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DESIGN AND IMPLEMENTATION OF THE SEX AND GENDER SPECIFIC HEALTH MULTIMEDIA CASE-BASED LEARNING MODULES

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This case presents the design and implementation process of multimedia case-based learning modules for a Sex and Gender Specific Health (SGSH) education curriculum. The learning modules were designed to advance understanding of sex and gender differences, increase awareness of gender-specific health issues, and improve clinical knowledge of sex and gender evidence-based medicine. This paper describes the three phases of the project. In the first phase of planning, five diseases actively examined in the medical field were chosen to address sex and gender differences, and the instructional development team specifically adapted a case-based learning framework to provide more authentic and interprofessional learning opportunities for health science trainees. In the second phase, learning modules were structured with multiple revisions incorporating multimedia case-based learning strategies, such as case movie trailers, expert guides, and case solutions. In the third phase, a number of decisions regarding module interface, case videos, and server management were made. Throughout the phases, the instructional designers resolved a number of issues, such as communication with subject matter experts (SMEs), consistency of learning materials, copyright, case movie production tool, closed captioning, server configuration, and dissemination. The design process and challenges described in this paper would be useful for others developing similar instructional materials in a healthcare environment.

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INTRODUCTION

This design case describes the process undertaken by a curriculum development project team consisting of academic administrators, curriculum committees, instructional designers, web programmers, multimedia developers, and voice actors to produce a series of award-winning (Distance Education Best Practice award by AECT) multimedia case-based learning modules titled *Sex and Gender Specific Health (SGSH)*. Medical students and health professionals were the target learners of the SGSH curriculum, and the learning modules are being used by more than 15 medical schools to increase clinical knowledge and skills in sex and gender-based medicine.

This article describes the design process that evolved as the team developed the first two modules. The project was initiated in 2013, with the first two modules being completed in 2015; the third module was completed in 2016, and the remaining two modules will be finished in 2019. A major constraint placed upon the team was the need to create stand-alone instructional resources that were supplementary to the primary curriculum. This implementation constraint led the team to construct independent multimedia case-based learning modules, consisting of interactive online clinical cases, that could be used to enrich the existing didactic curriculum at the instructor's discretion.

The system was designed to be used by faculty to enhance student learning of a specific disease state by introducing sex and gender differences related to the disease state. A

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FIGURE 1. SGSH partner map.

number of medical schools across the United States are currently using the modules in this manner (see Figure 1).

PROJECT PLANNING

Need Assessment and Goals

To address the need for SGSH education, in 2010 the Laura W. Bush Institute for Women's Health at Texas Tech University Health Sciences Center (TTUHSC) created a task force consisting of faculty groups from different schools and initiated a project to integrate SGSH education into the existing TTUHSC curricula. The task force conducted a needs assessment involving the medical education literature, medical school faculty, and medical students to gauge the gaps between curriculum goals and student outcomes. A review of the medical education literature showed that medical professionals' lack of understanding and consideration regarding sex and gender differences in etiology, pathology, presentation, and treatment response has become a major concern in health science education and practice (Baggio, Corsini, Floreani, Giannini, & Zagonel, 2013; McGregor, Templeton, Kleinman, & Jenkins, 2013). Experts in clinical medicine underscore the importance of health professionals understanding differences in sex (biological) and gender (socio-cultural) in the clinical care process to improve healthcare outcomes for patients. Accordingly, SGSH initiatives have been implemented in clinical medicine over the past decade, including short and spontaneous in-service trainings for healthcare professionals (Laura Bush Institute, 2014; Regitz-Zagrosek & Seeland, 2012). However, very few initiatives have involved sustained trainings for medical, nursing, or public health professionals.

The task force concluded that the best approach to address the limited SGSH related resources was to develop learning modules on SGSH content that could be used either as stand-alone modules or as instructional resources to the current curricula. The project leader then secured funds from the Schools of Medicine, Pharmacy, Nursing, and others to pursue the project. Thereafter, a curriculum committee was created to set curricular goals and select learning topics.

The curriculum committee identified the following overarching goals to guide the module development: (a) increase awareness of gender specific health issues, (b) advance understanding of sex and gender differences, (c) improve knowledge of sex and gender evidence-based medicine, (d) demonstrate the benefits of an inter-professional approach to healthcare, and (e) engage students in real-world medical problem solving. These goals clarified the values that would ultimately undergird the SGSH education initiative at TTUHSC in terms of curriculum quality (e.g., evidence-based, interprofessional approach), focus (e.g., sex and gender specific health issues), and methods (e.g., real-world problem solving).

