Integrating Clinical Neuropsychology Into the Undergraduate Curriculum

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Clinical neuropsychology has experienced unprecedented growth. The popularity of this specialty has affected graduate training, but little information exists for undergraduate education. Three approaches to presenting neuropsychological information for undergraduate psychology courses are discussed. As one approach, an undergraduate neuropsychology course is described. Ways to integrate clinical neuropsychology into some existing courses is presented as a second approach. The third approach involves developing specialized audiovisual materials for telecourses or existing courses.

Recent growth in clinical neuropsychology has prompted the formation of an APA division and several other professional organizations as well as publication of numerous journals and books. As the specialty area of neuropsychology has grown, concern about what constitutes adequate educational experience to produce competent practitioners in the field has increased. Development of training and educational standards has accompanied this growth. Meier (1987), Division 40 of the APA, and others developed stringent guidelines that have influenced graduate education and training.

Although little attention has been given to the undergraduate experience, these graduate standards imply the importance of well prepared undergraduate students. Newly developed undergraduate courses in clinical neuropsychology seem to be increasing in number and popularity. Unfortunately, little information is available about teaching these courses.

There are several reasons for the growing emphasis on undergraduate courses in clinical neuropsychology: One reason may be the growth of the field itself; another reason may be the increasing standards for entry into graduate training programs. This increase, which occurs regardless of subspecialty area within psychology, places more demands on students and faculty at the undergraduate level. This article describes various ways of teaching a first course in clinical neuropsychology and ways of integrating neuropsychological principles into existing courses. Although we emphasize three specific approaches used at different universities, our goal is to suggest information that will help prepare students for graduate training and accommodate typical financial constraints.

A First Course in Clinical Neuropsychology

Undergraduate students usually learn about brain–behavior relations in physiological psychology courses. The academic and experimental orientation of this course does not always satisfy the interests of students pursuing a clinical or health psychology career, however, because an applied orientation is not emphasized. Abnormal psychology courses provide, at best, a glimpse of brain–behavior relations in the organic brain syndrome section.

The first author developed a clinical neuropsychology course for undergraduates. This course is based largely on the educational guidelines for graduate training of Division 40 of the APA and the International Neuropsychological Society (1987).

The course is divided into three sections. The first section presents an academic (e.g., personality) and clinical (e.g., psychopathology) core that provides a foundation for later topics. Neuroscience and basic neuropsychology are presented as the second section. The third section covers specific neuropsychological topics, including introduction to neuropathology, assessment, and intervention methods. Students are required to participate in a 25-hr practicum in a health care or academic setting in which they are exposed to one or more of these topics (see Table 1).

Recommended prerequisites include introductory courses in psychology and biology. Preferably, students should also have completed other related courses, including anatomy and physiology, abnormal psychology, physiological psychology, tests and measurements, and behavior change/modification. Practicum experience may also be good preparation. Students with related majors, such as nursing, premed, and biology, should be encouraged to enroll after being

Table 1. Clinical Neuropsychology: Course Syllabus

Outline:	Pretest and Introduction to Course
Foundation:	Neurophysiology, Neuroanatomy, and Neuropathology
	Psychometric and Behavioral Assessment
	Psychopathology and Personality Theory
Introduction:	History of Neuropsychology
	Defining Clinical Neuropsychology
	Clinical Neuropsychology as a Science and as a Profession
Assessment:	Initiating an Examination
	Battery Versus Flexible Approach
	Battery: Luria–Nebraska
	Battery: Halstead–Reitan
	Individual Test: Intellectual Function
	Individual Test: Sensory, Motor
	Individual Test: Language
	Individual Test: Memory
	Individual Test: General Cognitive and Executive Function
Treatment:	Treatment Planning
	Rehabilitation Approaches
	Summary and Review
	Student Presentation
Requirements:	⅓ = midterm evaluation (after introduction section)
	⅓ = comprehensive final examination
	⅓ = outside-of-class project (5- to 10-page written paper)

reminded about the course's emphasis on behavioral approaches to assessment, understanding, and rehabilitation. Regardless of the prerequisites, students should receive an introduction to the field and to how neuropsychology can effectively bridge seemingly unrelated areas of interest. The scientist–practitioner model is emphasized with the intent of developing a basic understanding of brain–behavior relations from an applied perspective. These points reflect both the first author's approach as well as his recommendation. A syllabus for the course is presented in Table 1.

