



# Factors Influencing Learning

## Instructor Manual

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This instructor's manual is designed to help you craft a lesson about learning and the factors that influence learning. The module upon which this manual is based describes a variety of forms of learning. The module introduces students to the science of learning, and offers helpful suggestions for improving learning and recalling information. This instructor's manual provides guidance for creating a one- or two-class lesson on learning. The supplied PowerPoint presentation, which includes activities, videos, and discussion questions, is designed to accompany and correspond to this lesson. The manual also contains additional outside resources that you may find useful for your module on the factors influencing learning.

## Learning Objectives

### Content Specific Learning Objectives

- Consider what kinds of activities constitute learning.
- Name multiple forms of learning.
- List some individual differences that affect learning.
- Describe the effect of various encoding activities on learning.
- Describe three general principles of learning.

### Relevant APA Learning Objectives (Version 2.0)

- Describe key concepts, principles, and overarching themes in psychology (1.1)

- Develop a working knowledge of psychology's content domains (1.2)
- Describe applications of psychology (1.3)
- Use scientific reasoning to interpret psychological phenomena (2.1)
- Apply psychological content and skills to career goals (5.1)

## Abstract

Learning is a complex process that defies easy definition and description. This module reviews some of the philosophical issues involved with defining learning and describes in some detail the characteristics of learners and of encoding activities that seem to affect how well people can acquire new memories, knowledge, or skills. At the end, we consider a few basic principles that guide whether a particular attempt at learning will be successful or not.

## Class Design Recommendations

This topic may be taught in one long class period (75-90 minutes) or two short class periods (50-60 minutes each). The Noba PowerPoint slides will also assist you in determining what schedule works best for your class.

- Introduction
- Differences in Learners
  - Motivation
  - Working Memory
  - Anxiety
  - Expertise
- Encoding Activities
  - How we learn is just as important as intention to learn
  - Self-control of learning strategies
  - Research-backed effective encoding strategies

- General Principles of Learning
  - The value of effective metacognition
  - Transfer-appropriate processing
  - The value of forgetting

## Module Outline

- **Introduction:** While most learners merely follow their intuition about effective learning strategies, they can benefit from an interdisciplinary science of learning that studies basic principles of learning and memory. Learning is a broader domain than it appears, and includes changes in perception and the brain in response to a wide variety of experiences, and often takes place without conscious awareness or intention to learn. These less conscious forms of learning are seen across species, and include non-associative learning, classical conditioning, and operant conditioning. In contrast, this chapter will focus on factors that affect explicit, intentional forms of learning.
- **Differences in Learners:** This section outlines the significance of individual differences in learning. The following factors have been found to have an effect on learning.
  - Motivation to learn is not greatly enhanced by money, but material that is prioritized by students will elicit greater effort.
  - Higher working memory capacity predicts better reasoning, reading comprehension, and control of attention among learners.
  - Anxiety hurts working memory, but having students write about their learning-related anxiety (e.g. math anxiety) can reduce worry and improve performance.
  - Because the usual bottleneck to remembering information is in *accessing* rather than *storing* information, greater expertise in the domain of study enhances the ability to learn new information.

- **Encoding Activities:** While how hard we *try* to learn is important, *how* we go about encoding information is just as important for successful learning.
  - Paradoxically, while intentionally trying to remember a list of words does help you *recall* the list (as opposed to merely evaluating the words for their part of speech), it actually impairs your ability to *recognize* the words. This is a case where incidental learning is superior to intentional learning
  - Survival processing – rating a word for its relevance to a survival scenario – also led to much higher recall than intentional learning.
  - Thus, merely intending to learn or being motivated to learn is not enough; *how* a learner processes the information plays a large role in successful learning.
  - Self-control of learning can be effective, but only when learners have good ideas about effective learning strategies.
    - Learner control over what material they study and how long they study it is moderately beneficial, but only if learners choose to spend more time on difficult material, and restudy what they don't understand as well.
- The following factors have solid evidence supporting their benefits for learning.
  - Spacing out repetitions of study is superior to bunching them all together. Increasing the space between study sessions appears to benefit learning even more.
    - Five 1-hour study session is better than a single 5-hour study session.
- Interleaving (mixing) multiple skills is more beneficial than “blocking” these skills by type when learning.
  - Baseball hitters improved more when they faced a mix of different pitches than the same pitches blocked by type.
  - Math students showed better test performance when different types of math problems were interleaved than when they were blocked by type.
- Tests are not just for assessment. Because retrieving information is one of the most powerful ways of enhancing learning, testing can also improve memory.

