

85-738 / 85-438 Educational Goals, Instruction, and Assessment

Core Course 2 for the Program in Interdisciplinary Educational Research (PIER)

Carnegie Mellon University

Sample Syllabus

Professor: Dr. Sharon M. Carver 412-268-1499 sc0e@andrew.cmu.edu MMC 17D

Goals:

Students will learn to use scientifically-based principles and practical strategies for

- 1) developing learner models and educational goals based on detailed task analysis of the knowledge, skills, and dispositions required for understanding and mastery,
- 2) aligning the instructional program and its valid assessment with learners and goals, and
- 3) considering additional aspects of learning environments that may impact implementation and evaluation.

In the process, students will enhance their ability to read and critique professional articles, synthesize theories and research findings to design and evaluate evidence-based educational applications, and communicate effectively both orally and in writing.

Learning Opportunities

Readings & Seminar Dialogue: Tuesday / Thursday 4:30 – 5:50 pm Baker Hall 340A

Individual Course Project, Reflection & Critique of Peer Projects:

This project involves the choice of a specific unit to teach at a particular age level, followed by progressive development of a learner model, task analysis of the learning goals, and design of assessment and instruction. Explicit rationale for the design will be based on key underlying principles from the course, with specific citations from both course readings and additional project-related references. This design will be supplemented by briefly outlining a research program to test key components, and then culminated by class and public presentations of the project to provide deep reflection and broad feedback for revision.

Field Trips, Guest Speakers & Other Application Opportunities that Arise:

September – CMU Children’s School (www.psy.cmu.edu/childrenschool)

October – UPCLOSE (www.upclose.lrdc.pitt.edu)

November – Propel Charter School (www.propelschools.org)

OR propose a “Create Your Own Adventure” Field Trip

Assignments:

- Preparatory Assignment re: “What the best college teachers do” (Summer 2012)
- Field Trip, Guest Speaker & Application Reflections & Words of Appreciation
- Big Ideas Summary with Key References

Assessment / Grading:

Students demonstrate progress relative to the goals of the course informally via seminar discussion and formally via assignments and the iterative course project. The instructor will provide written notes on all assignments, verbal or email corrective feedback as issues arise, and formal written evaluation using the attached form at both mid-term and semester end.

Seminar Preparation & Participation 25%

Assignments 25%

Course Project, Rationale & Reflection 30%

Class Presentation 10%

Poster Presentation 10%

85-738 / 85-438 Educational Goals, Instruction, and Assessment
Student Progress Evaluation

Name:

Course Grade:

(Note: the rough rubrics in parentheses indicate the contrast between B, B+, A-, and A level graduate work. Specific individual indicators of achievement at each level may vary.)

Class Preparation & Participation (25%)

(attends regularly & prepares thoroughly, fully engages in seminar activities, contributions advance discussion, critique is constructive)

Assignments (25%)

(submitted, complete, integrates principles in depth, includes extra insight / creativity)

Preparatory Reading (Bain)

Field Trip, Guest Speaker & Application Reflections & Words of Appreciation

Big Ideas Summary with Key References

Course Project

(submitted, complete, integrates principles in depth, includes extra insight / creativity)

Class Presentation (10%)

Poster Presentation (10%)

Final Project (30%)

Context & Rationale, Anticipated Learner Profile, Learning Goal Specification,
Assessment Design, Instructional Design, Research Design & Reflection

Sharability factor (clear, complete, detailed, user-friendly, etc.)

Alignment factor (goals, assessment and instruction)

Justification factor (explicit, thorough, theoretically grounded, etc.)

Feasibility factor (valuable, compatible, reasonable, practical, etc.)

Innovation factor (insightful, novel, cool, etc.)

Additional Feedback:

85-738 / 85-438 Educational Goals, Instruction, and Assessment
Course Reading List for Fall 2012

We will read these three books in total, so they are worth purchasing for your library.

Ambrose, S.A., Bridges, M.W., DiPietro, M., Lovett, M.C. & Norman, M.K. (2010). *How learning works: 7 Research-based principles for smart teaching*. San Francisco, CA: Jossey-Bass.

Bain, K. (2004). *What the best college teachers do*. Cambridge, MA: Harvard University Press.

Wiggins, G. & McTighe, J. (2005). *Understanding by Design* (Expanded 2nd Edition). Alexandria, VA: Association for Supervision and Curriculum Development.

We will also be using chapters from the following two older books, which are now available for free download.

