessons learned

During the development process, numerous lessons were learned. Developing an online program that would go beyond simply publishing the support materials for the paper-based version required significant collaboration and resources. Brainstorming among team members and close, consistent communication led to effective and creative solutions for delivery methods including reflective practice, problem-based approaches, and strategies to maintain participation – methods identified as effective for online CME (Zimtat, 2001). In addition, the adherence to adult learning principles, as recommended by McLeod and McLeod (2004), increased the value of the program. Finally, allocation of resources – financial, technical, and human as well as the all-important 'time' – was, and remains, critical to the success of this project.

Future plans

The goal is to continue to add design elements that increase TIDE's relevance and usefulness. For example, Pareto charts generated from data entered by a learner will reveal the most common factors contributing to less than optimal immunization coverage in the learner's practice. Such a summary will make any problems in immunization delivery readily apparent and will be used to tailor a list of interventions for improving rates to the characteristics of the learner's clinical setting and patient population.

Another area for future development involves extending the online assessment tool to allow a learner to work in a cycle of implementing an intervention and following up with another online assessment (the traditional Plan-Do-Study-Act cycle of Quality Improvement (Cleghorn & Headrick, 1996)). Such a cycle would provide relatively quick feedback on the success – or failure – of an intervention. We hope this will prove to be a flexible tool for isolating and correcting immunization delivery problems in individual clinics and practices. In summary, the development team is striving to create an online environment in which real-life learning takes place with real problems and real people.

Practice points

- Continuing education courses designed as self-paced, online modules can provide learners with new venues for increasing their depth of understanding and application of knowledge.
- Significant and consistent collaboration among content experts, site developers, and CE experts is necessary for the success of a large-scale, online CE project.
- Incorporating methods for efficient updates is critical, particularly for courses focused on dynamic subject matter.

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