- Self-testing is a powerful way to make learning more durable
- **General Principles of Learning**
  - The value of effective metacognition
    - Metacognition describes the skills people have in monitoring and controlling their learning. Learners benefit from a sense of what material have mastered (or not).
    - We can improve metacognition by paying attention to our successes and failures in estimating what we know, and self-testing often to measure our progress.
  - Transfer-appropriate processing
    - It often makes sense to think of learning *as revealed by a particular test*, rather than learning “in general.”
    - Memory is better when the tests taps the same type of knowledge as the original encoding activity.
    - It benefits learners to think about the situations in which they are likely to need to access the information they learn (e.g. in a stressful work situation, on a quiz).
  - The value of forgetting
    - Though often seen as a problem, forgetting is actually a desirable part of the learning process.
    - Forgetting irrelevant or outdated information can help to “unclutter” our memories, making room for important new information.
    - Forgetting during the time in between spaced out study session can benefit learning, because when the information is relearned later, it may be more durable.

## Difficult Terms

Classical conditioning

Habituation

Implicit learning

Implicit memory

Metacognition

Nonassociative learning

Operant conditioning

Perceptual learning

Sensitization

Transfer-appropriate processing

## Lecture Frameworks

Overview: This lecture framework can be delivered in two 50-60 minute periods, or condensed into one longer lecture period (e.g. 75-90 minutes). Students will begin with a warm-up to get them reflecting metacognitively upon their own learning techniques. Next, students will learn about learner characteristics and encoding strategies that can affect learning. Along the way, students will participate in two activities/demonstrations of encoding processes (chunking and deep/shallow processing). Students will be asked to think about the mechanisms behind certain successful techniques and their implications for learning. The first class ends with a classroom assessment technique (CAT) to assess student understanding. The second class begins with a review of the previous day (based on the results of the CAT from day 1). Students watch a brief video about a memory champion, and are asked to reflect on his memory techniques. Next, general principles of learning are covered, with emphasis on the benefits of spacing and forgetting. Finally, this lesson also ends with a CAT.

### First Class (50-60 minutes)

- **Warm Up Activity – Learning Strategies:** The purpose of this activity is to have students reflect on the learning and memory strategies that they typically use.
- Refer to the Activities/Demonstration section for a complete description of this activity.
- **Direct Instruction on Differences in Learners:** In this section you will introduce students to the science of learning, explain learner characteristics that impact learning; and explain that experts can chunk information.
- **Chunking Activity (introduced to students as a “Memory Activity”):** The purpose of this

activity is to demonstrate the power of chunking to improve short-term memory.

- See the Activities/Demonstrations section for detailed instructions of this activity.
- **Direct Instruction of Encoding Activities:**In this part of the lesson, you will need to explain to while how hard we *try* to learn is important, *how* we go about encoding information is just as important for successful learning. You will also explain the difference between implicit and explicit learning; explain that control over our encoding methods can be beneficial if we know useful techniques; and explain effective methods of encoding information that are supported by research
- **Depth of Processing Effect Demonstration (introduced to students as a “Remembering Activity”):**The purpose of this activity is to carry out a demonstration of effects of processing information deeply versus processing it in a shallow manner.
  - For a complete description of how to do this activity, see the Activities/Demonstration section.
- **The Muddiest Point CAT:**The purpose of this activity is to assess how students are gaining knowledge, and what concepts remain unclear.
  - For directions on how to do this CAT, refer to the Activities/Demonstrations section below.

## Second Class (50-60 minutes)

- **Review of The Muddiest Point CAT:**To start the second day of class, it is important to review the results of the Muddiest Point CAT. In an open discussion with the class, go over concepts that student struggled with and even those they did well on. Use content from the previous lesson, based on responses to the one-minute paper CAT.
- **Discuss Overview:**Explain that you’re going to talk next about what makes a “memory champion,” and then discuss some general principles of learning.
- **Activity, Video & Discussion – The U.S. Memory Champion:**The purpose of this activity is

to have students think about the strategies of a memory expert, and how they might apply them to their own learning.