Bransford, J.D., Brown, A.L. & Cocking, R.R. (2000). *How people learn: Brain, Mind, Experience, and School*. Washington, DC: National Academy Press.
http://www.nap.edu/catalog.php?record_id=9853

National Research Council (2001). *Knowing what students know: The science and design of educational assessment*. Washington, DC: National Academy Press.
http://www.nap.edu/catalog.php?record_id=10019

Preliminary List of Additional Readings Provided in .pdf format on the course BlackBoard:
<http://www.cmu.edu/blackboard/>

Carver, S.M. (2001). Cognition and instruction: Enriching the laboratory school experience of children, teachers, parents, and undergraduates. In S.M. Carver & D. Klahr (Eds.) *Cognition and instruction: Twenty-Five years of progress* (pp. 385-426). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Chipman, S.E.F. (2009). Applications in Education and Training: A Force Behind the Development of Cognitive Science. *Topics in Cognitive Science*, **2**, 386-397.

Clark, D. & Linn, M.C. (2003). Designing for knowledge integration: The Impact of instructional time. *Journal of the Learning Sciences*, **12** (4), 451-492.

Kirschner, P.A., Sweller, J. and Clark, R.E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discover, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist*, **41**(2), 75-86.

Levine, M. (2002). *A Mind at a Time* (Chapters 1 & 2). New York, NY: Simon and Schuster.

McCandlis, B.D., Kalchman, M., and Bryant, P. (2003). *Design Experiments and Laboratory Approaches to Learning: Steps Toward Collaborative Exchange. Educational Researcher*, **32(1)**, 14-16.

Minstrell, J. (2001). The Role of the Teacher in Making Sense of Classroom Experiences and Effecting Better Learning. In Carver, S.M. and Klahr, D. (Eds.) *Cognition and instruction: Twenty-Five years of progress* (pp. 121-149). Mahwah, NJ: Lawrence Erlbaum Associates.

Rayner, K., Foorman, B.R., Perfetti, C.A., Pesetsky, D., and Seidenberg, M.S. (2002). How Should Reading Be Taught? *Scientific American*, March 2002, 53-59.

Salden, R.J.C.M., Alevan, V.A.W.M.M., Renkl, A. and Schwonke, R. (2008). Worked Examples and Tutored Problem Solving: Redundant or Synergistic Forms of Support? In C. Schunn (Ed.) *Proceedings of the Annual Meeting of the Cognitive Science Society, CogSci 2008*, 589-594. New York, NY: Lawrence Earlbaum. Cognition and Student Learning Prize.

Schwartz and Martin, (2004). Student Production in Statistics Instruction. *Cognition and Instruction*, **22(2)**, 129-184.

Siegler, R.S. (1983). How Knowledge Influences Learning. *American Scientist*, **71**, 631-638.

Zohar, A. (2006). The nature and development of teachers' metastrategic knowledge in the context of teaching higher order thinking. *Journal of the Learning Sciences*, **15 (3)**, 331-378.

85-738 / 85-438 Educational Goals, Instruction, and Assessment
Course Schedule for Fall 2012

WEEK 1: EGIA and the SCIENCE of LEARNING

Tuesday, August 28

What the Best College Teachers Do (Bain)

Thursday, August 30 [Facilitated by Dr. Marsha Lovett, Director of CMU's Eberly Center for Teaching Excellence and Co-Author of *How Learning Works*]

Applications in Education and Training: A Force Behind the Development of Cognitive Science (Chipman, 2009)

Review the *Eberly Center web site* (<http://www.cmu.edu/teaching/eberly/>) to explore its mission, philosophy, available resources, etc.

Guiding Questions:

- Based on Chipman's national perspective, how has the science of learning advanced in the past 30 years? What challenges remain?
- Which advances and challenges relate to design aspects of context, learners, goals, assessment, instruction, and/or research?
- In what ways does the Eberly Center support university instructors in utilizing the science of learning to design more effective courses? Again, note which aspects of the design process they are supporting.

WEEK 2: EGIA and the SCIENCE of LEARNING

Tuesday, September 4

Cognition and instruction: Enriching the laboratory school experience of children, teachers, parents, and undergraduates (Carver, 2001)

Understanding by Design (Wiggins & McTighe, 2005, Introduction & Chapter 1)

Guiding Questions:

- What did the readings add to our understanding of the course focus (big ideas)?
- In what ways do the two readings advocate similar approaches (or not)?
- What specific strategies are suggested for identifying goals, planning assessments, and designing instruction?
- What is missing from one or both of the approaches?

