TH!NK Faculty Development Institute 2019  
May 13, 14, 17   DH Hill Library Faculty Commons

Monday, May 13 (9 am – 5 pm)
8:40    Coffee
9:00 Welcome and introduction to TH!NK, faculty and student learning outcomes; introductions
9:45 Icebreaker
10:15 Introduction to the critical and creative process
      Mapping existing class assignments and activities to critical and creative thinking process
12:45 Lunch
2:00 Library elective
3:00 Introduction to the intellectual standards and using them to assess information and arguments
      How the intellectual standards fit in the critical and creative process, and using them as prompts
      for self-reflection
4:45 Daily reflection

Tuesday, May 14 (9 am – 5 pm)
8:40 Coffee
9:00 Divergent and convergent thinking strategies
10:00 Critical thinking scenarios
10:45 Case studies
11:30 Maria introduces SoTL and DBER
12:00 Lunch and TH!NK Showcase poster session
1:15 Concept mapping and building an inclusive learning community
2:30 Library elective
3:30 Introduction to the common rubric and reflection of work
4:45 Daily reflection

Homework: Select 1 assignment with explanation of work. Mark which items you could score on the
rubric and whether it came from the work product or explanation of work. Try one of your assignments -
are there reflective questions you could add (brainstorm an assignment if you don’t have an existing
one)?

Friday, May 17 (9 am – 5 pm)
8:40 Coffee
9:00 Intellectual risk-taking
10:15 Discussion techniques/strategies
11:15 Database and resource sheets
12:00 Working lunch
      Cluster Breakout: discuss homework, deliverables for August, questions, summer support
      network
1:45 Synthesis matrix
2:15 Multi-modal thinking; integrating visual thinking
3:15 Student learning outcome assessment/timeline
4:00 Daily reflection
Critical and Creative Thinking Behaviors

Record the range of Critical and Creative Behaviors used in your discipline.

- Effectively communicating
  - Combines ideas in logical ways?
  - Communicates using intellectual standards?
  - Does it connect to overarching principles?

- Raising questions, formulating problems
  - Defining scope
  - Is it novel?
  - Frame question from different points of view

- Reaching reasoned conclusions
  - Is it logical?
  - Does alternative align with constraints?
  - Evaluate findings

- Considering alternatives
  - Evaluating interpretations, solutions, or consequences

- Synthesizing and generating ideas
  - Are they novel?

- Gathering and assessing relevant information
  - Evaluating:
    - Logic
    - Appropriateness
    - Significance
    - Relevance

- Checking for:
  - Flexibility & adaptability
  - Clarity

- Evaluating:
  - Appropriateness
  - Fairness

- Identifying bias and assumption
- Evaluate sources using intellectual standards
- Addressing contradictions

- Evaluating:
  - Breadth
  - Fairness
## Critical and Creative Thinking Behaviors

Brainstorm possible course assignments which reinforce critical and creative thinking behaviors.

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## Teaching Strategies Aligned with Critical and Creative Thinking Behaviors

### Raising questions and formulating problems
- Divergent Thinking *
- Working Across Vehicles of Thought *
- Concept Mapping and Lotus Blossom *
- Three-finger Summary and Issue Tree *
- Analytic Memos ***
- Case Studies

### Reaching reasoned conclusions
- Critical Thinking Scenarios *
- Concept Mapping and Lotus Blossom *
- Three-finger Summary and Issue Tree *
- Paper or Project Prospectus ***
- Case Studies

### Effectively communicating
- Peer Review *
- Data Visualization *
- Discussion Strategies
- Collaborative Learning Techniques **
  - Think-Pair-Share
  - Round Robin
  - Buzz Groups
  - Talking Chips
  - Three-Step Interview
  - Critical Debate
- Writing to Think/Exit Slips/Minute Paper ***
- Invented Dialogs ***
- Gallery Walk

### Reflecting at each stage of the process
- Metacognition *
- Reflection of Work *
- Peer Review *
- “Chunking” or Process Review of Drafts *
- Writing to Think *
  - 3-2-1
  - Exit Slips/Minute Paper (repeated)
  - Exam Wrappers
- Goal Ranking and Matching ***
- Annotated Portfolio ***
- Fundamental and Powerful Concepts
- Journal Writing/Learning Logs

### Gathering and assessing relevant information
- Synthesis Matrix *
- Critical Reading *
- Rhetorical Analysis *
- Using the Intellectual Standards to Assess Information and Arguments *
- Concept mapping and Lotus Blossom *
- Categorizing Grid / Defining Features Matrix ***
- Content, Form, and Function Outline ***
- Evaluation / Critique of Primary Literature
- Content Analysis, Data Analysis

### Synthesizing and generating ideas
- SEE-I Activity *
- Writing to Think *
- Analogies/Metaphors
- Critical Thinking Scenarios *
- Concept Mapping and Lotus Blossom *
- Divergent Thinking *

### Considering alternatives
- Divergent Thinking **
- Critical Thinking Scenarios **

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* Introduced at Spring 2016 TH!NK Faculty Workshop
** Collaborative Learning Techniques (Barkley, Major, & Cross)
*** Classroom Assessment Techniques (Angelo & Cross)
TH!NK FACULTY WORKSHOP
MAY 13, 14, 17 2019

What do we want our students to do?

- Raising questions/identifying problems
- Finding Relevant Information
- Evaluating Information
- Using Information to generate appropriate answers/solutions
- Effectively communicate

But there is often a disconnect between what we value, how we teach, and what we assess. We must align these!
What do we owe our students?
aka – what can we do that textbooks cannot?

The “test” should assess the outcomes we want our students to achieve. Therefore, we should always “teach to the test”!

TH!NK Faculty Outcomes

Through this program, participating faculty will:

• Participate in faculty development that emphasizes evidence-based pedagogical strategies that impact student higher-order thinking.
• Create discipline-specific classroom activities and assignments that engage students and enhance higher-order thinking skills.
• Become adept at providing students feedback on their thinking skills, rather than just their final work products.
• Engage in a learning community where faculty share and provide peer feedback on pedagogical innovations.
• Contribute exemplary discipline-specific classroom activities/assignments to a searchable database.
TH!NK Student Outcomes

Raising questions

Effectively communicating

Gathering & Assessing information

Reaching reasoned conclusions

Synthesizing & generating ideas

Considering alternatives

Reflection

Faculty and Student Engagement to Date

- >150 faculty members representing ALL undergraduate-serving colleges
- >11,000 students (enrollments) directly impacted in TH!NK sections
- Faculty report enhancement not only to TH!NK course, but all courses
Scholarship related to TH!NK

https://think.dasa.ncsu.edu/publications-and-conference-proceedings/
TH!NK Student Learning Outcomes

- Effectively communicating
- Raising questions, formulate problems
- Gathering and assessing relevant information
- Synthesizing and generating ideas
- Considering alternatives
- Reaching reasoned conclusions

TH!NK Student Learning Outcomes

- Asking problem-based questions
- Questioning personal and disciplinary assumptions
- Seeking and generating alternative answers
- Reflecting on how I'm thinking and working
Icebreaker

TH!NK Faculty Workshop
Spring 2019

Practicing Flexibility of Thought

Designing a better wallet

This is a rapid exercise that the design and research firm, IDEO, does with clients and other non-designers to practice critical, creative and adaptive thinking.
Practicing Flexibility of Thought

Pair Up

Interview your partner (10 min)

- Who are they and where are they from? What is important to them? What do they like to do? What does an average day look like for them? (5 min ea.)

- Try to seek out current issues and/or problems with the wallet / money holder that they currently use. What works for them? What is problematic about it? If they don’t use a wallet, why not? (5 min ea.)

Practicing Flexibility of Thought

Define the problem. (5min)

- What are the issues that your partner seems to face with the way their current wallet is designed? What core feature is missing? What is overly apparent?

- Give the issues hierarchy in terms of importance, feasibility, and usability.
Practicing Flexibility of Thought

Find and propose alternative solutions. (5min)

- Sketch / draw diagram what money holder you would design for your partner. What would you propose for them based on your conversation? Are there features that they might not “know” they need that were illuminated?

- Functionality, everyday ease of use

- Try to come up with as many alternatives as you can in 5min.

Practicing Flexibility of Thought

Develop/test conclusions through prototyping

- Using the paper, and tape create a rough prototype of your design. Think about size, how it folds, etc. (5min)

- Test it- Fill it up with stuff!
Practicing Flexibility of Thought

Reflect

- 1 or 2 people share what you did, why you did it and what was most difficult within the process.
- Did you gain any insight? How might you do it differently next time?
Critical and Creative Thinking Process

TH!NK Faculty Workshop
Spring 2019

CRITICAL THINKING

- How do you define critical thinking?
- Where is it most important to engage in critical thinking in your discipline (teaching environment)?
- Where do you see students having the biggest challenges with it?
- What are some strategies you have used to incorporate it into the classroom and your course(s)?
Defining Critical Thinking

“Active, persistent, and careful consideration of a belief or supposed form of knowledge in light of the grounds that support it, and the future conclusions to which it tends.” (1)

“Habitually inquisitive, well informed, trustful of reason, open-minded, flexible, [and] fair-minded in evaluation.” (2)


Defining Critical Thinking

“The intellectually disciplined process of actively and skillfully 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 in its exemplary form. It is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. (3)
QEP Definition of Critical Thinking

Critical thinking is the active, persistent, and careful consideration of a belief or form of knowledge, the grounds that support it, and the conclusions that follow. It involves analyzing and evaluating one’s own thinking and that of others. In the context of college teaching and learning, critical thinking deliberately and actively engages students in:

- Raising vital questions and problems and formulating these clearly and precisely;
- Gathering and assessing relevant information;
- Reaching well-reasoned conclusions and testing them against appropriate criteria and standards;
- Openly considering alternative systems of thought or points of view; and
- Effectively communicating to others the analysis of and/or proposed solutions to questions or problems.

Critical Thinking Intellectual Standards

The Intellectual Standards for evaluating Critical Thinking are:

- **Clarity**: easy to understand; free from confusion or ambiguity; lacking obscurities.
- **Accuracy**: free from errors, mistakes, or distortions; conforming to fact, truth, or some standard.
- **Precision**: accurate, definite, and exact.
- **Relevance**: bearing upon or relating to the matter at hand; having a close logical relationship to the matter under consideration.
- **Significance**: having relative importance.
- **Depth**: dealing with the complexities of the issue.
- **Breadth**: recognizing insights in more than one side of a question.
- **Logic**: reasoning correctly within the system of principles, concepts, and assumptions that underlie a discipline, activity, or practice; understanding the set of rational considerations that bear upon the truth/justification of any belief or the settlement of any question(s).
- **Fairness**: treating all sides alike without reference to one’s own feelings or interests.
CREATIVE THINKING

- How do you define creative thinking?
- What are the biggest challenges to incorporating creative thinking into your discipline or curriculum?
- Where do students struggle with creative thinking?
- Why is it important in your discipline to use creative thinking?
- Can you see opportunities for how it might be incorporated?

Testing Creativity

Creativity Tests (including TTCT- Torrance Test of Creative Thinking) measures creativity primarily by discrete, non-judgmental tasks that focus on:

- Fluency of thought – number of alternatives generated
- Flexibility of thought -- diversity of topics/types represented in alternatives
- Originality of thought -- statistical rarity of the responses
- Elaboration of one’s own thinking -- the ability to add details and fill in the gaps

TTCT Test Developed by Ellis Paul Torrance building on the work of J.P. Guilford in 1996 and has been renormed 4 times since.
Testing Creativity: TTCT

Starting Shapes

Use

Combine

Complete

Sample TTCT question Developed by Ellis Paul Torrance.

Testing Creativity: TTCT

Starting Shapes

Use

Combine

Complete

Completed Drawing

More Creative

Less Creative

Sample TTCT question Developed by Ellis Paul Torrance.
Expanding What Defines Creativity

In addition to having eccentric or unique thoughts—creativity involves preparation, incubation, insight, evaluation, and elaboration. (1)

Judgements about the appropriateness and usefulness of ideas and the ability to be adaptive within task constraints are essential criteria for creative thinking. (2)

It is important for creative thinking to move across vehicles of thought, from numbers to verbal language to visual imagery. (3)


QEP Definition of Creative Thinking

“Creative Thinking is generating new ideas within or across domains of knowledge, drawing upon or intentionally breaking with established symbolic rules and procedures. In the context of college teaching and learning, creative thinking, deliberately and actively engages students in bringing together existing ideas into new configurations, developing new properties or possibilities for something that already exists, and discovering or imagining something entirely new.”

NCSU QUALITY ENHANCEMENT PLAN: Higher-order Skills in Critical and Creative Thinking p 17
Creative Thinking Intellectual Standards

The intellectual standards for judging Creative Thinking are:

• **Originality** – constructive imagination and independent thought.
• **Adaptability and flexibility** – the ability to adjust thinking under new or unstable conditions and to move among various vehicles of thought (numerical, linguistic, visual) depending on the situation or context.
• ** Appropriateness** – goodness of fit between the constraints of the problem and the properties of the solution.
• ** Contribution to the domain** – the accepted worth of new ideas within the discipline.

“CREATIVICAL” THOUGHT

• How might creative and critical thought be merged in your classroom?
• Is there an assignment or a module where you could emphasize these two things concurrently?
• Is your motivation for being part of TH!NK to inject more creativity in the classroom? More criticality? a mixture?
• Where have you seen the biggest issues?
The Relationship between Critical and Creative Thinking, from The Five Colleges of Ohio Creative and Critical Thinking Project
TH!NK Video

Discipline-specific Critical + Creative Process Activity
Critical and Creative Thinking in Design.