Teaching Clinical Neuropsychology in Other Courses

If undergraduate departments cannot add separate courses, then neuropsychological information may be covered in other courses, including clinical, abnormal, introductory, tests and measurements, and practicum courses.

The most extensive coverage of neuropsychology can be included in undergraduate courses in clinical psychology. One way to incorporate neuropsychology into a clinical course is through the use of case study methods. First, give the students a referral question, information about the individual's history, and appropriate assessment tools. After one student expresses an opinion, other students are encouraged to add to the original suggestion or make alternative proposals. With this additional information about the patient, students are asked to make suggestions for the recommendations section of the report. Students are encouraged to recognize that no one test battery or approach is best for answering a specific clinical question. Furthermore, they are taught that clear, specific answers to the referral questions are never easily understood or addressed. Integration of material from other sections of this course, other psychology courses, and related courses is reinforced.

An abnormal psychology course is a typical prerequisite for a clinical psychology course, and the majority of clinical courses are devoted to the study of psychopathology. Toward the end of an abnormal psychology course, neuropsychological assessment and rehabilitation procedures can be introduced. Although students often consider the importance of physiological psychology, many have not previously appreciated its relation to the mental health specialties. An introduction to clinical neuropsychology encourages the application of physiological psychology to the understanding of abnormal behavior.

In the introductory psychology course, information about neuropsychology can be covered in the section on abnormal behavior so that students are exposed to brain–behavior issues in an applied context. When the class is considering the more traditional sections on physiological processes, topics such as alcoholism and head injury can be presented and related to brain function. Because most introductory psychology students will not take other psychology courses, the goal is to integrate psychopathology with biological bases of behavior as one way to make psychology more personally meaningful.

Neuropsychology can be integrated into the practicum course in several ways. For example, at a medical or rehabilitation center neuropsychology assessment laboratory, undergraduates can become involved in both research and technician-level assessment procedures. Assessment training is provided by the center's staff, but students are expected to have prior theoretical knowledge about psychological testing. Their research participation could involve gathering data for ongoing projects or for their own pilot projects.

Audiovisual Supplements to Neuropsychology Courses

Two important sources of supplementary materials for teaching neuropsychology at the undergraduate level are reviewed in this section. The first source consists of public television productions, such as *The Brain* and *The Mind*, which provide a variety of audiovisual material for any neuropsychology course. These productions have full television-assisted courses (telecourses) associated with them, which are available through the Public Broadcasting System (PBS). The second innovation is the advent of computer-assisted instructional materials and Hypercard, a programming system available on the Apple Macintosh, used to develop courseware. Although these two developments may seem unrelated, they are important supplements to the traditional neuropsychology course and provide some alternatives to the lecture or seminar style of teaching. They are often available through university media/resource centers.

Television-Assisted Neuropsychology Courses

One of the author's (Williams) observations concerning telecourses and the PBS television series are derived from teaching undergraduate physiological psychology using the

telecourse style. This approach was first used when *The Brain* series was first aired in 1985. The telecourse consists of three main components: the television series, the text and study guide, and discussion groups held during the evening. Communication with the students is through the mail and during discussion group meetings. Test sessions can also provide for student–teacher interactions.

These groups meet weekly in the evening throughout the semester, although the meetings could be optional. Discussions generally cover the television episode aired that week or supplementary materials introduced by the instructor. These sessions can also include demonstrations of neuropsychological tests, laboratory demonstrations of perceptual or cognitive phenomena presented on the television series, and discussions of brain-injured patients seen by the instructor in clinical practice.

Administering tests and giving feedback on them by mail is potentially a problem. Of course, students must appear for test sessions, which are scheduled at the university in the evening. Study guides for each test are mailed to students during the previous week. The three tests are administered in similar fashion to tests given in regular courses. Unfortunately, unless students call the instructor or the test items are considered during the weekly sessions, posttest discussion may be limited.