Thursday, September 6

Review the *IES Practice Guide* entitled, *Organizing Instruction and Study to Improve Student Learning* on the What Works Clearinghouse web site. Then choose two additional guides to skim (http://ies.ed.gov/ncee/wwc/publications_reviews.aspx). Notice what else is available on this site and bookmark it as potential reference material for your project.

Guiding Questions:

- What are the pros and cons of the Practice Guide development process?
 - In what ways do the Practice Guide recommendations relate to our focus (big ideas)?
 - Assuming the guides are representative, what is the state of the learning sciences field?
 - What challenges for future educational research are identified by the panels or evident from your review?
-

WEEK 3: LEARNING CONTEXT

Tuesday, September 11

How Learning Works (Ambrose et. al, 2010, Introduction & Chapter 6)

Guiding Questions:

- Why do student development and course climate matter for student learning?
- How might your understanding of student development and course climate impact your goal setting, assessment planning, and instructional design?

Thursday, September 13

How Knowledge Influences Learning (Siegler, 1983)

How Should Reading Be Taught (Rayner, Foorman, Perfetti, Pesetsky, and Seidenberg, 2002)

Designing for Knowledge Integration: The Impact of Instructional Time (Clark and Linn, 2003)

Guiding Questions:

- How well is each aspect of the EGIA Framework re: Context, Learners, Goals, Assessment, and Instruction addressed?
- Why might some have been less well emphasized?
- What suggestions for improvement do you have?
- How might strategies from one or more of these articles be applicable to your project?

• **Project Step 1: Context & Initial Resources**

WEEK 4: LEARNERS

Tuesday, September 18

How Learning Works (Ambrose et. al, 2010, Chapters 1 & 3)

Guiding Questions:

- How does students' prior knowledge affect their learning?
- What factors motivate students to learn?
- How might your understanding of prior knowledge effects and motivational factors impact your goal setting, assessment planning, and instructional design?

Thursday, September 20

A Mind at a Time (Levine, 2002, Chapters 1 & 2)

Guiding Questions:

- What individual differences factors should be considered when setting goals, planning assessments, and designing instruction? How?
 - Specifically how might each matter for your project domain?
-

WEEK 5: GOALS

Tuesday, September 25

How Learning Works (Ambrose et. al, 2010, Chapters 2 & 7)

Locate several examples of state standards that relate to your project topic.

Guiding Questions:

- How does the way students organize their knowledge affect their learning?
- How do students become self-directed learners?
- What aspects of knowledge organization and metacognition are crucial for expertise in your project domain?
- Which of these key concepts, skills, and dispositions are evident in the state standards?

Thursday, September 27

Understanding by Design (Wiggins & McTighe, 2005, Chapters 2-6)

Seek goal specifications related to your project topic. Consider existing curricula, research specifications (task analyses), etc.

Guiding Questions:

- What different types of goals must be specified in order to identify the complete learning target?
- To what extent are the goals declarative vs. procedural vs. dispositional?
- How about cognitive vs. metacognitive?
- In what ways could the goals of this course be better specified by utilizing the UbD approach?

• Project Step 2: Anticipated Learner Profile

WEEK 6: ASSESSMENT

Tuesday, October 2

How Learning Works (Ambrose et. al, 2010, Chapter 5)

Guiding Questions:

- What kinds of practice and feedback enhance learning?
- What are the specific implications of the practice and feedback recommendations for the learners you are targeting and the goals you have for them?

Thursday, October 4

Understanding by Design (Wiggins & McTighe, 2005, Chapters 7 & 8)

Guiding Questions:

- How does thinking “like an assessor” differ from thinking like a teacher?
 - What kinds (note the plural) of assessments are needed to provide valid evidence that learners have achieved the course goals?
-

WEEK 7: INSTRUCTION

Tuesday, October 9

How Learning Works (Ambrose et. al, 2010, Chapter 4)

Guiding Questions:

- How do students develop mastery?
- What specific strategies can you utilize in your project design to help your learners progress toward conscious competence?
- In what ways could the learning opportunities in this course be improved in order to promote your mastery of educational design?

Thursday, October 11

Understanding by Design (Wiggins & McTighe, 2005, Chapters 9 & 10)

Guiding Questions:

- What makes the best instructional designs engaging and effective?
- In what ways can you use each of the WHERETO elements for planning engaging and effective instruction in your project domain? Be specific!
- What strategies can help you ensure that you are teaching for understanding rather than merely covering content?

- **Project Step 3: Learning Goal Specification**

WEEK 8: ALIGNMENT

Midterm Grades Due

Tuesday, October 16

Understanding by Design (Wiggins & McTighe, 2005, Chapters 11-13)

Guiding Questions:

- In what ways have you found the UbD design process helpful?
- In what ways has it been challenging?
- What are the benefits and drawbacks of using this approach for a single project?
- How about for an entire program of study?

