

**Psychology 710 – Training and Skill Acquisition**  
**Tuesday 5:40 PM - 7:30 PM?**

Room 205 - Poe Hall

**INSTRUCTOR:** Dr. Anne Collins McLaughlin  
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**OFFICE HOURS:** By appointment  
**REQUIRED TEXTS:** Set of readings available from Vista

### **COURSE OVERVIEW**

The primary goal of this course is to explore general issues in skills, broadly defined, from both a methodological and a substantive perspective. We will cover skills in a variety of domains ranging from motor skills to complex cognitive skills. We will also discuss issues in expertise, automaticity, and training. Pedagogical tools for this class will include reading empirical studies and review articles, critically evaluating such papers, participating in group discussions, writing an integrative review paper, and learning by doing.

### **EVALUATION**

Your course grade will be determined by:

(1) *Learning by Doing* (35%). You will acquire a skill this term. You must select an activity at which you are not already proficient. You will commit to practicing your skill 4-8 hours per week so you should select something you really want to learn. You must make your selection by **January 22** because you need to start practicing and keeping a journal immediately. You also need to select metrics for performance assessment.

Ideas:

Art (appreciation, painting, drawing)	Knitting
Board Game (Chess, Othello, Backgammon, Go)	Magic
Bowling	Martial Arts
Candle making	Music (appreciation, playing, writing)
Calligraphy	Piloting
Computer Graphics	Public Speaking
Computer Programming	Speed Reading
Crossword Puzzles	Sports
Dancing	Typing
Fencing	Videogames
Film Making	Wine tasting
Foreign Language (including sign language)	Writing (haiku, poetry, limericks, stories)
Juggling	Yoga

(1a) *Skill Acquisition Journal* (20%). You are to keep a journal of your skill acquisition activities. You must start by developing some performance metrics so that you will be able to measure your baseline level of skill and monitor your performance from week-to-week. You must develop a system for training – how are you going to acquire this skill? What are your

performance goals? All of these initial activities and decisions should be documented in your journal. In addition, throughout the semester you should measure and track your performance, keep notes about quantitative and qualitative changes, errors, apparent plateaus, difficulties, frustrations, set-backs, and so on. You may want to introduce and assess variables such as massed versus distributed learning, retention intervals, or transfer to other activities. Keep your journal up to date – we will devote the first section of every class to discussion of skill development for class members (i.e., students will share their experiences so that we will all learn from everyone's skill acquisition progress). You will turn your journal in on the last day of class.

(1b) *Demonstration & Presentation (15%)*. On the last day of class you will demonstrate your skill to the class. If you have selected a skill that cannot be performed in class (e.g., playing the piano) or you do not wish to demonstrate in front of a live audience, you may videotape yourself performing the skill. You will also make a presentation of your journal – noteworthy transitions, graphics of performance improvements across time, classifications of errors, development of performance metrics, and so on. You will have a 10 minutes for your demonstration and presentation.

(2) *Review Paper (30%)*. A 15-25 page review paper is due on **April 15 at 4:30 PM**. The paper will be an integrative review of the literature for the skill that you have chosen to acquire. You should review the literature for skill acquisition, transfer, and retention for that domain with consideration for accepted theories of training for that skill, measurement issues, controversies in the literature, and so on. Your paper should culminate in recommendations for optimizing skill acquisition and retention for that domain – based on the empirical literature. The paper should be in APA format for review papers. An outline (1-2 pages) of your paper is due at the beginning of class on **February 12**. The outline should provide the structure of the paper – the areas you are planning to cover, the sources you will be relying on for the different sections, areas of controversy, and so on. Thus you must have thought about your topic and done some reading by this time to be able to write a reasonable outline. I will provide feedback on your outline to ensure that you are covering all of the relevant areas.