A text used by the third author for such a course is *Brain, Mind, and Behavior* (Bloom & Lazerson, 1988), which is a good introduction to human neuropsychology. It is simpler and less comprehensive than Kolb and Wishaw (1985), which covers similar material. The text is also much different from traditional physiological psychology texts, which tend to stress the basic biology of neuronal function and inadequately cover human neuropsychology.

This focus on human neuropsychology represents a new and pervasive trend in the teaching of physiological psychology. There has been a clear shift from course content that stresses the animal literature and neuronal function to material that emphasizes facts and theories of human brain function derived from clinical neuropsychology and the study of brain-injured humans.

The Brain television series is a remarkable presentation of basic neuroscience for the general public. The material is accurate and presented in an exciting and entertaining format. Unfortunately, the television episodes can only function as supplements to a course; they are far too simple to serve as the primary vehicle to inform and educate students.

The television programs present neuroscience material in an engaging fashion and break up the usual, sometimes tedious, lecture format. They are useful for this purpose in almost any undergraduate psychology course. At least one episode is relevant for any course, including introductory psychology, abnormal psychology, and specialty courses, such as clinical psychology and human sexuality.

The major advantages of the telecourse format for a neuropsychology course are:

1. The course involves nontraditional students. Many older students who are not available for classes during the day can now take a university course because it interests them or better prepares them for their occupation or further educational experiences. In general, these students are more conscientious in their approach to a telecourse and do not need as much structure or supervision as younger, full-time university students.
2. The text, study guide, instructor's manual, and television series provide a comprehensive package. The course materials are well designed and integrated. These materials can also form the framework of a traditional course.

The disadvantages of a telecourse are:

1. Communication with students can be very poor. Discussion or exchange of ideas during the course is unlikely.
2. No laboratory or class demonstrations are possible except in discussion sessions, and these are very limited. Interesting demonstrations are important in neuropsychology but are not feasible in a telecourse.

Table 2 includes several sources of information about clinical neuropsychology.

Computer-Assisted Instruction in Neuropsychology

A few software packages have been developed on the Apple Macintosh that may enhance an undergraduate

Table 2. Clinical Neuropsychology: Resources

Journals
Archives of Clinical Neuropsychology
Cortex
International Journal of Clinical Neuropsychology
Journal of Clinical and Experimental Neuropsychology
Neuropsychology
Neuropsychology Review
Neuropsychologia
The Clinical Neuropsychologist
Videotape Series
The Brain. Public Broadcasting System
The Mind. Public Broadcasting System
Associations
Division 40, Clinical Neuropsychology, American Psychological Association
International Neuropsychological Society
National Academy of Neuropsychology
Ancillary Books
Lezak, M. D. (1983). *Neuropsychological assessment* (2nd ed.). New York: Oxford.
Ornstein, R., & Thompson, R. F. (1984). *The amazing brain.* Boston: Houghton Mifflin.
Restak, R. (1984). *The brain.* New York: Bantam.
Other Resources
Alzheimer's Disease and Related Disorders Foundation, 70 East Lake Street, Suite 600, Chicago, IL 60601
Association for Brain Tumor Research, 3725 North Talman Avenue, Chicago, IL 60618
Deveraux Center for Head Trauma, 19 South Waterloo Drive, Devon, PA 19333
Epilepsy Foundation of America, 4351 Garden City Drive, Landover, MD 20785
JMA Foundation, 1900 L Street, NW, Suite 300, Washington, DC 20036
New Medico Head Injury Systems, 113 Broad Street, Lynn, MA 01902
Rebound, Inc., 103 Hazel Path, Hendersonville, TN 37075
Tourette Syndrome Association, 42–40 Bell Boulevard, Bayside, NY 11361–2861

neuropsychology course. Three courseware applications are available: *Model Neuron, Hyper-Neuroanatomy,* and *Neuroanatomy Foundation.* Other helpful computer packages are *Mind Lab* and *Maclaboratory for Psychology.* (All of these are available from the Academic Courseware Exchange, 4141 State Street, Santa Barbara, CA 93110-1991; Telephone: 800–235–6919.)

