



PennState

Office for General Education

Integrative Studies Seed Grant Kick-off Workshop The Penn Stater – Room 208 Monday May 15, 2017

9:00-9:30 am	Breakfast and registration
9:30-10:20 am	Welcome and Integrative Studies in the new General Education @ PSU Maggie Slattery Interim Director of the Office for General Education and Assistant Dean of General Education
10:20-10:30 am	Break
10:30-11:30am	What is Integrative Teaching and Learning: A Practical Guide for Penn State Faculty Edmund Hansen Senior Research Associate, Schreyer Institute for Teaching Excellence Larkin Hood Research Associate Schreyer Institute for Teaching Excellence
11:30-12:00 noon	Seed Grant Collaborators Meeting Please go to the group which is most relevant to your proposed course. Sustainability Institute – Room 205 TLT – Room 206 Libraries/OER – Room 208
12:00-1:00 pm	Lunch at The Gardens restaurant
1:00-2:30 pm	Integrative Studies Course Design Workshop Larkin Hood, Edmund Hansen, and Mary Ann Tobin Schreyer Institute for Teaching Excellence Red dots – Room 205 Green dots – Room 206 Yellow dots – Room 208
2:30-2:45 pm	Break and snacks
2:45-3:45 pm	Assessing Integrative Studies courses as part of General Education Barbara Masi Associate Vice-Provost for Learning Outcomes Assessment
3:45-4:15 pm	Wrap up




Seed Grant Kick-Off Workshop

Primary Materials

1. **PowerPoint Slides on Integrative Studies in the new General Education @ PSU**
These slides accompany the morning presentation and discussion
2. **PowerPoint Slides on Integrative Course Design**
These slides accompany the morning presentation and discussion
3. **Course Design Worksheet**
Detailed worksheets for you to fill in as you design your course; includes AAC&U VALUE rubric on integrative learning
 - You will get started on the worksheets during our session and finish them as you work on your course design in the time ahead
4. **Appendix A: General Education: Updated Learning Objectives and Foundation and Domain Criteria**
General Education guidelines from the PSU website
 - This will help you fill in parts of the course design worksheet
5. **Appendix B: Activities for Turning Students into Integrative Learners**
 - *Short tips from the literature on integrative learning and teaching*

Supplemental Materials:

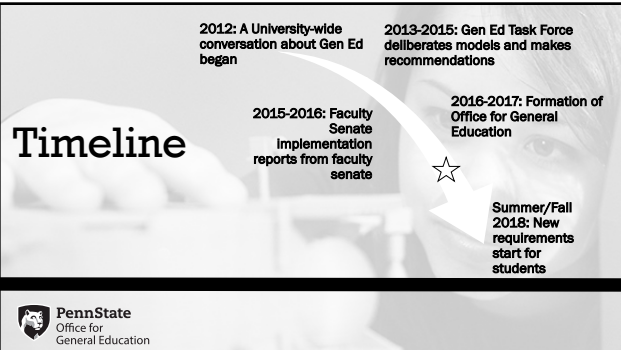
6. **Interdisciplinary Approaches to Teaching (Carleton College Website)**
Excerpts from the Carleton College website on "Interdisciplinary Approaches to Teaching"
 - Lots of good information on topics such as: What makes interdisciplinary instruction different – Why teach with an interdisciplinary approach – How to teach with an interdisciplinary approach – Challenges facing interdisciplinary teachers
7. **Building Students' Integrative Thinking Capacities: A Case Study in Economics and History**
Excerpts from the Abbott & Nantz 2012 article "Building Students' Integrative Thinking Capacities: A Case Study in Economics and History"
 - Good illustration for how disciplines can benefit from each other's methodological approaches when taught in an integrative course.
8. W.H. Newell. **Interdisciplinary Curriculum Development.** *Issues in Integrative Studies*, No. 8, pp. 69-86 (1990).
9. **List of potential mentors to contact as needed**



Integrative Studies in General Education @ PSU

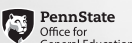
Seed Grant Workshop
May 15, 2017







Timeline

- 2012: A University-wide conversation about Gen Ed began
- 2013-2015: Gen Ed Task Force deliberates models and makes recommendations
- 2015-2016: Faculty Senate Implementation reports from faculty senate
- 2016-2017: Formation of Office for General Education
- Summer/Fall 2018: New requirements start for students



The foremost goal of the Gen Ed revision was to foster opportunities for student learning.



GenEd Learning Objectives

EFFECTIVE COMMUNICATION

KEY LITERACIES e.g. quantitative, health, intercultural, historical, aesthetic, linguistic, scientific

CRITICAL AND ANALYTICAL THINKING

INTEGRATIVE THINKING

CREATIVE THINKING

GLOBAL LEARNING

SOCIAL RESPONSIBILITY AND ETHICAL REASONING

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General Education



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INTEGRATIVE THINKING

What/Why?

A hallmark of modern General Education, Integrative Thinking involves the ability to synthesize knowledge across multiple domains, modes of inquiry, and perspectives, as well as the ability to identify linkages between existing knowledge and new information to formulate solutions to complex problems or create new understanding. Individuals who engage in integrative thinking

How?

With an explicit requirement to indicate importance and intentionality.

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Integrative Studies Requirement 6 credits

Inter-domain Courses

- 3 credits, students must take 2
- 2 domains represented in each course
- creates 6 credits of exploration in General Education because may count toward both domains

Linked Courses

- 2 courses that link in some substantial way
- each course used by a student is designated in a different domain
- may be used toward integrative studies requirement or regular domain course requirement if link is not taken



Foundation Courses

(15 credits and C or better)

Quantification (GQ)

Writing and Speaking (GWS)

Domain Courses

(30 credits includes 6 Integrative Studies credits)

Arts (GA) – 6 credits

Humanities (GH) – 6 credits

Health and Wellness (GHW) – 3 credits

Natural Sciences (GN) – 9 credits

Social and Behavioral Sciences (GS) – 6 credits



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Criteria for each foundation and domain area was reviewed, updated, and to some degree made parallel.

What
needs to
be done
now?



**IMPLEMENTATION OF
NEW REQUIREMENTS**




ASSESSMENT



**RECERTIFICATION OF
COURSES BY
CURRICULAR AFFAIRS**




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Seed Grants for General Education Integrative Studies

- 71 Awards
- Significantly increased budget to increase number of awards



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SEED GRANT PRIORITIES

Courses that are expected to have broad student appeal.

Courses that embrace the intention and goals of the General Education update.

Courses that reflect the General Education learning objectives.

Courses that are transferable to a range of University campuses and that engage faculty from different units.



Collaborating Academic Units:

- College of Agricultural Sciences
- College of Education
- College of Engineering
- College of Health and Human Development
- College of the Liberal Arts



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Collaborating University-wide Units:

- Teaching and Learning with Technology
- Office for Learning Outcomes Assessment
- Open Educational Resources(TLT/Libraries)
- University Libraries
- World Campus
- Schreyer Honors College
- Schreyer Institute for Teaching Excellence
- Center for Performing Arts
- Sustainability Institute



Collaborating University-wide Units:

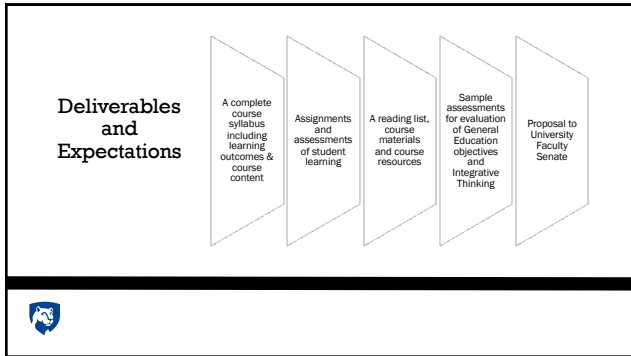
- Teaching and Learning with Technology
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- Schreyer Institute for Teaching Excellence
- Center for Performing Arts
- Sustainability Institute



Seed Grant Timeline

- ✓ Feb 28th – proposals due
- ✓ First part of April ~~End of March~~ – funded proposals announced
- ☐ Start of summer – first half of award money dispersed
- ☐ Summer – works gets done
- ☐ End of summer/early fall – proposal submitted to the faculty senate, other deliverables are submitted, second half of award money dispersed
- ☐ FA17/SP18 – offer courses if possible (X97 model)
- ☐ Summer 2018 – symposia to share across the University











Gen Ed Faculty Fellows

16 FELLOWS TOTAL

7 FROM UNIVERSITY PARK – ONE PER DOMAIN AND FOUNDATION


5 FROM CAMPUS COLLEGES

4 FROM UNIVERSITY COLLEGE REPRESENTING GEOGRAPHIC GROUPS


PARTIAL SUMMER SUPPORT FOR EFFORT

 **PennState**
Office for
General Education


General Education @ PSU




**SOLID
FOUNDATION**



**TRANSFORMATIVE
EXPLORATION**



**INTEGRATIVE
LEARNING**



Wed, October 25, 2017
8:30 a.m. - 1:15 p.m.
Nittany Lion Inn

Click for a sneak peek
and additional details!

SAVE THE DATE


Schreyer Conference

General Education: Inspiration for Integration

Preliminary Topics:


- Integrative Courses: Lessons Learned
- Linked Courses: What are the Options?
- Designing Inclusive Gen Ed Courses

and more ...

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General Education

Slide 1

What is Integrative Teaching and Learning: A Practical Guide for Penn State Faculty



Schreyer Institute for Teaching Excellence, 2017

1

Slide 2

Integrative teaching helps students learn how to learn

“We need to set students up to learn outside of college for the rest of their lives.” (Paul T. Corrigan, 2013)

“We are currently preparing students for jobs that don’t yet exist... using technologies that haven’t been invented... in order to solve problems we don’t even know are problems yet.” (Karl Fisch, 2008: *Shift Happens*)

2

Slide 3

Typical definitions of integrative learning:

“It pushes the boundaries of the disciplines”

“The whole is more than the sum of its parts”

“It balances different ways of knowing”

“It all comes together”

3

Slide 4

What we are offering you this morning...

... a definition and a procedure for integrative teaching and learning

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Slide 5

Integrative courses are for helping students learn higher order thinking skills:

- Ability to synthesize
- Critical & unconventional thinking
- Demythologize experts

after J. Thompson Klein, 1999

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Slide 6

Integrative courses are for helping students acquire intellectual mindsets:

- Tolerance of ambiguity
- Sensitivity to ethical issues
- Humility & sensitivity to bias

after J. Thompson Klein, 1999

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Slide 7

Examples of specific topics from different disciplines:

1. The Causes and Consequences of Unemployment (*Economics & Psychology/Sociology*)
2. The Causes & Remedies to the Racial Achievement Gap (*PoliSci & Education & Sociology*)
3. How Breakfast is Related to (increased) Brainpower (*Biology & Psychology*)
4. Confronting the Political Power of Climate Change (*Economics, Political Science, Sociology*)
5. To Raise or not to Raise the Minimum Wage (*Economics & Justice Studies*)

Carleton College website

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Slide 8

Examples of topics from Seed Grant Proposals:

1. Food Psychology: Why We Eat What We Eat (*Health Science*)
2. Historical Perspectives on Health Care Innovations (*Nursing and History*)
3. How Weather Played an Instrumental Role in Great World Events (*History & ?*)
4. Robots and Their Role in Society (*Aerospace Engineering*)
5. The Film Media and Extraterrestrial Life: Science Fact or Fiction? (*Physics*)
6. On Bullshit: Identifying Bias and Falsehoods (*Science and Liberal Arts*)

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Slide 9

What does integrative learning do?

Integrative Learning Makes Connections:

1. Between academic learning and *personal experience*
2. Across *disciplines* and/or perspectives
3. From one *situation* to new situations (to explore and solve problems)
4. Between different *communication purposes* or audiences
5. Between the *effectiveness* of current and previous learning experiences

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Slide
10

Sketch out a key assignment or project for your course:

1. Jot down some thoughts for a key project or assignment in your course
2. Then look at the *Integrative Learning Rubric* (p. 10 on Worksheet) and identify elements in your project that link up with each of the 5 performance criteria
3. Is the rubric applicable for you, or are there problems?
4. Discuss at your table how the rubric fits or doesn't fit your project ideas.

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PERFORMANCE CRITERIA:	PERFORMANCE LEVEL (high):
Connections to Experience: <i>Connects relevant experience and academic learning</i>	Effectively selects and develops examples of life experiences, drawn from a variety of contexts (e.g., family life, artistic participation, civic involvement, work experience) to illuminate concepts, theories, or frameworks developed in academic learning.
Connections to Discipline: <i>Makes connections across disciplines and/or perspectives</i>	Independently connects examples, facts, or theories from more than one field of study, discipline or perspective.
Transfer: <i>Adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations</i>	Adapts and applies skills, abilities, theories, or methodologies, gained in one situation to new situations to solve problems or explore issues .
Integrated Communication: <i>Makes strategic and meaningful communication choices across multiple contexts and purposes (professional, academic, and civic)</i>	Choices of language or other modes of expression, within individual performances of tasks, demonstrate awareness of and calibration toward purpose and audience .
Reflection and Self-Assessment: <i>Demonstrates a developing sense of self as a learner, building on prior experiences to respond to new and challenging context (evident in self-assessment, reflective, creative work)</i>	Evaluates changes in own learning over time, recognizing complex contextual factors, e.g.: works with ambiguity and risk, deals with frustration, considers ethical frameworks.

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Slide
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Debriefing:

1. Did the rubric help you flesh out your assignment?
2. Did the rubric's criteria fit with your assignment?
3. Where—if at all—did you see discrepancies?
4. Would you want to modify pieces of the rubric or even create a new one?

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Why is (the teaching of) integrative thinking difficult?

- Two disciplines combined
- Critical thinking, open-mindedness, self-reflection, intellectual curiosity required
- Students & teachers not used to qualitative assessment tools (e.g. rubrics)
- Students' social and cognitive development at different levels (William Perry)

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Perry's Intellectual Developmental Stages

1. DUALISM:

There are right/wrong answers... known to authorities

2. MULTIPLICITY:

There are conflicting answers. Therefore, students must trust their inner voices

3. RELATIVISM:

There are disciplinary reasoning methods

4. COMMITMENT:

Integration of knowledge learned from others with personal experience and reflection

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Students' Categories of Integration

CATEGORY	DEFINITION	ACTION VERBS
Establishing a Connection	Student finds similarity between ideas, skills, or pieces of information	Compare and contrast; Relate; Something is like something else
Application across Contexts	Student takes an idea learned in one context and uses it in another context	Apply; Use; Transfer
Synthesis of a new Whole	Student brings two or more ideas together to form a new idea or concept	Incorporate; Adapt; Elaborate; Bounce ideas off one another

James Barber, 2012

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How to foster integrative learning in students?