- See the Activities/Demonstrations section for a complete description on how to do this activity.
- **Direct Instruction of General Principles of Learning:** In this part of the lesson, you will explain general principles of learning and explain that forgetting can actually be a *positive* thing for learning.
- **The Spacing Effect Demonstration:** The purpose of this activity is to provide a live demonstration of the spacing effect.
  - See the Activities/Demonstrations section for detailed instructions on how to do this demonstration.
- **The Minute Paper CAT:** The purpose of this CAT is to assess the most important things that students are learning, as well as what remains unanswered.
  - End class by asking students to write a brief response to the following questions: “What was the most important thing you learned during this class?” and “What important question remains unanswered?”
  - This a 1 to 2-minute activity recaps student learning and asks them to reflect on what questions about learning are still unanswered.

## Activities & Demonstrations

**Warm Up Activity:** The purpose of this activity is to have students reflect on the learning and memory strategies that they typically use.

- Time: 5 minutes
- Materials: Warm-Up slide (see PowerPoint slides)



- Directions:
  - Ask the class to jot down answers to the following questions:
    - What do you do when you really want to remember something?
    - What do you do when you really want to learn something important?
    - What do you do when you are studying for a test?
  - Have the class pair up with the person next to them and share what they wrote. (2 minutes)
  - Call on various pairs of students to share the learning strategies and techniques they talked about. You can jot a few of these on the chalkboard if you'd like to. Then ask the students who shared these strategies *why* they use them. Chance are that students are either following their own intuitions, sticking with something that worked in the past, or doing what a parent, teacher, or friend told them was a good strategy.
  - Explain to the class that we often adopt strategies for various (often unscientific) reasons, but that there is no reason to limit ourselves to these strategies. That's because there is a thriving science of learning and memory that we can draw from!

Chunking Activity: The purpose of this activity is to help demonstrate the power of chunking to improve short-term memory.

- Time: 5-7 minutes
- Materials: Letters and instructions for chunking (see PowerPoint slides).
- Directions: Display the letters on the PowerPoint slide. Give students the following instructions: *Look at the letters printed below for about 10 seconds and then look away and try to write them down without looking at the screen.*
  - XIBMSATMTVPHDX
- After 1 minute, ask students how they did. Find out if any of the students used a chunking technique, and ask them to explain it if they did.
- Next, ask students: *If you had difficulty, like most of us did, it's because 14 letters are difficult for most people to store in their short-term memory. But you can use a technique called chunking to increase the capacity of short-term memory. Instead of trying to remember 14 letters you can first chunk the letters into larger units that are meaningful or memorable.*

- Then display the next PowerPoint slide with the letters chunked:
  - X IBM SAT MTV PHD X
- Then say to students: *If you chunk the 14 letters into 6 chunks as shown above, it's much easier to keep all the letters in your short-term memory. If you use an active imagination, you can chunk anything. But chunking takes work, and to get good at chunking it takes practice. It will be easier to chunk information in areas in which you have developed expertise.*
- End by asking students: *Can anyone think of an area in which you have expertise and you do this kind of chunking almost automatically?*

Depth of Processing Demonstration: The purpose of following activity is to demonstrate the benefits of deep processing in comparison to shallow processing. Rogers, Kuiper and Kirker (1977) extended levels-of-processing theory to include a self-referencing condition. This extension has been adapted to create the following classroom demonstration, in which students are assigned to one of three conditions without their knowledge. Two the conditions involved processing a word list deeply (for pleasantness, and self-reference) and one condition demonstrates shallow word processing (counting vowels).

- Time: 15-20 minutes
- Materials: Word list (see PowerPoint slides) and printed handouts for each class member. These handouts should be in three slightly different forms (as detailed below).
- Directions: Hands out equal numbers of 3 similar (but different) printed sheets to the class. Each sheet contains a blank list numbered 1 to 16, but each sheet is different.
  - A. 1/3 of the class is given sheets that instruct them to count and write down the number of vowels in each word (shallow condition), filling in the blank list with these numbers.
  - B. 1/3 of the class is given instructions to rate the pleasantness of the word on a 1 (very unpleasant) to 5 (very pleasant) scale (deep/semantic condition).
  - C. 1/3 of the class is given instructions to rate the extent to which the word describes them on a 1 (does not describe me at all) to 5 (very much describes me) scale (deep/self-reference condition).
  - Students are not told that they will be taking a recall test. Next, the instructor should visually present this list of 16 words (see the PowerPoint slide) for 2-3 minutes.