Thursday, October 18

Planning Meeting / Mid Course Evaluation - Based on Student Input, Project Topics, and Progress in the first 8 weeks of the course, students will meet to generate input regarding the six open sessions, as well as to collaboratively develop a mid-course evaluation.

Possibilities for Additional Topics Include:

Specific Subject Area Session(s)

Ethics / Equity / Individual Differences

Technology and Education

Speakers from the Field – Teacher, Principal, Curriculum Coordinator, etc.

CMU Speakers – University Level discussions re: EGIA, accreditation, ethics, etc.

- **BIG Ideas Draft**

WEEK 9: TEACHER LEARNING & RESEARCH APPROACHES

Tuesday, October 23 – *Teacher Learning* (HPL, Chapter 8)

AND The Role of the Teacher in Making Sense of Classroom Experiences and Effecting Better Learning (C&I, Chapter 4, Minstrell)

OR The nature and development of teachers' metastrategic knowledge in the context of teaching higher order thinking (Zohar, 2006)

Guiding Questions:

- How does the G-I-A framework relate to teachers as learners?
- What BIG ideas that we've already discussed are specifically advocated in the readings?
- What's new?
- In what ways does the ill-defined nature of teaching challenge the BIG ideas?

Thursday, October 25

Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discover, Problem-Based, Experiential, and Inquiry-Based Teaching (Kirschner, Sweller, and Clark, 2006)

Worked Examples and Tuted Problem Solving: Redundant or Synergistic Forms of Support? (Salden, Alevan, Renkl, and Schwonke, 2008)

Design Experiments and Laboratory Approaches to Learning: Steps Toward Collaborative Exchange (McCandlis, Kalchman, and Bryant, 2003)

Inventing to Prepare for Future Learning: The Hidden Efficiency of Encouraging Original Student Production in Statistics Instruction (Schwartz and Martin, 2004)
[NOTE: Read last and scan to get the main points of the research design.]

Guiding Questions:

- What type of research questions and/or approaches are the most productive for advancing the learning sciences? Why?
- What constraints limit the progress of research in the learning sciences?
- Who might have a different perspective on either of these questions? Why?

• **Project Step 4: Assessment Design**

WEEK 10:

Tuesday, October 30 – Constructivism and Explicitness

Constructionism (Kafai, from Sawyer's 2006 Handbook of the Learning Sciences)
Learning and Transfer of Debugging Skills (Carver, 1988)

Guiding Questions:

- From each of the perspectives you review, determine the underlying theory of learning, i.e., in what ways is the curriculum facilitating student action and thought to promote learning?
- What principles of human cognitive architecture, expert-novice differences, cognitive load, etc. are factored into the design?
- What principles of learning are given lower priority in the design or being ignored?

Thursday, November 1 – Educational Approaches that incorporate Benefits of Both
Small groups will consider 4 different alternatives and then report to the group

Cognitive Apprenticeship (Collins, from Sawyer's 2006 HLS)
Cognitive Tutors (Koedinger & Corbett, from Sawyer's 2006 HLS)
Learning in Activity (Greeno, from Sawyer's 2006 HLS)
Knowledge Building (Scardamelia & Bereiter, from Sawyer's 2006 HLS)

Friday, November 2 – Field Trip to the Propel-Montour Charter School

WEEK 11:

Dr. Carver traveling to the Board Mtg of the National Coalition for Campus Children's Centers (NCCCC) at the National Association for the Education of Young Children (NAEYC) Conference

Tuesday, November 6 - Alternate Forms of Education: Magnet & Charter Schools
Guest Speaker Dr. Stephen Pellathy, Upper School Principle of the Environmental Charter School and former Science Curriculum Coordinator for the Pittsburgh Public Schools Science & Technology Magnet Secondary School

Please review the ECS and Sci Tech web sites thoroughly so that you are familiar with the features of each program.

[Environmental Charter School](#)
[Pittsburgh Science & Technology Academy](#)

Thursday, November 8 – Motivation
Guest Speaker Dr. Vincent Alevan (HCII)

Please choose 2 to read in depth and just read the abstracts or scan the other two. These might provide good ideas for your Step 6 Research Design.