- Interactions with faculty and mentors...
- Key assignments stretched out over semester
- Integrative learning rubric/s
- Practice activities for crit. skills & habits of mind
- Student self-evaluation and reflection

(see Barber, p. 610/11)

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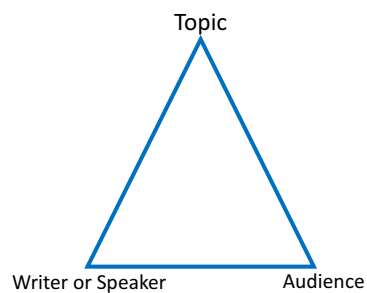
Suggestions for effective assignments:

- Make the task “real”
- Create a different audience
- Include opportunities for reflection

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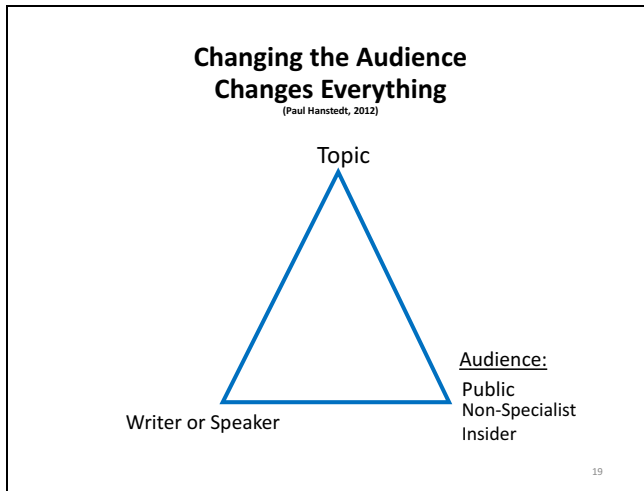
Slide
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Changing the Audience Changes Everything



18

Slide
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Slide
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**Importance of
(Signature) Assignments**

1. Who is the audience of the paper?
 - a. Insider-to-**insider** situations
 - b. Insider-to-**non-specialist** situations
 - c. Insider-to-**public** situations
2. Suggestions for multiple assignments:
 - a. Each paper designates **an audience**
 - b. The **audiences change** for each essay
 - c. (Only) the final paper is a **research paper**

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What other strategies can you use?

Look at **Appendix B** for smaller activities such as:

- Practice perspective taking
- Integrate conflicting insights
- Point out/discuss ethical dimensions in science
- Use a variety of interactive activities

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Integrative Course Design

PART B: Design Worksheets

1. The Big Question
2. Gen-Ed Learning Objectives
3. Learning Actions (incl. integrative assignments)
4. Assessments
5. Course Alignment

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Slide
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References:

- AAC&U Integrative Learning VALUE Rubric.
- Barber, J.P. (2012). *Integration of learning: A grounded theory analysis of college students' learning*. AERA Journal.
- Carleton College's Science Education Resource Center.
- Clinton Golding. Centre for the Study of Higher Education. (2009). *Integrating the disciplines: Successful interdisciplinary subjects*.
- Corrigan, P.T. (2013). Preparing students for what we can't prepare them for.
- Fisch, K. (2008). *Shift happens*. YouTube video.
- Hanstedt, P. (2012). *General Education Essentials*.
- Newell, W.H. & Luckie, D.B. (2013). *Pedagogy for interdisciplinary habits of the mind*.
- Perry, W.G. (1981). *Cognitive and ethical growth: The making of meaning*.
- Thompson Klein, J. (1999). *Mapping interdisciplinary studies. The Academy in transition*.

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Course Design Worksheet

(Adapted from: International Council for Higher Education)

Title of the course:

- ☐ Interdomain Domains & disciplines to be included: (a)
☐ Linked (b)

What is the **big question** for this **integrative** course (in one or two sentences)?

Example 1: What determines the level of schooling people complete? (with perspectives from Education and Economics)

Example 2: How is breakfast related to increased brainpower? (with perspectives from Biology and Psychology)

Example 3: To raise or not to raise the minimum wage? (with perspectives from Economics and Justice Studies)

Which 2-4 of the seven **Gen-Ed Learning Objectives** will be emphasized in the course?

*Select from this list (see also **Appendix A**):*

1. Effective Communication
2. Key Literacies
3. Critical/Analytical Thinking
4. Integrative Thinking
5. Creative Thinking
6. Global Learning
7. Social Responsibility & Ethical Reasoning

Which **Student Learning Criteria** (minimum of 3) will be addressed per domain?

*(select from lists in **Appendix A**)*

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Explain how the scientific approaches and interests of the two knowledge domains will be addressed in the course and practiced by the students.

What does the research in discipline 1 focus on when addressing this big question?	
What does the research in discipline 2 focus on when addressing this big question?	
How might the two disciplines benefit from each other and generate a more complete analysis of the problem?	
What strategies and activities will you use to help students practice integrative learning? (see Appendix B)	

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Course-level Learning Outcomes:

Given the specifics of your course(s), which specific learning outcomes do you consider most important?

Frame your course outcomes in view of the chosen Gen-Ed Learning Objectives (see p. 1 above) and consider different levels of learning, including *comprehension*, *application*, and *integration* of content!

- (a) Comprehension: What *key information and ideas* are important for students to *understand and remember*? (*just a couple of broad sentences!*)

- (b) Application: What kinds of *skills and ways of thinking* do students need to learn? (*just a couple of broad sentences!*)

- (c) Integration A: What *connections* should students *recognize and make* between the two disciplines? (*i.e., connections between ideas in the two disciplines!*)

- (d) Integration B: What—if any—*connections* should students *recognize and make* between the course and *their own life*? (*i.e., connections between ideas from the two disciplines and students' own lives!*)

- (e) Integration C: What *connections* should students *recognize and make* between course content and the *broader social context* within which they live? (*i.e., connections between ideas from the two disciplines and contemporary society!*)

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Learning Actions:

Each learning action is aligned with a corresponding learning outcome. Answer the following questions to form appropriate actions.

- (a) What sources, data, lectures, and texts will be used for the *receiving of information and ideas?* (i.e., *knowledge acquisition*)

- (b) What kinds of doing and observing will be used for *developing skills and thinking?* (i.e., *practicing specific skills*)

- (c) What type of active reflection will be used for *making connections between the two disciplines?* (i.e., *reflection of how the two disciplines are connected*)

- (d) What type of active reflection will be used for *building connections between content and students' lives?* (i.e., *reflection on how students' lives are connected to the two disciplines*)

- (e) What type of active reflection will be used for *building connections between content and the broader social context?* (i.e., *reflection of how society as a whole is connected to the two disciplines*)

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Key Assignment:

Does the course have one or more key assignments? *Earlier today, you already identified a main assignment.* You may use the same assignment again, or create a new one. Answer the following questions:

What is the topic of the assignment and its intended purpose?

How much time do you give students to finish the assignment?

What types of periodic feedback (if any) will students receive while working on the assignment?

Who is the (presumed) audience for this assignment?

Which aspects of your course's integrated disciplines are your students expected to address?

What role should student-reflection and self-assessment play? In what form should they be expressed?

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Assessment Techniques:

Each assessment procedure evaluates the degree to which the student has met the corresponding objective. Answer the following questions to structure appropriate forms of assessment. When finished, **share your ideas** with a colleague or two:

(a) How will students' *understanding of key information and ideas* be assessed?
(e.g. with quizzes and tests)

(b) How will students' *application of thought and skills* be assessed?
(e.g. with tests, roleplays, case studies)

(c) How will students' *recognition of connections between the two disciplines* be assessed?
(e.g. with short essay tests or course projects)

(d) How will students' *recognition of connections between content and their own life* be assessed?
(e.g. with reflection activities, such as reflective journaling)

(e) How will students' *recognition of connections between content and the social context* be assessed?
(e.g. with reflection activities and a course project)

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Course Alignment Worksheet

Course-level Outcomes: Understand and remember key information and ideas	Learning actions: Receive information and ideas	Assessment: Understanding of key information and ideas
Course-level Outcomes: Learn skills and ways of thinking	Learning actions: Doing and observing experiences	Assessment: Application of thoughts and skills

GENERAL EDUCATION INTEGRATED COURSE DESIGN

Course-level Outcomes: Make connections between ideas, self, and society	Learning actions: Active reflection upon new information and experiences	Assessment: Recognition of connections between ideas, self, society

Responsibilities for Co-Instructors in Linked Courses only:

Upon developing the syllabus, use the following questions to review the instructor responsibilities:

- (a) What responsibilities will be shared by the instructors?

- (b) What responsibilities will be divided generally (across the semester or term) and specifically (on particular days)?
 - a. What are the responsibilities of the instructor “in charge” of a particular event or assignment?
 - b. How can the other instructor(s) facilitate student learning by assisting the instructor with the primary responsibility for a given event or assignment?

- (c) How will instructors handle disagreements about content or procedure without undermining one another or compromising student learning?

- (d) How and when will instructors meet to discuss the course and consider changes to content or procedures throughout the semester?

For all Faculty: Develop a Syllabus:

Address the details of the course by developing a syllabus with daily plans.

Integrative Learning Rubric (AAC&U)

Simplified Criteria and one Performance Level

PERFORMANCE CRITERIA:	PERFORMANCE LEVEL (high):	YOUR NOTES:
Connections to Experience: <i>Connects relevant experience and academic learning</i>	Effectively selects and develops examples of life experiences, drawn from a variety of contexts (e.g., family life, artistic participation, civic involvement, work experience) to illuminate concepts, theories, or frameworks developed in academic learning.	
Connections to Discipline: <i>Makes connections across disciplines and/or perspectives</i>	Independently connects examples, facts, or theories from more than one field of study, discipline or perspective.	
Transfer: <i>Adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations</i>	Adapts and applies skills, abilities, theories, or methodologies, gained in one situation to new situations to solve problems or explore issues .	
Integrated Communication: <i>Makes strategic and meaningful communication choices across multiple contexts and purposes (professional, academic, and civic)</i>	Choices of language or other modes of expression, within individual performances of tasks, demonstrate awareness of and calibration toward purpose and audience .	
Reflection and Self-Assessment: <i>Demonstrates a developing sense of self as a learner, building on prior experiences to respond to new and challenging context (may be evident in self-assessment, reflective, or creative work)</i>	Evaluates changes in own learning over time, recognizing complex contextual factors (e.g., work with ambiguity and risk, deals with frustration, considers ethical frameworks).	

Adapted from The Washington Center for Internships and Academic Seminars

Integrative Learning Rubric

	Capstone 4	Milestones 3 2		Benchmark 1
Connections to Experience <i>Connects relevant experience and academic learning</i>	Meaningfully synthesizes connections among experiences outside of the formal classroom (including life experiences and academic experiences) to deepen understandings gained in academic learning and/or to broaden own points of view.	Effectively selects and develops examples of life experiences, drawn from a variety of contexts (e.g., family life, artistic participation, civic involvement, work experience), to illuminate concepts/theories/frameworks developed in academic learning.	Compares life experiences and academic learning to infer differences, as well as similarities, and acknowledge perspectives other than own.	Identifies connections between life experiences and those academic texts or ideas perceived as similar and related to own interests.
Connections to Discipline <i>Sees (makes) connections across disciplines, perspectives</i>	Independently creates wholes out of multiple parts (synthesizes) or draws conclusions by combining examples, facts, or theories from more than one field of study, discipline or perspective.	Independently connects examples, facts, or theories from more than one field of study, discipline or perspective.	When prompted, connects examples, facts, or theories from more than one field of study, discipline or perspective.	When prompted, presents examples, facts, or theories from more than one field of study, discipline or perspective.
Transfer <i>Adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations</i>	Independently adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations to solve difficult problems or explore complex issues in original ways.	Adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations to solve problems or explore issues.	Uses skills, abilities, theories, or methodologies gained in one situation in a new situation to contribute to understanding of problems or issues.	Uses, in a basic way, skills, abilities, theories, or methodologies gained in one situation in a new situation.
Integrated Communication <i>Makes strategic and meaningful communication choices across multiple contexts and purposes (professional, academic, and civic)</i>	Choices of language or other modes of expressions within and/or across complex performances of tasks work together in ways that enhance meaning.	Choices of language or other modes of expression, within individual performances of tasks, demonstrate awareness of and calibration toward purpose and audience.	Within the appropriate form or format, makes basic choices about language or other modes of expression that are appropriate to the form or format.	Choices of basic form or format are appropriate to the assignments or tasks (i.e. to produce an essay, a poster, a video, a PowerPoint presentation, etc.).
Reflection and Self-Assessment <i>Demonstrates a developing sense of self as a learner, building on prior experiences to respond to new and challenging contexts (may be evident in self-assessment, reflective, or creative work)</i>	Envisions a future self (and possibly makes plans that build on past experiences that have occurred across multiple and diverse contexts).	Evaluates changes in own learning over time, recognizing complex contextual factors (e.g., works with ambiguity and risk, deals with frustration, considers ethical frameworks).	Articulates strengths and challenges (within specific performances or events) to increase effectiveness in different contexts (through increased self-awareness).	Describes own performances with general descriptors of success and failure.

Slightly adapted from AAC&U Integrative Learning Rubric

APPENDIX A

GENERAL EDUCATION

UPDATED LEARNING OBJECTIVES AND FOUNDATION AND DOMAIN CRITERIA

The General Education curriculum will enable students to acquire skills, knowledge, and experiences for living in interconnected contexts, so they can contribute to making life better for others, themselves, and the larger world. General Education encompasses the breadth of knowledge involving the major intellectual and aesthetic skills and achievements of humanity. This must include understanding and appreciation of the pluralistic nature of knowledge epitomized by the natural sciences, quantitative skills, social and behavioral sciences, humanities, and arts. To achieve and share such an understanding and appreciation, skills in self-expression, quantitative analysis, information literacy, and collaborative interaction are necessary. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. General Education, in essence, aims to cultivate a knowledgeable, informed, literate human being.

An effective General Education curriculum shall facilitate teaching and learning through seven key objectives:

(each course will have 2-4 per senate implementation report March 15, 2016)

- a. **EFFECTIVE COMMUNICATION** – the ability to exchange information and ideas in oral, written, and visual form in ways that allow for informed and persuasive discourse that builds trust and respect among those engaged in that exchange, and helps create environments where creative ideas and problem-solving flourish.
- b. **KEY LITERACIES** – the ability to identify, interpret, create, communicate and compute using materials in a variety of media and contexts. Literacy acquired in multiple areas, such as textual, quantitative, information/technology, health, intercultural, historical, aesthetic, linguistic (world languages), and scientific, enables individuals to achieve their goals, to develop their knowledge and potential, to lead healthy and productive lives, and to participate fully in their community and wider society.
- c. **CRITICAL AND ANALYTICAL THINKING** – the habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.
- d. **INTEGRATIVE THINKING** – the ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts.
- e. **CREATIVE THINKING** – the capacity to synthesize existing ideas, images, or expertise in original ways and the experience of performing, making, thinking, or acting in an imaginative way that may be characterized by innovation, divergent thinking, and intellectual risk taking.
- f. **GLOBAL LEARNING** – the intellectually disciplined abilities to analyze similarities and differences among cultures; evaluate natural, physical, social, cultural, historical, and economic legacies and hierarchies; and engage as community members and leaders who will continue to deal with the intricacies of an ever-changing world. Individuals should acquire the ability to analyze power; identify and critique interdependent global, regional, and local cultures and systems; and evaluate the implications for people's lives.

- g. SOCIAL RESPONSIBILITY AND ETHICAL REASONING – the ability to assess one’s own values within the social context of problems, recognize ethical issues in a variety of settings, describe how different perspectives might be applied to ethical dilemmas, and consider the ramifications of alternative actions. Individuals should acquire the self-- knowledge and leadership skills needed to play a role in creating and maintaining healthy, civil, safe, and thriving communities.

FOUNDATIONS CRITERIA

(courses will have at least 3 of the 5 per domain senate implementation report March 15, 2016)

Writing/ Speaking (GWS)

In Writing and Speaking (GWS) courses, students do more than improve their abilities to communicate information clearly. They learn to set forth arguments persuasively and well, both orally and in writing. Students should emerge from their GWS courses as more accomplished writers and speakers, competent in a wide variety of settings.

To help students achieve GWS goals, the university provides GWS courses and an appropriate learning environment that will:

- Provide opportunities for students to become increasingly effective communicators as they enter new contexts and address new audiences
- Provide opportunities for students to become increasingly accomplished in written, oral, digital, and visual communication.