**NOTES:**

- *Remember what plagiarism is and how to avoid it (see next page).*
- *I will not read more than 25 pages (not including references)*
- *Papers will be penalized a full letter grade for each calendar day late.*

(3) *Discussion questions prepared for each class (25%)*. For each class you will prepare a one-page discussion of the readings (not a summary). You should extract the important issues of the readings, and, more importantly, propose discussion questions for class. The questions can be points of confusion, issues for further consideration, follow up research ideas, and so on. I will often ask you to read one of your questions for the class. These will be collected. There is an example on Vista.

(4) *Class participation (10%)*. You will be expected to participate in the class discussions by sharing your discussion questions and by participating in the general discussion of skill acquisition experiences.

## Writing Papers on Topics in Psychology

### 1) Plagiarism

- Webster's Ninth New Collegiate Dictionary (1986). Springfield, MA: Merriam-Webster "plagiarize: to steal and pass off (the *ideas or words* of another) as one's own; use (a created production) without crediting the source; to commit literary theft - present as new and original *an idea or product* derived from an existing source" (p. 898, emphasis added).
- APA Ethical Principles of Psychologists and Code of Conduct: 6.22: "Psychologists do not present substantial portions or elements of another's work or data as their own, even if the other work or data source is cited occasionally" (p. 13).

### 2) Primary Sources

- ALWAYS go to the primary source, if available.
- In other words, don't trust anyone but yourself to interpret an article. If you are going to reference it, you should have read it.
- Exceptions - reference is in a foreign language; reference is a technical report that is not accessible (may be classified).

### 3) Use of References

- To support an assertion (e.g., "Distributed practice leads to better learning than massed practice." What research is this claim based on? A reference must be provided to support it).
- ALL references cited in the text MUST be listed in the reference list (in APA format - which includes the author(s), year, title, journal or book, volume, page numbers, and for books, the publisher).
- The ONLY references in the reference list are those that are referenced in the text. It doesn't matter if you read 30 other articles - if you didn't reference them in any way, they don't belong in the reference list.
- It is the author's responsibility to ensure that the references are complete and ACCURATE. It is therefore irresponsible not to double-check all of your references.

**ANTICIPATED SCHEDULE**

WK	Date	General Topic	Reading Assignment	Skill Discussion	Deliverable
1	1/15	Welcome & Organization			
2	1/22	Historical Overview	James (1890); Bryan & Harter (1899); Posner, DiGirolamo, & Fernandez-Duque (1997)	Skill Selection	Discussion Questions
3	1/29	Training & Measurement Issues	Schneider (1985); Schmidt & Bjork (1992); Rubio, Diaz, Martin, & Puente (2004)	Measurement Metrics	Discussion Questions
4	2/5	Models of Skills	Newell & Rosenbloom (1981); Pirolli (1999)	Skill Journal (share anecdotes) Ideas for Paper	Discussion Questions
5	2/12	Psychomotor Skills	Adams (1987); Perkos, Theodorakis, Chroni (2002)	Plans for Paper	Discussion Questions Outline for Paper
6	2/19	Automaticity Theory & Perceptual Skills	Shiffrin & Dumais (1981); Schneider & Chein (2003); Parr, Heatherbell, & White (2002)	Experiences/Samples	Discussion Questions
7	2/26	ACT; ACT*; ACT-R	Anderson (1982); Anderson (1996); Taatgen & Lee (1993)	Graphics – Bring examples (3-5 wks data)	Discussion Questions
8	3/4	No Meeting	<b>Spring Break</b>		
9	3/11	Memory/Cognitive Skills	Chase & Ericsson (1981); Ericsson & Polson (1988); Renkl & Atkinson (2003)	Experiences/Samples	Discussion Questions
10	3/18	High Performance Skills	Mane & Donchin (1989); Frederiksen & White (1989); Kirlik et al. (1998); Gopher (in press)	Experiences/Samples	Discussion Questions
11	3/25	Job Skills	Campbell, Brown & DiBello (1992); Joslyn & Hunt (1998); Drake & Palmer (2000)	Experiences/Samples	Discussion Questions
12	4/1	Expertise	Ericsson & Charness (1994); Gardner (1995); Ericsson & Charness (1995); Eccles, Walsh, & Ingledew (2002)	Skill Journal (share anecdotes) Experiences/Samples	Discussion Questions
13	4/8	Practice and the Brain	Chein & Schneider (2005); Kelly Garavan (2005); Schumacher Hendricks D'Esposito (2005)	Plans for Demos	Discussion Questions
14	4/15	Dual-task skills	Byrne Anderson (2001); Hazeltine, Teague, Ivry (2002); Schumacher et al (1999)		Discussion Questions
15	4/22	Student Presentations			Review Paper Due Skill Journal Due