Muddiest Point CAT: The purpose of this CAT is to assess how students are gaining knowledge, and what concept remain unclear.

- Time: 2-3 minutes
- Materials: The “CAT” slide (see PowerPoint slides). Students need a piece of paper.
- Directions:
  - Ask students to take 1-2 minutes to answer these questions:
    - What was the muddiest point about today’s class?
    - Write down the concept you are still struggling to understand.
- Review answers after class and use students’ responses to help guide your review at the start of day 2.

The Spacing Effect Demonstration: The following demonstration is adapted from Balch (2006), who reported the outcomes of a within-subjects demonstration that compared memory for words that were studied in a massed versus spaced manner.

- Time: 15 minutes
- Materials: Word list (see PowerPoint slides).
- Directions: Tell students that they will hear a list of words read aloud for them to remember, at a pace of one every 3 seconds, and to expect that most of the words will appear twice in the list. Then, read these 36 two-syllable words to the class, one every 3 seconds:
  - (1) Vessel (2) Household (3) Household (4) Tower (5) Message (6) Basket (7) Basket (8) Fashion (9) Justice (10) Justice (11) Artist (12) Supper (13) Fashion (14) Ticket (15) Ticket (16) Remark (17) Cousin (18) Message (19) Leather (20) Leather (21) Artist (22) Witness (23) Witness (24) Pattern (25) Bottle (26) Empire (27) Empire (28) Pattern (29) Cousin (30) Giant (31) Giant (32) Supper (33) Remark (34) Habit (35) Habit (36) Bottle
  - After the presentation of the list, ask students to count backward by 3’s from a three-digit number (e.g., 245) for 18 seconds, to avoid contamination from the recency effect due to items in short-term memory. Then ask students to write down as many words as possible, in any order, in 2 minutes.
  - After two minutes, display the correct word list, and have students score their papers. Tell students to ignore the first four words, as they are merely “buffer” words to avoid

contamination from the primacy effect. Explain that besides these first 4 words, 8 words on the list are presented in a spaced fashion, with other words intervening between the repetition of that word. Explain that a different set of 8 words are presented in a massed fashion (i.e., immediately repeated).

- The 8 spaced words are: message, fashion, artist, supper, remark, cousin, pattern, and bottle. The 8 massed words are: basket, justice, ticket, leather, witness, empire, giant, and habit.
- Have students tally the number of “spaced” words out of 8 that they recalled, and the number of “massed” words out of 8 that they recalled. By a show of hands, have students can indicate whether they recalled more “spaced” than “massed” words, more “massed” than “spaced,” or the same number of each type. Write on the board the number of students in each group.
- It is expected that more students will do better on the spaced words than the massed words. This is in line with Balch’s (2006) results showing that students recalled significantly more distributed/spaced words (47.8%) than massed words (34.5%). If this result is not found, you can point out that it is possible the results would be different if we were to average every student’s score on each set of words. You can do this if you are so inclined (and if your class is a reasonable size) by having students call out their scores, writing students scores on the board, and then having students calculate an average.
- Ask: Why do you think we obtained these results? How might these results related to the benefits of distributing study over time rather than bunching it together?
- Point out that spacing can have beneficial effects over the short term, or the long term, as discussed in class number one.

Video & Discussion Activity – The U.S. Memory Champion: The purpose of this is to have students think about the strategies of a memory expert, and how they might apply them to their own learning.

- Time: 10 minutes
- Materials: “Video and Discussion – The U.S. Memory Champion” slide (see PowerPoint slides).
- Directions:
  - Show this 3-minute video about how the U.S. Memory Champion trains:

[https://www.youtube.com/watch?v=KxD\\_XQ7ltyA](https://www.youtube.com/watch?v=KxD_XQ7ltyA)

- Have students discuss in pairs:
  - What seem to be the key techniques that allow Nelson to remember incredibly long strings of digits?
  - Does it seem like this technique could be useful for school learning?
  - If not, what might be a similar process that could help to remember important information?
- Cold-call various groups to share their ideas.

The Minute Paper CAT: The purpose of this CAT is to assess the most important things that students learned, and what questions remain unanswered.