Once the goals were identified, the curriculum committee proceeded to delineate the disease states most germane for exploring SGSH issues in clinical practice. The committee selected five diseases: (a) osteoporosis, (b) diabetes, (c) cardiovascular disease, (d) alcohol use disorder, and (e) infectious disease. For each disease, the committee determined that the following aspects of SGSH should be addressed: (a) gender bias in the research of each disease, (b) how sex and gender differences are associated with both shared and unique factors related to the development of diseases and their risk factors, (c) sex and gender differences in screening indications for each disease, and (d) different medications used to treat each disease in males and females (Crooks, Cheon, Casanova, & Jenkins, 2016).

The project leader consulted two of the authors to seek an effective way to develop online instruction, and an instructional development (ID) team was formed. The ID team proposed possible ways to create engaging instruction and optimal instructional delivery media.

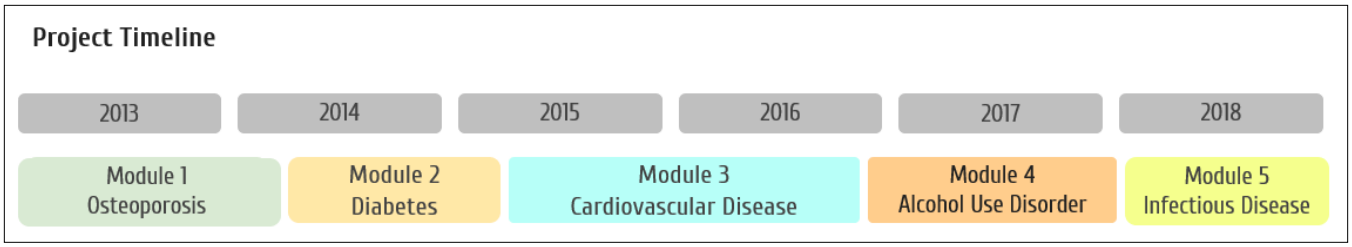

FIGURE 2. Project timeline.

Project Team

The project team consisted of project directors, a curriculum committee, and the ID team. Each subgroup and its dynamic relationships are detailed below:

Project Directors: The project team was led by a project director and a project manager who served as the communication liaison for all groups. The project director was a physician (M.D.) with renowned expertise in SGSH issues at national and international levels. The project manager had administrative experience in medical settings and a general knowledge in SGSH content.

Curriculum Committee: The curriculum committee consisted of TTUHSC faculty who were SMEs in SGSM topics in contexts such as medicine, nursing, pharmacy, and basic science (e.g., chemistry, biology). The role of the committee was to provide the instructional development team with instructional content, such as case scripts, learning materials, assessment items, and additional resources. Subgroups of the main curriculum committee were formed to work on different module topics, depending on their interest and expertise. For each module, one committee member was selected to be the leader; this person worked with the project manager to schedule meetings and update instructional content.

Instructional Development Team: Two faculty members from the Instructional Technology program functioned as the instructional designers for the project. They joined the project team immediately after its formation in 2013. Both instructional designers have instructional design and development experience with online training of interprofessional healthcare education. Their role was to work with the curriculum subcommittees in translating their expertise into effective, efficient, and appealing online instructional modules. A web programmer and a video developer joined the ID team later in the project to assist with the development of the online system (e.g., databases and case video materials). Finally, professional voice-over actors joined the team to create voice-overs for the virtual patients in the multimedia program.

Project Timeline

The SGSH project has been in progress for five years. The first phase of the project (2013–2015) consisted of the design and development of the first two modules (i.e., osteoporosis and diabetes). The second phase (2016–2019), which is currently underway, includes the design and development of the remaining three modules (i.e., cardiovascular disease, alcohol use disorder, and infectious disease). It usually takes more than a year to complete a module: (a) content development: 4 to 5 months, (b) content review and revision: 2 to 3 months, (c) storyboard creation: 1 month, (d) module development: 2 to 3 months, (e) module review and revision: 1 month, and (f) formative evaluation and revision: 1 month. Completion of Module 3 took a longer time due to a delay in content development. A timeline of the overall design process is provided in Figure 2.

Selecting an Instructional Framework

Literature Review

Before selecting an instructional framework for the SGSH curriculum, the team reviewed the current medical education literature. Among the most prominent themes identified in the literature were problems associated with traditional lecture-based approaches to medical education (Cooper & Richards, 2017; Prober & Heath, 2012). Indeed, traditional instructional approaches (e.g., lecture-based) in medical education often fail to adequately prepare students in applying medical knowledge in clinical settings, as *situational* and *context-dependent* knowledge are excluded in the learning process (Crooks et al., 2016). The lecture-based instruction potentially limits students' acquisition and use of *strategic* knowledge, as they have little opportunity to reason through real medical cases.