## READING LIST

### Week 1 – Welcome and Organization

#### Week 2 – Historical Overview

- James, W. (1890). *The principles of psychology* (pp. 104-127). New York: Holt.
- Bryan, W. L., & Harter, N. (1899). Studies on the telegraphic language: The acquisition of a hierarchy of habits. *Psychological Review*, 6, 345-375.
- Posner, M. I., DiGirolomo, G. J., & Fernandez-Duque, D. (1997). Brain mechanisms of cognitive skills. *Consciousness and Cognition*, 6, 267-290.

#### Week 3 – Training and Measurement Issues

- Schneider, W. (1985). Training high performance skills: Fallacies and guidelines. *Human Factors*, 27, 285-300.
- Schmidt, R.R. & Bjork, R. A. (1992). New conceptualizations of practice: Common principles in three paradigms suggest new concepts for training. *Psychological Science*, 3, 207-217.
- Rubio, S. Diaz, E., Martin, J., & Puente, J.M. (2004). Evaluation of subjective mental workload: A comparison of SWAT, NASA-TLX, and workload profile measures. *Applied Psychology: An International Review*, 53, 61-86.

#### Week 4 – Models of Skills

- Newell, A. & Rosenbloom, P. S. (1981). Mechanisms of skill acquisition and the law of practice. In J. R. Anderson (Ed.), *Cognitive skills and their acquisition* (pp. 1-55). Hillsdale, NJ: Erlbaum.
- Pirolli, P. (1999). Cognitive engineering models and cognitive architectures in human-computer interaction. In In F. T. Durso, R. S. Nickerson, R. W. Schvanaveldt, S. T. Dumais, D. S. Lindsay, and M. T. H. Chi (Eds.), *Handbook of applied cognition* (pp. 443-477). Chichester: Wiley.

#### Week 5 – Psychomotor Skills

- Adams, J. A. (1987). Historical review and appraisal of research on learning, retention, and transfer of human motor skills. *Psychological Bulletin*, 101, 41-74.
- Perkos, S., Theodorakis, Y., & Chroni, S. (2002). Enhancing performance and skill acquisition in novice basketball players with instructional self-talk. *Sport Psychologist*, 16, 368-383.

#### Week 6 – Automaticity Theory & Perceptual Skills

- Shiffrin, R. M., & Dumais, S. (1981). The development of automatism. In J. A. Anderson (Ed.), *Cognitive skills and their acquisition* (pp. 111-140). Hillsdale, NJ: Erlbaum.
- Schneider, W., & Chein, J. M. (2003). Controlled and automatic processing: Behavior, theory, and biological mechanisms. *Cognitive Science*, 27, 525-559.

Parr, W. V., Heatherbell, D., & White, G. (2002). Demystifying wine expertise: Olfactory threshold, perceptual skill, and semantic memory in expert and novice wine judges. *Chemical Senses*, 27, 747-755.

### **Week 7 – ACT; ACT\*; ACT-R**

Anderson, J. R. (1982). Acquisition of cognitive skill. *Psychological Review*, 89, 369-406.

Anderson, J. R. (1996). ACT: A simple theory of complex cognition. *American Psychologist*, 51, 355-365.

Taatgen, N., & Lee, F. J. (1993). Production compilation: Simple mechanism to model complex skill acquisition. *Human Factors*, 45, 67-76.