GWS Student Learning Criteria. Upon successful completion of the General Education Writing and Speaking requirements, students will have increased their abilities to:

- Demonstrate rhetorical and analytical skills as they explore, compose, interpret, and present a variety of texts
- Communicate effectively and persuasively to a range of audiences
- Demonstrate capacities for critical thinking, listening, and generating ideas
- Demonstrate proficiency in composing processes
- Employ the conventions of both spoken and written communication with sensitivity to context and venue.

Quantification (GQ)

In Quantification (GQ) fields, students practice and master basic mathematical and statistical skills of lifelong value in solving real world problems. Students should learn to apply mathematical skills appropriate to solve such problems.

To help students achieve GQ goals and master foundational quantification skills, the university provides GQ coursework and an appropriate learning environment that will:

- Provide experience in assessing and interpreting quantitative data and information
- Guide students to recognize patterns, establish relations, exercise conceptual thinking, develop problem-solving skills, and think logically and critically
- Support students in their efforts to draw accurate and useful conclusions; make informed decisions based on quantitative analysis; and use basic mathematical and statistical skills to solve conceptual problems.

GQ Student Learning Criteria. Upon successful completion of the General Education Quantification (GQ) requirement, students should have increased their abilities to:

- Use mathematical, statistical, or computational models, principles, and processes to integrate, synthesize, generalize, or make judgments about real world problems
- Recognize patterns, establish mathematical relations, apply problem-solving skills, and think logically and critically
- Develop, explore, analyze, and reason about multi-variable relationships using quantitative tools
- Use probability to reason and make judgments based on data that exhibit variability
- Communicate and explain mathematical and statistical ideas.

DOMAIN CRITERIA

(courses will have at least 3 of the 5 per domain senate implementation report March 15, 2016)

Arts (GA)

In Arts fields (GA), students focus on exploring or creating works of art. Students should become familiar with the importance of significant creative works, the traditions and history associated with those works, and the important role that the arts play as expressions of the cultural values of society and the human condition.

To help students achieve GA goals, the University provides GA courses and an appropriate learning environment with purposeful engagement with the arts and creative works for students to:

- Encounter and become conversant with the terminologies, techniques, practices, knowledge, and skills employed by the arts
- Gain a comprehension of the role that the arts play as expressions of the cultural values of society and the human condition
- Expand their knowledge of the variety of expressions and experiences that are provided through the arts
- Develop competencies in interpreting and critically evaluating diverse expressions in the arts.

GA Student Learning Criteria. Upon successful completion of the General Education Arts (GA) requirement, students should be able to:

- Explain the methods of inquiry arts fields and describe how the contributions of these fields complement inquiry in other areas
- Demonstrate expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor
- Demonstrate competence in the creation of works of art and design
- Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works
- Identify and explain the aesthetic, historical, social, and cultural significance of important works of art and critically assess creative works, their own or others', through evaluative processes of analysis and interpretation.

Humanities (GH)

In Humanities (GH) fields, students focus on exploring important works of literature, history, religion, philosophy, and other closely related forms of cultural expression, thereby broadening their understanding of diverse ways of seeing, thinking about, and experiencing the self and society. Students will enlarge their intellectual horizons and knowledge of the world through encountering humanistic representations of both lived experiences and imaginative or speculative constructions, past or present. Students thus become

increasingly prepared to live as thoughtfully engaged members of multiple communities, whether local, regional, or global.

To help students achieve GH goals, the University provides GH courses and an appropriate learning environment for students to:

- Engage in the qualitative study of the humanities
- Expand their knowledge of the variety of human experiences
- Gain access to various intellectual traditions and their changes through time
- Probe the foundations of communication and thought and become aware of the scope and limitations of human communication
- Encounter concepts and traditions that attempt to bring sense to human existence
- Develop their competency in interpreting and critically evaluating diverse ways of life, traditions, and shared or individual values, including their own

GH Student Learning Criteria. Upon successful completion of the General Education Humanities (GH) requirement, students should have increased their abilities to:

- Explain the methods of inquiry humanities fields and describe how the contributions of these fields complement inquiry in other areas
- Demonstrate competence in critical thinking about topics and texts in the humanities through clear and well-reasoned responses
- Critically evaluate texts in the humanities— whether verbal, visual, or digital— and identify and explain moral or ethical dimensions within the disciplines of the humanities
- Demonstrate knowledge of major cultural currents, issues, and developments through time, including evidence of exposure to unfamiliar material that challenges their curiosity and stretches their intellectual range
- Become familiar with groups, individuals, ideas, or events that have influenced the experiences and values of different communities

Health and Wellness (GHW)

In Health and Wellness (GHW) fields, students focus on the physical and psychosocial well-being of individuals and communities. They expand their theoretical and practical knowledge about health and wellness—concepts that are multidimensional and culturally defined. The University provides opportunities for students to study such diverse topics as nutrition, physical activity, stress, sleep, healthy leisure, alcohol, tobacco, and other substance use, sexual health, and safety—all useful in maintaining lifelong health and wellness and in creating healthy work and community environments.

- Identify and practice skills, attitudes, and behaviors that should enable them to better maintain health and wellness across their lifespans
- Identify wellness as a positive state of well-being, not merely the absence of disease or illness
- Recognize the importance of social, emotional, and physical health and wellness for communities as well as for individuals. To help students achieve GHW goals, the University provides GHW courses and an appropriate learning environment for students to:

GHW Student Learning Criteria. Upon successful completion of the General Education Health and Wellness (GHW) requirement, students should have increased their abilities to:

- Explain the methods of inquiry Health and Wellness fields and describe how the contributions of these fields complement inquiry in other areas
- Describe multiple perceptions and dimensions of health and wellness (emotional, spiritual, environmental, physical, social, intellectual, and occupational)
- Identify and explain ways individuals and/or communities can achieve and maintain health and wellness
- Describe health-related risk factors and explain changes in knowledge, attitudes, behaviors, activities or skills that have the potential of improving health and wellness
- Disseminate knowledge about health and wellness and demonstrate behavioral practices needed to engage in healthy living across the lifespan

Natural Sciences (GN)

In Natural Science (GN) fields, students develop the skills necessary to make informed judgments about scientific information and arguments. Along with building knowledge of foundational scientific principles, students expand their understanding of how and why science works, why it is an effective tool for knowledge generation, and how it can address contemporary questions and challenges.

To help students achieve GN goals and develop this scientific literacy, the University provides GN courses and an appropriate learning environment for students to:

- Encounter the order, diversity, and beauty of nature
- Sample some of the ways which science offers additional lens through which to view the human condition
- Engage with scientific material through discussion, exploration, data analysis, and experimentation
- Gain practice in recognizing the nature of scientific process and discovery, in identifying what science can and cannot achieve, and analyzing why scientific arguments may lead to different conclusions than other forms of intellectual discourse.

GN Student Learning Criteria. Upon successful completion of the General Education (GN) requirement, students should have increased their abilities to:

- Explain the methods of inquiry the natural science fields and describe how the contributions of these fields complement inquiry in other areas
- Construct evidence-based explanations of natural phenomena
- Demonstrate informed understandings of scientific claims and their applications
- Evaluate the quality of the data, methods, and inferences used to generate scientific knowledge
- Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to address contemporary problems

Social and Behavioral Sciences (GS)

In Social and Behavioral Science (GS) fields, students focus on analyzing the forces that influence behaviors, values, habits, attitudes, and institutions. GS courses allow students to explore the multiple perspectives and methodologies useful in analyzing and addressing complex social issues.

To help students achieve GS goals, the university provides GS courses and an appropriate learning environment for students to:

- Explore the interrelationships of the many factors that shape behavior

- Be introduced to methodological analyses of the forms, practices, and theories of politics, economics, and social institutions
- Develop comprehensive, integrated, reasoned, and theoretical views of their contemporary and emerging social worlds
- Expand their understanding of how social, political, and economic influences and trends affect individual, group, organizational, local, national, and global contexts.

GS Student Learning Criteria. Upon successful completion of the General Education Social and Behavioral Sciences (GS) requirement, students should have increased their abilities to:

- Explain the various methods of inquiry used in the social and behavioral sciences and describe how the contributions of these fields complement inquiry in other areas
- Identify and explain major foundational theories and bodies of work in a particular area of social and behavioral sciences
- Describe the ways in which many different factors may interact to influence behaviors and/or institutions in historical or contemporary settings
- Explain how social and behavioral science researchers use concepts, theoretical models, and data to better understand and address world problems
- Recognize social, cultural, political and/or ethical implications of work in the social and behavioral sciences.

APPENDIX B

Activities for Turning Students into Integrative Learners

Offer smaller tasks that target particular interdisciplinary skills, e.g.:

1. Present students with a situation & have them describe it from several perspectives or disciplines
2. Present students with three disciplinary perspectives about a case, and have them make a balanced judgment that incorporates all three
3. Teach a general skill that is useful for interdisciplinary work (e.g. Crit. Thinking) and have students apply it across disciplines (e.g. a quantitative, a legal, and a social issue)

(U. of Melbourne white paper)

Help students:

4. Acquire perspective-taking techniques
5. Integrate conflicting insights from alternative disciplines
6. Understand over what issues conflicts commonly arise
7. Understand that there are ethical dimensions to most issues of concern.

(SERC Portal for Educators)

Best Practices for Interdisciplinary Pedagogy:

1. Case Studies
2. Critique
3. Reflection
4. Group Work
5. Instructor Modeling
6. Class Discussion
7. Writing
8. Ill-structured Problems
9. Multiple Disciplinary Instructors
10. Guest Instructors
11. Creative Exercise
12. Iterative Practice
13. Reading Literature
14. Role Playing

(based on a polling of 14 expert instructors, with the number of votes ranging from 13 to 4 in the above rank-order)

Eight Strategies for Making Learning Integrative:

1. Identify conflicts and areas of complementarity between the insights offered from each discipline
2. Design one (or more) key course assignments that require integrative thinking. Consider the importance of “changing the audience”
3. Help students develop a basic understanding of main concepts and methodologies of the two disciplines used in this course
4. Use an integrative learning rubric to teach students how to apply it to the course assignments
5. Provide smaller practice opportunities for students to learn how to integrate ideas from multiple disciplines for solving relevant problems
6. Use best practices in interdisciplinary pedagogy (such as case studies, critiques, reflection, groupwork, and instructor modeling) to help students grow intellectually
7. Using the *Integrative Learning Rubric*, give students frequent feedback on short practice assignments and main class projects
8. Have students reflect on their own progress by applying the rubric (or parts thereof) on their own work

Pedagogy in Action

The SERC Portal for Educators

<http://serc.carleton.edu/sp/library/interdisciplinary/index.html>

Interdisciplinary Approaches to Teaching

This material is replicated on a number of sites as part of the [SERC Pedagogic Service Project](#)

Developed by [Arthur H. Goldsmith](#), Washington and Lee University. Assistance provided by: [Darrick Hamilton](#), Milano-The New School for Management and Urban Policy, [Karen Hornsby](#), North Carolina A&T State University, and [Dave Wells](#), Arizona State University.

What is Interdisciplinary Teaching?

Interdisciplinary instruction entails the use and integration of methods and analytical frameworks from more than one academic discipline to examine a theme, issue, question or topic.

Interdisciplinary education makes use of disciplinary approaches to examine topics, but pushes beyond by: taking insights from a variety of relevant disciplines, synthesizing their contribution to understanding, and then integrating these ideas into a more complete, and hopefully coherent, framework of analysis.

In dealing with multi-faceted issues such as teenage pregnancy, new drug development, genetically modified foods, and health care access, interdisciplinary perspectives are needed to adequately address the complexity of the problems and to forge viable policy responses.

Interdisciplinary teaching is different from multi- or cross-disciplinary teaching in that it requires the integration and synthesis of different perspectives rather than a simple consideration of multiple viewpoints.

Some Definitions

Cross-disciplinary analysis – examines an issue typically germane to one discipline through the lens of another discipline (i.e., how physicists explore music, sociological perspectives on the purpose of religion).

Multi-disciplinary analysis – examines an issue from multiple perspectives, without making a concerted effort to systemically integrate disciplinary perspectives.

Inter-disciplinary analysis – examines an issue from multiple perspectives, leading to a systematic effort to integrate the alternative perspectives into a unified or coherent framework of analysis.

What Makes Interdisciplinary Instruction Different?

A single disciplinary perspective often has limitations in that it is driven by the norms and framework of a particular discipline without consideration and incorporation of alternative views.

The single disciplinary view can lead to hegemony which prevents critical assessment of both their own and other perspectives. In contrast, interdisciplinary education draws on multiple disciplines to acquire a deep and thorough understanding of complex issues and challenges students to synthesize what each of the disciplines offers before attempting to design efforts to resolve noted concerns.

Teaching Economic Growth: An Interdisciplinary Example

Every Principles of Economics student learns that an economy grows in the near term through the use of additional labor, subject to the law of diminishing returns, and over a longer horizon by adding more capital and technology. This set of insights is depicted using the circular flow model or diagram. After discussing this perspective an educator can ask if other disciplines have additional insights to offer on this topic. They should expect some students to indicate that natural scientists often challenge this narrow, economic based, characterization of the productive process as incomplete and potentially misleading. This provides an opportunity for the instructor to introduce and model for students the integration of insights regarding economic growth from both economists and natural scientists.

For instance, Ecologists have argued for decades that the economy does not function separate from the natural world. They assert that there are ecological constraints or planetary boundaries that govern the economy and alter the conventional economic characterization of the link between inputs and output growth. They offer three insights that an interdisciplinary economics educator could integrate into their conventional analysis to produce an interdisciplinary exploration of economic growth. First, natural resources need to be included as an input to economic growth and must simultaneously be viewed a constraint on the process since they are not easily altered in the near term. Second, the production process creates waste which must be assimilated back into the biosphere and the environment may be coming under severe stress due to this inefficiency in the production process. This idea/concept leads directly to the third notion that the contribution of inputs to output is contingent upon the level and status of natural resources. For example, the combination of boats and fishers in the Gulf of Mexico will be unable to produce any seafood for a period due to the condition of the Gulf waters as a result of the BP oil leak. Thus, expanding the standard economic framework used to understand economic growth to account for ecological insights provides a richer understanding of production and growth.

Assignment: Ask students to expand the circular flow framework to formally account for ecological insights to produce an interdisciplinary framework for exploring economic growth. Then, students should address the following questions using the interdisciplinary framework they have developed, (1) how big can the economy grow before it starts to push up against these planetary boundaries? (2) where does the pollution go and how might this effect the environment and the productivity of other inputs? (3) how much energy and what amount of natural resources are used to sustain the economic system? and (4) what is the effect of a degraded environment of the economy and the quality of life?

Assessment: Students who approach the problem of growth with a purely economic focus would be assigned a C for the assignment, while those who account for insights from Ecology but are unable to clearly integrate ideas from both disciplines in their answers would be given a B. A grade of A is reserved for those who display the ability to integrate notions associated with growth from both Economics and Ecology.

Why Teach with an Interdisciplinary Approach?

