

Five Easy Pieces: Capstones and Their Kin as Effective Devices for Learning and Assessing



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Five Easy Pieces (1916-17)

Igor Stravinsky

1. Andante

2. Espagnola -- Won Hee An & Vytas Baksys,
February, 2009

3. Balalaika

4. Napoletana

5. Galop



Assessment Theme:

Show students the bar

1. Deep learning means transference and application to new circumstances.
2. Successful, deep-learning capstones use embedded pedagogies.
3. Effective capstones tackle big questions that students care about.

Memory Matrix

[--from Angelo and Cross]

	<i>Description</i>	<i>Example</i>	<i>Application</i>
Performance dictionary			
Fatal error list			
Primary Trait Analysis			
Multiple measures (wing design)			
Double entry journal			
Memory matrix			

Double Entry Journal

[--after Barbara Millis]

Direct response or observation	Thoughts and reflections
Modified idea or concept	What caused a change of mind?

How do you know that your students
can do *there* what they do *here*?

Five Conditions That Foster Deep Learning

[Halpern & Hakel, Marchese, DeWinstanley & Bjork, Shpancer, National Research Council]

1. Engaging students actively
2. Practicing retrieval and presentation in varied environments
3. Linking new learning to prior learning
4. Applying learning to new situations that students care about
5. Receiving timely and relevant reinforcement

7 Principles of Good Practice in Effective Undergraduate Education

1. Encourages active learning
2. Gives prompt feedback on performance
3. Develops reciprocity and cooperation among students
4. Encourages contact between students and faculty
5. Emphasizes time on task
6. Communicates high expectations
7. Respects diverse talents and ways of learning

#1. Performance Dictionary

Performance Dictionary -- Making Standards Visible

	Excellent	Very Good	Adequate	Weak	Poor
1. Presents a manifest topic statement	Topic statement appeared within the first paragraph and manifestation was elegant	Topic statement appeared within the first paragraph	Topic statement was easy to locate, but not within first paragraph	Topic statement was lengthy or unfocused or was difficult to locate	Topic statement could not be located or was so garbled as to violate principles of the discipline
3. Offers an alternative position or counterclaim	Counterclaim is evident and stated concisely and elegantly with no evidence of straw man	Counterclaim is evident and stated concisely with no evidence of straw man	Counterclaim is evident and presented fairly	Counterclaim is evident but offered as a straw man	Counterclaim offered wholly as straw man with obvious prejudice and unfairness
5. Exercises good critical thinking	Exhibited all 5 criteria: clarity, logic, breadth, depth, discrimination seamlessly	Exhibited all 5 criteria: clarity, logic, breadth, depth, discrimination	Exhibited all 5 criteria but some non-fatal flaws appeared	Exhibited fewer than all 5 criteria or displayed a fatal flaw	Exhibited fewer than all 5 criteria and displayed a fatal flaw
6. Arrives at appropriate conclusion	Conclusion eloquently stated and supported by evidence	Conclusion concisely stated and supported by evidence	Conclusion clear and supported by weight of evidence	Conclusion confused or evidence is weighted improperly	Conclusion is "because I say so"; evidence overruled
7. Correctly documents and cites sources	-----	-----	All citations arose appropriately from refereed sources and all presented in APA format	Most citations arose from appropriate sources or most presented in APA format	Citations absent or arose from inappropriate sources or violated APA formatting

Performance Dictionary -- Making Standards Visible

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7. Correctly documents and cites sources	----	----	All citations arose appropriately from refereed sources and all presented in APA format	Most citations arose from appropriate sources or most presented in APA format	Citations absent or arose from inappropriate sources or violated APA formatting
OVERALL	A	B	C	D	F

In the next assignment....

...to what extent does the writing improve? Reassess.

(It is not necessary to repeat instructions or spend time on reminders of any kind. Just use the rubric grid while grading.)

What now?

What have you now learned about your students' learning?

What else?

What else are you going to do about it besides reading this report?

What next?

When, where, and how are you going to do it?

Duet

Examine and compare before and after rubric grading grids. Analysis:
What now? What else? What next?



If one links what one doesn't know to what one does know, learning is faster, easier, and more enduring.