### **Week 9 – Memory/Cognitive Skills**

Chase, W. G. & Ericsson, K. A. (1981). Skilled memory. In J. A. Anderson (Ed.), *Cognitive skills and their acquisition* (pp. 141-189). Hillsdale, NJ: Erlbaum.

Ericsson, K. A., & Polson, P. G. (1988). An experimental analysis of the mechanisms of a memory skill. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14, 305-316.

Renkl, A., & Atkinson, R. K. (2003). Structuring the transition from example study to problem solving in cognitive skill acquisition: A cognitive load perspective. *Educational Psychologist*, 38, 15-22.

### **Week 10 – High Performance Skills**

Mane, A., & Donchin, E. (1989). The Space fortress game. *Acta Psychologica*, 71, 17-22.

Frederiksen, J. R., & White, B. Y. (1989). An approach to training based upon principled task decomposition. *Acta Psychologica*, 71, 89-146.

Kirlik, A, Fisk, A. D., Walker, N., & Rothrock, L. (1998). Feedback augmentation and part-task practice in training dynamic decision-making skills. In J. A. Cannon-Bowers and E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 91-113). Washington, DC: American Psychological Association.

Gopher, D. (in press). Emphasis change as a training protocol for high-demand tasks. In A. Kramer, D. Wiegmann, & A. Kirlik (Eds.): *Applied attention: From theory to practice*. Oxford, Psychology Press

### **Week 11 – Job Skills**

Campbell, R. L., Brown, N. R., & DiBello, L. A. (1992). The programmer's burden: Developing expertise in programming. In R. R. Hoffman (Ed.), *The Psychology of Expertise* (pp. 269-294). New York: Springer-Verlag.

Joslyn, S., & Hunt, E. (1998). Evaluating individual differences in response to time-pressure situations. *Journal of Experimental Psychology: Applied*, 4, 16-43.

Drake, C., & Palmer, C. (2000). Skill acquisition in music performance: Relations between planning and temporal control. *Cognition*, 74, 1-32.

### **Week 12 – Expertise**

Ericsson, K. A., & Lehmann, A. (1996). Expert performance: Its structure and acquisition. *American Psychologist, 49*, 725-747.

Gardner, H. (1995). Why would anyone become an expert performance? *American Psychologist, 50*, 802-803.

Ericsson, K. A., & Charness, N. (1995). Abilities: Evidence for talent or characteristics acquired thorough engagement in relevant activities? *American Psychologist, 50*, 803-804.

Eccles, D. W., Walsh, S. E., & Ingledew, D. K. (2002). A grounded theory of expert cognition in orienteering. *Journal of Sport and Exercise Psychology, 24*, 68-88.

### **Week 13 – Practice and the Brain**

Chein, J. M., & Schneider, W. (2005). Neuroimaging studies of practice-related change: fMRI and meta-analytic evidence of a domain-general control network for learning. *Cognitive Brain Research, 25*, 607-623.

Kelly, A.M.C., & Garavan, H. (2005). Human functional neuroimaging of brain changes associated with practice. *Cerebral Cortex, 15*, 1089-1102.

Schumacher, E.H., Hendricks, M.J., D'Esposito, M.D. (2005). Sustained involvement of a frontal-parietal network for spatial response selection with practice of a spatial choice-reaction task. *Neuropsychologia, 43*, 1444-1455.

### **Week 14 – Dual Task Skills**

Byrne, M. D., & Anderson, J. R. (2001). Serial modules in parallel: The psychological refractory period and perfect time sharing. *Psychological Review, 108*(4), 847-869.

Hazeltine, E., Teague, D., & Ivry, R.B. (2002). Simultaneous dual-task performance reveals parallel response selection after practice. *Journal of Experimental Psychology: Human Perception and Performance, 28*, 527-545.

Schumacher, et al. (1999). Concurrent response-selection processes in dual-task performance: evidence for adaptive executive control of task scheduling. *Journal of Experimental Psychology: Human Perception and Performance, 25*(3), 791-814.