Implicit Theories of Intelligence Predict Achievement Across an Adolescent Transition: A Longitudinal Study and an Intervention (Blackwell, Trzesniewski & Dweck, 2007)

Improving Adolescents' Standardized Test Performance: An Intervention to Reduce the Effects of Stereotype Threat (Good, Aronson & Inzlicht, 2003)
Intrinsic and Extrinsic Motivational Orientations in the Classroom: Age Differences and Academic Correlates (Lepper, Corpus & Iyengar, 2005)
Helping Parents to Motivate Adolescents in Mathematics and Science: An Experimental Test of a Utility-Value Intervention (Harachiewicz, Rozek, Hulleman, and Hyde, 2012)

Guiding Questions:

- According to each set of authors, what is motivating?
- How can educators capitalize on the proposed cognitive and social mechanisms to promote their students' motivation to learn?
- What research strategies have these scientists utilized to experimentally isolate various factors affecting motivation and to identify the mechanisms underlying their impact?

• **Project Step 5: Instructional Design** (*Please submit your projects via email!*)

WEEK 12:

Tuesday, November 13 – Scientific Evaluation of Curricula

Assessing for Deep Understanding (Carver from Sawyer's 2006 HLS)

NOTE: For the purpose of this class discussion, we will use Table 13.1 as an outline for evaluating the research described in the other two articles. For items in the table that don't sound familiar, I suggest that you read the relevant section of the text. You may notice that this chapter essentially also reviews many of the criteria for evaluating the EGIA course projects, so I suggest that you read the full article prior to the first round of presentations.

Mathematics Learned by Young Children in an Intervention Based on Learning Trajectories: A Large Scale Cluster Randomized Trial (Clements, Sarama, Spitler, Lange, and Wolfe, 2011)

Sustaining Knowledge Building as a Principle-Based Innovation at an Elementary School (Zhang, Hong, Scardamalia, Teo, and Morley, 2011)

Guiding Questions:

- Use the Carver table mentioned above as an outline for your critique of the two curriculum evaluations (Building Blocks and Knowledge Building). What are the strengths and weaknesses of each?
- What additional strengths and weaknesses of these scientific evaluations can you identify?
- Begin to evaluate your own course project according to the same criteria and plan improvements in the weak areas you identify.

Thursday, November 15 – Culture and Teaching

Learning as a Cultural Process: Achieving Equity Through Diversity (Nasir, Rosebery, Warren, and Lee from Sawyer's 2006 HLS)

Collaboration in Cognitive Tutor Use in Latin America: Field Study and Design Recommendations (Ogan, Walker, Baker, Rebolledo-Mendez, Castro, Laurentino, and deCarvalho, 2012)

Guiding Questions:

- What cultural assumptions embedded in educational practices were exposed when the interventions discussed in the articles were implemented with broader student populations?
- How did the educators suggest adapting the goals, instruction, or assessment to the diverse cultural practices rather than forcing conformity?
- How might you design your own course project to better serve a culturally broad range of students? In what ways might it be better to narrow your cultural focus?

Other possibilities if you're interested in more visual exploration

Explore the Trends in International Mathematics and Science Study (TIMSS) work related to international comparisons

A) <http://forum-network.org/speaker/james-stigler> (online lecture re: Lessons from Japanese and Chinese Education)

Or B) <http://nces.ed.gov/timss/video.asp> (explore the National Center for Educational Statistics web site re: TIMSS, includes data and classroom videos)

Preschool in Three Cultures (videos on the blackboard)

WEEK 13: COURSE CONCLUSION I

Tuesday, November 20 – Summary of BIG Ideas

• **BIG Ideas Project DUE**

Guiding Questions:

Which of your BIG Ideas do you consider the BIG 5?

Identify one or two remaining questions in the learning sciences that you want to investigate as you move forward in your education / career.

Thursday, November 22 – *No Class – Thanksgiving Holiday*

WEEK 14: COURSE CONCLUSION II

Tuesday, November 27

Class Presentations – Katie, Kate, Kelly, Jason

• **Project Step 6: Research Design**

Thursday, November 29

Class Presentations – Samantha, Caitlin, Ryan, Nick

WEEK 15: COURSE CONCLUSION III

Tuesday, December 4

Class Presentations – Amanda, Tom, Thomas, Courtney

Thursday, December 6

Class Presentations – Abi, Whitney, Erik, extra slot

CULMINATING EXPERIENCES:

PIER Poster Session (Public)

Tuesday, December 11 from 1:00-4:00pm

• **Final Project Submission**

Friday, December 14, any time

Course Celebration (Private)

Saturday, December 15, 6:00pm at the Carver Home
Significant others and children are welcome.

1579 Cumberland Street, Pittsburgh, PA 15205
412-937-2307