#2. An Example of a Fatal Error List [--from SIUE]

1. Each different word misspelled
2. Each sentence fragment
3. Each run-on sentence or comma splice
4. Each mistake in capitalization
5. Each serious mistake in punctuation that obscures meaning
6. Each error in verb tense or subject/verb agreement
7. Lack of conformity with assignment format
8. Each improper citation, or lack of citation, where one is needed

**Once again,
in the next assignment....**

...to what extent do the
errors disappear? Reassess.

(It is not necessary to repeat
instructions or spend time on
reminders of any kind.)

Duet

Compare before and after
incidence of fatal errors. Analysis:
What now? What else? What next?



#3. Primary Trait Analysis...

...is a very strong link.



Some North American institutions with capstones

LaGuardia Community
College, CUNY
Portland State University
The College of Wooster
Philadelphia University
Princeton University
[Ryerson University](#)
Bryn Mawr College
Augustana College
[CEAB Universities](#)
Brown University
Hamilton College
[Quest University](#)
Carleton College
Elon University
Reed College
Miami University

DePaul University
Allegheny College
Haverford College
Kalamazoo College
Washington College
Swarthmore College
University of Hartford
Boise State University
University of California,
Los Angeles
Salve Regina University
[Simon Fraser University](#)
Michigan State University
Southern Illinois University
Edwardsville
California Polytechnic State
University San Luis Obispo

CAPSTONE STRUCTURE VARIES

- Comprehensive exam, integrative experience
- Independent, collaborative team
- Assigned faculty mentor, all-faculty resource
- Directly funded, indirectly funded, not funded
- Expected workload, course equivalent workload
- Senior seminar, contract course, individual project, internship/clerkship, individual major

The assessment goals have same theme

Capstones authentically assess:

Written and oral communication

Information literacy, technological competence

Critical, analytical, & creative thinking

Quantitative & scientific literacy

Problem solving

Teamwork

Leadership

Content knowledge

Open mindedness

Motivation and life-long learning

Personal ethics & social responsibility

Global awareness, embrace of diversity

...

Think “**systems**”: Don’t merely assess accounting in accounting courses

Teach accounting here

Accounting 201, 202

Assess accounting here

Management 440
e.g., Case study with
Personnel issue

Financial statement

Accounting component

Management decision



The test of good dribbling in soccer is not only whether the player can dribble between cones.

Rather, does the player dribble effectively during a game, knowing when to dribble, and when not to?

**Deep (expert) learning is not
a course function.**

It is a curriculum function.

**Colleges and
Universities
are Systems**

Duet

Examine: What have we learned about our students' learning?

Analysis: What now? What else?
What next?



#4. Double Entry Journal

[--after Barbara Millis]

Direct response or observation	Thoughts and reflections
Modified idea or concept	What caused a change of mind?

Duet

Examine: What kinds of learning experiences cause students to reflect, question, reframe, and rethink?

Analysis: What now? What else? What next?



#5. Memory Matrix

[--from Angelo and Cross]

	<i>Description</i>	<i>Example</i>	<i>Application</i>
Performance dictionary			
Fatal error list			
Primary Trait Analysis			
Multiple measures (wing design)			
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Duet

Examine: How might this learning apply toward solving a problem?

Analysis: What now? What else?
What next?



Closing Thought

Le mieux est l'ennemi du bien. -- Voltaire

The enemy of the good
is the perfect.

Capstones and Their Kin as Effective Devices for Learning and Assessing

Learning Outcomes Assessment, Practically Speaking
Toronto, Canada
Monday/Tuesday, April 22-23, 2013

with

Douglas Eder
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"Deep learning" is the kind of integrative learning that lasts beyond the final exam. Ideally, it is the kind of learning that universities, colleges, and community colleges aim to produce. Deep learning takes place over a curriculum, not generally in a single course. Practically speaking, capstones, senior assignments, culminating experiences, and integrative portfolios are excellent venues for assessing deep learning.

The theme of this genial seminar on capstone assessment follows the plan Igor Stravinsky used for composing *Five Easy Pieces* as piano duets. A complex accompaniment part (for the assessment steward) coexists with a featured but less complicated part (for the teaching faculty member). This structure invites faculty buy-in for assessment while it simultaneously captures data and closes the feedback loop to improve student learning.