Contextual Analysis

While selecting the appropriate instructional approach, the instructional designers realized the importance of considering the unique content and manner in which the SGSH instruction was to be implemented across institutions. There were three major constraints: first, faculty would use the new SGSH instruction at their discretion as "curricular threads" in the existing curricula; second, the new SGSH instruction should not require the presence of an instructor; rather, the modules themselves were to "teach" the content; and third, the new SGSH instruction was to provide authentic learning experiences that wove the SGSH content with traditional clinical knowledge and skills. These constraints led the

designers to consider developing the SGSH instruction as stand-alone instructional modules and chunking the SGSH content into small modules that could be easily integrated into and supplement existing curricula.

Framework Selection

In acknowledging the state of current medical education, the project team decided to design SGSH instruction based on an evidence-based pedagogical framework that has proven to enhance problem-solving and decision-making abilities in dynamic, real-world settings. The ID team realized that to teach medical professionals to function effectively in a healthcare environment, an instruction needs to contain more than isolated facts and how-tos, or even sophisticated role plays. The ID team discussed several instructional approaches with potential to address the challenges, including goal-based, scenario-based, and problem-based learning. Eventually, the discussion led the ID team to select an interactive, multimedia case-based learning approach and cognitive-affective theory of learning with media as the theoretical framework for supporting the approach. There were several reasons for using an interactive, multimedia case-based learning approach rather than immersing medical students in an authentic medical setting with an actual medical facility and patients:

- The approach enables students to simultaneously apply medical knowledge and skills without compartmentalizing knowledge areas as separate entities to be learned independently (Kim, Hannafin, & Kim, 2004).
- The approach is risk-free and cost-effective. The price of mistakes is too high in a real healthcare environment, in which routine mistakes in judgment can cost millions of dollars or even a patient's well-being. Case-based learning allows medical students to make mistakes and learn from them without compromising patient care (Barrows, 1986; DeMarco, Hayward, & Lynch, 2002; Zary, Johnson, Boberg, & Fors, 2006).
- The approach allows instructors to control the complexity, content, and/or pacing of the learning experience, ensuring students learn the right content at the right time (Derry et al., 2010; Ryan & Marlow, 2004; Williams, 1992). Case-based learning may help instructors design instruction to avoid the problem of cognitive overload that medical students may experience when placed in an actual context without sufficient training. This control over the learning experience is especially critical for SGSH education, as the subject matter requires students to compare and contrast instructional methods (e.g., onset and progression of disease as expressed in different gender populations) that are difficult to implement in a real medical setting. The approach enables instructors to juxtapose contrasting cases in a manner that highlights important SGSH differences.
- The approach allows relative novice students to use all of their cognitive resources in learning the substantive aspects of their profession without having to deal with less substantive or even trivial aspects before they have learned the basics (Cicourel, 2004; Derry et al., 2010). A real healthcare environment inevitably contains noise and stress, which make it difficult for novices to have quality learning experiences and make appropriate medical decisions.

From cognitive-affective theory of learning with media (CATLM; Mayer, 2014; Mayer & Moreno, 2007; Moreno, 2007), two assumptions guided the instructional design: (a) deep and meaningful learning occurs when learners invest cognitive effort in purposefully integrating new information with existing knowledge; and (b) motivational factors mediate learning by increasing or decreasing cognitive effort. The CATLM enhances Mayer's cognitive theory of multimedia learning (2009) by expanding the traditional cognitive perspective to include affective and motivational aspects of learning.

Delivery Mode Selection

In reflecting on the selected instructional framework, an asynchronous online delivery medium was chosen for the SGSH learning modules. The need for asynchronous online delivery was one of the design constraints identified early in the planning stages of this project. This delivery format requires the development of independent learning modules, which necessarily preclude learner-to-learner interactivity. Without the possibility of peer interaction to stimulate learning and engagement, the ID team made a conscientious effort to develop quality learner-content interaction to compensate for this design constraint.

An additional limitation of the asynchronous delivery constraint for this project was that the SGSH modules needed to be made available for faculty to use at their discretion. To accommodate this limitation, the SGSH content was chunked into small modules that could easily be used to supplement various instructional content across the curriculum. The ID team realized that a practical result of this design decision was that faculty would use the SGSH modules as independent learning activities, requiring students to use them between and after regularly scheduled learning activities. The decision to develop small, asynchronous, self-paced modules was to facilitate and encourage students to complete the modules.