- Gather information to empathize more fully with users.
  - What are user needs and wants?
  - What is their frame of reference?
  - How has past experience shaped current understanding or use?
  - What are the different points of view?
  - What are my assumptions about the users and product?

- Evaluate constraints, reach conclusion about production.
  - How will this work?
  - How will it be produced?
  - How will it look?
  - What are the potential consequences?
  - Am I being flexible and adapting what I’ve learned?

- Translate, test and program and solutions.
  - What are the wicked problems?
  - What are the subproblems?
  - What other problems that might arise?
  - Have I looked at this from all angles?

- Consider alternative programs and solutions.
  - What are the components that need to be included?
  - What is the experience of using it?
  - How do the form and function relate?
  - How can I challenge myself to gain insight? Have I explored all possibilities?

- Communicate functionality, usability and innovation.
  - Is my idea clear?
  - What gap does it fill?
  - Is my research connected to my outcome?
  - Have I been thorough?
  - How is this contributing to future designs and to the world?

- Effectively communicating
  - Raising questions, formulating problems
  - Reaching reasoned conclusions
  - Considering alternatives
  - Synthesizing and generating ideas
Have I clearly defined the problematic?
Have I thoroughly addressed all areas defined in the problematic?
Does the organization/visual presentation aid the argument?
Does it address audience at their level of expertise/interest?

What questions arise from the text(s)?
What specifically elicits these questions (key notions)?
What are the relations between the key notions/forms?
Which question is most pertinent (to CFP, conference, course, interest, etc.)?

Communicate argument effectively.

Gather secondary sources, refine problematic.

Critical and Creative Thinking in the Humanities

What is the literary/historical/theoretical context of "text"?
What is the critical consensus on this topic/text?
What remains to be examined (gaps)?
What are possible theoretical approaches to the question?
Why does this question matter?

Reach reasoned and novel conclusions.

What are the main axes of analysis?
What subquestions must be addressed to reach a reasoned conclusion?
What is the scope of the question to be considered?

What is the quality of my sources (scholarship record, publication, etc.)?
What contradictions arise within primary and/or secondary sources?
Should I consider alternative theoretical approaches?

Define the problematic.

Consider alternative solutions.

Tailor to Behaviors in Your Discipline
### Course Timeline

**Fall Semester 2015**

<table>
<thead>
<tr>
<th>WK</th>
<th>PRIMARY TOPICS</th>
<th>AUGUST</th>
<th>SEPTEMBER</th>
<th>OCTOBER</th>
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Critical and Creative Thinking Behaviors

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## Critical and Creative Thinking Behaviors

Brainstorm possible course assignments which reinforce critical and creative thinking behaviors. You may explore either quick, low stakes projects which isolate one or two behaviors or you may consider how to scaffold the larger “Critical and Creative Thinking Activity” which you will score with the Common Rubric.

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Mapping Existing Assignments

TH!NK Faculty Workshop
Spring 2019

CONTENT vs. PROCESS

Course primarily organized through topics and information to be covered

Course primarily organized through thinking processes and behaviors
CONTENT vs. PROCESS

Course primarily organized through topics and information to be covered

Course primarily organized through thinking processes and behaviors

THINK Course Timeline
Fall semester 2006

- Composition
- Stereotomic
- Tectonic
- Light
- Portfolio

- Photos
- Diagrams
- Models
Behaviors | Assignment Ideas (or in class activities)
--- | ---
Raising Questions, Formulating Problems | Understanding context in order to frame the problem space — in small groups or individually; the primary goal is to come from the specific requirements of the domain to the form of questions; challenge, or issue at hand. Evaluating: Logic, Appropriateness, Significance, Relevance.
Gathering and Assessing Relevant Information | Analyzing and evaluating information further framing and articulating the problem space scope and identifying and analyzing information. Evaluating: Breadth, Fairness.
Synthesizing and Generating Ideas | Synthesizing information and generating multiple solutions to the problem — assess the problem of how interrelated ideas produce relevant and constructive ideas while relating to the thinker’s knowledge of the domain. Use peer review; require synthesizing concepts and information, often in original configurations. Evaluating: Appropriateness, Fairness, Originality.
Considering Alternatives | Evaluating insight about alternatives and choosing a solution — when one of these associations for the problem as well i.e., inappropriate idea to consider. The thinker monitors developing work, pays attention to good and bad options, compares ideas to domain knowledge and methods, and exhibits strategies in solving similar problems. Evaluating: Adaptability, Flexibility, Appropriateness.
Resolving Reasoned Conclusions | Evaluating the worth and consequences of an interrelated solution — critical judgmental work in multisteps to the original idea. Evaluating: Contribution to the Domain, Appropriateness.
Effectively Communicating | Evaluating: clarity, originality, logic, significance.
Scales of Transformation...

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<th>Redesigning the Entire course</th>
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<td>Identifying weakness from critical / creative process</td>
<td>Considering larger framework of critical / creative process</td>
<td>All assignments + curriculum tweaked / re-designed.</td>
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<tr>
<td>Identify weakness from Intellectual Standards</td>
<td>Some existing assignments, some new / redesigned assignments.</td>
<td>All assignments follow critical / creative process</td>
</tr>
<tr>
<td>Demonstration + Reflection</td>
<td>Goal is to strengthen multiple Intellectual Standards, Critical/ Creative Process and Self-Reflection</td>
<td>Multiple Intellectual Standards are addressed in each assignment</td>
</tr>
<tr>
<td>Goal is to strengthen one or two Intellectual Standards, Critical/ Creative Processes and/or Self-Reflection</td>
<td></td>
<td>Goal is all standards and process is addressed by end of semester</td>
</tr>
</tbody>
</table>
## Examples of In-Class Activities

### Teaching Strategies Aligned with Critical and Creative Thinking Behaviors

<table>
<thead>
<tr>
<th>Raising questions and formulating problems</th>
<th>Reaching reasoned conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divergent Thinking *</td>
<td>Critical Thinking Scenarios *</td>
</tr>
<tr>
<td>Working Across Vectors of Thought *</td>
<td>Concept Mapping and lotus Blossom *</td>
</tr>
<tr>
<td>Concept Mapping and lotus Blossom *</td>
<td>Three-Finger Summary and Issue Tree *</td>
</tr>
<tr>
<td>Case Studies</td>
<td>Case Studies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gathering and assessing relevant information</th>
<th>Effectively communicating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthesis Matrix *</td>
<td>Peer Review *</td>
</tr>
<tr>
<td>Critical Reading *</td>
<td>Data Visualization *</td>
</tr>
<tr>
<td>Rhetorical Analysis *</td>
<td>Discussion Strategies</td>
</tr>
<tr>
<td>Using the Intellectual Standards to Assess Information and Arguments *</td>
<td>Collaborative Learning Techniques **</td>
</tr>
<tr>
<td>Concept Mapping and lotus Blossom *</td>
<td>Think-Pair-Share</td>
</tr>
<tr>
<td>Categorizing Grid / Defining Features Matrix ***</td>
<td>Round Robin</td>
</tr>
<tr>
<td>Content, Form, and Function Outline ***</td>
<td>Baz Groups</td>
</tr>
<tr>
<td>Evaluation / Critique of Primary Literature</td>
<td>Talking Chips</td>
</tr>
<tr>
<td>Content Analysis, Data Analysis</td>
<td>Three-Step Interview</td>
</tr>
<tr>
<td></td>
<td>Critical Debate</td>
</tr>
<tr>
<td></td>
<td>Writing Individual or Group Project ***</td>
</tr>
<tr>
<td></td>
<td>Invented Design ***</td>
</tr>
<tr>
<td></td>
<td>Gallery Work</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Synthesizing and generating ideas</th>
<th>Reflecting at each stage of the process</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEE Activity *</td>
<td>Misconception *</td>
</tr>
<tr>
<td>Writing to Titles *</td>
<td>Reflection of Work *</td>
</tr>
<tr>
<td>Synthesis Matrix *</td>
<td>Peer Review *</td>
</tr>
<tr>
<td>Analogies/Metaphors</td>
<td>* &quot;chunking&quot; in Process Review of Drafts *</td>
</tr>
<tr>
<td>Critical Thinking Scenarios *</td>
<td>Writing in Threes *</td>
</tr>
<tr>
<td>Concept Mapping and lotus Blossom *</td>
<td>3-3</td>
</tr>
<tr>
<td>Divergent Thinking *</td>
<td>Eat a Skillet Paper (repeated)</td>
</tr>
<tr>
<td></td>
<td>Exam Wrappers</td>
</tr>
<tr>
<td></td>
<td>Goal Revising and Matching ***</td>
</tr>
<tr>
<td></td>
<td>Annotated Literature, Fundamental and Powerful Concepts</td>
</tr>
<tr>
<td></td>
<td>Journal Writing/Grouping Log</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Considering alternatives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Divergent Thinking **</td>
<td></td>
</tr>
<tr>
<td>Critical Thinking Scenarios **</td>
<td></td>
</tr>
</tbody>
</table>
### Intellectual Standards of Critical Thinking

<table>
<thead>
<tr>
<th>Clarity</th>
<th>Could you give me an example or elaborate further? Could you illustrate what you mean?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>How could we check on that? How could we verify or test that?</td>
</tr>
<tr>
<td>Precision</td>
<td>Could you be more specific? Could you give me more details?</td>
</tr>
<tr>
<td>Relevance</td>
<td>How does that relate to the problem? How does that help us with the issue?</td>
</tr>
<tr>
<td>Depth</td>
<td>What are some of the complexities of this question? What factors make this a difficult problem?</td>
</tr>
<tr>
<td>Breadth</td>
<td>Do we need to look at this from another perspective? Do we need to consider another point of view?</td>
</tr>
<tr>
<td>Logic</td>
<td>Does all this make sense together? Does what you say follow from the evidence?</td>
</tr>
<tr>
<td>Significance</td>
<td>Is this the central idea to focus on? Is this an important problem to consider?</td>
</tr>
<tr>
<td>Fairness</td>
<td>Do I have any vested interest in this issue? Am I sympathetically representing the viewpoints of others?</td>
</tr>
</tbody>
</table>

### Intellectual Standards of Creative Thinking

<table>
<thead>
<tr>
<th>Originality</th>
<th>Did the idea arise from constructive imagination and independent thought?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility &amp; Adaptability</td>
<td>Did you adjust your thinking to changes in the situation or context?</td>
</tr>
<tr>
<td>Appropriateness</td>
<td>Is there a good fit between the constraints of the problem and the properties of the solution?</td>
</tr>
<tr>
<td>Contribution to the Domain</td>
<td>Is the new idea of value to the discipline?</td>
</tr>
</tbody>
</table>

Using the Intellectual Standards to Gather & Assess Relevant Information and Arguments

## Intellectual Standards

<table>
<thead>
<tr>
<th>Clarity</th>
<th>being easy to understand and free from confusion or ambiguity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>being free from errors, mistakes, or distortions</td>
</tr>
<tr>
<td>Precision</td>
<td>being accurate, definite and exact</td>
</tr>
<tr>
<td>Relevance</td>
<td>bearing upon or relating to the matter at hand</td>
</tr>
<tr>
<td>Depth</td>
<td>dealing with the complexities of the issue</td>
</tr>
<tr>
<td>Breadth</td>
<td>recognizing insights in more than one side of a question</td>
</tr>
<tr>
<td>Logic</td>
<td>reasoning correctly with the system of principles, concepts, and assumptions that underlie a discipline, activity or practice</td>
</tr>
<tr>
<td>Significance</td>
<td>having relative importance</td>
</tr>
<tr>
<td>Fairness</td>
<td>treating all sides alike without reference to one’s own feelings or interests</td>
</tr>
<tr>
<td>Originality</td>
<td>constructive imagination and independent thought</td>
</tr>
<tr>
<td>Adaptability</td>
<td>the ability to adjust thinking under new or unstable conditions and to move among various vehicles of thought depending on context</td>
</tr>
<tr>
<td>Appropriateness</td>
<td>goodness of fit between the constraints of the problem and the properties of the solution</td>
</tr>
<tr>
<td>Contribution to the Domain</td>
<td>the accepted worth of new ideas within the discipline</td>
</tr>
</tbody>
</table>
Skills Practiced

Evaluating Primary Literature: BEFORE

Overview
- Provide title, authors, and journal reference.
- An explicit statement of the purpose and focus of the current work.
  In other words, put the work in context and state what the authors are trying to prove, disprove, or find out.

Results
For at least two experiments, summarize:
- What question was addressed?
- What was done (broadly, not specific protocol steps)?
- State the result obtained.
  Decide in advance what experiments are best to cover. I suggest you read the Results section of the paper, referring to the Materials and Methods for details and clarification as you go along.

Summary
- What did you learn?
- What do the authors state still needs to be done?
- Was the paper good or bad? Why?
Evaluating Primary Literature: AFTER

• What was the overall question/problem addressed by this paper? Define the scope of the problem that was explored (depth, breadth/perspective)?

• Select one experiment detailed in the results section of the paper (usually each experiment has one or more figures associated with it), and summarize the following:
  – What question was addressed? Was it/why was it significant to the study?
  – What was done (broadly, not specific protocol steps)? Were the methods employed appropriate to address the problem/question?
  – State the result obtained and its relevance to the overall question addressed by the paper.

• Who is the intended audience for this article? Was this article written with clarity for the intended audience?

• Did the conclusions follow logically from the data? Provide an example.