Double Entry Journal

[--after Millis]

Direct response or observation: <i>How do you interpret the concept, academic capstone (definition and sentiment)?</i>	Thoughts and reflections: <i>What context or circumstance has influenced your thinking?</i>
Modified idea or concept: <i>What is your modified interpretation of academic capstone?</i>	What caused a change of mind? <i>If a shift in your thinking occurred, what caused it?</i>

Memory Matrix

[--after Angelo & Cross]

	Description	Example	Application
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Five Conditions That Foster Deep Learning

[Halpern & Hakel, Marchese, DeWinstanley & Bjork, Marchese, Shpancer,
National Research Council]

Deep learning is enhanced when students:

- 1. Become actively engaged.**
(So they can learn to self-assess, reflect, and learn to learn for themselves.)
- 2. Practice retrieval and presentation in varied environments.**
(And activate multiple neural pathways --- sensory, motor, and association.)
- 3. Link new learning to prior learning.**
(In order to use existing knowledge as a foundation for new knowledge.)
- 4. Apply learning to new situations that they care about.**
(Because generating applications is a powerful way to make connections.)
- 5. Receive timely and relevant reinforcement.**
(So they can learn to self-assess, reflect, and learn to learn for themselves.)

Seven Principles for Good Practice in Undergraduate Education

Good Practice:

- 1. Encourages active learning.**
(Writing, applying, doing, thinking, and thinking about what they're doing.)
- 2. Gives prompt feedback on performance.**
(So they can learn to self-assess, reflect, and learn to learn for themselves.)
- 3. Develops reciprocity and cooperation among students.**
(Deepens understanding, improves thinking, enhances communication.)
- 4. Encourages contact between students and faculty.**
(Especially contact focused on the academic agenda---in and out of class.)
- 5. Emphasizes time on task.**
(Practice improves learning because learning = time \times effective energy.)
- 6. Communicates high expectations.**
(Reward the positive and encourage students to learn high *self*-expectations.)
- 7. Respects diverse talents and ways of learning.**
(And engenders respect for the many forms of genius.)

Checklist for Editing

Checklist for Editing Your Seven Paragraph Analytical Paper

Two days before paper is due---near final draft form---reread your paper and examine it for the following points:

1. () An introductory paragraph clearly introduces the subject. A topic statement is evident within the paragraph. The position taken is clear. If the position is unclear, put a question mark in the margin.
2. () The next two paragraphs each have a single or main claim. Note each claim in the margin in a 3-4 word phrase. If you can't identify the claim, put a question mark in the margin. If two or more claims exist and tend to diverge from a coherent thought, put a question mark in the margin.
3. () The same thing holds for the next two paragraphs on the opposite side of the issue.
4. () The four paragraphs above all focus on the issue at hand; they do not wander off into irrelevant territory. If any paragraph wanders, put a question mark in the margin.
5. () The sixth paragraph weighs the conflicting claims from the four paragraphs above and arrives at a conclusion. *Why* some evidence is more convincing than other evidence is explained. The ensuing conclusion is clearly stated. Circle it. If you can't find the conclusion, put a question mark in the margin.
6. () The final paragraph returns to what was stated in the first paragraph and, in light of the evidence presented and weighed above, convincingly rephrases the position statement. If the conclusion expected by the assignment is to be finessed, justifying statements for the variance must appear here and flow from the explanation in the sixth paragraph of your paper.

Consider all question marks appearing in the margin and fix those that need fixing.

Next:

7. () Is each claim in paragraphs 2-5 supported by evidence? Are there any naked claims supported only by variations of "I believe..."? If so, put a big X in the margin beside that paragraph.
8. () Is each claim backed up by a reference? If a claim stands naked of supporting evidence or argument, put a big X in the margin.

Consider any X appearing in the margin and fix those that need fixing.

Another thing:

9. () Does the paper do more than simply but gloriously restate the question? Examine the case study and cross out all ideas that appear in *both* the case study and in your paper. What remains uncrossed out is your analysis. It should constitute the majority of your paper. If it doesn't, you haven't done an analysis.

Rewrite as necessary. When you've finished, let it sit at least one night before doing the final step below.