Interdisciplinary Teaching Increases Student Learning

Engaging students and helping them to develop knowledge, insights, problem solving skills, self-confidence, self-efficacy, and a passion for learning are common goals that educators bring to the classroom, and interdisciplinary instruction and exploration promotes realization of these objectives. Repko (2009) asserts that interdisciplinary instruction fosters advances in cognitive ability and other educational researchers (Kavaloski 1979, Newell 1990, Field et al. 1994, Vess 2009) have identified a number of distinct educational benefits of interdisciplinary learning including gains in the ability to:

- **Recognize bias**
- **Think critically**
- **Tolerate ambiguity**
- **Acknowledge and appreciate ethical concerns**

Interdisciplinary Teaching Helps Students Uncover Preconceptions or Recognize Bias

Interdisciplinary instruction allows us to understand our preconceptions of "what is" and the framework by which we arrived at "what is." It also fits with recent advances in learning science about how to foster learning when students bring powerful pre-existing ideas with them to the learning process. Bransford (2000) drawing on scientific research findings from the fields of neuroscience, cognitive science, social psychology, and human development asserts that interdisciplinary forms of instruction,

- Help students overcome a tendency to maintain preconceived notions. This is accomplished by recognizing the source of the preexisting understandings they arrive with, and by introducing students to subject matter from a variety of perspectives that challenge their existing notions. Interdisciplinary instruction accomplishes this goal in two ways. First, by helping students identifying insights from a range of disciplines that contribute to an understanding of the issue under consideration. Second, by helping students develop the ability to integrate concepts and ideas from these disciplines into a broader conceptual framework of analysis.

The Gain - when students put aside their pre-existing notions they position themselves to learn facts more readily and are more open to adopting a range of methodologies that promote understanding. Teachers can thus spend more time exploring issues with them that promote *significant learning* (for information on *significant learning* see the section below entitled *Interdisciplinary Teaching Promotes Significant Learning*).

Interdisciplinary Teaching Helps Advance Critical Thinking and Cognitive Development

Interdisciplinary instruction helps students develop their cognitive abilities - brain-based skills and mental processes that are needed to carry out tasks. Allen Repko (2009) identifies a number of cognitive attributes that interdisciplinary learning fosters. He asserts, that interdisciplinary learning helps students:

- Acquire Perspective-Taking Techniques (Baloche, Hynes, and Berger 1996) - the capacity to understand multiple viewpoints on a given topic.

The Gain - students develop an appreciation of the differences between disciplines on how to approach a problem and their discipline specific rules regarding viable evidence. This leads to a broader understanding of the issue under investigation.

- Develop Structural Knowledge - both *declarative knowledge* (factual information) and *procedural knowledge* (process-based information).

The Gain - each of these forms of knowledge are needed to solve complex problems. Thus, as students enhance their knowledge formation capacity, teachers can engage them in conversations dealing with more complex issues.

- Integrate conflicting insights from alternative disciplines.

The Gain - a host of disciplines attempt to understand the same or related problems, but each disciplines adopts different mechanisms of analysis and approaches to evaluating the viability of their insights. Obtaining a clear understanding of problems with roots in multiple disciplines requires the capacity to integrate ideas and this skill is advanced by interdisciplinary learning.

Interdisciplinary Teaching Helps Students Tolerate or Embrace Ambiguity

- Interdisciplinary instruction helps students understand why conflicts commonly arise over; the causes and consequences of an issue and, the ideal way for policy to address the issue of concern. When learning is confined to a single disciplinary perspective ambiguity is often considered either a shortcoming of the analytical framework or evidence that assumptions need to be adopted to provide a clear prediction.

The Gain - interdisciplinary instruction advances the notion that ambiguity results from alternative perspectives on issues that are advanced by different disciplines rather than a shortcoming of a particular discipline. Thus, students acquire a better understanding of the complexity of problems of interest and the associated challenges of solving them.

Interdisciplinary Teaching Helps Students Appreciate Ethical Dimensions of Concerns

- Interdisciplinary instruction helps students understand that there are ethical dimensions to most issues of concern. Ethical considerations entail moral concerns which means accounting for perceptions of right vs. wrong, good vs. bad, and the provision of justice. Many disciplines steer clear of such subjective phenomena and confine their analysis to more objective factors in an effort to be scientific.

The Gain - interdisciplinary instruction promotes the integration of ideas from relevant disciplines - including moral philosophy when exploring an issue so ethical considerations are often part of an interdisciplinary examination of an issue. This is useful since our perspectives on a question, and policy considerations are likely to include discussion and valuation of ethical factors.

The World is Interdisciplinary

- According to The National Council for Teachers of English (NCTE 1995) "educational experiences are more authentic and of greater value to students when the curricula reflect real life, which is multi-faceted rather than being compartmentalized into neat subject-matter packages." In their view, real-world problems are complex, so no single discipline can adequately describe and resolve these issues. Therefore, they are not surprised that

interdisciplinary forms of learning are prevalent and growing in abundance and stature throughout higher education (Edwards, 1996, Gaff & Ratclif, 1997, and Liein, 1996).

The Gain - students recognize that there are a variety of perspectives what can be brought to bear in an effort to understand most issues. Thus, they find interdisciplinary forms of exploration more compelling, which promotes engagement and learning.

In summary, the emerging popularity of interdisciplinary teaching is grounded in the student gains that various researchers have identified.

Interdisciplinary Thinking and Four Cognitive Abilities

Interdisciplinary teaching is a demanding enterprise. Therefore, educators must believe there are sufficient gains for their students to justify the investments they must make and the stresses they will face as they expand their instructional approach. Allen Repko (2009), Director of the Interdisciplinary Studies Program for the School of Urban and Public Affairs at the University of Texas at Arlington, identifies four cognitive abilities (i.e., brain-based skills and mental processes that are needed to carry out tasks) that interdisciplinary learning fosters which helps to explain the emerging popularity of interdisciplinary inquiry;

1. Perspective-Taking Techniques (Baloché, Hynes, and Berger 1996)
This refers to the capacity to understand multiple viewpoints on a given topic including an appreciation of the differences between disciplines and especially their perspectives on how to approach a problem and their rules of evidence.
2. Development of Structural Knowledge
This is composed of two elements, declarative knowledge (i.e., factual information) and Procedural Knowledge (i.e., process-based information), which are needed to solve complex problems.
3. Integration of conflicting insights from alternative disciplines
When ideas from a variety of disciplines are embraced when investigating an issue alternative perspectives and predictions often arise. The intellectual challenge is to find ways to account for these which entails careful and creative thinking rather than revert to a single disciplinary explanation.
4. Interdisciplinary Understanding
This entails seeing an issue from an array of perspectives and recognizing how each of the alternative approaches influences one another.

How to Teach with an Interdisciplinary Approach

How to Make Your Classroom Interdisciplinary

Effective design and implementation of interdisciplinary classroom explorations, regardless of the level or type of class, entails six key steps.

1. **Pre-Instructional Planning** - Prior planning establishes the topics to be examined in an interdisciplinary manner, and allows the educator to acquire the requisite knowledge, and to develop an action plan—codified in a set of notes that may include open ended questions—to guide the classroom experience.
2. **Introduce the Methodology to Students** - Explain to students the nature of interdisciplinary, rather than discipline based learning. Impress upon them the importance of integrating insights and approaches from multiple disciplines to form a framework of analysis that will lead to a rich understanding of complex questions. Make clear that you will be modeling how to approach an issue in an interdisciplinary manner, and that ultimately they will be asked to master this skill. Allay student fears by noting they will be given assignments that help them reach this objective by practicing approaching topics as interdisciplinary investigators.
3. **Take it to the Classroom** - Model how to explore questions from an interdisciplinary perspective. Repko and Welch (2005), leading figures in the movement to promote interdisciplinary education, identify 9-steps to follow to engage students in an interdisciplinary exploration:

1. **DEFINE** problems, issues, topics or questions that warrant interdisciplinary examination
 2. **PRESENT** a clear rationale for taking interdisciplinary approach including the advantages to be gained
 3. **IDENTIFY** relevant disciplines
 4. **CONDUCT** a literature review (what is known on the topic from each of the disciplines)
 5. **DEVELOP** a command of each relevant discipline set out the analytical structure central to each discipline, identify key underlying assumptions, and methods of evaluation.
 6. **STUDY** the problem and generate insights including predictions from each of the relevant disciplines - in isolation!
 7. **IDENTIFY** conflicts between and/or areas of complementary between the insights offered from each discipline
 8. **CREATE** common ground by developing a cohesive framework of analysis that incorporates insights from the relevant disciplines in a systematic manner
 9. **COMBINE** disciplinary insights to construct new more integrated understanding of the problem
4. **Practice Interdisciplinary Thinking** - Students practicing interdisciplinary thinking by reenacting what they observe in the classroom is an effective way to acquire this higher order cognitive skill. Students can be assigned the task of rethinking an issue discussed in a discipline-based manner in class by bringing another discipline to bear and then attempting to synthesize and integrate their analysis.

In a small class setting (i.e. freshmen seminars, upper level classes supporting interdisciplinary programs, capstone courses) students can be asked to prepare *interdisciplinary position papers* for each assigned reading that extends the analysis to reflect the interdisciplinary process; consider other disciplinary perspectives, synthesize, and integrate. Collaborative forms of learning can be used to promote development of interdisciplinary analysis skills—such as breaking into groups in class to work on ways to approach issues of concern in an interdisciplinary fashion. Student groups can bring their work back to the larger group for refinement.

5. **Provide Feedback** - Extension and interdisciplinary position papers should be evaluated regularly using a rubric. The aim should be to provide the students with feedback on their ability to understand and delineate the underlying structure and analytical framework of other relevant disciplines (*multidisciplinary thinking*) and to produce an integrated analysis (*interdisciplinary thinking*). Grading might best take the form of check, check plus, and check minus, so as to simply identify the areas in need of additional skill development. Faculty student conferences may be necessary for those students struggling to master the integration element of interdisciplinary learning. The goal is for students to improve their capacity to think in an interdisciplinary manner over the course of the term.
6. **Assessment** - Students should engage in self evaluation periodically by rating their ability to: set out the structure of multiple disciplines that are well suited to the problem of interests, synthesize insights from multiple disciplines, and integrate ideas across disciplines. This information will allow them to gauge their progress, identify challenging areas, to seek help, and set goals for improvement.

Applying the Six Steps: An Example - Explaining the Racial Wage Gap

The racial gap in wages is a longstanding feature of the U.S. economy. The source and consequences of this phenomenon is covered in most Principles of Economics classes in the section on poverty and inequality and is a central theme discussed in every labor economics class. Psychologists and Sociologists have also offered thoughts on the source of the racial wage gap, making this an ideal topic to present to students in an interdisciplinary fashion. How to go about this following the six-step procedure for teaching in an interdisciplinary manner is briefly set out below to highlight the ease with which interdisciplinary teaching can become part of a conventional economics course.

1. **Pre-Instructional Planning** -read literature in sociology, social psychology, and industrial psychology on racial differences in wages. Acquire introductory books in sociology and psychology to familiarize yourself with terms used to describe behaviors and thoughts that might be unfamiliar (e.g., self efficacy, agency, perception). Set out the differences in approach between these disciplines and economics, identify common ground, and establish ways to extend the conventional economic model to account for relevant insights from the other disciplines—integration - do this in the form of questions to ask students and prototype answers.
2. **Introduce the Methodology to Students** -engage students in a preliminary conversation about why racial differences in wages may arise. Encourage insights from a wide range of disciplines. Use this to make clear that an interdisciplinary investigation of racial wage differences is warranted to obtain a deep understanding of this phenomenon. Note that you will partner with them in the process of integrating relevant insights from multiple disciplines.
3. **Take it to the Classroom** - lay out the conventional economic explanation for racial wage differences; that black workers have accumulated less of the skills that foster productivity (i.e., education, workplace experience, on-the-job training) than white workers leading to lower pay. Present notions from sociology and psychology to explain racial wage differences including; customer discrimination, employer discrimination, coworker discrimination, and stereotyping (i.e., that blacks have acquired poorer quality schooling and workplace knowledge, and are less

cognitively skilled). Then, model how to extend the standard economic of wage determination to account for such factors.

4. **Practice Interdisciplinary Thinking** -give students a related assignment to help them develop their interdisciplinary analysis skills. For instance, ask them to conduct an interdisciplinary analysis of why there is a gender pay gap in the U.S.
5. **Provide Feedback** - review students' gender pay gap essay. Note if they are able to set out hypotheses from multiple disciplines and then are able to integrate these into an interdisciplinary analysis.
6. **Assessment**- ask students to evaluate their ability to examine the gender pay gap and other topics in an interdisciplinary manner. If they are uneasy about their ability to do so, arrange a meeting with them to set out a procedure for them to improve this key skill.

Assessment

Assessing Interdisciplinary Learning

The Association of American Colleges and Universities (AAC&U) founded in 1915 has long been on the forefront of efforts strengthening liberal education - education that empowers individuals with broad knowledge and transferable skills, while promoting in students a commitment to civic engagement, strong values, and ethics. Greater Expectations, a major initiative of AAC&U from 2000-2006, promoted comprehensive academic reforms to foster liberal education that meets these objectives. Liberal Education and America's Promise (LEAP), instituted in 2005, embodies specific reforms championed by AAC&U including better use of assessment instruments to gauge the realization of valued student learning outcomes.

AAC&U champions the belief that of utmost importance is fostering students' abilities to integrate learning—across courses, over time, and between campus and community life. They take this stance because developing students' capacities for integrative and applied learning is central to personal success, social responsibility, and civic engagement in today's global society. One of the most effective ways to realize these academic goals is by providing students with interdisciplinary forms of learning.

The VALUE project is a component of LEAP that advances a national dialogue on how to most effectively assess college student learning, especially the ability to integrate insights across disciplines. At the core of VALUE is a philosophy of learning assessment that privileges multiple expert judgments of the quality of student work over sole reliance on standardized tests. Moreover, the use of rubric designed to assess integrative skills is highly endorsed by the AAC&U. For those interested in the AAC&U Integrative and Applied Learning VALUE rubric see [Integrative Learning Value Rubric](#) (Acrobat (PDF) 82kB Apr19 10)

Best Practices in Assessing Interdisciplinary Learning

There are two widely recognized means of assessing student ability to analyze in an interdisciplinary manner; the *pre-and-post student survey* method, and the *grading rubric* approach. Student surveys can be designed and used to capture perceptions (subjective information) and the capacity to think in an interdisciplinary manner (objective information). Grading rubrics provide objective feedback on the status of both multidisciplinary and interdisciplinary thinking.

Pre-and-post Student Surveys - can be administered to students at the beginning and again at the end of the course to explore their level of understanding of fundamental principles in their disciplinary major, in relevant related majors and their capacity to synthesis and integrate across disciplines. This information can then be used to identify if a gap exists between perceived and actual understanding both at the beginning and at the end of the class. The exit survey can also include questions on whether they thought the interdisciplinary form of instruction was worthwhile or if they believe they would have experienced greater knowledge gains if the pedagogical approach was confined to a single discipline.

Grading Rubrics -are most effective when used in a two-step method. First, students are asked to analyze an issue or problem using the analytical framework of at least two disciplines. This entails multidisciplinary analysis since integration and synthesis is absent. Second, students are now required to present an interdisciplinary analysis of the same problem, using a synthesized framework that integrates the disciplinary insights used in the first step. The grading rubric is used to evaluate both multidisciplinary and interdisciplinary skills.

A step-by-step guide on how to construct an interdisciplinary grading rubric is available from the Center for Innovative Teaching and Learning at the University of Minnesota constructing an interdisciplinary grading rubric site. H. Hayes Jacobs also provides a helpful example of an easy way to adopt an interdisciplinary rubric:

http://www.thirteen.org/edonline/concept2class/interdisciplinary/implementation_sub1.html .