• Did the authors consider alternate conclusions of the data? Provide an example. Are there any interpretations that you thought about that the author did not consider?

• Given the findings and approach taken in this work, does it lead you to any questions you would like to address with respect to the P. larvae phage we are studying in our research project? List as many research questions as you can think of. Select one research question and provide a possible methodology to pursue (briefly). Explain why you selected the above research question from among your alternatives.

Quick Comparison

Before Revising
For at least two experiments, summarize:
• What question was addressed?
• What was done (broadly, not specific protocol steps)?
• State the result obtained.

After Revising
Select one experiment detailed in the results section of the paper (usually each experiment has one or more figures associated with it), and summarize the following:
• What question was addressed? Was it/why was it significant to the study?
• What was done (broadly, not specific protocol steps)? Were the methods employed appropriate to address the problem/question?
• State the result obtained and its relevance to the overall question addressed by the paper.
Peer Evaluation Rubric (partial)

<table>
<thead>
<tr>
<th>Section</th>
<th>1. The report scratches the surface.</th>
<th>2. The report explores complexities with appropriate depth.</th>
<th>3. The report explores complexities with appropriate depth.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>1. The report only scratches the surface.</td>
<td>2. Some complexities are explored in the report, but it would benefit from deeper exploration.</td>
<td>3. The report explores complexities with appropriate depth.</td>
</tr>
<tr>
<td>Breadth</td>
<td>1. The scope is either much too narrow or much too broad (unfocused).</td>
<td>2. Some adjustment in narrowing or broadening the scope is needed.</td>
<td>3. The scope of the report is appropriately broad and contains the important elements/experiments of the research.</td>
</tr>
<tr>
<td>Logic</td>
<td>1. The report has a significant or multiple logical flaws.</td>
<td>2. The overall report makes sense, but there are some logical inconsistencies.</td>
<td>3. The conclusions stated follow logically from the data.</td>
</tr>
<tr>
<td>Significance</td>
<td>1. Student relates a few of the findings back to the research question, and/or relationship is not fully clarified.</td>
<td>2. Student appropriately relates a number of findings to the research question.</td>
<td>3. Student eloquently relates findings to the overall research question.</td>
</tr>
<tr>
<td>Fairness</td>
<td>1. Alternate interpretations are either not raised or discarded without consideration.</td>
<td>2. Alternate interpretations are raised, but are given only partial consideration.</td>
<td>3. Alternate points of view/interpretations are appropriately considered.</td>
</tr>
</tbody>
</table>

Overall recommendation:
- Publish with no or minor revision
- Recommend for publication with moderate revision
- Not recommended for publication

Below, indicate an aspect of the paper that you thought was well-done and you learned from.

---

Self-Reflection of Rhetorical Analysis of Film Trailer

1. Pick **three** Intellectual Standards of Critical and/or Creative Thinking that are exemplified in your Project 2 paper. Explain how each standard was used effectively, citing *specific* examples from your work.

2. What, in your opinion, was the **most important** Intellectual Standard that contributed to your paper’s success? Explain.

3. Pick **at least one** Intellectual Standard that could’ve been more explicit or effective in your paper. Explain how you might approach or incorporate this particular standard in future assignments.
Student Example

Pick at least one Intellectual Standard that could’ve been more explicit or effective in your paper. Explain how you might approach or incorporate this particular standard in future assignments.

“Fairness: I never addressed any argument but my own in this paper and this means that I did not display much fairness in my paper. I think that if I had found some articles that criticized the trailer for Inception, I could have used their opinions versus my own and actually make my argument stronger. This is a strategy discussed in our book, They Say, I Say. For future assignments, I will make sure to look out for information that goes against my argument just as much as supporting evidence. That way, I can establish more of the ‘they say, I say’ conversations in my papers.”
TH!NK Faculty Workshop
Spring 2019

Intellectual Standards & Self-Reflection

“We don’t learn from experience. We learn from reflecting on experience.” - Dewey
WRITE! (Interpretation with Justification Routine)

1. What’s going on?
2. What do you see that makes you say that?

Reflecting on Your Thinking

- What prior knowledge did you activate during the process?
- Did your interpretation change in reaction to other interpretations? Why or why not?
- Would you approach the task differently in the future? Why or why not?

***Bring in intellectual standards here
Why do we reflect on thinking?

**Metacognition** enhances one’s ability to think critically and creatively and promotes intellectual development.

Reflection about Thinking

• How do you help students reflect on their thinking process?

• The **Intellectual Standards** provide a foundation for many reflective prompts.

**Significance** Is this the important problem to focus on?
**Breadth** Do we need to consider another perspective?
**Fairness** Do I have a vested interest in this issue?
**Logic** Does what I say follow from the evidence?
**Flexibility/Adaptability** Did/would/should you adjust your thinking to changes in the situation or context?
The Critical and Creative Thinking Process

Raising Questions, Formulating Problems

- Is this an important problem to consider?
- Is the idea original?
- What is the scope of the question?
- What is broader context/situation of this question?
- What assumptions and bias do I bring to the issue at hand?
Gathering and Assessing Information

- Is the information relevant?
- What is the source of this information? Is it reputable? Is it biased?
- Do I have any vested interest in this issue?
- Am I considering the viewpoints of others?

Synthesizing and Generating Ideas

- Are my ideas novel and diverse?
- Am I approaching the question from diverse perspectives?
- Am I limiting possible divergent ideas due to pre-existing assumptions?
- Which ideas could be combined and which should be developed further?
Considering Alternatives

- Are the alternatives adaptable to different contexts?
- How well does each alternative meet the criteria of the question?
- In revisiting the initial problem/question, does this solution or interpretation address all dimensions of the problem/question?

Reaching Reasoned Conclusions

- Does this conclusion logically follow from the evidence?
- Are there alternative conclusions? How might I test those?
- Did I weigh the benefits and drawbacks of different ideas?
Effectively Communicating

- Do I understand my audience and how best to communicate to them?
- Am I using appropriate communication media (verbal, written, visual, etc.)?
- Do I connect it to overarching principles/“The Big Idea”?

How to Reflect: Writing to Think

- Writing increases students’ participation.
- Writing increases students’ communication skills.
- Writing encourages critical and creative thinking.
- Writing helps you know your students better.
Formative/Informal Reflective Writing

- Benefits of low-stakes writing activities:
  - Easily constructed and not very time-consuming
  - Serve a large range of goals
  - Do not necessarily require any grading (though you could use a very simple system – check/plus/minus scale; 5-point scale; etc.)

Opening Reflective Prompts

- Write down one question you have about the reading for today’s lesson and what you are most interested in learning more about.
- How does the topic we will talk about today relate to previous course work?
- Write or draw what you already think or know about the topic (e.g., use a concept map)
- What assumptions and bias do you bring to the issue at hand?
- What is the broader context/situation of this topic?
- Why is this an important problem/issue to consider?
Closing Reflective Prompts

- Minute papers / Exit slips
- How has your understanding of X changed?
- What kind of connections did you make in class today to prior knowledge?
- Suggest a modification to the experiment we discussed in class today that would make it more objective.
- Reflect on an assumption or how your thinking has changed as a result of the lesson, discussion, etc.
- What do you need to explore next in terms of thoughts and/or actions?

Other Reflective Prompts

- What you found confusing, inspiring, difficult, interesting and why.
- How you: solved a problem; reached a conclusion; found an answer; reached a point of understanding.
- Alternative interpretations or different perspectives on what you have read or done in the course.
- Comparisons and connections between what you are learning and: your prior knowledge and experience; your prior assumptions and preconceptions; what you know from other courses or disciplines.
- How new ideas challenge what you already know.
“3-2-1”

- **3 WORDS** that you think are important/essential to the meaning of the text
- **2 PHRASES** that are important to the text’s argument
- **1 SENTENCE** (this does not have to be the “thesis”; it could be a sentence that you found particularly well-written or thought-provoking)

**Uses:**
- Discussion (in class)
- Homework (out of class)
- Post to forum/website (Moodle, Padlet, etc.)

**Padlet**

Emma Ding
3 words: description, insiders, outsiders
2 phrases: “autobiography is both process and product” (para. 1) “the purpose of helping insiders and outsiders better understand the culture” (para. 7) 1 sentence “This is the autobiography not only to make personal experience meaningful and cultural experience engaging, but also by extending accessible texts, she or he may be able to reach wider and more diverse mass audiences that traditional research usually targets, a move that can make personal and social change possible for more people.” (para. 14).

Christopher Gross
3 words: engagement, experiences, culture
2 phrases: “study a culture’s relational positions, common values and beliefs, and shared experience” (para. 7) “help insiders understand the culture for insiders and outsiders” (para. 10) 1 sentence “In particular, they needed to concentrate on ways of describing meaningful, accessible, and engaging experiences grounded in personal experience, research that would enable readers to issue of identity politics, to experiences shared in social, and in terms of representation that deepens our capacity to empathize with people who are different from us.” (para. 6).

Mary Kate Harris
3 words: Personal, Subjectivity, Narrative
2 phrases: “famous characteristics of autobiography and ethnography” (para. 7) “offers new experiences and similar experiences” (para. 19) 1 sentence “Autobiography, not on the other hand, expands and opens up a wider lens of the world, exploring new definitions of what constitutes meaningful and useful research. This approach also helps us understand how the kinds of people we claim, or are perceived, to be influenced interpretations of what we study, how we study it and what we see about us.”

Sarah Ruby Ferguson
Systematically, analyze, meaningfully
2 phrases: “expanded and opens up a wider lens on the world…” (para. 4) “make classification of a culture familiar for insiders and outsiders.” (para. 8) 1 sentence “When researchers write autobiographies, they seek to produce aesthetic and meaningful texts descriptions of personal and interpersonal experience.” (para. 14)

Ciera Starkey
Related others, autobiography, and narrative
2 phrases: “autobiography combines characteristics of ethnography and ethnography” (para. 14) “autobiographies often maintain and value interpersonal ties with their participants…” (para. 30) 1 sentence “An autobiography should be aesthetic and evocative, engage readers, and use conventions of storytelling such as character, setting, and plot development and/or chronological or fragmented story progression.” (para. 7)

Alex Dostop
3 words: ethical, personal, identity
2 phrases: “problem of identity” (para. 10) “expands and opens up a wider lens of the world” (para. 9) 1 sentence “Autobiographies recognize the incorporation ways personal experience influences the research process.” (para. 3)

Connor Voelke
3 words: research, autobiography, experiences
2 phrases: “studying a culture’s relational positions, common values and beliefs, and shared experiences for the purpose of helping to understand the culture for insiders and outsiders” (para. 13) 1 sentence “Consequently, autobiography is one of the approaches that acknowledges and accommodates subjectivity, emotionality, and the researcher’s

Cara Brannen
3 words: autobiography, personal experiences, perspectives
2 phrases: “Autobiography recognizes the incorporation ways personal experience influences the research process.” (para. 3)
Out-of-class Reflective Writing

● Formative:
  ○ Journals
  ○ Blogs
  ○ Learning logs: especially useful for documenting & reflecting on process
  ○ Discussion boards

● Summative:
  ○ Reflection of Work

Sample out-of-class reflections on thinking:

○ Citing a specific example, did you take any linguistic risks when writing your journals? For example, did you try using a new word or phrase? How did it work out? Would you try this again? Do you think that not taking risks enhances or limits language learning? If you did not take any risks, why?

○ Last week, you reflected on whether the end justified the means with respect to the discovery of the smallpox vaccine (Jenner vaccinated then exposed his gardener’s son to smallpox). Do you think the end justified the means with respect to the Tuskegee experiment (greater understanding of the progression of syphilis)? How are these two experiments similar or different? If your views on whether the end justified the means are different, why?
Divergent Thinking Workshop

TH!NK Faculty Workshop
Spring 2019

TH!NK Student Learning Outcomes

- Effectively communicating
- Reaching reasoned conclusions
- Considering alternatives
- Synthesizing and generating ideas
- Raising questions, formulating problems
- Gathering and assessing relevant information
- Asking problem-based questions
- Questioning personal and disciplinary assumptions
- Seeking and generating alternative answers
- Reflecting on how I'm thinking and working
Convergent + Divergent Thinking Process

Divergent Thinking
Imagination
Generating New Possibilities

Convergent Thinking
Judgement
Decisions
Testing and evaluating
Divergent Thinking + Creativity

Divergent Thinking + Disciplinary Methods
Valid reasons why divergent thinking is often discouraged in classrooms:

- Divergent thinking acknowledges the merit of multiple ideas;
- Divergent thinking is often hard to measure;
- Divergent behavior in larger classrooms might cause disruption.
Emphasis on Convergent Thinking: Unintended Consequences

“All children are artists. The problem is how to remain an artist once he grows up.”

Pablo Picasso

We are currently “educating people out of their creativity capacities” by making mistakes the worst thing a student can do.

Sir Ken Robinson, TED Talk “How Schools Kill Creativity”

Creativity Research: George Land

- At 5 years old 98% scored in the “Creative Genius Category”
- Adults only scored 2% in the “Creative Genius Category”.

Land concluded that non-creative behavior is learned early on.
How do we encourage BOTH?

Integrating Divergent and Convergent Thinking:

Separate and give space to each type of thinking:
One of the problems with many educational models is that we ask students to do both types of thinking at the same time. So as students are supposed to be “brainstorming” they are also judging and criticizing and censoring--This sets up an unnecessary conflict between knowledge and imagination.

How do we encourage BOTH?