Finally:

Up to now, you've been working on substance and thinking. **Now, on the final morning over breakfast on the day the paper is due, check out the mechanics.** Sweep your paper with a spell checker and comb it for the common fatal errors in the list below. If you find such an error, put a check in the box.

(For a longer listing of mechanical errors, see [How to Rite Rite](#)).

10. () A sentence lacks either a subject or a verb; a sentence does not begin with a capital letter or end with a period (citations in parentheses go ahead of periods, not behind them).
11. () A sentence begins with a relative pronoun such as *Which, Who, That, Where, and When*.
12. () A pronoun lacks a clear antecedent; that is, a word such as *it, he, she, or they* does not have an obvious link to a noun (especially noticeable if a sentence begins with *it, he, she, or they*).
13. () A pronoun or verb fails to agree with its antecedent in number; that is, a single person or agency is referred to as *they*, or a plural subject is given a singular verb (such as, "members of the school board.... gives their vote...").
14. () A sentence runs-on or uses a comma to splice independent ideas together; that is, complex ideas are not split into two sentences but are linked, often by a comma, into an overly long, wandering sentence.

The five check boxes in the list above should be empty. If not, fix the errors.

When you're done, hand in the paper and take in a day at the beach. You've done a good job!

* * * * *

A Fatal Error List [--from SIUE]

1. Each different word misspelled
2. Each sentence fragment
3. Each run-on sentence or comma splice
4. Each mistake in capitalization
5. Each serious mistake in punctuation that obscures meaning
6. Each error in verb tense or subject/verb agreement
7. Lack of conformity with assignment format
8. Each improper citation, or lack of citation, where one is needed

Papers with more than three fatal errors marked by an instructor on any one page, or more than a number specified by the instructor for the entire document, will be returned to the student subject to a grading penalty as prescribed by the instructor....

Performance Dictionary -- Simultaneous assessment & evaluation

	Excellent	Very Good	Adequate	Weak	Poor
1. Presents a manifest topic statement	Topic statement appeared within the first paragraph and manifestation was elegant	Topic statement appeared within the first paragraph	Topic statement was easy to locate, but not within first paragraph	Topic statement was lengthy or unfocused or was difficult to locate	Topic statement could not be located or was so garbled as to violate principles of the discipline
2. Offers a position or claim	Claim is evident and stated concisely and elegantly	Claim is evident and stated concisely	Claim is evident	Claim is evident but garbled or unclear	Claim is either not evident or so garbled as to violate disciplinary principles
3. Offers an alternative position or counterclaim	Counterclaim is evident and stated concisely and elegantly with no evidence of straw man	Counterclaim is evident and stated concisely with no evidence of straw man	Counterclaim is evident and presented fairly	Counterclaim is evident but offered as a straw man	Counterclaim offered wholly as straw man with obvious prejudice and unfairness
4. Provides adequate supporting arguments	Each claim backed by correct reasons or evidence and appropriate bibliographic support	Each claim back by correct reasons or evidence	Each claim backed by reasons or evidence but some non fatal flaws appeared	Most, but not all, claims backed by reasons or evidence, with or without non-fatal flaws	Significant claims not backed by reasons or evidence or fatal flaw appeared
5. Exercises good critical thinking	Exhibited all 5 criteria: clarity, logic, breadth, depth, discrimination seamlessly	Exhibited all 5 criteria: clarity, logic, breadth, depth, discrimination	Exhibited all 5 criteria but some non-fatal flaws appeared	Exhibited fewer than all 5 criteria or displayed a fatal flaw	Exhibited fewer than all 5 criteria and displayed a fatal flaw
6. Arrives at appropriate conclusion	Conclusion eloquently stated and supported by evidence	Conclusion concisely stated and supported by evidence	Conclusion clear and supported by weight of evidence	Conclusion confused or evidence is weighted improperly	Conclusion is "because I say so"; evidence overruled
7. Correctly documents and cites sources	-----	-----	All citations arose appropriately from refereed sources and all presented in APA format	Most citations arose from appropriate sources or most presented in APA format	Citations absent or arise from inappropriate sources or violate APA formatting
8. Is free of mechanical errors	Publishable as is; "prose flows"	One or fewer non-distracting errors per page	No more than 2 non-distracting errors per page	Sufficient number and seriousness of errors to distract reader or change meaning	Fatal error: 3 errors on a page or 10 errors overall