Challenges

Challenges Facing Interdisciplinary Teachers

Educators who successfully introduce interdisciplinary forms of instruction into the classes they lead must overcome a number of hurdles that can be surmounted by interested educators. Those who make the transition must:

- **Become sufficiently knowledgeable** in relevant related disciplines to be able to comfortably introduce and guide an interdisciplinary investigation.
- **Find the appropriate level of interdisciplinary complexity.** For most students, integrating introductory level concepts from multiple disciplines will add sufficient depth and breadth to their understanding.
- **Convince students** that the additional costs of thinking in an interdisciplinary fashion are worth it.
- **Avoid polarity** which occurs when instructors in an interdisciplinary setting become territorial about their content area and its role in the analysis because they are threatened by another discipline's viewpoint.
- **Offer a balanced examination** of theoretical and methodological assumptions underlying each discipline that is part of the interdisciplinary examination (Cowan et al. 1997).
 - **Promote the synthesis of ideas** from a variety of disciplines leading to an integrated form of analysis. Acquiring the ability to synthesize, a higher-order cognitive skill in Bloom's (1956) taxonomy and a key objective of interdisciplinary teaching is taxing for students. Moreover, helping students learn to synthesize is the greatest challenge for an educator to navigate or overcome on the path to interdisciplinary examination of topics. Learn more about **Blooms Taxonomy** and it's link to synthesis and interdisciplinary teaching at:
 - **A confounding issue** is that there are often fundamental contradictions between disciplines regarding methodology and assumptions leading to divergent insights and predictions. Thus, although an interdisciplinary examination is conducted in a systematic fashion, it is often difficult to generate a coherent framework of analysis, which is ideal. However, reflection on *why* a cohesive framework is elusive is a vital part of interdisciplinary thinking and should be embraced when appropriate.

Overcoming the Challenges Facing Interdisciplinary Teachers

There are a number of strategies and actions an instructor can adopt to facilitate a smooth transition to offering interdisciplinary learning opportunities.

- **Become sufficiently knowledgeable:** read introductory level material on topics to be covered from related disciplines. Talk to colleagues in related disciplines about concepts you will discuss in class to instill confidence that you have a clear understanding of the fundamental ideas.
- **Find the appropriate level of interdisciplinary complexity:** begin with a topic where basic principles from another discipline are sufficient to offer a viable interdisciplinary examination of the topic under consideration. If students are comfortable with this level of analysis, selectively introduce one or more desired additional concepts, and monitor student understanding.
- **Convince students that interdisciplinarity is worthwhile:** during class conversation and in assignments ask students to identify insight they would have missed if they had engaged in a discipline specific investigation of the topic and if the gain is substantial enough to warrant an interdisciplinary examination.
- **Avoid polarity:** incorporate insights from other disciplines that you believe are well suited to enrich student understanding of the topic so that students clearly see that the instructor believes this form of integration is valuable.
- **Offer a balanced examination:** make a conscious effort to present insights from each discipline in a non-hierarchical manner, with the likely exception of choosing one discipline (usually that of the instructor) as the base from which to begin the analysis.
- **Promote the synthesis of ideas:** after modeling interdisciplinary thinking for students, especially how to synthesize and integrate insights from multiple disciplines, it is essential that the instructor ask the students to attempt this activity when new problems are addressed.
- **Do not intervene too quickly:** let the students grapple with how to integrate and offer a range of ideas and approaches to reach this end. Consider adopting small group activities to allow students to engage in cooperative learning to become more proficient in integrating insights from a host of disciplines.
- **In small class settings:** ask students open-ended questions that require them to broach synthesis and integration. Moreover, ask them to identify areas of conflict and cohesion across disciplines. Do not be afraid to follow reasonable pathways, if they turn out to be barren. That is part of the way in which students will learn how to integrate.
- **Encourage students to be creative** and take risks as they wrestle with the challenges of being more inclusive thinkers.
- **Summarize often,** always beginning with the notions that each discipline in isolation would offer. Then identify the potential gains from synthesis and integration, and clarify the options on the table to foster integration.

Additional Tips for New Interdisciplinary Teachers

- Start with a topic in which you are already highly knowledgeable about how other disciplines address the issue and have a clear sense of how to synthesize and integrate. This will build your confidence and allow you to more effectively gauge how students respond.
- Allocate sufficient time for interdisciplinary investigations if the methodology is being used for a portion of the class. Be flexible or prepared to cover more or less material in a discipline specific manner based on how the interdisciplinary exercise progresses.

Class Size and Interdisciplinary Learning

Class size also influences the degree to which an instructor can effectively adopt interdisciplinary methods. Learning the fundamental analytical framework and methodological features of other disciplines is demanding, and may be confusing to students concentrating on grasping their major discipline. Students confronting this challenge are likely to have a host of questions about disciplines external to their major and the process leading to integration. Thus, small classes where they can ask questions and follow up with additional inquiries are better suited to interdisciplinary explorations, especially when the topics being broached are complex. In the large classroom setting, interdisciplinary methods can still be embraced but the instructor will likely have to present the framework of the other disciplines and demonstrate how to form an integrated perspective rather than have students lead this process through discussion. In addition, assignments that promote understanding by incorporating insights from a range of disciplines will most likely differ in form due to class size. In small class environments, students can be assigned writing exercises to demonstrate both their ability to identify alternative disciplinary structures and to form an inclusive analysis. However, in large class settings, assignments will need to be more structured to facilitate time efficient assessments.

Overcoming the Challenges of Synthesis and Integration

The most challenging aspect of interdisciplinary teaching entails integration of insights from multiple disciplines. Interdisciplinary teaching is most effective when educators take a step-by-step approach that entails six elements:

- **Pre-Instructional Planning**
- **Introduce the Methodology to Students**
- **Take it to the Classroom**
- **Practice Interdisciplinary Thinking**
- **Provide Feedback**
- **Assessment**

Four of the six-steps feature integrative thinking. For instance, interdisciplinary educators are encouraged to establish the importance of integration (**Introduce the Method to Students**), model how to integrate in the classroom (**Take it to the Classroom**), provide students with assignments that ask them to engage in integrative thinking (**Practice Interdisciplinary Thinking**), and offer them feedback on their level of integrative proficiency (**Provide Feedback**).

One approach to reaching this objective is provided below. It is ideal to select a discipline as the lead discipline to establish a benchmark or baseline way of investigating a topic and then proceed to extend this framework to systematically account for insights from other relevant disciplines. Typically the home discipline of the instructor is best suited to be adopted as the baseline structure. Then use the following steps to achieve synthesis and integration:

1. Set out the analytical structure central to the baseline discipline and identify key underlying assumptions.
 2. Apply this discipline to the problem of interest.
 3. Discuss methods of evaluation in this discipline and what previous studies by scholars in this field have learned on the topic being evaluated.
 4. Identify areas where other disciplines may offer valued insights.
 5. For these additional (i.e., non-baseline) disciplines, follow the same procedure (follow steps 1-4 above). At this point you have engaged in a systematic multidisciplinary analysis - each relevant discipline has been explored in isolation from the others. This exercise simply prepares the class to engage in the complex and challenging processes of synthesis and integration.
 6. Synthesize the multidisciplinary examination by comparing and contrasting frameworks, methodologies, predictions, and evidence. Identify common ground. Ask how the analytical framework of the baseline discipline can be extended to account for insights from the other disciplines.
 7. Attempt to integrate the alternative perspectives into a new coherent, more inclusive framework of analysis. Extension of the baseline analytical construct to facilitate integration often requires the adoption of assumptions, sometimes strong ones. Identify these assumptions and investigate how understanding of the topic is altered by using this interdisciplinary form of analysis. Finally, attempt to make additional extensions, and be clear about the necessary assumptions. When integration is no longer possible, discuss the elements preventing further integration.
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Using Interdisciplinary Teaching in Economics

It is fascinating that many questions of interest to economists are also examined by other disciplines. For instance, political scientists are interested in the impact of trade between countries, and scholars in the field of education investigate what determines the level of schooling people complete. Ecologists and Epidemiologists investigate the impact of environmental degradation on health, although they may not refer to this development as a *negative externality*.

When Neil Rudenstein was president of Harvard he asked the faculty to envision a University organized around questions rather than departments. He imagined various buildings on campus that would house faculty, regardless of their current departmental affiliation, with common interests such as: the well-being of children, peace, technology and life, or water. He initiated this conversation to emphasize his belief that examining issues from multiple perspectives and integrating insights from across disciplines – *interdisciplinary thinking* – would lead to a deeper understanding of the issues that we find perplexing. Within this spirit, economic research and instruction is becoming increasingly interdisciplinary.

Why Use Interdisciplinary Teaching in Economics?

The discipline of economics is a behavioral science primarily concerned with the production of goods and services and the allocation of scarce resources to promote social welfare. Economists typically examine questions that are also being investigated in other disciplines, but with different analytical frameworks and methodologies. Thus an interdisciplinary approach that fuses knowledge and insights from other disciplines with an economic framework of analysis to form a more inclusive means of examining questions will foster a richer, more productive, discourse.

Some examples where an interdisciplinary perspective might be useful in exploring issues of interest to economists would include efforts to understand the causes and consequences of; joblessness, pollution, educational attainment, and health care. All of these issues have psychological, sociological, moral, and political dimensions for which a market framework may not be sufficient means of exploration.

Thinking Like an Economist is Becoming More Interdisciplinary

Economics Teaching is Now More Interdisciplinary

Colander and McGoldrick (2010) prepared a book for the Teagle Foundation on the status of the economics major and its contribution to the liberal education of students – the accumulation of broad knowledge, transferable skills, and a passion for learning. They assert that economics courses should help students develop their capacity to think critically, integrate insights from the full range of courses they have taken across the curriculum, explore "big think" questions, and account for moral and ethical dimensions of issues – the fundamental features of interdisciplinary learning.

However, most economics professors teach students "*how to think like an economist*," which in their view became narrow and highly technical over the course of the past few decades. They believe this is the case because the material economics professors teach and the manner in which they teach are heavily influenced by the nature of their research, which has become both inward looking (i.e., discipline specific) and grounded in high level mathematics and statistics. Fortunately, economic research that accounts for insights from other disciplines, while maintaining its technical

status, has increased markedly in recent years, especially among younger scholar educators. This development has substantially increased opportunities for economics majors to learn how to approach issues in an interdisciplinary manner. In their view, as scholarship in economics that draws on ideas from related disciplines becomes commonplace more economics educators will teach in an interdisciplinary fashion.

Economic Research is Now More Interdisciplinary

A number of economic research studies are now drawing on insights from other disciplines to inform their efforts to understand a wide range of questions. This development suggests that in the research sphere, economists believe the gains of interdisciplinary evaluation are greater than the costs. A number of examples will serve to illuminate the breadth of interdisciplinary research that economists are engaged in, and serve as a signal that economics instruction benefits from the integration of ideas from other disciplines, and the gains likely supersede the costs.

- **Biology, Sociology, and Economics**

- Bedhard and Dhuey (2006) use insights from biology and sociology in their work asking at what age should a child start kindergarten
 - Their work could be discussed in a course on labor economics when the link between family wealth and schooling is discussed or in courses on poverty, income distribution, or social problems when discussing factors leading to greater income inequality over time.
- [Show more on their work](#)

- **Psychology and Economics**

- Akerlof (1982) draws on ideas from psychology and sociology in a study that asks how a firm can motivate employees to work hard and reject shirking
 - This paper would be illuminating as part of the section in a labor economics class dedicated to understanding ways to reduce worker shirking.
- [Show more on his work](#)

- **Neuroscience and Economics**

- Berns, Laibson, and Loewenstein (2007) draw on neuroscience scholarship to examine how people make decisions about outcomes today - such as marriage, enrolling in school, saving - and alternative outcomes at a future date.
 - A fundamental topic in courses on Finance concerns why some people are savers and others are so myopic. An examination of this work would offer some insights and likely stimulate interesting discussion.
- [Show more on their work](#)

- **Religion, Sociology, and Economics**

Krueger, and Maleckova (2003) draw on ideas from the disciplines of religion and sociology to ascertain the factors that lead a person to become a terrorist and engage in a suicide bombing.

- Economics and policy courses that address contemporary social issues as well as courses in international trade and development inevitably discuss factors that inhibit trade and economic well-being. A discussion of this paper would contribute to that dialogue.

- **Demography, Sociology, and Economics**

Chiteji and Hamilton (2002) use insights from demographers and sociologists to explain why the racial gap in wealth exists and to challenge the longstanding belief that African American families are less thrifty than comparable white households.

- Courses on the Economics of Race and on Income Inequality cover the causes and consequences of the racial wealth gap. This paper offers a neglected or ignored explanation - intrafamily financial relations and how they may differ across racial groups - that will enrich the classroom discussion

These examples offer a flavor of the types of questions economists are examining in an interdisciplinary manner and reveal that the notions integrated from other disciplines are leading to new insights that would have been undiscovered if a discipline specific approach was adopted.

It's Rational

The Benefits are Large and the Costs are Small

Educators considering adopting an interdisciplinary approach to teaching face both **time costs** associated with preparation and **psychological costs** generated by stresses brought about by the uncertainty common to this form of instruction. **These costs are likely to be small** because most economics educators already possess relevant cross-disciplinary knowledge and, as a consequence, of the standard manner in which economics is taught.

There is a longstanding connection between economics and other disciplines that are typically fused with economics including: sociology, psychology, politics, religion, anthropology, demography, public health, ecology and biology, mathematics, and management. Many economists received formal training as an undergraduate and in graduate school in these fields. Thus, economics instructors often already possess a foundational knowledge of methodologies and frameworks of analysis in key related disciplines which reduces:

- the time needed to prepare for the delivery of interdisciplinary learning
- the stress associated with teaching in an interdisciplinary manner.

Economics educators typically teach students how to "*think like an economist*." This entails:

- observing outcomes or developments of interest
- wondering and pondering until an educated guess or hypothesis to explain the developments is formulated
- evaluating the influence of alterations in this development leading to predicted effects
- using data to test the hypotheses generated
- constructing policy proposals based on the empirical findings.

A standard learning technique in economics is to challenge students to identify shortcomings of the analysis applied to any problem or issue they are examining. Typically, the extensions identified are

intradisciplinary - the incorporation of more complex economic ideas or concepts including uncertainty, long run consequences, and spillover effects.

Thus, a natural next step, and hence one that imposes few stress related costs, would be to ask students to consider how **interdisciplinary** extensions of the analytical framework and analysis can lead to a richer understanding.

Issues Teachers Should Consider

Types of Economics Classes and Interdisciplinary Learning

There are six types of courses commonly led by economics instructors where interdisciplinary learning may be adopted and each of these situations calls for a different level and intensity of interdisciplinary exploration.

1. Courses serving as the port-of-entry to the economics major (i.e., Principles of Economics)
2. Advanced core courses in economics (i.e., Intermediate Microeconomics, Intermediate Macroeconomics)
3. Advanced or specialized economics classes (i.e., Labor Economics, Environmental Economics, Women and the Economy, Economic Development)
4. Interdisciplinary program port-of-entry courses led by economists (i.e., Poverty and Inequality [Poverty Studies], Women and the Economy [Women's Studies], Race-Ethnicity and Well-Being [African American Studies])
5. Freshman Seminars (i.e., Economic Themes in Literature and Film, Society and Well-Being)
6. Capstone course in economics (i.e., senior seminar to close the major)

Class Size, Class Structure and Interdisciplinary Economics Teaching

Economics classes often fulfill general university requirements and many departments required their majors to complete economics classes. To accommodate so many students courses such as the Principles of economics are often taught in large classes settings. In such situations it is difficult for students to ask questions, making the lecture hall and large class environment less than ideal for interdisciplinary instruction on the part of economics educators. Upper-level economics classes which have far fewer students are environments where economics students can ask questions and engage the instructor and their peers in a conversation about the topic from an interdisciplinary perspective, making these situations well suited to interdisciplinary learning.

Interdisciplinary instruction can be offered by a team of educators or by a single teacher.