Integrating Divergent and Convergent Thinking:

Encourage play & manage failure
When failure is framed by reflection and iteration, and less by penalty and closure, we are more likely to loosen up in our efforts and be less afraid to make mistakes. Once we are less afraid to make mistakes, we open up the environment for play and experimentation.
How do we encourage BOTH?

Integrating Divergent and Convergent Thinking:

Encourage a diversity of perspectives
Intelligence is dynamic and interactive. Creativity (process of having original ideas that have value) comes about by the interaction of different disciplinary and perceptual ways seeing things.

• Encourage cross disciplinary connections
• Acknowledge contextual factors and alternative viewpoints
• Facilitate collaborative projects and group discussions

How do we encourage BOTH?

Integrating Divergent and Convergent Thinking:

Acknowledge multiple approaches
Intelligence is distinct and diverse. We think in all the ways we experience the world:

• Visually (through sight)
• Audibly (through sound)
• Kinesthetically (through touch)
• Abstractly (through concepts)
• Kinetically (through movement)

Divergent thinking assignments need to consider how a learner can use different ways to approach a problem. It requires using association and multiplicity of thought.
Divergent Thinking Activities

Asking Problem-Based Questions

Open-ended / Speculative Questions
- What if we looked at it from __________ perspective?
- What if we were ___________ stakeholder?
- What if the opposite happened?
- What if we switched __________ with __________?

Topic Analysis
- How would you describe __________?
- What are the causes/effects of __________?
- What is important about __________?
- How has __________ changed? Why are those changes important?
- What is known and unknown about __________?

Divergent Thinking Activities

Questioning Assumptions

Assessing Relevant Information
- Guided Peer Questioning
  What are the implications of __________?
  Why is _____________ important?
  What is another way to look at _____________?
- Inquiry-based Feedback
  I noticed that _______ why? and how?
Divergent Thinking Activities

Generating Alternative Answers

Ideating (1)
- Change your media
- Change constraints or criteria of the challenge or issue at hand
- Work in unknowns, take RISKS
- Build-in Translation and Abstraction

Concept Mapping
Free Writing
Brainstorming
Debate

Lateral Thinking
- Force New Associations and question bias and assumptions

(1) Keith Sawyer, Zig Zag

Divergent Thinking Tools:
Debate

In the late nineteen-forties, Alex Osborn, a partner in the advertising agency B.B.D.O., decided to write a book in which he shared his creative secrets. At the time, B.B.D.O. was widely regarded as the most innovative firm on Madison Avenue. Born in 1888, Osborn had spent much of his career in Buffalo, where he started out working in newspapers, and his life at B.B.D.O. began when he teamed up with another young adman he’d met volunteering for the United War Work Campaign.

By the forties, he was one of the industry’s grand old men, ready to pass on the lessons he’d learned. His book “Your Creative Power” was published in 1948. An amalgam of pop
Divergent Thinking Tools: Lateral Thinking

A term coined by Edward DeBono, lateral thinking describes problem solving through an **indirect** and **iterative** approach.

- Forces new associations
- Think about a concept or problem from a new angle
- Rethink a problem that we assume we understand
- Question assumptions and biases

Lateral Thinking

**Idea Generating Tools:**

- **Forced association:** Using either random association (pick an entry from the dictionary) or intentional analogy, think of the problem in terms of something else.
- **Provocation:** Exaggeration, wishful thinking, opposite perspective, distortion.
- **Concept Fan:** Take one idea and continue to build on it, again and again.
- **Anti-Solution:** Challenge conventional thinking and spark debate by starting with an action that would make the situation worse and work backwards.
Lateral Thinking: Forced Association

How could an office work more like a beehive?

Lateral Thinking: Provocation

What would this be like from the dog’s point of view?
Lateral Thinking: Concept Fan

How could we make grocery shopping worse?

Lateral Thinking: Anti-Solutions
Throughout the Entire Process

Divergent Thinking in Your Course

- How might you incorporate divergent thinking into an assignment, a lecture, a exercise?

- Are there short term, low-stakes exercises which you can scaffold throughout your course to encourage Divergent Thinking Behaviors? (inside or outside of class time)
Discipline-specific Critical Thinking Scenarios

Skills Practiced

- Effectively communicating
- Raising questions, formulate problems
- Reaching reasoned conclusions
- Considering alternatives
- Synthesizing and generating ideas
- Gathering and assessing relevant information
- Asking problem-based questions
- Questioning personal and disciplinary assumptions
- Seeking and generating alternative answers
- Reflecting on how I'm thinking and working
Sue’s Data

| Skill Assessed by CAT Question | Max points | Pre Mean | Post Mean | Probability of difference | Effect size
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 Summarize the pattern of results without making inappropriate inferences.</td>
<td>1</td>
<td>0.71</td>
<td>1.00</td>
<td>*</td>
<td>+.86</td>
</tr>
<tr>
<td>Q6 Provide alternative explanations for spurious associations.</td>
<td>3</td>
<td>1.93</td>
<td>2.36</td>
<td>*</td>
<td>+.69</td>
</tr>
<tr>
<td>CAT Total Score</td>
<td>39</td>
<td>23.33</td>
<td>26.02</td>
<td>*</td>
<td>+.67</td>
</tr>
</tbody>
</table>

Transferrable gains measured by CAT
Mean scores on pre-/post- Critical Thinking Assessment test. N=14

- a. * p<.05 **p<.01 ***p<.001 (2–tailed)
- b. Mean difference divided by pooled group standard deviation. (0.1 - 0.3 = small effect; 0.3 - 0.5 = moderate effect; >0.5 = large effect)

Discipline-specific gains on research papers
Mean rubric scores with standard error of control group versus test group. N=14 for both groups. p= 0.0064 and p= 0.016 (2–tailed) for each question respectively.
Blue = control; Red = TH!NK


Specific Skills

- Provide alternative interpretations for information or observations that have several possible interpretations.

- Identify additional information or evidence needed to evaluate the alternative interpretations.
Sample Scenario (exaggerated)

A scientist working in a government agency believes that an ingredient commonly used in bread causes criminal behavior. To support the hypothesis, the scientist notes the following evidence:

• 99% of criminals consumed bread prior to the criminal activity.
• Crimes rates are extremely low in areas where bread is not consumed.

Questions:
1. Do the data strongly support the hypothesis?
2. Are there other explanations for the data besides the scientist’s hypothesis? If so, describe.
3. What kind of additional information or evidence would support or oppose the scientist’s hypothesis?

Public Health Scenario 1

“But my Dad had the vaccine and still got the flu.”

1. Does this statement strongly support the idea that flu vaccines are not effective?
2. What are some alternative explanations for Dad getting the flu, besides that flu vaccine is not generally effective?
3. What other information would you need in order to support or oppose the different explanations?
MMR/Autism Scenario

1. What does the author of the graph want you to infer?
2. Give an alternate explanation for the data shown in the graph.
3. Suggest further data that you could gather to investigate the alternatives above.

Overstated conclusion in Primary Lit.

The 2014 publication by Lu et al entitled “Sub-lethal exposure to neonicotinoids impaired honey bees winterization before proceeding to colony collapse disorder” in Bulletin of Insectology has received considerable media attention. In the study, the researchers set up an experiment with 18 bee colonies. All 18 colonies are fed a constant supply of either a sucrose or HFCS syrup over a period of 13 weeks from July 2 – Sept 17. In 12 of the colonies, neonicotinoid pesticides were added to the syrup in a sub-lethal dose of 0.74 ng/bee/day. Bees were permitted over-winter, as normal. The researchers observed no difference in the treated versus non-treated hives during the summer and fall months. However, in April, 6 of the 12 neonic-treated colonies were dead, and 1 out of 6 non-treated colonies were dead. Furthermore, in the neonic-treated hives that had not successfully overwintered, few dead bees were found in the hive (as occurs in CCD), whereas many dead bees were present in the one control hive that did not successfully overwinter. The authors state that the data strongly support the idea that neonicotinoid poisoning is the primary cause of Colony Collapse Disorder.

- How strongly does the data support the conclusion that neonicotinoid poisoning is the cause of the widespread problem of colony collapse?
- Describe any problems you see with the experimental design or conclusion reached in the paper.
- What further information would you need to assess the veracity of the conclusion (either known information or further experimentation that could be pursued)?
Article review write-up

- What was the overall question/problem addressed by this paper? Define the scope of the problem that was explored (depth, breadth/perspective)?
- Select one experiment detailed in the results section of the paper (usually each experiment has one or more figures associated with it), and summarize the following:
  - What question was addressed? Was it/why was it significant to the study?
  - What was done (broadly, not specific protocol steps)? Were the methods employed appropriate to address the problem/question?
  - State the result obtained and its relevance to the overall question addressed by the paper.
- Who is the intended audience for this article? Was this article written with clarity for the intended audience?
- Did the conclusions follow logically from the data? Provide an example.
- Did the authors consider alternate conclusions of the data? Provide an example. Are there any interpretations that you thought about that the author did not consider?
- Given the findings and approach taken in this work, does it lead you to any questions you would like to address with respect to the P. larvae phage we are studying in our research project? List as many research questions as you can think of. Select one research question and provide a possible methodology to pursue (briefly). Explain why you selected the above research question from among your alternatives.

Possible Kinds of Topics

Data generated in class:
Students design an experiment but neglect an important control. They must describe all of the possible interpretations of the data and figure out how they should redesign the experiment to rule out some of the possibilities.

Current Headlines:
- Girls Who Play Soccer Have More Success in STEM Fields
- Frequent Reliance on Social Services Yields Shorter Life Span
- Eating Fast Food Leads to Depression

Overstated claims in primary literature (students can read entire paper, or summary of data and conclusions drawn)
Create a Scenario

Set up scenario – headline, figure from a journal article, public misperception of something in your discipline, results of an experiment that is consistent with more than one interpretation, etc.

1. Does the evidence strongly support the conclusion?
2. Are there other possible explanations? If so, describe.
3. What kind of additional information or evidence would support or oppose the original conclusion or any of the alternatives?

Acknowledgements

- Structure for Critical Thinking Scenarios was developed by Tennessee Tech for the NSF-funded Critical Thinking Assessment Test project.

- Autism/MMR and Public Health Scenarios developed by Sue Carson (NCSU).
Case Studies

Effectively communicating

Reaching reasoned conclusions

Considering alternatives

Synthesizing and generating ideas

Gathering and assessing relevant information

Raising questions, formulate problems

Skills Practiced

ASKING PROBLEM-BASED QUESTIONS

QUESTIONING PERSONAL AND DISCIPLINARY ASSUMPTIONS

SEEKING AND GENERATING ALTERNATIVE ANSWERS

REFLECTING ON HOW I'M THINKING AND WORKING
What is a Case Study?

1. Introduce the situation or problem.

2. Give background information - describe previous research or give students reading beforehand. Supporting data can range from data tables to links to URLs, quoted statements or testimony, supporting documents, images, video, or audio.

3. Evaluate, ask questions, come up with potential solutions.

4. Report out, summarize, make recommendations, reflect.

Case Study Example

PART I
Ignaz Semmelweis, a young Hungarian doctor working in the obstetrical ward of Vienna General Hospital in the late 1840s, was dismayed at the high death rate among his patients. He had noticed that nearly 20% of the women under his and his colleagues' care in Division I of the ward (the division attended by physicians and male medical students) died shortly after childbirth. Semmelweis noted that this death rate was four to five times greater than that in Division II of the ward (the division attended by female midwifery students).
Case Study Example

PART II
One day, Semmelweis and some of his colleagues were in the autopsy room performing autopsies as they often did between deliveries. One of Semmelweis' colleagues, Jakob Kolletschka, accidentally punctured his finger with the scalpel during an autopsy. Days later, Kolletschka became quite sick, showing symptoms not unlike those of “childbed fever.” His friend's subsequent death strengthened Semmelweis' resolve to understand and prevent childbed fever.

Case Study Example

PART III
In an effort to curtail the deaths in his ward due to childbed fever, Semmelweis instituted a strict hand washing policy amongst his male medical students and physician colleagues in Division I of the ward. Everyone was required to wash their hands with chlorinated lime water prior to attending patients. In 1848 (the first full year of hand washing in Division I), 45 of 3556 patients died in Division I and 43 of 3219 patients died in Division II.
Case Study Example

PART IV

Despite the dramatic reduction in the mortality rate in Semmelweis’ ward, much of the greater medical community greeted his findings with hostility or dismissal. And despite evidence that hand washing (to remove “cadaverous particles”) could save lives, doctors were reluctant to comply, as expressed by Dr. Charles Meigs, a leading obstetrician and teacher: “Doctors are gentlemen, and gentlemen’s hands are clean.” In 1861, Semmelweis finally published his principal work on the subject of puerperal sepsis, which received a mixed response.

In 1879, Pasteur identified the *Streptococcus* responsible for puerperal sepsis.

Why Use Case Studies?

To teach problem-solving skills

To foster learning communities

To engage students in genuine exploration of content

Or to keep them awake
How Can You Use Case Studies?
Small-Enrollment Classes

• Have students work on and present their case studies to the class.

• Allow students to develop their own case studies based on current events, scientific data, or literary discoveries.

• Consider having students write a case study as an honors project – it builds up your bank of case studies.

How Can You Use Case Studies?
Large-Enrollment Classes

• ALWAYS make time in class to introduce the study and allow for questions and discussion.

• Embed them into powerpoints and do them as clicker activities.

• Put information on projector in small digestible pieces and encourage discussion before giving them the next piece.

• Assign groups and have students do them as a take home assignment.
Brainstorm for Your Discipline

- What would make a good case study topic?