In addition, multimedia cases and presentations were designed to integrate three different types of knowledge (i.e., situational, content, and strategic) using mini-activities, scaffolds, or quizzes (Crooks et al., 2016).

DESIGN PROCESS

The first iteration of design and implementation took two years after the initial approach was decided. In this phase, the first two modules were completed. They focused on two specific diseases (i.e., osteoporosis and diabetes).

Module Design Structure

The project leadership and curriculum committee decided to structure the SGSH learning modules around authentic patient cases. Their idea was that each module would consist of three consecutive appointments between a healthcare professional and a patient in order to depict the progress of each patient from diagnosis to treatment. Thus, each module was structured around three authentic patient scenarios. The intent was that as learners progressed through these module components, they would learn about the progression of a disease state by observing how the disease was diagnosed and treated over time for the same patient. Learners were exposed to increasingly complex learning material as they cycled through each increasingly complex clinical scenario.

Project leaders and the ID team elaborated on the SMEs' authentic-case idea by adopting the theoretical framework and corresponding instructional model. This evidence-based instructional model was used to develop a prototype module to guide SMEs on how the SGSH content should be organized within each of the three provider/patient scenarios. The components of the initial instructional model were as follows:

- Introduction
- Objectives
- Clinical Scenarios (i.e., situational knowledge)
- Expert's Advice (i.e., strategic knowledge)
- Resources (i.e., content knowledge)
- Assessment

During the development of the first SGSH module, the ID team revised the initial instructional model components to enhance the presentation of situational and strategic knowledge. First, as described above, the initial model used clinical scenarios as the sole means of conveying situational knowledge about a patient case; the instructional designers added a case trailer component (explained below) at the beginning of each scenario to enrich the presentation of situational knowledge. Second, the positioning of strategic knowledge was moved to after the presentation of content knowledge with other experts in an expert section. Thus, the clinical case was named as a case solution in which learners were asked to answer questions from the patients or provide appropriate treatment in a first chunk of case video clip. Then learners could check actual responses or suggestions from experts in the next video clip. The revised structure was as follows:

- **INTRODUCTION:** In each module, a lead person (e.g., chief resident) introduces a main topic and guides learners to learning steps throughout the module as a pedagogical agent. The modules' lead persons vary in gender and ethnicity in order to provide an image of diversity in healthcare professions.
- **CASE TRAILER:** Students watch a medical "movie trailer" designed to motivate them to search for specific instructional content that is directly related to the instructional objectives. The trailers include short segments of authentic patient-case scenarios. Each segment ends with the patient asking a medical question that is left unanswered in the trailer. Each patient question is carefully designed to align with a specific objective and corresponding assessment item. To answer the question, the learner must search for information in the next section (i.e., meeting with medical experts) that directly relates to the objective.
- **OBJECTIVES:** The lead person provides specific objectives for each part of a module.
- **EXPERTS:** Learners meet medical professionals who have expertise related to the patient cases. Material in the medical expert section contains information that answers the patient questions that were raised in the trailer. However, the medical experts in this section do not refer to the actual patient situations that were depicted in the movie trailers because learners are supposed to apply the knowledge gleaned from experts to the specific situation. Learners peruse the medical expert section for the information needed to answer the patient questions raised in the trailer.
- **CASE SOLUTION:** Learners watch the full videos (i.e., medical cases). Watching the full medical-case movies provides authentic feedback to learners, as they are now able to hear the medical professional in the movie trailer answer the patient questions. However, before hearing the answers the learners are asked to answer the questions themselves. Patient charts are available for learners as references to help them answer the questions.
- **SUMMARY:** Learners read the summary of the key information for each part of a module, and additional reading materials are provided in a "Dig Deeper" section.
- **ASSESSMENT:** After the summary, two questions similar to United States Medical Licensing Examination (USMLE) questions are provided. This assessment is intended to help medical students prepare for the exam. Next, learners receive a digital badge reflecting their completion.
- Credit: At the end of the module, a closing credits page shows a list of people who contributed to the module's development.

Challenges

Hindsight suggests that one physician with a particular specialty in a module disease state should lead the curriculum

committee for that module. There were often multiple physicians on a committee, making it difficult to reach consensus. An additional challenge was that the curriculum committee often struggled to find the variety of medical professionals needed for each module. Each module required a curriculum committee comprising, but not limited to, medical doctors, nurses, scientists, physical therapists, and speech language pathologists, depending on the disease. Gathering individuals with expertise and experience in specific diseases to work on the curriculum at the same time was particularly challenging due to their tight work schedules.

