Bridging the Gap: Theory-Based Design of a Microsurgical Skills Course for Ophthalmology Residents

Antigoni Koukkoulli, MD, Aman Chandra, BSc,* Hithen Sheth, FRCOphth,* Narciss Okhravi, PhD,* Seema Verma, MD,* Paul Sullivan, MD,* and Daniel G. Ezra, MD*,†,‡,§*

*Department of Education, Moorfields Eye Hospital, London, United Kingdom; †National Institute for Health Research, Biomedical Research Centre for Ophthalmology, Moorfields Eye Hospital and UCL Institute of Ophthalmology, Moorfields Eye Hospital NHS Foundation Trust, London, United Kingdom; ‡Adnexal Department, Moorfields Eye Hospital NHS Foundation Trust, London, United Kingdom; and §Department of Cell Biology, UCL Institute of Ophthalmology, London, United Kingdom

OBJECTIVE: Although theory-based schemes for course design are widely used in educational settings, making use of cognitive theory in the design of surgical skills courses in ophthalmology is rare. The primary aim of this study is to describe the application of instructional design, an established theory-based approach in course design, to the development of a surgical skills course for ophthalmology residents. The secondary aim of this study is to assess the educational effect of this theory-based course.

DESIGN: A 1-day skills course was designed according to Gagné's events of instruction model, which was employed as a template for the instructional sequence of learning steps. Skills acquisition following the implementation of the model was measured with precourse and postcourse assessments.

SETTING: Moorfields Eye Hospital organized the 1-day annual intermediate surgical skills course, which was hosted at the Royal College of Ophthalmologists' microsurgical skills laboratory.

PARTICIPANTS: A total of 20 ophthalmology residents of Moorfields Eye Hospital participated in the study.

RESULTS: A 1-day surgical skills course was formulated according to the instructional design principles outlined. The 4 objectives of the course (corneal suturing, corneal gluing, intravitreal injections, and eyelid suturing) were addressed in a parallel fashion as to allow for multiple objectives to be processed simultaneously, in the context of the instructional design sequence.
Assessments demonstrated significant improvement in skills acquisition for the 4 course objectives.

CONCLUSIONS: Instructional design is a valuable tool for planning effective surgical training courses as it is portable, allowing its application to a wide variety of outcomes and settings, and its terminology is simple and understandable to those working in clinical education. (J Surg 72:585-591. © 2015 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: microsurgical skillourse, instructional course design theory

COMPETENCIES: Patient Care, Medical Knowledge, Professionalism, Practice-Based Learning and Improvement

INTRODUCTION

One of the most fundamental changes in surgical training over the past decade has been the move away from an apprenticeship model of teaching toward a more systematic approach. Integral to this shift has been the implementation of teaching strategies to provide for the development of skills and experience in a graduated process toward reality. This involves trainees acquiring skills in a simulated patient environment before or in parallel with exposure to patients.[1] This transition has been established for some time in undergraduate medical training and is now being embraced by postgraduate surgical training.[2,3] Simulated surgical teaching techniques including surgical skills courses,

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Correspondence: Inquiries to Antigoni Koukkoulli, MD, FRCOphth, Moorfields Eye Hospital NHS Trust, City Road, London EC1V 2PD, UK; fax: (208) 202-5383; e-mail: antigoni_koukkoulli@hotmail.com

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multimedia demonstrations, and virtual reality training techniques have been widely used in other surgical specialities.[4] In ophthalmic surgical training, there has been a recent emergence of a variety of surgical training modalities to allow residents to improve their skills.[5] Microsurgical skills courses in ophthalmology have played a central role in skills development, and the effectiveness of these courses is now widely accepted.[6]

Teaching complex motor skills in a formal environment can be challenging. Modern educational theory suggests that there is a psychomotor domain of learning consisting of a hierarchy of internal cognitive processes, which include an awareness of the task, sensory stimulation, and guided responses.[7] To enhance the effectiveness of teaching, it is argued that these processes must be addressed by an instructional approach.[8] One such model for linking internal cognitive processes to a teaching template is "instructional design theory," which refers to the use of frameworks for developing teaching methods that enhance the effectiveness and efficiency of learning.[9] Several different instructional design models exist, and perhaps one of the most widely used is that developed by Gagné who described 9 instructional events that detail the conditions necessary for learning to occur. This is known as the "events of instruction" model.[9,10]

Moorfields Eye Hospital runs a 1-day surgical skills course for ophthalmology residents. The primary aim of this study is to describe the application of Gagné's instructional design model to the process of construction and development of a surgical skills course for ophthalmology residents based on our experience at Moorfields. The secondary aim of this study is to assess the effectiveness of this theory-based course using precourse and postcourse assessments.

MATERIALS AND METHODS

Setting

Moorfields Eye Hospital organizes a 1-day annual intermediate surgical skills course, consisting of microsurgical and oculoplastics components, for 20 residents, which is hosted at the Royal College of Ophthalmologists' microsurgical skills laboratory. No ethical approval was required for the study.

Objectives

The first step in the design process is to be clear about the objectives of the teaching exercise and then organize instructional events appropriate to that outcome. The course objectives were determined by content experts (P. S., N.O., and S.V.) in the context of the curriculum for higher surgical training by the Royal College of Ophthalmologists (Table 1).[11]

Instructional Design Model: Gagné's Events of Instruction

Gagné's "events of instruction" model was employed as a template for the instructional sequence of learning steps. Gagné proposed 9 events of instruction to be sequentially applied to be compatible with cognitive learning processes.[9] These events as applied to motor skill acquisition have been summarized in Table 2.

Event 1: Gaining Attention—Introducing Stimulus Change

The purpose of this initial step is to focus learners on the tasks ahead. Techniques for gaining attention include the presentation of dramatic or difficult cases. Stimulus change also relates to the choice of media used for the duration of the course.

Event 2: Informing Learner of Objective(s)—Provide a Demonstration of the Performance to be Expected

The objectives must be clarified from the outset to inform the learner what is expected to be achieved by the end of the course. This instructional step will help to prime the learner to organize the teaching material in the context of the expected objective.

TABLE 1. The Course Objectives as Determined by the Course Experts

Task	Description of Task
Corneal suturing	All ophthalmologists are expected to be competent in corneal suturing, as it is a skill required for globe repair following trauma, and in dealing with leaking wounds in cataract surgery. It is performed under the microscope using 10-0 nylon suture in interrupted or continuous fashion.
Oculoplastic suturing in the form of reconstitution of the eyelid margin	Trainees are expected to be able to repair eyelid lacerations involving the lid margin. It is repaired in sequential anatomical layers using a 6-0 vicryl suture, either with the aid of loops or unaided.
Vitreous tap and intravitreal injection	Endophthalmitis is an ocular emergency that requires urgent treatment in the form of intravitreal injection of antibiotics, preceded by vitreous sampling.
Corneal gluing	Corneal gluing is indicated for small corneal perforations, corneal melts, or leaks. Cyanoacrylate glue is used, and the procedure is performed under the slit lamp in clinic.