- How could you fit it into your class? In-class or out-of-class?

- How would you assess it?

Giving Up Content in a Content-Intensive Course

- Re-write your learning outcomes to address problem-solving skills.

- Students already know how to memorize - most employers value problem-solving over memorizing.

- Remind yourself that it’s more important for students to have a big picture than memorize minutiae that they will forget as soon as the test is over.
Other Pitfalls of Using Case Studies?

How Can You Avoid Them?

Concluding a Case Study:
Assessment from Student Perspective

Grading (especially in large-enrollment classes) can be daunting.

- Consider having students complete and turn in assignments as a group.

- It does not have to be a large percentage of their grade – sometimes just check to make sure they’ve completed it. Give feedback as general discussion or via Moodle.
Concluding a Case Study: Assessment of Activity

• Anecdotally, case studies are well-received by students and they think they remember concepts presented this way.

• But how can you assess that? Build in test questions or assignments specific to skills addressed in case studies.

• How do their skills compare to students that did not participate in the case study?

This takes FORETHOUGHT!

Acknowledgements/Resources

• National Center for Case Study Teaching in Science
  http://sciencecases.lib.buffalo.edu/cs/

• Agriculture and Industry
  www.agofthemiddle.org

• Using Case Studies to Teach
  http://www.bu.edu/ctl/teaching-resources/using-case-studies-to-teach/

• Childbed Fever Case Study
Introduction to SoTL/DBER Research

TH!NK Faculty Workshop
Spring 2019

What is SoTL (Scholarship of Teaching and Learning)?

- The goal of SoTL is to improve one's own teaching practice through innovations in pedagogy and curriculum and to serve as a model for others
- SoTL studies are typically descriptive, and focus on innovations that address learning goals
- Scholars systematically gather data that lead to self-reflection, improved teaching practices, and improved student learning
- SoTL studies are often specific to a course and the instructor's personal context, but conclusions must be supported by evidence and have broader applications so as to serve as a potential model for other instructors and at other institutions
Things to consider

- SoTL is an opportunity to think deeply, gather data purposefully, and disseminate your teaching excellence
- SoTL research is a good option as a first foray into education research
- SoTL is also a sustainable research direction for those who plan to maintain their research career while also branching into GER

List of SoTL Journals

- [https://go.ncsu.edu/sotljournals](https://go.ncsu.edu/sotljournals)
- Arranged by discipline
- Also consider blogs
What is DBER (Discipline-Based Educational Research?)

- The goal of DBER is to test theory and produce generalizable findings focused on teaching, learning, and ways of thinking in a discipline
- DBER can also include investigations into the development and nature of expertise in a discipline as well as strategies for making the field more inclusive
- While DBER may differ slightly between disciplines, common to all is that researchers systematically gather data that leads to knowledge for improved teaching and student learning
- The findings should be broadly applicable beyond a single course or instructional context; they are usually published in peer-reviewed journals

Keep in mind

- Editors and reviewers will have high expectations for methodologies and theoretical frameworks
- It is important to make sure you are using and citing the appropriate methodological and theoretical references
- There are journals both in and outside your field that may be appropriate to publish your studies
List of DBER Journals

- https://go.ncsu.edu/dberjournals
Concept Mapping, Mind Mapping, Lotus Blossoms

Skills Practiced

- Effectively communicating
- Reaching reasoned conclusions
- Considering alternatives
- Asking problem-based questions
- Questioning personal and disciplinary assumptions
- Seeking and generating alternative answers
- Reflecting on how I'm thinking and working
- Gathering and assessing relevant information
- Synthesizing and generating ideas
- Raising questions, formulating problems
What the research tells us.....

• Experienced professionals:
  – Spend more time understanding and defining “the problem”
  – Spend more time in problem scoping & information gathering
  – Think broadly about constraints of the problem
  – Consider assumptions and perspectives of others
  – Evaluate many alternatives

• Undergraduate students:
  – Sacrifice quality for speed
  – More prone to bias
  – Struggle to identify constraints
  – Consider fewer alternatives

A Tool to Uncover Relationships

Concept maps, mind maps, and lotus blossoms are types of graphic organizers used to organize ideas and show interrelationships. They remove the barrier of writing prose in a linear fashion and allow the creator to brainstorm freely.

Concept maps are less hierarchical than mind maps/lotus blossoms.

3 Main Steps:

1. Start with a main idea, issue, or topic to focus on
2. Determine the key concepts
3. Connect the concepts - using linking words and phrases
When and How?

**BEFORE** a learning module to help students reflect on what they already know (or assume) about a topic.

*Students mind/concept map on giant post-its in small groups.*

**AFTER** a learning module to help students integrate new understanding with prior knowledge.

*Repeat activity above revising or adding to old map, or work individually, including concept map in reflective journal.*

To **ASSESS** understanding.

*Students create a concept map in response to a test or quiz question. Students often include more information and are better able to articulate interconnectedness in this format than in a written essay.*
Mind Maps

Mind Map of Social Media Components

Student Mind Map

Katherine Craven

Honors Outbreak Final Concept Map

Spanish Flu - 1918

Influenza

Black Plague

Economics: Growth, Stability, and Poverty

Mad Cow

Spanish Flu - 1918

Trade

Imperialism

War

What was at war

War and trade

Great depression

Spanish Flu - 1918

Economics: Growth, Stability, and Poverty

Great depression

Trade

Imperialism

War
Lotus Blossom Technique
forces minimum number of ideas

Developed by Japanese researcher, Yasuo Matsumura, See more at:
http://www.5by5design.com/blog/design-practice/lotus-blossom-technique/#sthash.QAh2VAGq.dpuf
Benefits

- Reflecting on prior understanding
- Organizing thoughts and relationships
- Generating new ideas and questions
- Allowing students to more clearly communicate ideas, thoughts and information without the barriers of linear writing
- Integrating new concepts with prior knowledge

Fostering Learning Communities in the Classroom

- Think-Pair-Share and discuss the following two questions.
- What is your definition of a Learning Community?
- What is the Value of a Student Learning Community?
What might a Learning Community Look Like in Your Classroom?

• What are some ways you are currently fostering learning communities in or out of your classroom?

• An opportunity for students to engage/collaborate with each other?

• Team Projects? Make your discipline relevant to students. EX: How does BIOLOGY “help” during epidemics, environmental disasters, feeding the growing world population?

Learning Community as Group Work

• Some students claim to “hate” group work.

• Can we design group work so students see the value?

• Is group work the only way of fostering a learning community?
Learning Community Design

- Benefits and Pitfalls: Can it be more meaningful to students or more manageable and productive for you?

- How inclusive is it? Is everyone benefitting? Is there closure and time for reflection and feedback?

Design a Concept Map or Lotus Blossom for a Learning Community in Your Classroom

It may look different depending on student enrollment, classroom facility, and many other factors.

Grab a giant post-it, some markers and some friends and create.

Take 5-10 minutes and then we will share out.
Further information & References

3. *The Pyramid Principle*, Barbara Minto – useful book on using logic to structure thinking, arguments and communication
4. Scoping SDD Projects: Part II: Issues Trees provided by the Australian Government’s Dept of the Prime minister and cabinet
Introduction to Common Rubric & Reflection of Work

Figure 1: The creative process

Assessment Tools

Figure 1: The creative process
<table>
<thead>
<tr>
<th>What is the problem you are trying to address, who is the intended audience, what is the desired outcome?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue/problem to be considered critically is stated but leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown</td>
</tr>
<tr>
<td>Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions</td>
</tr>
<tr>
<td>Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Gathering and assessing relevant information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information is taken from source(s) without any interpretation/evaluation</td>
</tr>
<tr>
<td>Information is taken from source(s) with interpretation/evaluation but not enough to develop a coherent analysis/synthesis</td>
</tr>
<tr>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis/synthesis</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Considering perspectives</th>
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<tbody>
<tr>
<td>Acknowledges (mentions in passing) alternate, divergent, or contradictory perspectives or ideas.</td>
</tr>
<tr>
<td>Includes (recognizes the value of) alternate, divergent, or contradictory perspectives or ideas in a small way.</td>
</tr>
<tr>
<td>Incorporates alternate, divergent, or contradictory perspectives or ideas in an exploratory way.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What factors did you consider in deciding the format of the work/the question to focus on, etc?</th>
</tr>
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<tbody>
<tr>
<td>Generates a single idea</td>
</tr>
<tr>
<td>Generates multiple ideas within a limited range.</td>
</tr>
<tr>
<td>Generates multiple, divergent ideas that draw on a wide range of perspectives</td>
</tr>
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<thead>
<tr>
<th>What other ideas did you rule out and why?</th>
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<tbody>
<tr>
<td>Recognizes relevant benefits and drawbacks of ideas but does not compare values of each</td>
</tr>
<tr>
<td>Weighs the value of relevant benefits and drawbacks of ideas</td>
</tr>
<tr>
<td>Weighs the value of relevant benefits and drawbacks of ideas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effectively communicating</th>
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<tbody>
<tr>
<td>Describes chronology of steps or an undifferentiated inventory of ideas</td>
</tr>
<tr>
<td>Attributes some decisions to an overarching principle; applies principle inconsistently; or explanation is piecemeal or afterthought</td>
</tr>
<tr>
<td>Provides coherent narrative linking idea/solution attributes to constraints and provides some insight into generalizable concepts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abstract thinking or Relating the “Big Idea”</th>
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</thead>
<tbody>
<tr>
<td>Ideas may not be relevant and/or there is no/tite obvious organization</td>
</tr>
<tr>
<td>Presents relevant information but ideas are poorly organized</td>
</tr>
<tr>
<td>Presents compelling argument linking ideas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides coherent argument linking ideas</td>
</tr>
<tr>
<td>Provides coherent argument linking ideas</td>
</tr>
<tr>
<td>Provides coherent argument linking ideas</td>
</tr>
</tbody>
</table>
Project Summary for Tailored RoW

Outbreak Final Project:
This final project will combine your knowledge and ability to research aspects of an infectious disease outbreak with your critical and creative thinking skills. You will create a work aimed at educating a certain group of individuals about your chosen infectious disease. There must be an outcome that you want to achieve through this educational strategy. Some examples of possible audiences and types of work are listed below, but you are not limited to these ideas.

- Possible audience: American elementary school children, American parents, West African adults, American health care workers, West African health care workers, future college students taking this class, etc.

- Possible types of work: brochure/pamphlet, novel case study with discussion questions, board or video game, short documentary, poster, video or radio PSA, painting, song, etc.

The type of work you chose must be appropriate for your target audience and the outcome you want your work to achieve.

Student Work

Dengue Fever: What is it?
- Deadly viral disease carried by mosquitoes
- Cloudy related to the West Nile Virus and the West Nile Fever
- There are four different dengue strains
- Approximately 100,000 people are hospitalized each year
- Most cases occur in tropical areas around the world

What to do if you become infected
- If you are feeling ill, you should immediately consult a doctor.
- Take antibiotics with suspected bacterial infection.
- Seek emergency medical care if any of the following symptoms occur:
  - Severe bleeding
  - Severe headache
  - Severe vomiting
  - Skin rash
  - Yellowish discoloration of the skin
  - Swells of the face, legs, and eyes

Do you have Dengue Fever?
- Signs and Symptoms
  - Sudden high fever
  - Severe headache
  - Pain behind the eyes
  - Sore joints and muscle pain
  - Fatigue
  - Nausea
  - Vomiting
  - Skin rash
  - Weakness
  - Skin rash

What to do if you suspect Dengue Fever
- If you suspect Dengue Fever, you should consult a doctor immediately.
- If you are not sure, you should consult a doctor immediately.
- If you think you have Dengue Fever, you should consult a doctor immediately.
- If you have recently traveled to a country where Dengue Fever is common, you should consult a doctor immediately.
- If you have not traveled to a country where Dengue Fever is common, you should consult a doctor immediately.

Outbreak Final Project
Jake Nester, Fall 2015
Outbreak Final Project
Jacqueline Welles, Fall 2015

Link to Vickie Vaxx

Outbreak Final Project
Jessica Kronz, Fall 2016
Tailored Reflection of Work

Annotated Bibliography: (included in the assignment)

Provide an annotated bibliography of the references used for the work. The annotations should include why you selected each source and the strengths and weaknesses of the source. Mention any criticisms you have of the information provided in the sources. If you found the source to be biased or unreliable in some way, explain the issue and why you still chose to include the reference.

Reflection of Work:

1. Define the overall scope of your work (e.g. what is the problem you are trying to address, who is the intended audience, what are you trying to get across, what is the desired outcome, etc).

2. Imagine you are trying to get external funding for this project. Explain the significance of this project. Why is the problem you are addressing important and why is your approach likely to be successful?

3. Did any of your references conflict with one another? If so, how did you resolve this? If not, did you discard any conflicting sources? Explain.

4. What did you consider in deciding the format of the work? Why did you choose the medium you used (brochure, game, video, song, etc)? What other ideas did you rule out and why?

Reflection of Work (continued):

5. For at least one specific feature, describe the possibilities you considered and how you came to your decision.

6. If you were targeting a different audience, in what specific ways would you modify the work and why? For example, a change from patients to doctors or from college students to children – choose any change in audience you prefer. Please make clear the new audience along with the changes.

7. Over the course of researching this project, or another instance in the semester, was there a time when you realized you made incorrect or inappropriate assumptions? If so, describe here.