The curriculum committees struggled to apply the pedagogical method for case-based learning to develop all learning content at the beginning of the project. More specifically, it was hard to extract the essence of the SGSH content to present in scenarios that could be translated into online learning modules. The instructional designers struggled to train the SMEs in writing scenarios and aligning learning objectives, activities, and assessments. The ID team attended several curriculum committee meetings to show the importance of alignment and provided a learning module framework graphic. In addition, the ID team trained the project manager because she is the main person to communicate with curriculum committees.

MODULE IMPLEMENTATION

The implementation stage consisted of two phases: (a) module content development, and (b) module development.

Module Content Development

To facilitate the need to work with multiple SMEs for each disease, the team developed a process that could be replicated for each module. The initial process was threefold: (a) content development phase; (b) content review phase; and (c) storyboard creation.

Content Development

After the curriculum committee members' meeting with the project manager to discuss the overall structure of the module, the curriculum committee produced the following items:

- Three to four learning objectives per module.
- Two medical case scripts with a male and a female patient with the following conditions: (a) diverse demographic characteristics (e.g., ethnicity, age) between patients; (b) medical situation(s) that align with the learning objectives; (c) case situations that include questions from a patient and answers or clinical suggestions from a health professional. (This is the most critical content, which needs to be clearly delivered to students via case trailers); and (d) case trailers with three to four short segments that end with questions from the case script, based on the learning objectives.
- Learning content: (a) patient chart or pedigree (i.e., family medical history) for each patient to be used as a reference in the trailer or the case solution section; (b) content for the expert section: each part has two or three health professionals (e.g., clinical pharmacist, nurse, physical therapist, or diabetes educator) based on each disease, and each one provided fundamental knowledge about the disease and sex and gender issues; and (c) additional resources for the Dig Deeper section.
- Assessment items: (a) case questions for the case solution section (two or three questions for each case); (b) expert questions: two quiz items at the end of each expert section; and (c) post-test: a USMLE-type question at the end of each part.

Content Review

In the first round, an external expert and a project manager reviewed the content after the curriculum committee created it, including a case script. After the review, the project manager asked the curriculum committee to revise the content.

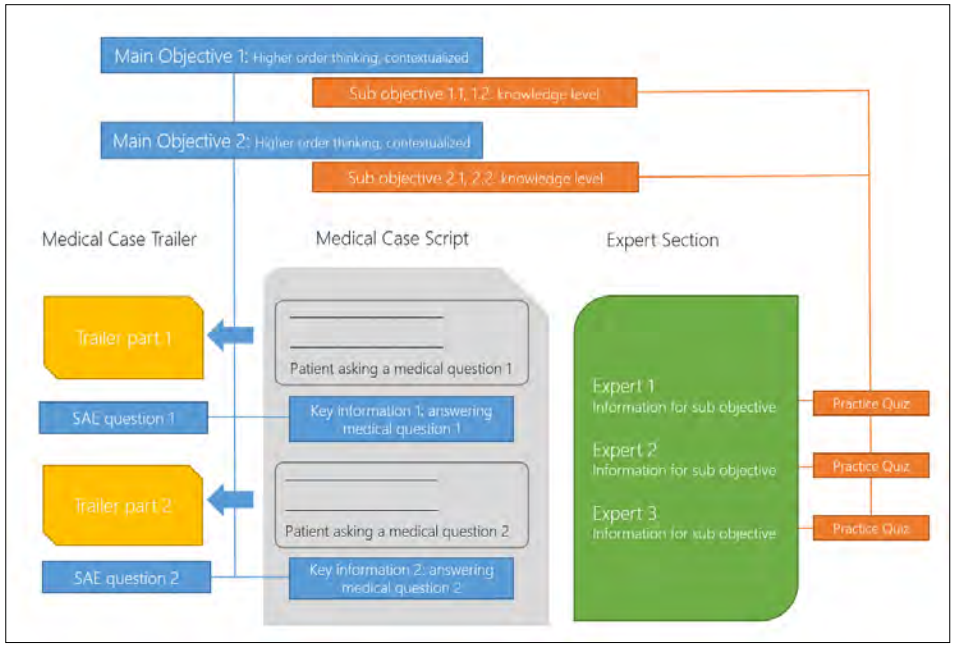

FIGURE 3. Learning module framework.