Some North American institutions with capstones

LaGuardia Community College, CUNY

Portland State University

Simon Fraser University

The College of Wooster

Philadelphia University

Princeton University

Bryn Mawr College

Ryerson University

Augustana College

Brown University

Hamilton College

Quest University

Carleton College

Elon University

Reed College

Miami University

DePaul University

Allegheny College

Haverford College

CEAB Universities

Kalamazoo College

Washington College

Swarthmore College

Boise State University

University of Hartford

Salve Regina University

Michigan State University

University of California, Los Angeles

Southern Illinois University Edwardsville

California State Polytechnic University San Luis Obispo

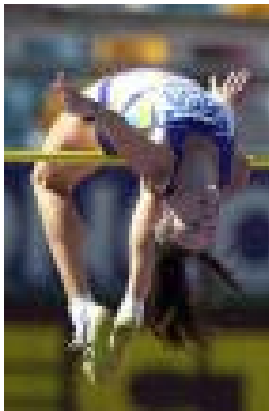
Some integrative portfolios

La Guardia Community College

Florida State University

Clemson University

St. Olaf College



Show students the bar

1. Deep learning means transference and application to new circumstances
2. Successful, deep-learning capstones use embedded pedagogies
3. Effective capstones tackle big questions that students care about

Four guidelines for building capstones

Replace, don't add

KISS, don't embellish

Faculty, not students, sets standards

Build high stakes assessments

Examples of their student learning goals

Written and oral communication	Leadership
Information literacy, technological competence	Content knowledge
Critical, analytical, & creative thinking	Open mindedness
Quantitative & scientific literacy	Motivation and life-long learning
Problem solving	Personal ethics & social responsibility
Teamwork	Global awareness, embrace of diversity
...	...

Examples of their assessment venues

- Civil Engineering:** Campus seismic analyses, campus water run-off
- Chemistry:** Student presentations and defenses before external referees, including Nobel Laureates Roald Hoffmann and Robert Floyd Curl
- Business:** Complete incorporation of a new enterprise
- Psychology:** Presentations and defenses at annual meeting of Midwest Psychology Association in Chicago
- Art & Design:** *Mexica* exhibitions
- Speech Communication:** Conflict resolution in resident halls
- Liberal Studies:** American Sign Language teaching protocol for college lectures
- Nursing:** Community health outreach in Mexico City

Examples of what they examined

- Nursing:** Clinical experience combines science, health science, communication, and problem solving + e-portfolio with reflections
- Education:** Philosophy and problem solving shown through professional teaching portfolio/application
- Collaborative civic engagements:** Showcase communication, diversity, critical thinking, social responsibility through journals, portfolios, direct observation
- Full independent study:** Defended senior thesis
- Group- and team-based projects:** *e.g.*, Engineering, Theater

Examples of what they did about it

- Chemistry:** Added writing and speaking at junior level; increased sophomore writing emphasis.
- Psychology:** Increased statistics, hypothesis forming and testing; shifted teaching emphasis toward research design.
- Biology:** Added student presentations; upgraded instruction in computer use, speech, graphics, and statistics.
- Mathematics & Statistics:** Increased writing and computer use; emphasized mathematical experimentation.
- Music:** Increased collaborative learning by emphasizing ensemble performance opportunities.
- Business:** Increased analytical writing, critical thinking, ethical understanding, working in teams.





On the History, Development, and Philosophy of Culminating Senior Experiences In US Higher Education

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Some lessons learned for assessing culminating experiences

- Embedded in learning and teaching -- not added on
- Matches departmental or program goals -- part of the discipline(s)
- Departmentally owned -- not imposed artificially
- Viewed by the faculty -- a collective enterprise
- High stakes assessment -- it matters to the institution
- Liberal education component -- subscribes to LEAP
- Engages deeply -- it matters to the student
- Integrative -- crosses ways of knowing
- Produces archival product or behavior -- subscribes to standards of disciplinary peer review
- Potential for sharing -- extends beyond the institution



Capstone or keystone?



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