- Time: 5 minutes
- Materials: Warm-Up slide (see PowerPoint slides)
- Directions:
  - End class by asking students to write a brief response to the following questions: “What was the most important thing you learned during this class?” and “What important question remains unanswered?”
  - This a 1 to 2-minute activity recaps student learning and asks them to reflect on what questions about learning are still unanswered.

## Additional Activities

McCabe, J. A. (2015). Location, location, location! Demonstrating the mnemonic benefit of the method of loci. *Teaching of Psychology*, 42, 169-173. Doi:10.1177/0098628315573143

- This article describes an activity in which students learned the Method of Loci (MoL) mnemonic technique. As a homework assignment, students created Memory Palaces to help them recall a grocery list. Students drew maps of the campus, with 12 locations labeled,

and practiced mentally walking the route while imagining sensory experiences at each location. They brought their maps to class and were given 5 min to take their “mental walk” before recalling the grocery list. Large gains were seen from pretest to posttest, students were convinced about the effectiveness of the strategy, and reported applying similar strategies in everyday life. This activity can be done in class or at home, and requires only relevant reading materials on MoL, which are supplied in the article.

Dewall, C. N., & Meyer, D. G. (2013). Why preschoolers sometimes learn better than their parents do. *APS Observer*, 28. Retrieved from <http://www.psychologicalscience.org/index.php/publ...>

- This blog entry describes three activities that can be used with undergraduates to get them to appreciate the flexible, creative, exploratory ways that children learn, as opposed to methods of rote memorization and regurgitation. All of the activities can be easily carried out in class and require no additional materials from the instructor.

## Discussion Points

- How would you best design a computer program to help someone learn a new foreign language? Think about some of the principles of learning outlined in this module and how those principles would be instantiated in “rules” in a computer program.
  - Here students should be thinking about how to apply the learning principles you have covered. Logical rules, if/then statements, and loops to check on learning could all potentially be involved in this computer program. The program should also encourage deep processing and space out practice in some fashion.
- Would you rather have a really good memory or really good metacognition, and why? How might you train someone to develop better metacognition if he or she doesn’t have a very good memory?
  - Expect some different answers to the first question, and make students justify *why* they would pick a better memory or metacognition. Their answers should stress the positive benefits of each, and how they help us learn. For the second question, self-testing and checking your actual knowledge against what you thought you knew would be a good method.

- In what kinds of situations not discussed here might you find a benefit of forgetting on learning?
  - Forgetting incorrect information would certainly be useful, along with forgetting past failures in educational or learning situations. Students may also point out that forgetting spurs us to go back and relearn information on a perhaps deeper basis, or to see it in a new way.

## Outside Resources

**Video: The First 20 hours – How to Learn Anything** - Watch a video by Josh Kaufman about how we can get really good at almost anything with 20 hours of efficient practice.

<https://www.youtube.com/watch?v=5MgBikgcWnY>

**Video: The Learning Scientists** - Terrific YouTube Channel with videos covering such important topics as interleaving, spaced repetition, and retrieval practice.

<https://www.youtube.com/channel/UCjbAmxL6GZXiaoXuNE7clYg>

**Video: What we learn before we're born** - In this video, science writer Annie Murphy Paul answers the question "When does learning begin?" She covers through new research that shows how much we learn in the womb — from the lilt of our native language to our soon-to-be-favorite foods.

[https://www.ted.com/talks/annie\\_murphy\\_paul\\_what\\_we\\_learn\\_before\\_we\\_re\\_born](https://www.ted.com/talks/annie_murphy_paul_what_we_learn_before_we_re_born)

**Web: Neuroscience News** - This is a science website dedicated to neuroscience research, with this page addressing fascinating new memory research.

<http://neurosciencenews.com/neuroscience-terms/memory-research/>

**Web: The Learning Scientists** - A website created by three psychologists who wanted to make scientific research on learning more accessible to students, teachers, and other educators.

<http://www.learningscientists.org/>

## Evidence-Based Teaching

Daniel, D. B., & Chew, S. L. (2013). The tribalism of teaching and learning. *Teaching of Psychology*, 40, 363-367. doi:10.1177/0098628313501034

- This article traces the recent growth and development of scholarly inquiry into teaching and learning and the emergence of different "tribes" within the movement, each with its own outlets, goals, and methods. The article discusses how basic learning science and in-the-classroom pedagogical research can bridge their differences and work together to advance teaching effectiveness.