Model Neuron simulates the activity of a "typical" neuron under conditions established by the student (see Figure 1). The student manipulates the factors that stimulate the cell and examines their effects on the cell's action potential. For example, the student may specify an electric current pulse of 1 nA for 1 msec and then run the simulation to view and measure the cell's action potential. Dopamine or other neurotransmitters can then be added, and their effects can be compared to the previous simulation.

Model Neuron is an interesting supplement for neuropsychology courses because undergraduate teaching laboratories are prohibitively expensive for many universities and colleges. This program allows the student to experiment without the expense and trouble of setting up an in vivo demonstration. Although *Model Neuron* comes with a manual, the program is only a simulation and requires the instructor to explain its workings, present and discuss the principles underlying the model, and develop a series of exercises for students to complete.

Hyper-Neuroanatomy and *Neuroanatomy Foundations* are Hypercard stacks designed as reference works and general introductions to neuroanatomy. *Hyper-Neuroanatomy* presents anatomy of the rhesus monkey brain using a technique based on the conventional coronal sections through the brain. The student clicks on the desired section, and it appears on the screen. Information about brain structures can be viewed by pointing and clicking to the brain structures. After exploring a number of sections, the student constructs a three-dimensional model of the cerebral architecture of the primate brain.

Neuroanatomy Foundations is a human brain anatomy atlas mediated by Hypercard (Figure 1). It is divided into four sections: the cerebral hemispheres, the cerebellum and brainstem, major fiber tracts, and subcortical structures. Each section contains digitized images, diagrams, and text, making up a presentation of basic knowledge in each of the areas. The images consist of three-dimensional dissections and enlargements of the human brain.

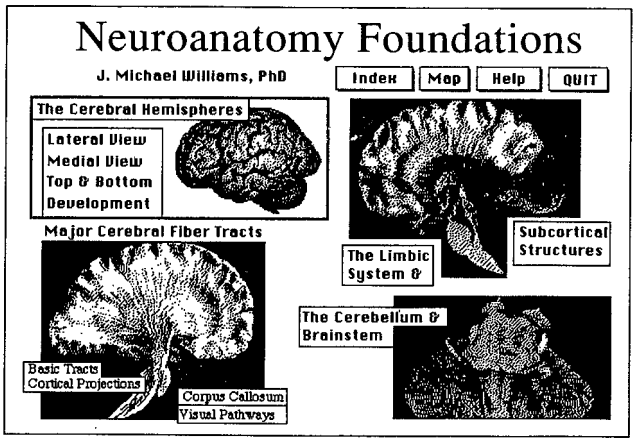

Figure 1. Sample screen. *Note.* From *Neuroanatomy Foundations* by J. M. Williams, 1987, Santa Barbara, CA: Academic Courseware Exchange. Copyright 1987 by J. M. Williams. Reproduced by permission.

Hypercard provides a flexible, efficient method for perusing a body of information according to the student's needs and interests. The student simply clicks through all the sections of these atlases and prints or stores material for later reference and note taking during class or for independent study of the course material. Such courseware represents a major advance in computer-assisted instruction for two major reasons: (a) Facts can be presented in a relational format that users explore according to their educational needs, as opposed to the structure imposed by a textbook author or lecturer; and (b) Hypercard is an object-oriented, as opposed to command-oriented, programming system that is so powerful and so easy to use that any educator can immediately begin designing applications without the help of professional programmers.

Discussion

The three approaches to teaching neuropsychology at the undergraduate level use diverse methods to accomplish their common goals. The first approach requires students to participate in a 25-hr practicum in a setting that exposes them to neuropsychological topics such as assessment, intervention, or neuropathology; it emphasizes the use of traditional clinical neuropsychology. A second approach teaches neuropsychology in existing courses, including introductory, clinical, and psychopathology courses. This approach emphasizes the integration of neuropsychological information and the importance of critical thinking in moving from a referral question to testing and how to help students develop such skills. The third approach focuses on the use of audiovisual materials (e.g., television programs) to supplement existing courses or to develop new ones.

