

The Development and Validation of a Survey Instrument for the Evaluation of Instructional Aids

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Abstract

The processes associated with survey development and testing are critical when doing survey research. Survey development for educational program evaluation is no different. This study offers the researcher both a model for survey development as well as a valid and reliable survey instrument to measure the effectiveness, appeal, and efficiency of instructional aids in an online course environment.

Introduction

Instructional aids in online environments have been used as a content tool to enhance learning in adult education. However, most articles addressing the use of instructional aids are based on personal experiences, expert opinion, and conventional wisdom. Few studies are grounded in the use of valid and reliable instruments to evaluate instructional aids. This study attempts to address this concern by developing an instrument to measure constructs associated with the use of instructional aids in a higher education context. This instrument was developed and pilot-tested in a health occupations science online course. In a kinesiology online course, students used instructional aids such as videos on movements of the body and muscle testing, digital flash cards and games to identify key concepts related to muscles of the body, and a tutorial program to review content on osteology. These instructional aids were placed within the Blackboard Learning Management System for review and practice of content in preparation for exams.

Instructional aids are defined as small units of digital educational materials that can be used flexibly and in a variety of formats (e.g., videos, interactive games, and tutorials) to enhance online lessons. Also known as learning objects, instructional aids “decompose content into granular pieces of information that can be stored, retrieved, and reused in instruction” (Jonassen & Churchill, 2004, p. 32). These learning objects, or instructional aids, can be used individually, or they can be linked together in units to form a course (Hamel & Ryan-Jones, 2001).

Instructional aids are being used increasingly more often in adult education and online education as teaching tools to help students understand concepts. They are easy to use, and can be reused in different contexts (making them cost efficient) (Conceição, Olgren, & Ploetz, 2006). Because of this flexibility, it has been suggested that they are the future of online instruction. Hamel and Ryan-Jones (2001) posit that instructional designers “will not be designing courses anymore. [Rather] they will be designing small stand-alone units of instruction called learning objects” (p. 1058). The successful use of instructional aids for learning incorporates the following constructs: effectiveness, efficiency, and appeal (Reigeluth, 1999). Effectiveness is how well the instructional aids work relative to student learning. Efficiency is defined by the

level of effectiveness of the instruction divided by the time of the instruction. The level of appeal is the extent to which the learners enjoy using the instructional aids.

Pollack (1998) notes that “evaluation is frequently difficult in face-to-face learning environments and is compounded in distance education” (p. 6). Using a valid and reliable instrument that measures all three constructs will help adult educators and instructional designers to more accurately know if the online instructional aids their students are using are, in fact, enhancing learning.

Survey Model

How can the constructs of effectiveness, efficiency, and appeal related to the use of instructional aids best be measured? In order to answer this question, a survey instrument was developed to evaluate the effectiveness, efficiency, and appeal of instructional aids in a kinesiology online course. The structure of the course for this study included 15 modules of online instruction, optional one-hour open labs held each week when there was a scheduled on-campus proctored exam, discussion groups, and online quizzes. The open lab was designed primarily as a review of content and for hands-on demonstration. Students were given surveys asking their opinion of the effectiveness, efficiency, and appeal of the instructional aids before taking the on-campus exams.

Twenty students enrolled in the online course completed a survey instrument to evaluate the instructional aids embedded within each lesson during the course of the semester. Students were given multiple surveys after each unit of instruction. The survey depended on the instructional aids used during the unit. For example, for unit 1 the instructional aid was video, so a survey with questions specific to the video aid was conducted. Units 2 and 3 used a tutorial, so a survey focusing on the tutorial was conducted. Units that contained video and interactive games used a survey specific to this type of instructional aid. The survey was the same with the exception of the name of the instructional aid.