Storyboard Creation

Using the content developed by the curriculum committee, an instructional designer created a storyboard with MS PowerPoint. During this process, the ID team sometimes asked the committee to find a different presentation or provide new content, because some content was not aligned with the instructional framework.

Challenges

In this phase, the project team as a whole and as sub-groups encountered several challenges. Because the project team consisted of multiple curriculum committees (one for each module), communication was a considerable challenge throughout the phase. Responses from curriculum committee members were sometimes delayed because of their busy schedules. Another challenge the curriculum committee encountered was that the medical case scenarios needed to be diversified in terms of sex, gender, ethnicity, and age; which was the whole purpose of this project to provide sex and gender issue in different disease and ages.

The most challenging issue was the lack of understanding among committee members related to the proper implementation of the various components of the instructional model: (a) sex and gender issues in both case scenario and expert section, and (b) the alignment between objectives and assessment in the medical cases. The project leader and manager agreed on the instructional model (i.e., multimedia case-based learning) the ID team presented, and the manager usually led the curriculum committee's meetings. While the curriculum committee understood their subject matter, they lacked an understanding of instructional design, including how the learning objectives needed to be reflected in scenarios, how the module content should be organized, and how each objective should be measurable to ensure learning outcomes. Thus, the ID team created a visual framework that showed the relationships among objectives, case scenarios, and experts (see Figure 3), and the instructional designers tried to attend the curriculum committee meetings.

However, the ID team was not able to attend every meeting, and the misalignment between content for the expert sections and case scenarios still existed while the sex and gender issues in the case scenarios were resolved. In the end, the ID team invested considerable time learning the subject matter in order to be able to change the content and structure to align learning objectives, case scenario, content, and assessments. This process caused several delays in the module development. (For a more detailed account of this challenge, see "Overall Reflections" below.)

Module Development

The learning module is a part of the SGSH website, which includes the following elements: (a) Slide Library, (b) Video Library, (c) Learning Modules, (d) Cases, (e) Partners, (f) Resources, (g) Communication, (h) Link to Laura Bush Institute for Women's Health Institute, and (i) Contact Us, as shown below. The learning module page requires users to register and provides a menu to select from five available

FIGURE 4. SGSH Website and Learning Module Home Page.

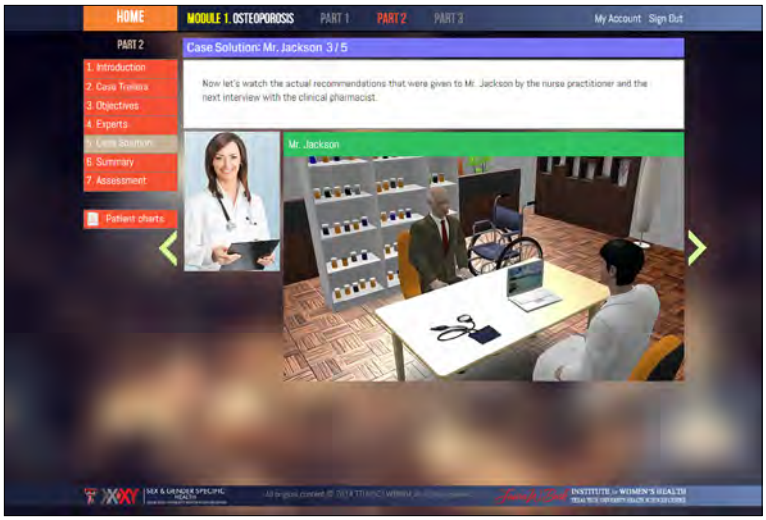

FIGURE 5. Medical Case Video.

FIGURE 6. Trailer Video.

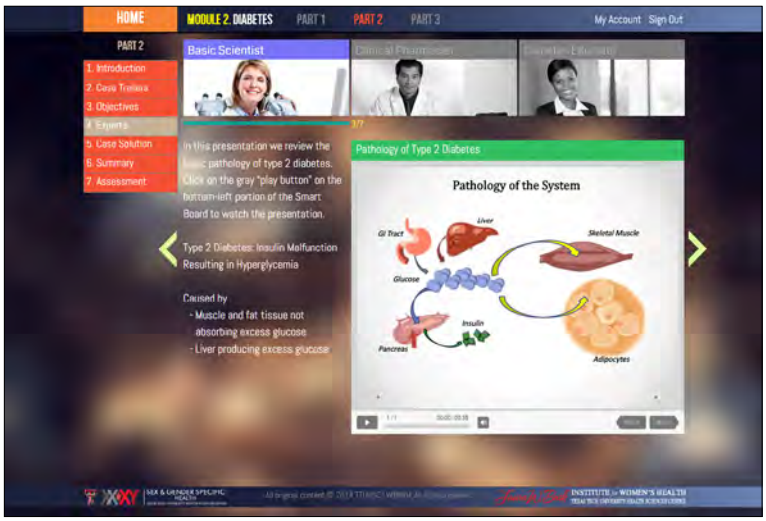

FIGURE 7. Interactive Presentation.

modules. The demo module is available at https://www.sexandgenderhealth.org/demo/menu.html

The modules were developed by the instructional development team. The development process and tools used are described as follows.