- The modeling skills and way of thinking that are common to the economics discipline make economists valuable members of interdisciplinary teaching teams.
- Because economists are familiar with the methodological approaches used by other social scientists, they can handle the challenge of teaching an interdisciplinary course on their own.

Interdisciplinary teaching is hierarchical when one discipline is selected as the core or baseline discipline and insight from other disciplines are integrated into the baseline discipline.

- Economists who teach in an interdisciplinary manner are likely to take a hierarchical approach, rather than a discipline-neutral approach. By doing so, they take advantage of the formal modeling structure that is a hallmark of economic analysis - the idea is to take the flexible framework and push it to accommodate ideas from other disciplines.

Use Assignments to Build Interdisciplinary Analysis Skills

Interdisciplinary assignments both inside and outside of the classroom can take many forms, but all of them should seek to help students advance their ability to synthesize insights from multiple disciplines to generate a more comprehensive perspective on issues being explored. One way to help students build confidence in their ability to analyze and think in an interdisciplinary manner is to ask them to work in teams where the different members of the team have alternative majors.

Teams and Interdisciplinary Learning

Working in teams in interdisciplinary learning situations often creates an environment where insights and methodologies from multiple disciplines are represented – but it is important to emphasize that students are not expected to defend the perspective of their disciplinary major to ensure that its way of approaching the issues in question are aired and integrated into the interdisciplinary analysis framework.

There are a number of ways that teams can work together to build each member's skills as an interdisciplinary thinker and to gain confidence in their capacity to engage in this type of analysis, including:

- cooperative learning exercises
- group analysis papers
- term projects

For instance, the group might be asked to construct an interdisciplinary position paper on the causes and consequences of dropping out of high school. A wide range of alternative types of assignments can be found in the section on examples of how economics is taught in an interdisciplinary manner.

Web Resources

The School of Education at the University of North Carolina at Chapel Hill: This site provides a basic reference article which explains the concept of interdisciplinary teaching and discusses considerations for developing interdisciplinary curriculum with an emphasis on K-12 education. The information was developed as part of the LEARN NC initiative, a program run by the University of North Carolina at Chapel Hill School of Education, that finds the most innovative and successful practices in K–12 education and makes them available to the teachers and students.

The Center for Teaching and Faculty Development at San Francisco State University: This site provides 10 instruction strategies to guide those engaged in interdisciplinary teaching.

Office of Faculty and Organizational Development at Michigan State University: This site compiled by Lois Rosen provides links to articles on a range of topics associated with interdisciplinary teaching including the use of this pedagogical form in the Service Learning context.

The Science Education Resource Center (SERC) at Carleton College: This site provides an array of information on the ways in which interdisciplinary forms of learning have been integrated into science education.

Examples of activities using an interdisciplinary approach

An Interdisciplinary Approach to Teaching the Causes and Consequences of Unemployment

To Raise or Not to Raise the Minimum Wage

In this interactive exercise, students explore the normative and economic issues that arise from minimum wage increases.

What are the causes and remedies to the racial achievement gap

The lecture is an interdisciplinary approach to understanding the causes and remedies of the racial achievement gap.

Application of oral history to economics: Family Economic History

Application of Oral History to Economics: Family Economic History The assignment will connect an oral history approach to the examination of economic concepts such as opportunity cost of attending school, economic crises (inflation and unemployment, etc.), and standard of living over time. Particularly, students will interview parents, grandparents, or family members from older generations regarding the types of work they performed, economic decisions they have made, and the economic conditions while they were growing up. The project develops a student's ability to understand and integrate these concepts from a variety of perspectives and real world situation.

Application of oral history to economics: Immigrant Economic Experiences

Application of oral history to economics: Immigrant Experiences This assignment will connect an oral history approach to the examination of economic development concepts such as push and pull factors related to immigration decision, job opportunities in the host country, and issues related to brain drain. In addition, students will be able to explore other relevant migration concerns such as assimilation and discrimination. The project develops a student's ability to understand and integrate these concepts from a variety of perspectives and real world situations.

"Breakfast, Brainpower, and Connecting Disciplines"

Activity to help students differentiate how disciplines focus on a problem.

Integrated Sciences This is an inquiry-based content course designed to familiarize students with the fundamental concepts of biology and geology.

Confronting the political economy of climate change

Students apply economics, politics and sociology to better understand why cap and trade is the preferred political approach, but also why it's potentially problematic.

Top Suggestions for Interdisciplinary Teaching (from San Francisco State University)

1. The objective of interdisciplinary teaching is to assist students with seeing complex problems and solutions from a holistic and global perspective ... reviewing the history of the pedagogical approach may be helpful, as well as linking it to the increasingly global nature of contemporary society (the world wide web, multi-national corporations, etc.)
2. Identify specific outcomes that illustrate interdisciplinary thinking and problem solving.
3. Construct lessons around a particular question or problem, and take time to identify the disciplines that may offer insights, responses and solutions.
4. Take time to identify issues both central and peripheral to the problem or question; explore how addressing the periphery could enhance the process of problem solving.
5. Explore how various disciplines would resolve an issue; analyze discipline-centric concepts and theories by investigating the success of their applications and comparing and contrasting various multi-disciplinary approaches.
6. Assist students with content analysis of unfamiliar sources that may represent documents outside their chosen field of study; allow them to evaluate the credibility of sources through small group discussion.
7. To enrich critical thinking and writing skills, provide ample opportunities for students to reflect upon the process of their problem solving and their insights on the relationship between the knowledge base and skills of different disciplines.
8. Generate rubrics for student work that satisfies both formative and summative assessments, and be sure to integrate interdisciplinary elements into the rubric.
9. Integrate skills into the problem-solving protocols that draw upon critical thinking, such as statistical literacy, content analysis, and deductive compositions.

The following excerpts from Abbott & Nantz' article provide detailed descriptions of instructional decisions and insights made by a faculty member from history and another one from economics, as they taught and re-taught several regular as well as Honors courses over a period of 18 years.

Excerpts from: William Abbott & Kathryn A. Nantz. (2012).

Building Students' Integrative Thinking Capacities: A Case Study in Economics and History.

Issues in Integrative Studies, no. 30, pp. 19-47.

Abstract: Having engaged in interdisciplinary team-teaching in both the two-course cluster format and the single course format, we intend to show how we helped students recognize and find their own integrative insights between the disciplines of history and economics. In the process we not only compare the advantages and disadvantages of each format but also illustrate more fully the differences between multidisciplinary and true integration. We show (1) how the weaknesses and strengths of our two disciplines complement each other, (2) how the different goals of each discipline can be reached using the methods of the other, and (3) how appropriately-designed readings, writing assignments, group presentations, and other activities can help students to achieve the goals of integrative interdisciplinary pedagogy. (p. 19)

What We Did:

Four times between 1990 and 1999 we offered a course cluster, scheduling "Introduction to Macroeconomics" and "History of Britain and its Empire since 1800" back-to-back and in the same room. Typically, students who took these courses in our cluster were satisfying core distribution requirements, but there were a few economics or history majors as well who needed the material as a base for upper-level departmental courses. For this cluster we, the two instructors, attended each other's classes, participated in class discussion, and even took each other's exams (Abbott & Nantz, 1994, pp. 22-23, 25; 2001, pp. 448-450.)

Then, three times between 2001 and 2008, we team-taught a course in our university's Honors program, teaching a third-year course on "Progress and Its Critics" in 2001 and then a first-year course on "Ideas that Shaped the West" in 2005 and again in 2008. In "Ideas that Shaped the West" we used an organizing theme of "Globalization and Empire" to make connections across history and economics, bring the past and present together, and engage students in a topic that many of them viewed as relevant to their daily and future lives. In all of these Honors courses we utilized content and methods not simply from our basic macroeconomics and British Empire courses but also from other courses we teach. Although these Honors offerings were single courses, they required slightly more class time than regular ones, and the students received credit for both history and social science core distribution requirements. The Honors program requires a seminar-type format with ample opportunities for discussion. (p. 26/7)

Unfortunately, too few history instructors actively teach the specific reading-comprehension skills necessary. These include:

- Distinguishing the general from the specific in a mass of prose. What are the basic points, and what is illustrative detail?
 - Organizing written information on causal chronological lines. Can you visualize, in your head, a causal timeline of the events about which you are reading?
 - Comparing a new development with what has gone before. What has changed as a result, and what has stayed the same?
 - Learning to visualize geographical areas described in texts. Can you develop a “bird’s eye” capacity to envision a map in your head and then use it whenever you encounter a place name?
- (p. 24/5)

While the economics discipline is not of much help with the first of these skills, it is of enormous help with the latter three. Diagrammed economic models, such as the circular flow or the production possibilities frontier, show how a numerical change causes other parts of the model to adjust. This is process; it gives students a visual picture of change and thus helps them to imagine historical change in a similarly structured, cause-and-effect form. Many history students do not like dates, but dates can help provide structure when they are organized, as all numbers are in economics. (p. 25)

Economics helps the history instructor in several other ways. Many students see history as having little relevance to the modern world. However, the economist’s frequent focus on current conditions helps to provide parallels between past and current events, thereby placing students in a more openly problem-solving mode. It is easier to get history students away from a rote-memorization mind-set when they must use facts, as economists do, to find practical solutions to immediate problems. Inasmuch as economists are constantly arguing over the interpretation of their data, a combining of that discipline with history can help show students that history, too, is an interpretative field and that historical interpretations are arguments that change over time (Middendorf et al., 2007, p. 3). (p. 26)

Course Organization:

Freed of departmental-coverage requirements in our 2000s team-taught Honors courses but seeking to cover 28 William Abbott & Kathryn A. Nantz Building Students’ Integrative Thinking Capacities 29 much of the same content, we organized these courses around basic themes that involved both disciplines: empire, globalization, progress and its critics, and alternative economic systems. These in turn bound together more specific topics, some of which were more historical in nature (feudalism, slavery, industrialization, war) and others more economic (balance of payments, the household-firm model, mercantilism, capitalism, socialism). Each week, and usually each session, involved some of each discipline’s topics, and we returned to our basic themes often. In both models we believe that the organization helped to show students the differences and similarities between the disciplines’ insights, and therefore helped them form integrative habits. (p.28)

Readings:

In trying to strengthen interdisciplinary habits of mind, we were unsure how often we should point out interdisciplinary connections as opposed to letting the students discover them for themselves. Like the gap in a spark plug, which fails if the gap is too wide or too narrow, the gap that our students must traverse to develop interdisciplinary habits of mind needs to be wide enough for mental exercise and growth, but not so wide that the students fail to make it across. (p. 32)

Care was needed in selecting our readings; even our Honors students found some of them difficult and complained that there was an excess of reading assignments, that not all of them were discussed in class, or that not all were “relevant to the main ideas.” Here we came up against methodological differences between the teaching of history and of economics, as the latter traditionally assigns short, intense readings that build logical structures, every part of which is gone over in class, whereas the former assigns much longer and broader narratives filled with miscellaneous detail, with the expectation that students will develop – simply by doing the reading – the ability to sort out basic themes from illustrative detail and organize that mass of detail into a coherent analysis. (p. 33)

Writing Assignments:

As many authors have pointed out, students take away more from readings when they are using them to solve problems as opposed to memorizing the text. While we could not, for practical reasons, build our courses around a single problem or issue, we did utilize a variety of writing projects that required students to use both disciplines in a problem-solving mode. (p. 34/5)

In the interest of forming integrative habits of mind, another advantage to our 2000s team-taught courses over the 1990s clusters was the greater amount of formally-graded written interdisciplinary work. The only integration that occurred in the clustered courses’ graded work was provided by two history term paper assignments and a few questions on the exams of each course. However, the 2000s team-taught course featured numerous short-essay “brainstormers” and two longer essays, all of which combined historical with economic problems. P. 35)

In their 2010 book, *How Learning Works*, Susan Ambrose et al. describe a cycle of basic metacognitive processes that help students develop as “self-directed” learners. These include assessing the task at hand, evaluating their own strengths and weaknesses, planning an approach to a task, applying and monitoring the effectiveness of alternative strategies, and reflecting upon those strategies’ outcomes (p. 193). (p. 37)

Group Presentations

Student engagement via class discussion was a major goal in all three of our Honors courses, more than it had been in the 1990s two-course clusters. In our 2001 third-year course, “Progress and its Critics,” we required that class discussions be led by a pair of students, who would make a brief oral presentation and come up with discussion questions based upon the weekly

readings. The assignment was to “get other students to talk meaningfully about the readings.” “This means,” we told them, “finding connections among the authors or events, or introducing broad topics that integrate the readings.” We also had these third-year students engage in debates, which were fairly popular. (p. 42)

Other Activities

In addition to the reading, written, and oral work in these Honors courses, we used role-playing exercises and “show and tell” sessions, in which each student was required to bring in an object from another culture and explain what it was, where it came from, its value and what generated that value, its significance or meaning for the culture, and how it represented its culture or its economy. As our groups become more creative in their oral presentations they began to have the rest of the class play games that illustrated historical and economic concepts kinesthetically; this may have made the connections between the concepts more real. Neither of us is an expert in art or literature, but we found that our attempts to bridge economics and history were facilitated by using other disciplines; we not only assigned the haiku brainstormer but also took field trips to the Yale Center for British Art in New Haven. Past and present were connected by field trips to the Federal Reserve Bank in New York City and to Ellis Island in New York harbor. (p. 45)

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Interdisciplinary Curriculum Development

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THE PROMISE OF INTERDISCIPLINARITY

I had the opportunity last year to sit down with alumni of the interdisciplinary University Studies / Weekend College Program at Wayne State University and ask them what they had gotten out of their education. Many of their responses seemed to reflect the **quality** of their education, not its interdisciplinary nature. They spoke of analytical thinking, critical thinking, how to write and do research and organize their thoughts, and how to communicate with others. They agreed that they had developed a deeper understanding of the world around them, an understanding that came from repeatedly asking “why?” instead of regurgitating memorized answers. In short, they gave some of the same responses we would look for from students who had received a high-quality discipline-based liberal arts education. Students in other interdisciplinary programs may emphasize clarity and precision in reading, thinking, and writing, or on how their assumptions about themselves and their world have been challenged, but the general conclusion is the same — interdisciplinary courses provide an effective vehicle for promoting traditional liberal arts skills.

The students at Wayne State also mentioned the spirit of mutual respect that developed between faculty and students in the program, and even between students of widely divergent backgrounds. Several revealed that lifelong friendships had grown out of the seminars. These outcomes seem to

reflect primarily the **ambiance** of the program, though interdisciplinary courses that stress the complementary role of diverse disciplinary perspectives certainly set a tone of respect for diversity which promotes that ambiance. While interdisciplinary courses can be taught in a formal, traditional manner, they lend themselves nicely to more student-centered, interactive teaching styles associated with progressive education and its outcomes.¹

Some of the outcomes they mentioned, however, seem to flow directly from the **interdisciplinary** nature of the program. They reported being able to “see all sides of the story,” to appreciate another’s perspective of the same situation. They felt able to evaluate the testimony of experts, knowing that “they don’t have the final word.” And they had confidence in their ability to write on a wide range of subjects. These outcomes are grounded in the lesson from interdisciplinary courses that each discipline has a valuable but limited insight into the issue at hand, as are the demystification of experts and the feeling of empowerment to examine issues in their full complexity.

Results from longitudinal comparisons of students in the interdisciplinary Paracollege with their counterparts in traditional majors at St. Olaf College show that students in that interdisciplinary program showed more tolerance of ambiguity or paradox — in fact, they seem to seek out ambiguity.² These findings are confirmed by students in other interdisciplinary programs who show more receptivity to new ideas or who move beyond tolerance to a celebration of diversity.