8. Select either a disease we covered in class, or a disease related to your final project. Create a concept map that makes labeled linkages between items that fall under different main categories (i.e. biological, historical, cultural, literary, etc.). I need to be able to read this – I recommend using the free trial version of https://bubbl.us/ (it is quite intuitive) or other concept mapping software.
Tailored Reflection of Work

Reflection Assignment for Transformation and Illumination (Lamp Design)

In this project you have explored what it means to “illuminate” and to “transform” through the design and construction of a light. You have engaged a number of different design methods to formulate your project questions and goals, refine your concept, develop your material and formal language, and craft an experience. Through this reflection I want you to unpack your process and honestly evaluate what aspects of your process were successful and why, how you could improve your process and products, and where you took risks to push the boundaries of what you knew vs. where you played it safe. This reflection should take time and should be something that you revisit a number of times over the next week (this reflection should not be an activity you sit down and crank out in 3 hours one afternoon).

The order and format you choose for your reflection is up to you, but it should include documentation of your prototypes and final models through quality photographs, sketches of your process and proposed revisions (probably as scans from your sketchbook), as well as your written concept statement and verbal reflection/notes which address all of the following questions. The final format of your reflection should be considered, legible, and appropriately synthetic; in other words do NOT answer the following questions as a simple bullet pointed word document list- have fun with the format and let it be informed by your light project.
**Tailored Reflection of Work**

**CONCEPT AND PROBLEM DEFINITION**

Document concept maps, precedent projects, and ALL other brainstorming processes.

Address the following questions:

- What is your concept statement? *(Not just a statement of what your light is physically or the timeline of events you went through to get there, but what is the intended effect and WHY?)*
- What aspects of transformation and illumination drive your project? How did you narrow in on that concept and rule out other ideas?
- How did your overarching and abstract concepts develop / evolve over the project?
- Which precedent projects did you find particularly helpful? Why? How did you evaluate the work of others?
- What were the major unknown questions embedded in your project ideas? How did you gather information on those questions?

**IDEATION PROCESSES**

Document ideation sketches and models, material tests, etc.

Address the following questions:

- How did you pursue your ideas? What were your most effective ideation tools? Did those change for different types of questions/stages in the design process? What processes were not effective for you and why?
- Did you have any happy mistakes or breakthroughs where you made an unexpected discovery?
- In what ways is your project unique vs. similar to others? *(Not just within the class but in relationship to the precedent projects you studied and other designed objects out there (in concept, methods/process and/or materials))*?
- What assumptions did you have at the start of the project (assumptions of materials, light effects, mechanics, etc.)? How did you test those? Which were upheld vs. contradicted by your tests?
- What did you leave unexplored that you wished you had considered further? If given more time how would you explore those ideas (give specific examples and sketch some alternative approaches to your final lamp)?
EXPLORING ALTERNATIVES + TAKING RISK

Document relevant tests/models

Address the following questions:
- How did you challenge yourself in this project?
- What risks did you take? Were those reckless risks (due to lack of testing, poor time management, etc.) or were those productive risks / leaps which challenged what you knew and pushed beyond your safe boundaries in the assignment?
- What additional productive risks could you have taken?

CRAFT + COMMUNICATION

Document your final product off, on, and in different stages of transformation.

Address the following questions:
- What aspects of your concept do you feel are most legible and well translated into a physical object and experience? Which could be improved? How? (Brainstorm ideas)
- What aspects of your final project do you feel are refined and well crafted? What aspects of the craft could be improved on and how would you develop your ability to do so?
I think my biggest breakthrough in the project was getting the mechanism of the aperture perfected. It was a longer process and wasn’t as much an instant breakthrough, but putting all the pieces together was satisfying. I think my project was similar to some other peoples’ in the way a mechanical transformation manipulated the quality and amount of light. I see similarities between mine and Jason’s and in some way Aziz’s in the way all of our projects use the mechanics to alter the light. I feel my project is especially unique to a lot of the other ones in studio as the aperture itself is an interesting mechanism no one else focused on and I emphasized the properties of it in my piece.

at this point the mechanism was almost perfected with chipboard

Cheap Reality varies in light by half of each color. Red, Green and Blue, the exact location to what they turn on is different. If all the lights are on, the box will appear as if it’d be loud in several sizes and colors. Cam, Maggie, Nelly and Bird (selected)

Mock-up

If half of my connection was shadows, I didn’t actually prototype in my material because of it. I mocked construction a week before non-tradtional. I was going to send the time to learn how to actually build it. I feel like I approached the step with a purely and through out plan. I knew I wanted the face to move square over the displaced malfunctions of color. I knew I wanted the box to be the scene over the displaced malfunctions. I knew I wanted the face to move square over the displaced malfunctions, the effect. I knew the box was not the scene over the displaced malfunctions, but the box was a tool to move the scene over the displaced malfunctions. The movement where the face moved up the box to be seen and the box was not the scene over the displaced malfunctions, but the box was a tool to move the scene over the displaced malfunctions. I wanted to play with the displacement of malfunctions over colors. I wanted to play with the displacement of malfunctions over colors and the shadow on the wall. Cutting down the face of the box left me to questions how I could actually fill the lights and have the illusion in mind. I saw it as a tool to play with the displacement of malfunctions over colors, playing with the light. I discovered the illusion of displacement over colors. I discovered the illusion of displacement over colors and the shadow on the wall. I saw it as a tool to play with the displacement of malfunctions over colors.
Exploring Alternatives & Taking Risk

I worked with wood, metal and sewing materials for the first time doing this project. I cut, routed (had to create a jig to run the handheld router along), and finished wood and welded, plasma cut (also have never used autocad), band sawed, horizontal band sawed, grinded, and sanded metal. Also I soldered together the stand for the light fixture. All things I need to remember how to do.

I don’t think the risks I took in this project were reckless and I don’t think any one risk that I took was ever a leap or breakthrough. I think I needed to take several tiny, small and calculated leaps over a long period of time to realize a breakthrough and when I realized a breakthrough it had happened a few days earlier and I didn’t know it was the right decision until that later moment. Lack of Tyvek was one very well defined boundary that I didn’t want to push and I think that while it might seem like I need to speed up the iterative process and push those breakthroughs and fail as much as possible I think those boundaries really made me think about every risk and plan for every outcome. I think that made my risks productive, but made them come more slowly. I was in a position with the Tyvek where I was afraid to damage the materials, and afraid to take apart an iteration that kind of worked because I didn’t know what would make it work better and if it was taken apart I wouldn’t know how to get it back to that state of kind of working. Kind of working isn’t really working though, so I guess I shouldn’t have been so concerned with taking them apart.

Introduce Homework for Friday
Intellectual Risk Taking Workshop

TH!NK Faculty Workshop
Spring 2019

TH!NK Student Learning Outcomes

Effectively communicating → Raising questions, formulating problems → Gathering and assessing relevant information → Synthesizing and generating ideas → Considering alternatives → Reaching reasoned conclusions
What are some synonyms, related behaviors, or attributes of intellectual risk taking?

1. What does this mean to you (in your discipline, in your classroom)?
2. Is it important (why or why not)?
3. Do you encourage it in your classroom now? How?
“There’s no such thing as a failed experiment (only experiments with unexpected outcomes)”

Buckminster Fuller

Intellectual Risk Taking

Entrepreneurs and innovators generally have a higher tolerance for risk. They are more likely to perceive:

- Strengths rather than weaknesses
- Opportunities versus threats
- Potential for performance improvement versus deterioration

Rolfe, Heather. NESTA Learning to Take Risks, Learning to Succeed. NIESR
Risk taking is a cognitive process and can be learned and refined with practice.


Anticipate, Take, and Manage Intellectual Risks

“Learn to anticipate, take and manage risk” as a learning objective:

- Understand / predict reward or consequence (in both negative and positive terms)
- Learn from and value failure through metacognitive reflections
- Understand “error” as a central part of the learning process
- Encourage informed discussions by acting on reasonable risk/reward assessment

Intellectual Risk Taking in the Classroom

What are the barriers to risk taking in the classroom (in projects, assignments)?

Barriers to risk taking in the classroom (+ life) are:

- Perception of loss vs. gain
- Frequent progress checks (example: high frequency milestones with expected results/progress)
- Desire for predictable outcomes and objectives
- Fear of failure
- Lack of ownership over decisions
- Lack of time

How we Discourage Intellectual Risk Taking

Barriers to risk taking in the classroom (+ life) are:

- Perception of loss vs. gain
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- Fear of failure
- Lack of ownership over decisions
- Lack of time

Rolle, Heather. NESTA Learning to Take Risks, Learning to Succeed. NIESR
Facilitating Intellectual Risk in the Classroom

Strategies to facilitate risk taking in the classroom:

- **Create a safe place for students** to voice opinions/answer questions/state hypotheses, etc.

- Provide **low-stakes opportunities where it’s OK for students to fail** *(as long as they learn from their failure).*
Facilitating Intellectual Risk in the Classroom

Strategies to facilitate risk taking in the classroom:

• **Create a safe place for students** to voice opinions/answer questions/state hypotheses, etc.
• Provide **low-stakes opportunities where it’s OK for students to fail** (as long as they learn from their failure).
• Instructors and TAs should have clear, **distinct roles in projects**, allowing students to take ownership of their decisions.
• Give students the **freedom to design or define** aspects of their assignment/project.
Facilitating Intellectual Risk in the Classroom

Strategies to facilitate risk taking in the classroom:

• Foster an environment that supports independent thinking.

• Ask questions that are open ended and do not advocate solutions.
Facilitating Intellectual Risk in the Classroom

Strategies to facilitate risk taking in the classroom:

• Foster an environment that supports independent thinking.
• Ask questions that are open ended and do not advocate solutions.
• Factor into the project reflection exercises where students report on their experiences and lessons learned.

• Engage students in exploring the course content with applied “real world” issues (include “external-champions” where possible)
Facilitating Intellectual Risk in the Classroom

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- Ask questions that are open ended and do not advocate solutions.
- Factor into the project reflection exercises where students report on their experiences and lessons learned.
- Engage students in exploring the course content with applied "real world" issues (include "external-champions" where possible)
- Discuss case studies / precedents of risk takers within the discipline whose risks transformed the field.

Fail Early and Fail Often

Experiencing risk inevitably involves experiencing failure.

- Risk in the “safe” environment of the classroom
- Distributed risk taking encourages students to not put all of your eggs in one basket but explore a number of possible and appropriate options.
- Risk taking skills have been shown to improve confidence and resilience to setbacks.
Students who learn to take risks are more RESOURCEFUL, RESILIENT, and EMPOWERED.

Most of our disciplines are built on processes and methods which incorporate risk taking because they involve stages of decision making, experimentation, testing, observation and adaptation. However there is evidence that teaching in the classroom often fails to include risk taking by giving prominence to knowledge and understanding rather than inquiry.

1. Come up with a specific example you can use in the classroom that values and practices risk taking:
   • What is the ultimate goal you hope to achieve?
   • What are the barriers to incorporating this specific example into your classroom?
Intellectual Risk Taking in your classroom

Remember to encourage long term informed intellectual risk taking:

1) You need to create a safe learning environment in the classroom for all students!!

2) Provide opportunities where it is OK to fail as long as students learn from their failures!

3) Value/assess inquiry and risk, (maybe even value risk and learning reflection over success of “final” work)

Summary

Types of intellectual risk range from:

- Thinking of creative “wild ideas”
- Speaking up and answering questions/expressing ideas in the classroom
- Expressing/Evaluating personal values/experiences/beliefs
- Exploring methods/processes/tools they have never done before
Information and Resources

Innovation design in education:
http://theasideblog.blogspot.com/2013/03/are-todays-students-afraid-of.html

Understanding intellectual risk

Creating a “safe” learning environment
http://soe.unc.edu/resources/technology/support/learn/index.php

The “deep dive”: IDEO
https://www.youtube.com/watch?v=2Dtrkrz0yoU

Marshmallow challenge: fail early
http://www.tomwujec.com/design-projects/marshmallow-challenge/

Celebrating failure
https://www.ted.com/talks/astro_teller_the_unexpected_benefit_of_celebrating_failure
Discussion Techniques/Strategies

TH!NK Faculty Workshop
Spring 2019

TH!NK Student Learning Outcomes
Warm Up: Discussion in your class

- What techniques do you currently use in your courses to facilitate/manage discussion?

Post your thoughts to Padlet via this link: https://padlet.com/acauten/discussion

Discussion Jigsaw

1. **2 minutes**: Read ahead and learn your technique (1 - Think, Pair, Share; 2 - Speed Date; 3 - Gallery Walk; 4 - Jigsaw).
2. **8 minutes**: All 1s get together and discuss their findings, brainstorm new uses, imagine challenges, create solutions. All 2s get together and do the same, etc.
3. **12 minutes**: Return to original (“home”) groups and teach your technique to others.
(1) Discussion Technique: Think-Pair-Share

Ask students to consider a question (think), turn to a partner (pair), and discuss their response with the partner (share).

- Extra Pointers:
  - Explain why you're doing it.
  - Set up pairs ahead of time.
  - Ask a specific question.
  - Ask each student to write down their thoughts.
  - Select a “Person A” and a “Person B.”
  - Listen.
  - Debrief.

(2) Discussion Technique: Speed Dating

- Line up class in two rows facing one another.
- Give each pair a talking point on an index card.
- Every one to two minutes, one line steps one space to the left and passes card to the right.
- Students discuss until all points are covered.
- If large class, give only 5 – 8 topics, but hand them out in order so that no one repeats a topic.
- After small discussions, recap salient points as a large group or, in a large class, in discussion groups of five or six.
(3) Discussion Technique: Gallery Walk (aka Chat Stations)

Stations or posters are set up around the classroom, on the walls or on tables. Small groups of students travel from station to station together, performing some kind of task or responding to a prompt, either of which will result in a conversation.