Similarities in all three approaches include emphasis on integrating the scientific and professional aspects of psychology within the courses. In addition, case materials are integrated with current lectures or related text presentation. All three approaches also emphasize learning basic neuroscience and the importance of physiological psychology for modern clinical practice. Providing a broader background for clinical students in the basic science of psychology can promote closer collaboration between clinical and experimental faculty. From a theoretical perspective, such relationships provide evidence that the Boulder model of training scientist–practitioners is adaptable to the undergraduate curriculum.

Availability of undergraduate courses in neuropsychology will probably increase rapidly in the next few years. Training in human neuropsychology must go beyond theory in the classroom. Although an undergraduate course in neuropsychology should increase the student's basic knowledge of the area, such a course or similar offerings are not meant to imply skills training in clinical neuropsychology. Professional skills necessary to be a neuropsychologist are acquired in graduate and postgraduate training.

Along with background and research in the basic neuro-

sciences, hands-on clinical experience should be an important component of all training in clinical neuropsychology. The current situation in graduate training indicates that most programs do not meet even minimal guidelines. However, the trend seems to be toward meeting some standards involving the incorporation of clinical neuropsychology as a subspecialty area with a traditional applied curriculum. As this trend continues, the burden will be placed on faculty to provide the appropriate background by introducing new courses or adding to existing courses, especially at the undergraduate level.

References

Bloom, F. E., & Lazerson, A. (1988). *Brain, mind, and behavior* (2nd ed.). New York: Freeman.

International Neuropsychological Society, Division 40 Task Force. (1987). Reports of the INS Division 40 Task Force on education, accreditation, and credentialing. *The Clinical Neuropsychologist, 1,* 22–29.

Kolb, B., & Wishaw, I. Q. (1985). *Introduction to human neuropsychology* (2nd ed.). New York: Freeman.

Meier, M. (1987). Continuing education: An alternative to respecialization in clinical neuropsychology. *The Clinical Neuropsychologist, 1,* 61–66.

Williams, J. M. (1987). *Neuroanatomy foundations.* Santa Barbara, CA: Academic Courseware Exchange.

Notes

1. A preliminary version of this article was presented at the annual meeting of the American Psychological Association, Atlanta, GA, August 1988.
2. Requests for reprints should be sent to Antonio E. Puente, Department of Psychology, University of North Carolina at Wilmington, Wilmington, NC 28403–3297.

The Undergraduate Clinical Child Psychology Course: Bringing Students to the Real World and the Real World to Students

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An undergraduate clinical child psychology course that combines classroom, practicum, and guest speaker components is described. The course provides students with an overview of the descriptive characteristics, clinical theory, and treatment of the primary disorders and problems of childhood and adolescence. It also attempts to create linkages between (a) academia and (b) practitioners and settings in the natural environment. Course evaluation data indicate that this instructional model has been meeting its goal of stimulating students' interest in child psychopathology and in the psychosocial needs of youth.

Many undergraduates have the opportunity to take only one course in abnormal psychology, which typically concentrates on adult psychopathology—perhaps a result of the training and interests of the instructor. The instructional literature in this area reflects this adult-oriented bias (e.g., Rabinowitz, 1989; Scogin & Rickard, 1987). Writings on the teaching of abnormal child psychology tend to focus on (a) graduate training (Tuma, 1985); (b) specialized, advanced undergraduate seminars (Daehler, 1974; Gartner, 1984); or (c) undergraduate practica and skill-teaching courses (Prerost, 1981; Stollak, 1975). Indeed, undergraduate practica in clinical child settings, though popular, have been criticized for their absence of "specific training in . . . pediatric, abnormal child, or clinical child psychology" (Prerost, 1981, p. 20).

At Fordham University, in addition to the standard abnormal psychology course, each fall semester the Department of Psychology offers a course titled Clinical Child Psychology. Its impetus came from our desire to (a) complement the abnormal psychology course with one focusing on child psychopathology and (b) provide a course particularly suited for undergraduates planning careers involving contact with children evidencing psychological and behavioral disorders.

Course Goals and Structure

The course's principal goal is to provide an overview of the descriptive characteristics, clinical theory, diagnosis, and treatment of the primary disorders and psychosocial problems of childhood and adolescence. As a survey course