Beyond these outcomes, the questionnaires completed by directors of interdisciplinary programs for *Interdisciplinary Undergraduate Programs: A Directory*³ provided anecdotal evidence that their students show:

More sensitivity to ethical issues (stemming, no doubt, from the humanities perspective included in courses traditionally limited to the social or natural sciences)

Ability to synthesize or integrate (from the distinguishing feature of interdisciplinary courses, that they pull together limited disciplinary insights into a more holistic understanding)

Enlarged perspectives or horizons, reduced privatism, and greater awareness of communal or public issues (from the topical, issue-oriented focus of most interdisciplinary courses)

More creative, original, or unconventional thinking (perhaps from the difficult task of integration)

More humility or listening skills (as students become conscious of the partial validity of *any* perspective including their own and how it can be enriched by learning from other perspectives)

Sensitivity to bias, whether it be disciplinary, political, or religious (probably from probing the assumptions underlying disciplinary perspectives)

Interdisciplinary courses have advantages for institutions beyond these educational outcomes for students:

The topical or issue-oriented approach of most interdisciplinary courses is inherently **more interesting** to students than survey courses or introductions to disciplines. For students who are often resentful of required general education courses, the motivation of an interdisciplinary approach may be invaluable.

Interdisciplinary courses can be designed to provide an efficient **introduction to the disciplines** themselves by showing how each discipline arrives at its distinctive perspective on the issue.

Interdisciplinary programs can provide an opportunity for administrators faced with tenured faculty in underutilized departments to **reallocate faculty resources** to where there is more student demand.

Interdisciplinary teaching offers an exciting form of **faculty development** since it necessarily stretches faculty, demanding that they come to grips with new perspectives that challenge long-held assumptions from their own disciplinary training.⁴

These desired outcomes must be kept clearly in mind as interdisciplinary courses and programs are developed. Different strategies for organizing and teaching interdisciplinary courses have different educational outcomes. While it may only be of semantic interest whether a particular course design is “truly” interdisciplinary by any one definition, its educational outcomes are what ultimately determine the value of the course. The recommendations that follow for developing interdisciplinary courses and programs are designed to produce courses which fulfill the promises held out above.

Interdisciplinary Courses

Definition of Interdisciplinarity. What I have in mind are courses that “critically draw upon two or more disciplines and...lead to an integration of disciplinary insights.”⁵ While the discussion that follows assumes that interdisciplinary courses are organized around a topic, the suggestions apply with equal force to courses organized around a theme, problem, issue, region, cultural or historical period, institution, figure, or idea.⁶

Breadth of Topic. An integrative course “covers” reductionist perspectives (typically disciplines or schools of thought) the way a disciplinary course covers subject matter. Topics need to be quite focused in order to allow sufficient time for each perspective in a 10-15 week course. For example, an integrative social science course might focus on “U.S. Unemployment,” drawing on the disciplines of economics, history, political science, psychology, and sociology to examine the causes of unemployment and its “solutions.” Such a course might start with a week on some provocative pieces (e.g., articles, films, short stories) on unemployment that “hook” the students’ interest. It might then spend one to two weeks per discipline on the insights afforded by each perspective, and then conclude with a week devoted to synthesizing them into a more holistic perspective. Similarly, an interdisciplinary humanities might examine “abortion” from the perspectives of philosophy, religion, history, and literature, and an interdisciplinary natural science course might focus on “the energy crisis” from the perspectives of chemistry, physics, geology, and biology. (See the distinctions among multidisciplinary, pluridisciplinary, crossdisciplinary, and interdisciplinary in the section of this article on *Indicators of Levels of Integration*.)

There is a temptation in designing interdisciplinary general education courses to cover too much subject matter. One might prefer the topic of “U.S. Urban Problems,” for example, to the seemingly narrower course on unemployment. However, if the course is to cover even the most major of urban problems — housing, race, education, government, crime, renewal, as well as unemployment — there will be no time left in the semester to explore more than one perspective on each topic. What appeared at first to be the narrower course on unemployment turns out to be much broader in terms of perspectives presented. Similarly, an interdisciplinary humanities course on “contemporary moral issues” (instead of “abortion”) or an interdisciplinary natural science course on “energy” (instead of “the energy crisis”) might appear preferable, but each would find itself over-extended as well. As long as an interdisciplinary course focuses on a topic of inherent interest to students and faculty, it is unlikely that the topic will be too narrow.

Instead of attempting to present the most important concepts and theories of each discipline in an interdisciplinary introduction to the social sciences, humanities, or natural sciences, it is preferable to give students a “feel” for each discipline by learning how it attacks a single problem. That way, students come away with some comparative sense of the disciplines. Since it is impossible anyway to include **all** major concepts and theories (even in a disciplinary course), the topical approach provides a rationale for selection that

is apparent to students as well as faculty. Coverage is complete because every discipline's perspective is presented.

Interdisciplinary courses tend to appear fragmented and incoherent to students as the term progresses because they shift from one disciplinary perspective to another. Teachers have a special obligation in interdisciplinary courses to keep the logic of the course organization in front of the students. The narrower and more tightly defined the topic, the easier it is for students and teacher alike to keep track of where the course is heading.

The Role of Disciplines in an Interdisciplinary Course. It is important for interdisciplinarians to keep in mind the value of the disciplines. It is easy to dismiss them as arbitrary or artificial ways of dividing up reality, ignoring the extent to which they offer alternative ways of viewing reality, each grounded in a worldview that has demonstrated its fruitfulness over time for a range of topics studied by an ongoing group of scholars. The disciplines can provide valuable insight into the complexity of an issue as a whole, not just into different pieces of that whole. To ignore the disciplines as interdisciplinary courses attempt is to ignore the accumulated wisdom of different approaches to understanding as well as the specific insights they afford.

Disciplines and not substantive facts are the raw materials of an interdisciplinary course. Students need to understand not only what each discipline has to say about the topic but *why* it says it. In the course above on "U.S. Unemployment," for example, students need to confront not only the arguments of a Milton Friedman but the supply and demand curves lying behind them, and they need to probe those supply and demand curves to see the assumptions in which they are grounded. Similarly, students in the course on "abortion" need to understand *why* different religions take the positions they do on abortion; in the course on "the energy crisis," they need to understand *why* powerplants are inherently inefficient. Instead of simply initiating students into a single disciplinary craft or guild, teaching them to accept the "truth" of that discipline's perspective, we need to help students appreciate the powerful contributions of the disciplines at the same time that they come to recognize their inherent limitations and biases. There is a remoteness and detachment from the disciplinary activity when we merely read about it, and an incomparable feel for that activity when we experience it. Students come to understand the scientific perspective, for example, much better when they put on scientific lenses than when they read the pronouncements of scientists.

Integration. I used to think of integration as analogous to completing a jigsaw puzzle (when disciplinary insights are complementary, as they often are in the natural sciences) or as a problem in identifying and choosing among assumptions underlying disciplinary insights (when they conflict, as they often do in the social sciences). In the course on “the energy crisis,” the jigsaw analogy might fit, in which geology explains the location and extent of fossil fuels, physics explains how their energy is released in a power plant, and chemistry and biology explain the environmental consequences of the pollutants given off in the process. In the course on “abortion,” one might argue that the integrative task is to choose among competing ethical or moral assumptions. Over the years I have come to realize, however, that the external reality scholars confront is often complex, variegated, and contradictory, so that mutually incompatible assumptions can all be “correct.” Human beings, for example — the building block of the social sciences and the focus of much of the humanities — are rife with internal contradictions; consequently assumptions of freedom and determinism, for example, may both be correct at the same time for a particular individual in a particular situation. I now see integration in interdisciplinary study as essentially holistic thinking, in which the different facets of a complex reality exposed through different disciplinary lenses are combined into a new whole that is larger than its constituent parts, that cannot be reduced to the separate disciplinary insights from which it emerged. Whether we call it integration, synthesis, or synergy, this process is more organic than mechanical, involving coordination as well as cooperation among disciplinary perspectives. It requires an act of creative imagination, a leap from the simplified perspectives that give the disciplines their power to a more holistic perspective of a richer, more complex whole. That leap is motivated by a dissatisfaction with the partial insights available through individual disciplines.

Models of integration such as systems theory, structuralism, and marxism are examples of the standard repertoire available to the interdisciplinarian. Neophyte interdisciplinarians may be well advised to study these models for their heuristic value. Yet there is some advantage to moving beyond well-established strategies for integration, since they tend to lose their responsiveness to disciplinary insights as they develop into a new school of thought with an orthodoxy of its own. While there are no firm guidelines for developing one’s own integrative strategy, since it is an essentially creative act, there are a number of books that suggest techniques for promoting creativity that may prove beneficial to interdisciplinarians.

Indicators of Levels of Integration

Ever since *Interdisciplinarity: Problems of Teaching and Research in Universities* was published by the OECD in 1972, the extent of integration in a course has been indicated by the labels “multidisciplinary” (the serial presentation of disciplines with no integration attempted), “pluridisciplinary” (disciplinary insights into the topic are compared or contrasted but still not integrated), “cross-disciplinary” (one discipline is applied to the characteristic subject matter of another, yielding new insights but not an integration of the insights of both disciplines, and providing a new but not a larger perspective) and “interdisciplinary” (the insights of the disciplines are integrated into a larger, more holistic perspective). For a more complete discussion of the various uses of these terms since 1972, see Julie Klein’s *Interdisciplinarity: History, Theory, and Practice*.⁷ Less apparent from the literature is that there are characteristic patterns of course development and design indicative of each of these levels, even when faculty from different disciplines collaborate.⁸

In multidisciplinary courses, faculty tend to work separately on “their” part of the course. They tend to see the topic only from the perspective of their discipline, and that perspective is unaltered by the course development process. Indeed, the course topic itself may be grounded in the perspective of a single discipline (perhaps that of the faculty member who proposed the topic). There is no section at the end of the course reserved for integration, and any integration is undertaken by the students without faculty assistance. The methodologies and epistemologies underlying the disciplines are unexamined, perhaps even unstated.

In pluridisciplinary courses, a section at the end of the course becomes “ours,” where faculty involved in the course can talk to each other even though no explicit integration takes place. Faculty members begin to understand each other’s perspective, though their own remains unaltered. There is still no explicit examination of epistemology or methodology, though it may become implicit in the discussion at the end of the course.

In cross-disciplinary courses, faculty interactions follow a dominant/subordinate pattern and one faculty member prevails. There is a conclusion to the course resulting from the new insights, but still no integration because only one perspective is evident.

In an interdisciplinary course, faculty tend to work together as much as alone, interacting instead of merely working jointly. The topic may well have shifted as the course evolved, and faculty perspectives on it have been altered. In the integration section at the end of the course, faculty work with

students in forging a new synthesis, which results in a larger, more holistic perspective. In order to bring about that synthesis, the world view and some of its underlying assumptions of each discipline are brought to light and made explicit.

Implicit in these indicators are some strategies for faculty participating in team-course design. In addition to some modest expertise in their discipline if not in the topic, faculty must come into the course development process with an openness to hearing what other faculty say about the topic from the perspective of their discipline, and with enough humility to recognize that much of what they thought they knew (and their colleagues back in the department are still sure they know) is at best partial truth if not misleading, distorted, or just plain wrong. Faculty should be representatives of their disciplines in the sense of a senator or congressperson who embodies the value and local wisdom of her or his constituency but who listens to the debate, studies the issues, and votes according to his or her own judgment. They should not emulate the member of the House or Senate who takes polls back home on each issue and then votes in Washington the way folks back home want even though they cannot see beyond the horizons of their county. Faculty need to work together on the course, representing their discipline by virtue of having been trained in it but not fighting on its behalf.

Once individual faculty members have had sufficient experience designing and team-teaching interdisciplinary courses, they should be ready to "go it alone." Beyond the obvious requirement of commitment to holistic thinking and the interdisciplinary process, two tests of readiness stand out. One is their command of the perspectives and underlying assumptions of disciplines other than the one(s) in which they received graduate training. Can they present those perspectives not just accurately, but sympathetically, persuasively, and comfortably to their students? Second, are they prepared to guide their students through the integrative process?

Disciplines do not need protection, nor do their pet theories, concepts, and methods. The problem the faculty member faces is not getting enough economics, say, into the course, but figuring out what economics can best contribute to the topic, and how that contribution relates to the contributions of the other disciplines. If there is insufficient time to include the entire theory of pure competition, for instance, in the course, no harm is done. If economics is well represented in the course, so that students come away with a respect for what economists have to say on the topic and some sense of how the economist's insights differ from those of other disciplines,⁹ those students who find that way of looking at the world congenial will be more inclined to sign up for economics courses (and more likely to pass them) than

students who have a mistaken impression of what economics is about. Interdisciplinary courses are the discipline's chance to "strut its stuff"; to learn the discipline, students will have to take a course in that department.

Enforcing Interdisciplinarity

Even the best team-developed interdisciplinary course can degenerate into a disciplinary course when it is taught by one faculty member from one disciplinary perspective. This problem occurs most frequently when a faculty member is "drafted" to teach a section of a required interdisciplinary general education course (though it can appear in any individually-taught interdisciplinary course). In the interests of economic feasibility, these courses are often team-developed but each section is individually taught and the faculty recruited to teach these sections were often not involved in developing the course. While faculty development (discussed below) is essential in preparing these faculty members, it can be supplemented by several structural features:

The different sections should share a common syllabus and readings. Even where a team has designed a "model" course when the requirement was adopted, the faculty actually teaching the course need a specific topic with which they feel comfortable. The process of tailoring the course to their interests ensures that they get some exposure to other perspectives on the topic *and* that their discipline's perspective is represented.

It is also useful to have all sections meet once a week for a common lecture (given by the faculty member with the most expertise on that week's material). Students get some exposure to each discipline's perspective from an adherent of that discipline. The lecture also provides a regular point of contact among sections, giving students and faculty alike the sense that they are part of a larger, cohesive course.

A weekly faculty seminar is invaluable. Faculty teaching different sections of the same course should meet weekly to go over what will go on in section the next week — issues to raise and their order, key questions, educational objectives; faculty take turns leading the seminar, depending on who has the most expertise in that week's material.

Finally, paper topics and examinations should be common to all sections, with grading standards worked out or at least ratified in faculty seminar. The first time around, one faculty member might grade several papers from her or his section, selecting out examples of A, B, C, D, and F papers and circulating them among the other faculty teaching in the course. They would be discussed in faculty seminar before others started grading.

Interdisciplinary Curricula

Factors Promoting Interdisciplinarity. The long term prospects for an interdisciplinary curriculum are best if it fits logically into the educational mission of the institution. As long as proponents can demonstrate its centrality to the mission, they can defend it in time of budget shortages or periodic curricular restructuring. Otherwise, scarce faculty or financial resources are likely to be reallocated to other programs more attuned to the institution's guiding vision.

Distinct interdisciplinary programs stand a better chance of longterm survival if their faculty have full-time appointments in the program. Faculty whose professional rewards of tenure, salary increases, and promotion emanate from the interdisciplinary program are taking much less of a professional risk to devote the considerable time required to learn other disciplinary perspectives and develop interdisciplinary research agendas. In fact, the interdisciplinary program is well advised to use those professional incentives to promote the interdisciplinary professional development of its faculty; otherwise, they may choose to redefine its interdisciplinary mission at some later date when institutional problems with enrollment or budget create pressure for retrenchment.

Institution-wide interdisciplinary curricula such as a required core of interdisciplinary liberal education courses must borrow faculty from disciplinary departments, so a different long-term strategy is required. Central administrators with responsibility for liberal education must provide sufficient faculty development opportunities over a period of years to create a critical mass of tenured faculty who are experienced in interdisciplinary curriculum development and pedagogy and committed to interdisciplinary education. Some of these faculty need to be widely recognized within the institutions as excellent teachers and scholars to dispell any claim that interdisciplinary courses are of inherently low quality. Others need to be leaders in the institution's governance procedure who can come to the defense of the interdisciplinary curriculum if it is threatened politically.