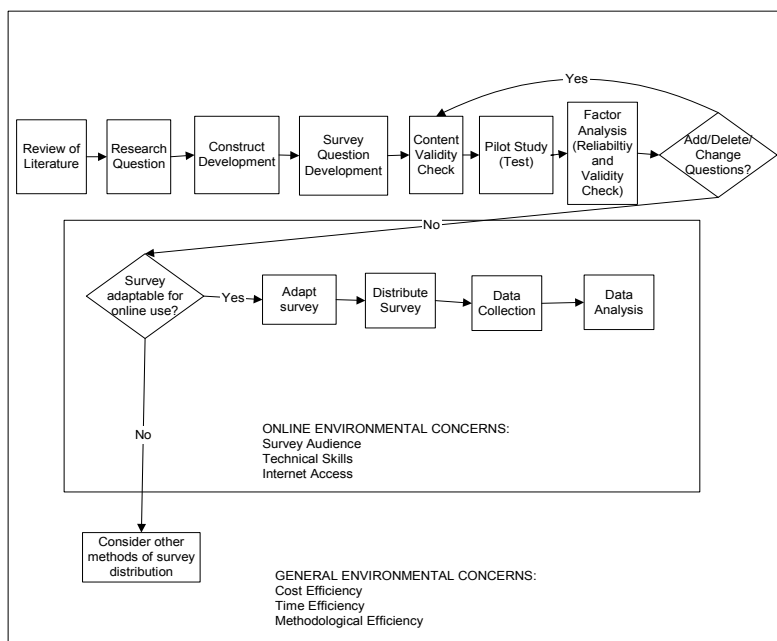


Figure 1. Model for Online Survey Development

Survey Instrument

In order to develop a survey instrument to evaluate instructional aids, a model for online survey development was used (see Figure 1) (Schmidt, Strachota, & Conceição, 2006). A review of literature on instructional aids was conducted, and it was determined that there was a gap in the literature related to the evaluation of instructional aids in higher education settings. Constructs related to the evaluation of instructional aids were identified based on Reigeluth's (1999) instructional design theory, and survey questions were developed. To ensure content validity, experts in survey research and in the subject matter were consulted and their input was used in question revision and redesign. A pilot test (N=20) was also conducted in order to establish content validity. Factorial analysis of data from the pilot test then determined the construct validity. Following factor analysis, the instrument was tested for reliability.

Instructional Aids Survey Instrument

Instructional aids were evaluated using the following instrument.

The purpose of this investigation is to study the effectiveness, efficiency, and appeal of instructional aids within this college course. Data collected from this survey will be kept confidential. Data will be grouped and your comments will not be individually identifiable. Filling out this survey indicates that you are at least 18 years old and are giving your informed consent to be a participant in this study.

DEMOGRAPHICS

Age: ☐ 18-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-64

Gender: ☐ Male ☐ Female

Ethnicity: ☐ Caucasian/White, ☐ African American, ☐ Hispanic, ☐ Asian, ☐ Native American

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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EFFECTIVENESS OF INSTRUCTIONAL AIDS

1. This instructional aid helped me when practicing (insert as appropriate: movements of the body, muscle testing positions, etc).
2. This instructional aid helped me to better understand the information (insert as appropriate: movements of the body, muscle testing positions, etc).
3. This instructional aid put meaning to the written material (content) for this lesson.
4. This instructional aid helped me to better understand the textbook information.

APPEAL OF INSTRUCTIONAL AIDS

5. This instructional aid was organized by a specific (insert as appropriate: joint, bone, muscle) so that it was easy to search and review information.
6. This instructional aid offered feedback so that I knew if my response was correct or incorrect and if I needed to continue to review.
7. I was satisfied with the design of this instructional aid.

8. I was satisfied with the look of this instructional aid (visual clarity).

EFFICIENCY OF INSTRUCTIONAL AIDS

9. Approximately how many hours did you spend reviewing the information in this instructional aid?

_____ Hours

10. Select the purpose for using this instructional aid (select all that apply):

____ Reinforce, ____ Clarification, ____ Practice, ____ Review, ____ Retention

11. I experienced technical difficulty when using this instructional aid? _____ Yes _____ No

If yes, describe what technical problems you encountered.

GENERAL SATISFACTION WITH INSTRUCTIONAL AIDS

12. Did you like using the instructional aids in this course? _____ Yes _____ No

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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13. Overall I was satisfied with this instructional aid.

14. Overall I feel I was able to learn the information from this instructional aid as well as I would have in a face-to-face class presentation.

Reliability and Validity

This study was conducted during the spring 2006 semester. Validity and reliability were established for the instrument. Through the process of factor analysis using varimax rotation the instrument identified two strong constructs: effectiveness and appeal. Items within the construct of effectiveness factor loaded from .800 to .916. Items within the construct of appeal factor loaded from .618 to .905. Reliability was found to have a Cronbach's alpha of .90. Efficiency was found not to be a strong construct because of its interdependency on effectiveness. It was determined that efficiency could be more accurately measured through the use of qualitative questions. Therefore, qualitative questions were designed for the efficiency category. The pilot test was found to be an important stage of the instrument development process as necessary revisions were identified. These revisions were made and the final survey instrument was used to evaluate the instructional aids.