Website and Module Development

The layout of the website and general content were created with Adobe Muse and other graphic software. All graphics, including guide images, were downloaded from a paid stock photo site, Shutterstock.

Movie Creation

All movies were created with software from Moviestorm, a 3D animation site. with medical case scripts and voice files (see Figure 5).

Human Voice Recording

While the movie characters and setting were 3D animation, the voices of all characters were human, in order to provide authenticity. The narrations were recorded by a team of amateur actors. Camtasia, a screen recorder and video editor, was used for the movie files.

The trailer movie clips were usually around 1 minute long, and multiple segments were extracted from the original case movie clips by adding animated title and transition effects with background music, as shown in Figure 6. The trailer movie clips were important because each segment ended with questions asked by patients, and the questions were closely related to the module objectives. So, learners were introduced to experts to learn knowledge that would help them find answers for the patients in the movie trailer.

Multimedia Development

Various interactive presentation techniques (e.g., composition, slide show, panel, etc.) and videos were used to provide medical information in the expert sections (see Figure 7).

Data and User Management

User signup, subscription, learning progress, digital badge, completion certificate was implemented by a web programmer on the ID team with PHP and MySQL.

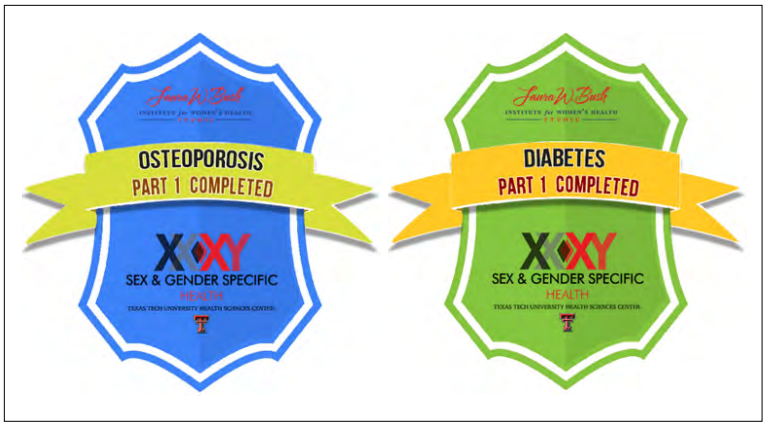

FIGURE 8. Digital Badges for Module Completion.

Digital Badge and Certificate

After completing each part, learners received a digital badge (see Figure 8) and certificate. This feature was also developed by the web programmer on our own server with PHP and MySQL.

Challenges

We encountered a number of challenges during module development, as follows:

Learning Material Inconsistency

The quantity and types of learning materials, especially for the expert sections, were not consistent across modules. Since each part should take the user around 20 minutes to complete, and multimedia should be included in the content, the ID team asked the curriculum committee to revise the materials, but it was challenging to meet the timeline. So, the ID team had to find multimedia, such as graphics, and videos, for topics. Since this task took lots of time, it slowed module development work.

Movie Creation

All modules needed to use different characters with diverse ages, genders, and ethnicities, but the ID team found that Moviestorm contained only a limited number of characters. The video developer had to find additional characters from an external library and modify faces or clothes to make avatars look different.

Another lesson the ID team learned was about importing human voice files. Originally, movie files were created first and imported human voice files later, but it took extra time to synchronize motion and audio. Thus, the ID team decided to have a voice file first, then create movie clips. With the scenarios that depict diverse patient populations, finding voices that represented different sexes, genders, ethnicities, and ages was challenging and time consuming. The ID team worked with an amateur voice actor group for the first three modules, and the team is currently working with a university School of Theatre and Dance to record voices.

PHP and Adobe Muse

The module interface and website layout were developed with Adobe Muse. However, the learning modules used a server-based script language to provide interactive content and save user data. The web developer and programmer had to find diverse ways to coordinate the web programming with Adobe Muse.