• Variation:
  – Have groups of students create informative posters, then act as tour guides or docents, giving other students a short presentation about their poster and conducting a Q&A about it.

Examples of Gallery Walks/Chat Stations
Sample Gallery Walk: Parts of Speech

• Give groups of students a part of speech.
• Students prepare a SEE-I.
• Students post their work without title.
• Groups walk around and try to match each work to a part of speech from a list given.
• Discuss responses, challenges, misconceptions, etc.

Gallery Walk: other uses

• Artistic Movements: Italian Renaissance, Dada, Surrealism, Impressionism, etc.
• Biology: Cell parts, DNA/RNA/mRNA, Krebs cycle steps, etc.
• Chemistry: Elements, bonds, compounds, etc.
• Earth Cycles: Water, Nitrogen, Phosphorus, etc.
• Statistics: ANOVA, etc.
• Can even use as a quiz
(4) Discussion Technique: Jigsaw

- Students are divided into small groups. Each member of the group is assigned a portion of an assignment or research project. Each member must research the material pertaining to their section of the project and be prepared to discuss it with their classmates.
  - Emphasizes cooperation and shared responsibility.
  - Group success depends on individual participation.
  - Increases the involvement of each student in the activity.

How to Jigsaw

1. Divide the material needed to cover a topic into four roughly equal parts.
2. Number team members and assign a different topic for each to become an expert.
   a. “All ones read X, all twos read Y, etc.”
3. Develop and assign homework/in-class questions or essays on the material (can be graded or ungraded).
How to Jigsaw

4. When complete (next class, after X time), students consult with experts from other teams.
   a. “All ones get together and consult, all twos, etc.”
   b. Give instructions:
      i. Introduce yourselves to the other expert group members.
      ii. Discuss the reading with the group, coming to consensus on the main points you will teach your teammates. Make sure everyone participates.
      iii. Try to think of at least two examples from your personal experiences to illustrate the main point(s).
      iv. Plan how you will check your respective teammates for understanding without asking, “Do you understand?”
      v. Thank your expert group members for their help.

5. Experts return to their teams and teach.

Reflection

- How can you improve discussion in your course?
- Which techniques/strategies would work best in your class?
Faculty Resources

TH!NK Faculty Workshop
Spring 2019
August Deliverables

The workshop to be held August 13-14, 2019 will be dedicated to the TH!NK Faculty presenting their material and receiving feedback.

Please submit the following items as a single merged pdf, in the order below (with titles), to no later than noon, August 2, 2019. Submission folder will be shared by your Fellow closer to the date.

1. New TH!NK syllabus with course schedule highlighting critical and creative thinking activities (we understand that not every activity will appear in your syllabus).

2. Main differences between the old and new syllabus in outline form (with respect to the TH!NK activities and outcomes).

3. A brief description of how you will introduce/integrate the intellectual standards in your course.

4. A brief description of an activity where students will evaluate the works of others (peer or expert) using relevant intellectual standards.

5. A brief description of at least one activity or assignment you will use to encourage/integrate student self-reflection.

6. Critical and Creative Process activity – this is the activity or assignment you will score on the Common Rubric at the end of the semester, and which you will submit to the Office of Assessment at the end of the term. Include all instructions and resources that will be provided to the students, as well as a description of how you plan to evaluate the activity with the Common Rubric (map student work to rubric criteria). Include Reflection of Work (RW) prompts if you plan to use them (highly recommended in most cases!).
TH!NK Syllabus Change Check-list

All syllabi should meet the standards of the university course syllabus regulation found at http://policies.ncsu.edu/regulation/req-02-20-07. A fillable syllabus tool that will automatically add all the “boiler plate” language is available at http://delta.ncsu.edu/apps/syllabus_tool/ if you choose to use it. TH!NK-specific additions to the syllabus are indicated below.

- Insert and personalize the Course Description (Box A) into your revised syllabus for your TH!NK course section.
- Insert and personalize the Program Assessment Statement (Box B) into your revised syllabus for your TH!NK course section.
- Insert TH!NK Student Learning Outcomes (Box C) into your revised syllabus for your TH!NK course section.

Box A: Course Description (please copy/paste this wording or something similar within the course description section):

Embedded throughout the content of this course, you will become adept at using the intellectual standards for critical and creative thinking in evaluating the work of others, as well as solving problems/addressing questions in [the discipline of this course*]. You will also be introduced to tools to help you reflect on your own thinking (i.e. metacognition).

Box B: Program Assessment Statement:

This course is a part of the NC State effort to enhance students’ critical and creative thinking skills. As a student in this course, you have some special responsibilities in helping us assess the effectiveness of teaching and learning for the critical and creative thinking (TH!NK) initiative.

Each student will receive an email from the Office of Assessment, asking you to provide an online reflection at the end of the semester. This is important in evaluating the success of the program. To receive credit for participation, you must complete the reflection online within the requested time frame.

Some of the assignments that are a part of this class will also be shared with the Office of Assessment. Your work will remain confidential. Your work will never be reported on individually, but may be part of a group report after identifying information is removed.

Box C: Student Learning Outcomes: The student learning outcomes of TH!NK should be reflected in the course student learning outcomes. (you may copy and paste these directly, expand upon them, or you may modify existing outcomes to reflect these in a course-specific manner):

Upon completion of this course, students will:
- Evaluate the work of others using the intellectual standards for critical and creative thinking.
- Apply critical and creative thinking skills and behaviors in the process of solving problems or addressing questions.
- Reflect on their own thinking and the thinking of others.
Summer Support Strategy

TH!NK Faculty Workshop
Spring 2019

Support Strategy for Summer

Monthly small group meetings with focused discussion areas
- May: Critical & creative project ideas/brainstorming and workshop recap
- June: Self reflection, integrating intellectual standards, and evaluating the work of others
- July: Critical & creative project, rubric mapping, and reflection of work draft

August Workshop: Aug 13th – 14th
### Synthesis Matrices

<table>
<thead>
<tr>
<th>Main Idea A</th>
<th>Source #1</th>
<th>Source #2</th>
<th>Source #3</th>
<th>Source #4</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Main Idea B</th>
<th>Source #1</th>
<th>Source #2</th>
<th>Source #3</th>
<th>Source #4</th>
</tr>
</thead>
</table>

**TH!NK Faculty Workshop**  
Spring 2019

### TH!NK Student Learning Outcomes

- Effectively communicating
- Reaching reasoned conclusions
- Considering alternatives
- Synthesizing and generating ideas
- Raising questions, formulate problems
- Gathering and assessing relevant information
- Asking problem-based questions
- Questioning personal and disciplinary assumptions
- Seeking and generating alternative answers
- Reflecting on how I’m thinking and working
TH!NK about it...

Think about how or if you currently teach students to organize their research findings. Briefly discuss your thoughts with a partner.

Synthesis Matrix

The synthesis matrix is a chart that allows a researcher to sort and categorize the different arguments presented on an issue (especially helpful for evidence-based writing assignments — e.g., literature reviews, etc.)

<table>
<thead>
<tr>
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</tr>
<tr>
<td>Main Idea B</td>
<td></td>
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</tbody>
</table>

### Alteration of women’s roles because of WWII

<table>
<thead>
<tr>
<th>Role</th>
<th>Event/Condition</th>
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</thead>
<tbody>
<tr>
<td>Cornelsen</td>
<td>Women accredited the WASP program for opening new doors, challenging stereotypes, and proving that women were as capable as men (p. 113). Women could compete with men as equals in the sky because of their exemplary performance (p. 116). WASP created opportunities for women that had never previously existed (p. 112).</td>
</tr>
<tr>
<td>Stewart</td>
<td>WAAC (Women’s ArmyAuxiliary Corp) was 1st chance for women to serve in army, given full army status in 1943 as WAS (p. 28). Needs of the war were so great that women’s traditional social roles were ignored (p. 30).</td>
</tr>
<tr>
<td>Bruley</td>
<td>Women given equal opportunities (p. 223). Women joined workforce as a break from the ordinary to help the war (p. 220). Unconscious decision to cross into male-dominated roles (p. 221). Seized these new opportunities to bring about change (p. 230).</td>
</tr>
<tr>
<td>Scott</td>
<td>Women born in the 1920’s found new doors open to them where they once would have encountered brick walls (p. 526). Even women not directly involved in the war were changing mentally by being challenged to expand their horizons because of the changing world around them (p. 562). War also brought intellectual expansion to many people (p. 557).</td>
</tr>
</tbody>
</table>

### Hardships and oppositions women faced

- From the outset, male pilots resented women’s presence in a traditionally male military setting” (p. 1113-4). “The WASP were routinely assigned inferior planes that were later found to have been improperly maintained” (p. 114) -Discrimination against WASP at every level of military service, women were only paid 2/3 of what men were for doing identical tasks (p. 114).

- Women in the military given extensive physical and mental tests, but still discriminated against, ridiculed, and considered inferior to men (p. 29).

- Women given unskilled labor positions by government because only seen as temporary workers, therefore no reason to train them (p. 221-2) - Women given less significant work and viewed as less intelligent and physically able (p. 224).

### Opposition: WWII did NOT effect women

- Women put in untraditional roles during/because of the war, but back to previous subservient roles after the war (p. 35).

- Women were not affected because they still remained in subordinate positions after the war (p. 217).

### SYNTHESIS MATRIX

**Topic: Female Gamers**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>General “focus” for the source:</strong></td>
<td>In-group support as a whole.</td>
<td>Proof that stereotypes can both negatively and positively affect gamers.</td>
<td>Examples of stereotypes and tropes. Shows that games, despite common conception, can be played by both genders.</td>
<td>Shoves the facts in the reader’s face, females games always loses, despite sexism, and the gaming community want them, to!</td>
<td>There are bad times and good times, but the great games, always outweighs the bad. Has some great examples.</td>
</tr>
<tr>
<td><strong>Stereotypes and how they affect female gamers</strong></td>
<td>Not much for specifics for this via Alipport, but I love this quote for this: “Women are viewed as a wholly different species from men, usually as an inferior species. Such primary and secondary differences as exist are greatly exaggerated and are inflated into imaginary distinctions that justify discrimination.” (Alipport, 1954)</td>
<td>Vermeulen et al. hypothesized that when exposed to a negative stereotype condition the women gamers will perform worse, less confidently, and show more stress. The finding supported this hypothesis. When exposed to stereotypes the female gamers performed worse than those who were not, even though they got the same amount of time.</td>
<td>Through a survey and study Thornham was able to look more intimately on the power skill of gaming in males and females. Even though the females within the study were well verse gamers, the guys they surrounded themselves with still seemed to be strong stereotypes that created tension between the groups. It was noted that there were distinct times where the females in the study would “The gaming industry has earned itself quite a reputation for sexism. Many female gaming reporters and game developers have spoken out about the harassment, threats and mistreatment they’ve faced just for being women who care about games” (para. 6).</td>
<td>She was purposely put into a tourney with one of the highest ranked NC players and even had it streamed. They tourney runners got a very good laugh out of the fact she could not even take a stock. I too competed in dominantly male video game tourneys, but my first match was another female. It was very upsetting to see two of the three girls competing to be put head to head.</td>
<td>Stereotypes have made me feel insecure about my skill. Even though I know how to play and how to game works, the nervousness to try to prove myself can be overwhelming. It is an extra layer of difficulty I have to overcome. Stereotypes also make me want to try harder. It gave me a goal to become one of the best smih players in the state. The lack of females in the top ranking</td>
</tr>
</tbody>
</table>
## Useful in all disciplines

- Synthesize background information to write introductions to research papers
- Identify possible research questions by visualizing gaps in knowledge
- Cite key papers in conclusions to show how new findings support or refute previous work
Scaffolding for formal assignments

Process work:
- Topic Proposal
- Annotated Bibliography
- **Synthesis Matrix**
- First Draft
- Peer Review
- Final Draft
- Metacognitive Reflection/Student Reflection of Work, etc.

Synthesis Matrices in your class

Think of an assignment or project in your course that could incorporate a Synthesis Matrix (for independent research or assigned texts). Share with a partner!
# THINK Assessments, Fall 2019

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Description of Assessment</th>
<th>How Administered</th>
<th>Estimated Timeline</th>
<th>Faculty Responsibilities</th>
</tr>
</thead>
</table>
| 1 | Reflection on Intellectual Standards and Post-TH!NK Self-Assessment | ● Online self-reflection and brief survey (1 activity administered in Qualtrics)  
● Students complete in or outside of class  
● Activity originates from Office of Assessment (OA)  
● OA will send reminders to students every 2-3 days | ● Administered from Nov 11 - 22. | ● Discuss purpose/value, encourage & remind students to participate, include on syllabus, give credit as planned |
| 2 | Common Rubric Applied to the Common Assignment | ● Faculty uses CR to rate performance on assignment  
● Faculty may also require a Reflection of Work from students  
● One time only after midterm, near end of semester, or in multiple phases across term  
● OA will ask you to score a sample of student work if your class has more than 25 students. OA will provide faculty with the random sample | ● In general timing is determined by instructor, but toward end of term | ● Instructor delivers (1) scores no later than Dec 24, 2019 and (2) student products and (3) final CR assignment description  
● Instructor will enter scores into a Google folder provided by OA |

**Other Notes for TH!NK Instructors**

**Rubric Training and Norming**
You are expected to participate in a rubric norming session. The sessions will be after fall break and before Thanksgiving for Fall classes, with similar timing for spring courses. This session is designed once again to clarify features and ratings and help facilitate consistent interpretation of the rubric.