Summary of Results

Survey results showed that students were highly satisfied with the instructional aids used in this online course. There was no significant difference in the level of effectiveness and appeal when comparing the use of instructional aids such as video, interactive games, and tutorial instruction. Overall video received the highest ratings compared to interactive games and tutorials. Video was used for the movements of the body and for all muscle testing units in the course. Through qualitative analysis of efficiency, students identified that video was used most often for clarification of concepts (81.3%). Comments included statements such as, "viewing the video clips helps me understand the content better by viewing it instead of just reading the material" or "when I had a question I was able to go back to the videos to find out the answer and it made it more clear." Therefore, the use of video enhanced learning by offering visual feedback for clarification of written content.

Interactive games were designed using a QUIA software program, which allowed the designer to develop a variety of activities such as flashcards with embedded graphics and audio, matching games, concentration, challenge boards, ordered lists, higher-ordered questioning, and self-assessment quizzes. Through qualitative analysis of efficiency, students identified that interactive games were used most often to reinforce concepts (76.5%) and for practice (58.8%) and review (58.8%). Interactive games were used least often for clarification (29.4%). Comments included statements such as, “the QUIA flashcards reinforced learning for example, being able to save or discard cards to find out which ones I needed to practice more” or “the flashcards help a lot. As soon as I saw the pictures on the cards I remembered them from the reading materials. It made studying more efficient.” The interactive activities were developed to reinforce written content and for practice and review as often as needed prior to the exam.

A tutorial was developed for the osteology unit using Authorware software. The tutorial was created with a graphic of each bone and the specific landmarks of that bone. Landmark names were created as labels on the left of the screen. The student was to mentally attempt to identify where the landmark was located and then click on a designated label. Once the label was selected it then moved to the correct location on the bone. Through qualitative analysis of efficiency, students identified that the tutorial was used most often to reinforce concepts (75%) and for practice (62.5%). Comments included statements such as, “the program helped me see the landmarks of the bones. It helps because the bone is there and I can say what it is, then click on it and I can see if I got it right” or “the tutorial was a great tool in reviewing and reinforcing all the landmarks of the bones.” The tutorial was developed to reinforce written content and to offer feedback to the student as to what content had or had not been learned.

Overall the majority of students felt that they could learn online as effectively as they could in a classroom environment. Analysis of instructional media showed that 87.5% of the students (strongly agree and agree) felt they could learn online as effectively when video was used (6.3% neutral, 6.3% disagree). This compared to 70.5% of the students (strongly agree and agree) who felt they could learn as effectively online when interactive games were used (17.6% neutral, 11.8% disagree), whereas 65% of the students (strongly agree and agree) felt they could learn online as effectively when tutorial instruction (18.8% neutral, 18.8% disagree) was used. As one student stated, “with video, I was able to replay it, and replay it. In a classroom setting you basically see it once.” Another valuable comment made was, “I would like to say that all of the instructional aids that are provided with this course have been extremely helpful and beneficial to grasping the course content. I don’t think this course could be an online course (effectively) without the way it is set up organizationally and also without the tools that have been provided.”

Limitations of this study include a small sample size and the fact that this course was a required program course only offered through an online format. Although students did not choose online learning the majority found it to be a positive experience. One student summed the course experience as, “I actually think I learn better online as I can take my time and go over things as many times as I need to.”

Conclusions and Implications for Practice

Klecker (2005) states that “online assessments can measure the student’s achievement of intended learning objects if, and only if, great diligence is used in their construction” (p. 2). The formal process used in the development of this survey instrument is an example of exactly that

diligence. Pilot testing a survey instrument is a critical step of survey research. In this study the survey instrument was revised based on the pilot study. A model for online survey development as well as a valid and reliable survey instrument to measure the effectiveness, appeal, and efficiency of instructional aids was developed and shared. This study further identifies the need to move beyond text and to create interactivity using instructional aids such as video, interactive games, and tutorials in an online environment. This study serves to link the theory of instructional design to the practice of adult education and online learning. Further studies of this nature should be conducted to support the findings of this research study.

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Presented at the Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, University of Missouri-St. Louis, St. Louis, MO, October 4-6, 2006.