Administrators need to foster a spirit of innovation in order for interdisciplinary education to thrive. Faculty need to experiment, to take risks; they need to be able to fail with impunity. It takes time to learn how to organize and teach an interdisciplinary course in the context of a particular institution for a particular student body. It is threatening for faculty new to interdisciplinary study to teach outside their area of expertise, to seek help from their colleagues, and to admit to their students that they are co-learners to some extent. It is unsettling for faculty to discover that long-cherished assumptions

of their discipline are sometimes misleading if not wrong, and it is harder still to admit it to their colleagues.

Finally, faculty should be encouraged to come to some consensus about the nature of interdisciplinary study (perhaps through the faculty seminars discussed above). Without at least some boundary conditions on what is and is not good interdisciplinary study, it is very difficult to elicit high quality proposals for interdisciplinary courses and to improve existing interdisciplinary courses. The problem is especially serious for faculty who were not involved in the process of setting up the curriculum and designing the initial courses.

Sequencing. Interdisciplinary courses represent a significant departure from the course structure and style of teaching and learning to which students are typically exposed in high school. They are most likely to accept the unfamiliar roles of faculty and students and the structure of an interdisciplinary course, and embrace its active, critically questioning style of learning, if they are exposed to it in the first semester of their first year in college, when studies indicate that the significant changes normally take place in college students. It is true that the relativistic thinking required in an interdisciplinary course may clash with the concrete thinking of some entering students,¹⁰ but interdisciplinary courses are an effective vehicle for moving students through Perry's stages (because they demonstrate the inadequacy of concrete thinking and the necessity of relativistic thinking and commitment), and the first semester of the first year is the time in college when they are most open to new thinking styles. Thus there are important advantages in introducing students to an interdisciplinary curriculum their first semester in college.

Since interdisciplinary study builds directly on the disciplines while offering a holistic counterbalance to the reductionist perspectives they afford, a curriculum that intersperses disciplinary and interdisciplinary courses allows each to build on the strengths of the other. For example, after taking intermediate theory courses in economics, sociology, and political science, students might take interdisciplinary topical courses drawing on those analytical tools; e.g., an interdisciplinary course on modernization (replacing currently offered courses on political modernization, economic development, and the sociology of modernization). With the assistance of interdisciplinary courses, students can place in perspective the disciplinary tools they are acquiring, keeping sight of their limitations as well as their strengths, and assessing their relative contributions to complex issues. Through disciplinary courses, students can extend and refine their command

of the analytical tools they bring to an interdisciplinary course, yielding more sophisticated insights into its complex topic.¹¹ And the slow process of moving students through Perry's scale can be continued, to the benefit of disciplinary as well as interdisciplinary courses.

After students have taken the bulk of their upper-division coursework in a single discipline, steeping themselves in its specialized way of looking at the world, it is important to conclude their undergraduate education with an interdisciplinary course that humanizes their new-found expertise by placing it in a larger context. One effective strategy is to conclude with a senior capstone seminar where students from a variety of disciplinary or professional majors gather to discuss a complex interdisciplinary issue. Topics in the general area of science, technology, values, and society are particularly effective in eliciting insights from the full range of disciplines and professions. Since the students themselves bring the requisite disciplinary expertise to the course, it can be staffed by a single faculty member broadly interested in the topic. Different capstone seminars can be offered by individual faculty members, each on a different topic.

In general, upper-division interdisciplinary courses can gain in sophistication and depth of analysis if they build on any required general education core or if they have disciplinary prerequisites that allow the discussion to move beyond introductory concepts and theories. Disciplinary prerequisites also simplify the task of making explicit the disciplinary worldview and its underlying assumptions. Students are then able, in an upper-division interdisciplinary course, to focus more attention on the challenging process of integration.

Resource Requirements. Interdisciplinary programs, especially institution-wide general education programs of interdisciplinary core courses, necessitate extra initial resources and special administrative structures not required by their disciplinary counterparts. This is not, however, because they are more expensive to teach in the long run, but because they require more faculty time to design the courses and prepare to teach them. As discussed above under *Indicators of Levels of Integration*, once faculty have gained the requisite command of other disciplines, they can teach an interdisciplinary course (or their own section of it) by themselves. The on-going major expense of team-teaching (with more than one faculty member teaching in the same room at the same time) is not required for high quality interdisciplinary courses. On the other hand, special administrative structures *must* be on-going to solicit and evaluate proposals for future courses and to ensure that they are adequately staffed.

Even after faculty committees have invested considerable time in designing an interdisciplinary curriculum and sketching out sample interdisciplinary syllabi in preparation for a faculty vote on a new interdisciplinary program, the demand for extra institutional resources has just begun. The faculty who will be teaching a given interdisciplinary course need to be the ones to select its substantive topic if they are to be expected to put the requisite effort into preparing themselves to teach it. Consequently, syllabi developed during the program approval process must be viewed as purely illustrative models only, and new syllabi will have to be developed by the actual teaching teams. It takes a lot of time to develop a good interdisciplinary course even when working from well-thought out models. It takes time to negotiate with colleagues from other disciplines over which sub-topics to include under the agreed-upon topic, and which disciplinary concepts and theories are most needed to explore those sub-topics. It takes time to find the appropriate readings, films, exercises, and so forth when working outside the area of one's expertise. The institution needs to provide either released time or summer stipends to faculty preparing these courses, both to free up the requisite faculty time and to send the message to faculty that the administration recognises and values the time it takes to prepare interdisciplinary courses.

Once a teaching team has been assembled and a common syllabus prepared, a major faculty development task remains to prepare faculty to actually teach the course they have developed. Since each faculty member must be prepared to present to her or his own students *all* the disciplinary perspectives in the course (and not just that of his or her own discipline), faculty need both assistance and extra time to develop the requisite grounding in the other disciplines. The most effective way I know to prepare first time interdisciplinarians to teach their own sections of a multisectioned interdisciplinary course is to have them meet weekly in a faculty seminar where they can take turns training each other in their respective disciplines. Such a seminar represents a major intellectual undertaking by faculty and a considerable expenditure of time. To ensure that they can put adequate time and effort into the seminar, it is desirable that it count in their teaching load. (If stipends are offered in lieu of course-load reductions, it must be accompanied by dramatic reduction in committee assignments to free up enough time for faculty to prepare adequately for the seminars.) Two times through an interdisciplinary course is usually sufficient to prepare them to handle discussions without the assistance of the faculty seminar, though at least one veteran would need to continue to work with any new additions to the staff of the course.

The cost to the institution of providing inadequate resources for course and faculty development are predictable and serious. Inadequate preparation time for designing and teaching interdisciplinary courses will result in weak, ineffectually taught courses. In a few years, the faculty as a whole will grow disaffected with what they will have come to see quite rightly as intellectually irresponsible core courses, and the program will be voted out of existence. Not only that, interdisciplinarity itself will probably come to have a bad name on campus ("We tried the interdisciplinary approach already and it didn't work") and opportunities for future innovations will be lost as well. Faculty frustration with interdisciplinary courses can also be avoided by exposing them to the interdisciplinary literature, which is replete with warnings about strategies that have failed at other institutions as well as tips on ideas that have worked. With the publication of Julie Klein's comprehensive bibliography,¹² the scattered and fragmented nature of the literature on interdisciplinary education need no longer force faculty to reinvent interdisciplinary wheels.

Since an interdisciplinary course of necessity falls outside normal administrative structures, interdisciplinary programs require their own coordinator. That person needs access to support staff and enough power to ensure that courses are staffed with appropriate faculty even when department chairs balk at releasing them from departmental teaching duties. That person should also have some input into the promotion and tenure process at the institution-wide level to help balance out departmental assessments that may not take participation in interdisciplinary programs as seriously as departmental teaching or research; otherwise, faculty may feel that the extra expenditure of time and psychic energy required for participation in an interdisciplinary program will not be rewarded (and may even be penalized). For institutional-wide general education programs, that person has to have the stature of a dean or vice-provost, and for large institutions it is a full-time job. It takes someone with considerable stature within the institution to serve as an effective advocate for interdisciplinary programs, protecting them from the inevitable attacks at some point in the future by faculty whose vision of education values a more narrow professionalism. That tension between different visions of education will always be with us. Institutions need to find structural mechanisms to ensure an on-going balance between reductionist and holistic perspectives within the curriculum, much as do individual interdisciplinary courses.

Community. Interdisciplinary courses, with their holistic perspective on complex topics, lend themselves well to the development of living-learning

communities, which take a holistic view of students (and faculty) as complex individuals who live as well as learn. Both perspectives emphasize the importance of moving beyond relativistic understanding to commitment. Both stress praxis, the application of classroom theories to real world issues we face in our lives. A program of required interdisciplinary core courses has the potential of contributing to the development of a coherent intellectual community. Students not only have a common vocabulary and set of intellectual skills, but they (and many of the faculty) have confronted a common set of issues within those courses and each has had to develop a personal position that takes the different disciplinary perspectives into account. But the formal curriculum alone cannot create a community. If the ideas, ways of thinking, and sensibilities students (and many faculty) share from these courses are to become connected to the rest of their lives, they must be placed in an environment that facilitates those connections. The institution can do much to promote such a sense of community by focusing its lecture and concert series, residence halls programming, exhibits, and so forth on themes raised in the required core courses. The coordination of these efforts would need to come from the office of the person administering the interdisciplinary program.

Individualized Interdisciplinary Programs

Many so-called interdisciplinary programs are more accurately individualized or self-designed majors that students put together from disciplinary offerings, though they may be used by students to explore an interdisciplinary topic. I conclude with some criteria for evaluating these programs. These criteria overlap with those for other kinds of interdisciplinary programs discussed above, but they are reiterated here for convenience's sake:

Explicit focus. Each student's proposal should have a brief title that captures the essential integrating thread that ties the courses together.

Coherence. Students should provide a well-thought-out rationale that explains why a particular set of courses was selected.

Depth. There should either be a set number of credit hours in upper-division courses required, or they should meet more generic criteria for depth, such as acquisition of higher-order thinking skills, appreciation of the complexity of a discipline, and awareness of its epistemology.

Breadth. Students should be asked to demonstrate that their major is not so narrowly technical that it is inappropriate for a bachelor's degree. They

should be encouraged to take courses that offer significantly different perspectives; e.g., English and business, not speech and theater.

Capstone experience. Students should take an interdisciplinary seminar or write an interdisciplinary senior project that gets them to pull together their major.

Interdisciplinary method. Students need an introductory interdisciplinary course that is explicitly designed to prepare them to integrate the courses they take in different departments. It should prepare them to draw effectively and critically on the disciplinary courses in their concentration and to place them in a holistic framework.

Appropriate program title. Truth-in-packaging considerations demand that an institution decide whether it is truly offering a flexible interdisciplinary major or merely an individualized major, and then label it accordingly. Students have enough trouble explaining these majors to prospective graduate schools and employers without being further burdened with an inappropriate label.

Publicity. Even if the institution wishes to keep the program small (or low-visibility for fear of losing the program through departmental turf protection), it is still important to make sure that students, especially non-traditional ones most likely to benefit from the program, are made aware of its existence. On campuses where the program is of particularly high quality, it may be important in terms of campus politics to publicize its successes even though the program may not be able to grow in size.

Student ownership of their education. Students in these programs have a special need to clearly articulate their educational goals for their program and explain how each course within their concentration contributes to those goals.

Administrative location. These programs are most likely to thrive when they are housed administratively in divisions or schools with a commitment to innovation and student-centered education, and that support broad-gauged (if not interdisciplinary) approaches.

Explicit guidelines. Since program directors come and go, written guidelines for preparing proposals (aimed at students) and for evaluating them (aimed at faculty or administrators) provide a valuable institutional memory of the criteria currently in use.

Faculty. Since the perceived caliber of individualized programs rests in the eyes of the faculty at large with the reputation of the faculty sponsoring them, it is important to attract faculty to the program with some stature within the institution. If such faculty are not interested in participating, it would be useful to ask them how the program might be changed to make

them interested. Then the program's structure should either be reexamined in the light of their comments, or faculty misperceptions about the program need to be corrected.

Faculty advisory committee. These programs are normally well served by a formal advisory committee that provides oversight as well as review.

Faculty rewards. In most programs, the rewards for faculty are only intrinsic. This is fine as long as the primary institutional emphasis is on teaching and advising over research and publication. Problems arise when institutions shift this emphasis while leaving the reward structure unaltered.

Testing the waters. Individualized programs are a useful institutional tool for identifying potential future programs or majors, since any groundswell in student demand should be felt there first. Institutions need to monitor these programs and probe the sources of any unusual increase in the numbers of students putting together concentrations on any one topic.

Biographical Note: William H. Newell is Professor of Interdisciplinary Studies in Miami University's School of Interdisciplinary Studies. The founding President of the Association for Integrative Studies, he has served for the last eight years as its Secretary-Treasurer and Newsletter Editor. Prior to becoming a charter faculty member in 1974 of the School of Interdisciplinary Studies, he taught for the first four full years of the interdisciplinary Paracollege at St. Olaf College. He holds an A.B. in Philosophy from Amherst College and a Ph.D. in Economics from the University of Pennsylvania. Over the last five years, he has served as a consultant or external evaluator for over 25 interdisciplinary programs and written extensively on interdisciplinary higher education, including the AIS publication *Interdisciplinary Undergraduate Programs: A Directory*.

Endnotes

1. William H. Newell and Allen J. Davis, "Education for Citizenship: The Role of Progressive Education and Interdisciplinary Studies," *Innovative Higher Education* 13:1 (Fall/Winter, 1988), pp. 27-37.
2. Allen J. Davis and William H. Newell, "Those Experimental Colleges of the 1960's: Where Are They, Now that We Need Them?" *The Chronicle of Higher Education* (November 18, 1981), p. 64. Reprinted in Stephen H. Barnes (ed.), *Points of View on American Higher Education*, Volume 2 Institutions and Issues (Lewiston, NY: Edwin Mellen Press, 1990), pp. 38-43.
3. William H. Newell, *Interdisciplinary Undergraduate Programs: A Directory* (Oxford, OH: Association for Integrative Studies, 1986).
4. Forrest H. Armstrong, "Faculty Development Through Interdisciplinarity," *The Journal of General Education* 32:1 (Spring, 1980), pp. 52-63.

5. For an extended examination of this definition, see William H. Newell and William J. Green, "Defining and Teaching Interdisciplinary Studies," *Improving College and University Teaching* 30:1 (Winter, 1982), pp. 24-25.
6. The interdisciplinary process underlying this definition is set up in some detail in Barbara Hursh, Paul Haas, and Michael Moore, "An Interdisciplinary Model to Implement General Education," *Journal of Higher Education* 54 (1983), pp. 42-59.
7. Julie Thompson Klein, *Interdisciplinarity: History, Theory, and Practice* (Detroit: Wayne State University Press, 1990).
8. See Forrest Armstrong, "Faculty Development Through Interdisciplinarity," *The Journal of General Education* 32:1 (Spring, 1980), pp. 52-63.
9. Again, see Hursh, et al., op. cit.
10. William Perry, *Forms of Intellectual and Ethical Development in the College Years: A Scheme* (New York: Holt, Rinehart, and Winston, 1970).
11. William H. Newell, "The Role of Interdisciplinary Studies in the Liberal Education of the 1980s," *Liberal Education* 69:3, pp. 245-255.
12. Julie Thompson Klein, op. cit.



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