Copyright Issues

The expert section contained multiple videos. The project manager contacted the creator of each video requesting permission to use it. If the creator rejected or did not respond to the permission request, the ID team and the project manager found alternative videos and materials where permission was granted.

Closed Captioning

Closed captioning was included in all video clips. Initially a student worker was hired to create the caption files but was unfamiliar with medical terms used. Thus, the project manager contacted a professional company to provide caption files. The team learned that that using a professional closed captioning company was more cost effective.

Web Server Management and Payment System

The university has a very strict policy to manage the institutional server and website layout. Therefore, the team used an external server hosting company to host the SGSH website. The online site charged a year-long subscription fee to utilize the learning module. There were two types of subscription: institutional level and individual faculty level. Because the payment system had to be housed in the institutional system, it took time to coordinate the internal payment system with the SGSH website, which is housed by an external webhosting company.

OVERALL REFLECTIONS

This project revealed some of the challenges that can occur when a relatively small ID team works with multiple committees composed of faculty members with content expertise and instructional experience. In the current project, the curriculum committee members were teaching faculty at the institution. Because of their teaching experience, the project directors concluded that the committees should have pedagogical knowledge in addition to an SME role. With this dual charge, the committees were tasked with not only gathering and curating instructional content (SME role), but also with developing instructional objectives, materials,

and assessment items (instructional role). Also, communication with the curriculum committee was handled by only the project manager. Thus, assigning curriculum committee members this additional instructional role proved to be somewhat counterproductive. This was likely due to two unique characteristics of the SGSH project. First, the delivery medium (online multimedia) was new to the committee members; and second, the instructional model was unfamiliar to the curriculum committee (e.g., communicating objectives through video trailers, ensuring that scenario segments [questions asked by patients] align with objectives, etc.).

These design characteristics of the SGSH intervention resulted in committee members frequently misunderstanding the intent of the instructional model, which, in turn, resulted in the creation of instructional materials inconsistent with the ID specifications and the need for multiple revision cycles. The ID team provided an instructional framework as a supplemental resource and attended several committee meetings, but this did not help the committee fully understand the module sequence. In some cases, after two or three "revise-and-resubmit" cycles between the ID team and the curriculum committee, the ID team, after consultation with the project directors, decided it was more efficient to assume the SME role themselves, rather than to go through more time-intensive revision cycles with the curriculum committee. This taxed the ID team with the need to conduct extensive research into the instructional content (e.g., understanding sex and gender issues related to osteoporosis, etc.) in order to complete the SGSH modules.

In hindsight, an official training or workshop session should have been held with each curriculum committee, and the ID team should have been involved in the analysis phase in the early stages of the project. It would have been more effective and efficient for the project directors to assign the more traditional SME role to the curriculum committee at the outset and to leave the ID role to the instructional designers.

In the implementation phase, the ID team resolved most of the issues of the multimedia production phase (e.g., movie creation, voice recording, close captioning, and copyright) and server-side programming (e.g., subscription payment, data management), except for the quality of the movie clip. Since the team was not able to create the medical movie clips with real actors, a 3D animation tool was used, but it was challenging to make it seem authentic due to the limitation of the characters and settings in the animation tool. All such technical requirements and specifications should be identified in the early stages of the project so that the ID team can effectively plan and manage the tasks.

Recent scientific evidence affirms that differences between the sexes is a significant factor in the manifestation, epidemiology, and pathology of many common health issues (e.g., cardiovascular, pulmonary, and kidney diseases). Yet, despite the evidence, SGSH remains a low priority in medical education and practice (Jenkins et al., 2016), putting millions of women and men at risk of improper diagnoses and treatment. Clearly, the integration of SGSH into the medical school curriculum is a high-stakes issue that requires designers to carefully maneuver through obstacles and barriers to SBSH implementation.

The ID team faced some significant obstacles during the design and development of the SGSH project that caused them to reevaluate and modify some earlier decisions. For example, the team did not anticipate the extent to which the emotion-laden climate associated with SGSH would influence the design process. In fact, the initial decision to create optional, stand-alone multimedia modules was considered a next-best solution that required less institutional commitment than a more ideal complete integration model, with SGSH threads strategically woven throughout the required curriculum (Verdonk, Benschop, De Haes, & Lagro-Janssen, 2009). Furthermore, gender issues did not receive the same priority among committee members and the faculty in general. This led to some spirited discussions and negotiations among committee members about the amount and type of SGSH content to include in the modules.

In sum, working with multiple SMEs should be carefully planned and managed in a large project, and instructional designers should be more actively involved in the project management process.

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