Hofer, B. K., & Yu, S. L. (2003). Teaching self-regulated learning through a 'learning to learn' course. *Teaching of Psychology*, 30, 30-33. doi:10.1207/S15328023TOP3001\_05

- This article addressed the impact of a semester-long course called "Learning to Learn," an undergraduate psychology course designed to teach college students to be self-regulated learners. Findings suggest that an intervention that targets a range of cognitive and motivational components can have utility for college students. This may be useful for a standalone course or extended module on teaching college students the best ways to learn.

## Links to ToPIX Materials

**Daniel Pink explains that money works as reinforcement for mechanical skills but not for cognitive skills or learning.**

<http://topix.teachpsych.org/w/page/19981016/Learning%20Video>

**Learning (Discovering Psychology Series, 2001). Discusses the basic principles of how we learn, and classical, instrumental, and operant conditioning.**

<http://topix.teachpsych.org/w/page/19981016/Learning%20Video>

**Remembering and Forgetting (Discovering Psychology Series, 2001). Looks at the complexity of memory: how images, ideas, language, physical actions, even sounds and smells are translated into codes that are represented in the memory and retrieved as needed.**

<http://topix.teachpsych.org/w/page/19981017/Memory%20Video>

**Secrets of a Mind Gamer (NY Times, 2/15/2011). Secrets of memory champions who have**



**learned to “think in more memorable ways.”**

<http://topix.teachpsych.org/w/page/23154167/Memory%20in%20the%20News>

**Stephen’s Chew’s Study Tips. A five-video series on what all students should know about the cognition underlying learning, and how to put this knowledge to use.**

<http://topix.teachpsych.org/w/page/19981017/Memory%20Video>

## Teaching Topics

Teaching The Most Important Course

[https://nobaproject.com/documents/1\\_Teaching\\_The\\_Most\\_Important\\_Course.pdf](https://nobaproject.com/documents/1_Teaching_The_Most_Important_Course.pdf)

Content Coverage

[https://nobaproject.com/documents/2\\_Content\\_Coverage.pdf](https://nobaproject.com/documents/2_Content_Coverage.pdf)

Motivating Students

[https://nobaproject.com/documents/3\\_Motivating\\_Students\\_Tips.pdf](https://nobaproject.com/documents/3_Motivating_Students_Tips.pdf)

Engaging Large Classes

[https://nobaproject.com/documents/4\\_Engaging\\_Large\\_Classes.pdf](https://nobaproject.com/documents/4_Engaging_Large_Classes.pdf)

Assessment Learning

[https://nobaproject.com/documents/5\\_Assessment\\_Learning.pdf](https://nobaproject.com/documents/5_Assessment_Learning.pdf)

Teaching Biological Psychology

[https://nobaproject.com/documents/6\\_Teaching\\_Bio\\_Psych.pdf](https://nobaproject.com/documents/6_Teaching_Bio_Psych.pdf)

## PowerPoint Presentation

This module has an associated PowerPoint presentation. Download it at [https://nobaproject.com//images/shared/supplement\\_editions/000/000/226/Factors%20Influencing%20Learning.pptx?1475602608](https://nobaproject.com//images/shared/supplement_editions/000/000/226/Factors%20Influencing%20Learning.pptx?1475602608).

## About Noba

The Diener Education Fund (DEF) is a non-profit organization founded with the mission of re-inventing higher education to serve the changing needs of students and professors. The initial focus of the DEF is on making information, especially of the type found in textbooks, widely available to people of all backgrounds. This mission is embodied in the Noba project.

Noba is an open and free online platform that provides high-quality, flexibly structured textbooks and educational materials. The goals of Noba are three-fold:

- To reduce financial burden on students by providing access to free educational content
- To provide instructors with a platform to customize educational content to better suit their curriculum
- To present material written by a collection of experts and authorities in the field

The Diener Education Fund is co-founded by Drs. Ed and Carol Diener. Ed is the Joseph Smiley Distinguished Professor of Psychology (Emeritus) at the University of Illinois. Carol Diener is the former director of the Mental Health Worker and the Juvenile Justice Programs at the University of Illinois. Both Ed and Carol are award-winning university teachers.

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