**Students in Multiple TH!NK Courses**
Students may be enrolled in multiple TH!NK courses. Students in multiple sections only need to complete one and may choose which course to focus on.

**Assessment Questions**
Contact Samantha Rich: snrich@ncsu.edu
Multi-Modal Thinking within the Critical and Creative Process

Skills Practiced

Effectively communicating

ASKING PROBLEM-BASED QUESTIONS

QUESTIONING PERSONAL AND DISCIPLINARY ASSUMPTIONS

SEEKING AND GENERATING ALTERNATIVE ANSWERS

REFLECTING ON HOW I'M THINKING AND WORKING

Gathering and assessing relevant information

Reaching reasoned conclusions

Considering alternatives

Synthesizing and generating ideas

Raising questions, formulating problems
It is important for creative thinking to move across vehicles of thought, from numbers to verbal language to visual imagery. (1)


It is important for divergent thinking to acknowledge multiple approaches: Intelligence is distinct and diverse. We think in all the ways we experience the world:

- Visually (through sight)
- Audibly (through sound)
- Kinesthetically (through touch)
- Abstractly (through concepts)
- Kinetically (through movement)
• Do you encourage multi-modal thinking in your course now? How?

• What are the benefits?
Visual Thinking as Multi-modal

When we are making images, we are foregrounding meaning. When we are reading, writing, and speaking, meaning is unfolding over time. (1)

It is through this reciprocal process, and the translation that occurs, that students can summarize, foreground and understand better what they are trying to say and how.

(1) Lees-Maffei, Grace. *Writing Design: Words and Objects*

Visual Thinking as Multi-modal

Robert McKim outlines three components of visual thinking.

- **Seeing** (Input, Reading)
- **Imagining** (Formulating, Processing, Testing)
- **Sketching** (Planning, Synthesizing, Communicating, Output)

ALL components involve translation and processing information.
Seeing (Reading)

*Raising questions and formulating problems*
*Gathering and assessing information*

- Bring in prior knowledge, use existing visual literacy
- Build confidence
- Encourage critical observation
- “Reading” information, connections
- See patterns
- Make comparisons
- Identify Gaps / Problems / Contradictions
Imagining (Formulating/Processing)

Considering alternatives.
Reaching reasoned conclusions

- Translating
- Planning
- Exploring
- Balancing Parts and the Whole
- Analogies
Sketching (Testing / Output)

- Raising questions and formulating problems.
- Gathering and assessing relevant information.
- Synthesizing and generating ideas.
- Considering alternatives.
- Reaching reasoned conclusions.
- Effectively communicating.
- Reflecting at each stage of the process.

- Forming a Conclusion, Narrative or Argument
- Emphasis and hierarchy to organize elements
- Describing Relationships
- Proposing a Solution
Thinking Across Modes of Thought: Seeing Abstract Concepts

A farmer plants potato plants. There are 6 rows of plants. Each row has 9 potato plants. How many potato plants does the farmer have in all?

6 \times 9 = 54

54 plants

54 Plants

Directions: Read the word problem. Show three ways you could solve the problem. You could show a diagram/picture, the number sentence, or a way using counters.

Thinking Across Modes of Thought: Seeing Abstract Concepts

Directions: Write the number for each drawing.

1. 10

2. 18

3. 54

4. 27

5. 86

6. 421

7. 6,734

Write the number for the words.
1. one thousand sixty

2. four thousand, three hundred

3. ninety-seven

4. one hundred fifty-four

Make a place value drawing for each number.

- Break apart a bundle
- Remove 50
- Remove 9

86 = 80 + 6

86 = (70 + 16)

- \( \text{100 - (50 + 9)} \)

20 + 7

27 remain
Thinking Across Modes of Thought: Seeing Abstract Concepts

Your structure should stand on three legs, with another three legs pointing straight up into the air. These are your axle positions.

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Thinking Across Modes of Thought: Seeing the Familiar in a New Light

Edward Muybridge, Chronophotography
Thinking Across Modes of Thought: Seeing/Processing Patterns

London, mid-late 1800's during the time of Cholera Outbreaks
John Snow, Cholera Outbreak Map 1854

Daily Rituals: How Artists Work by Info We Trust Research by Mason Currey
Freewriting: Cultural Context

- Freewriting is a strategy to help get the juices flowing for both critical and creative thought.
- In freewriting, you write for a shorter period of time without stop. The pen/pencil stays on the paper for 2, 3, 5, 10 minutes.
- You may do it digitally, but fingers must keep moving for the same period of time.
Seeing + Freewriting: Cultural Context

- Look at the image (don’t write yet!). What do you notice about it? Describe the image in detail (1 min)
- Explain what you think the significance of the image is. If you know anything about its background, include that. (1 min)
- What questions do you have about it? What do you want to know more about it? (1 min)
- What sort of impact (social, political, economic, environmental) do you think it has had? How do you think it has affected (or been affected by) cultural/social norms?
Concept Mapping

Concept Mapping, Lotus Blossom

Storyboards

Christine Minton
Anderson.Cavalier Science
NC STATE UNIVERSITY

Game of Thrones Infographic: History and Lore Timeline v1.0, HBO

NC STATE UNIVERSITY

Thinking Across Modes of Thought: Visualizing Narrative- Output

Napoleon’s March on Moscow, Charles Minard
Mistakes, We’ve Drawn a Few. The Economist March 27, 2109

**Original**

**Left-click**
Average number of likes per Facebook post
2016

<table>
<thead>
<tr>
<th>Jeremy Corbyn</th>
<th>Labour Party</th>
<th>Momentum</th>
<th>Owen Smith</th>
<th>Andy Burnham</th>
<th>Saving Labour</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>0</td>
<td>250</td>
<td>500</td>
<td>750</td>
<td>1,000</td>
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</tr>
</tbody>
</table>

Source: Facebook

**Better**

**Left-click**
Average number of likes per Facebook post
2016, ’000

<table>
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<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Facebook

“**The more colours the better!”** no good data visualiser, ever

Mistakes, We’ve Drawn a Few. The Economist March 27, 2109
**Multi-modal thinking in your classroom**

- What goals do you have for integrating multi-modal thinking into your classroom?

- What strategies might you incorporate or strengthen?

- What part(s) of the Critical and Creative Process could you reinforce with multi-modal thinking?
<table>
<thead>
<tr>
<th>LITTLE/NO EVIDENCE (1)</th>
<th>EMERGING (2)</th>
<th>DEVELOPED (3)</th>
<th>CAPSTONE (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Raising questions, formulating problems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Articulating the issue and its scope</td>
<td>Issue/problem to be considered critically is stated without clarification or description of scope</td>
<td>Issue/problem to be considered critically is stated but leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown</td>
<td>Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions</td>
</tr>
<tr>
<td><strong>Gathering and assessing relevant information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting and analyzing information</td>
<td>Information is taken from source(s) without any interpretation/evaluation Expert viewpoints taken as fact, without question</td>
<td>Information is taken from source(s) with interpretation/evaluation but not enough to develop a coherent analysis/synthesis Expert viewpoints taken mostly as fact, with little questioning</td>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis/synthesis Expert viewpoints are subject to questioning</td>
</tr>
<tr>
<td>Recognizing Assumptions</td>
<td>Does not show awareness of assumptions</td>
<td>Shows an emerging awareness of assumptions (may label assertions as assumptions). Begins to identify some contexts when presenting a position</td>
<td>Questions some assumptions. Identifies own and others' assumptions and several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa)</td>
</tr>
<tr>
<td>Considering perspectives</td>
<td>Acknowledges (mentions in passing) alternate, divergent, or contradictory perspectives or ideas.</td>
<td>Includes (recognizes the value of) alternate, divergent, or contradictory perspectives or ideas in a small way.</td>
<td>Incorporates alternate, divergent, or contradictory perspectives or ideas in an exploratory way.</td>
</tr>
<tr>
<td><strong>Generating, judging, and synthesizing ideas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generating alternatives</td>
<td>Selects from existing ideas</td>
<td>Generates a single idea</td>
<td>Generates multiple ideas within a limited range.</td>
</tr>
<tr>
<td>Judging appropriateness</td>
<td>Shows limited/no awareness of the benefits and drawbacks of various ideas Defends ideas with unrelated criteria</td>
<td>Recognizes relevant benefits and drawbacks of ideas but does not compare values of each</td>
<td>Weighs the value of relevant benefits and drawbacks of ideas</td>
</tr>
<tr>
<td>Originality of thought</td>
<td>Restates available ideas</td>
<td>Attempts to create unique/original ideas, questions, formats, or products, but in incomplete ways</td>
<td>Creates a novel or unique idea, question, format, or product.</td>
</tr>
<tr>
<td><strong>Effectively communicating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract thinking or Relating the &quot;Big Idea&quot;</td>
<td>Describes chronology of steps or an undifferentiated inventory of ideas</td>
<td>Attributes some decisions to an overarching principle; applies principle inconsistently; or explanation is piecemeal or afterthought</td>
<td>Provides coherent narrative linking idea/solution attributes to constraints and provides some insight into generalizable concepts</td>
</tr>
<tr>
<td>Communication</td>
<td>Ideas may not be relevant and/or there is little obvious organization</td>
<td>Presents relevant information but ideas are poorly organized</td>
<td>Presents coherent argument linking ideas</td>
</tr>
<tr>
<td>Capstone</td>
<td>Work Product?</td>
<td>Reflection of Work?</td>
<td>Unable to Evaluate</td>
</tr>
<tr>
<td>----------</td>
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<td>-------------------</td>
</tr>
<tr>
<td><strong>Raising questions, formulating problems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Articulating the issue and its scope</td>
<td>Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gathering and assessing relevant information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting and analyzing information</td>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis/synthesis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognizing Assumptions</td>
<td>Thoroughly analyzes own and others’ assumptions and carefully evaluates the relevance of contexts when presenting a position</td>
<td></td>
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</tr>
<tr>
<td>Considering perspectives</td>
<td>Integrates alternate, divergent, or contradictory perspectives or ideas fully.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Generating, judging, and synthesizing ideas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generating alternatives</td>
<td>Generates multiple, divergent ideas that draw on a wide range of perspectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Judging appropriateness</td>
<td>Weighs the value of relevant benefits and drawbacks of ideas</td>
<td>Selects/recommends appropriate ideas with sound argument</td>
<td></td>
</tr>
<tr>
<td>Originality of thought</td>
<td>Extends unique/novel ideas, questions, formats, or products to create new knowledge or knowledge that cuts across boundaries</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Effectively communicating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstract thinking or Relating the “Big Idea”</td>
<td>Articulates general concepts, poses overarching theories, and describes “Big Idea”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Presents compelling argument and responds to audience and/or context</td>
<td></td>
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</tr>
</tbody>
</table>
Outbreak Final Project

This final project will combine your knowledge and ability to research aspects of an infectious disease outbreak with your critical and creative thinking skills. There are some constraints in the assignment, but you have quite a bit of creative freedom in your project focus and implementation.

You will create a work aimed at educating a certain group of individuals about your chosen infectious disease. There must be an outcome that you want to achieve through this educational strategy. Some examples of possible audiences and types of work are listed below, but you are not limited to these ideas.

- Possible audience: American elementary school children, American parents, West African adults, American health care workers, West African health care workers, future college students taking this class, etc.
- Possible types of work: brochure/pamphlet, novel case study with discussion questions, board or video game, short documentary, poster, video or radio PSA, painting, song, etc.

The type of work you chose must be appropriate for your target audience and the outcome you want your work to achieve. One exception: if your audience is other than English-speaking, please still use English in your work for the purpose of this class.

Although the type of work is flexible, it must be fitting as a semester project. It requires research and thought, and the final project must be polished. A three-line haiku, for example, would not be acceptable.

Provide a separate annotated bibliography of the references used for the work. The annotations should include why you selected each source and the strengths and weaknesses of the source. Mention any criticisms you have of the information provided in the sources. If you found the source to be biased or unreliable in some way, explain the issue why you still chose to include the reference.

- In formatting your annotated bibliography, provide each reference in bold with the annotation below it in italics.

You may choose to work with a partner; however, you each need to turn in independent annotations for the bibliography and will write separate reflections, so both partners need to be involved in decision-making. Groups of more than two will only be considered if the type of work requires more than two individuals and special permission is required.

The project (including the annotated bibliography) is worth 20% of your grade. The reflection of your project (final exam) is worth 15% of your grade.

Work will be graded on the following:

- Purpose/scope of work is useful/meaningful.
- Appropriate references/resources were used.
- Strengths and weaknesses of references/resources, as well as biases of references/resources are discussed in the annotated bibliography.
- Work is original.
- Format (e.g. length, language usage, images, etc.) is appropriate for the intended audience.
- Work is compelling and likely to achieve the desired outcome.
Scope, Audience and Inspiration

**Scope:** Medicine, infectious disease in general → This Chapter: Vaccination

**Audience:** Elementary/Young middle-school age children

**Inspiration:** Maki Naro’s “Vaccines Work. Here are the Facts”
The Characters

Vicky Vax
Expertise: Vaccination

Sammy SportsMed
Expertise: Sports Medicine

Max Medicus
Expertise: Medicine/Medical Process

The Story!
VICKY VAX! HERE WITH THE FACTS!
About FLU SHOTS

Mornin’ Sammy! Mornin’ Max!

MORNING VICKY!!!!!

What’s with you two? 😴
A flu shot is a type of vaccine that gives you a needle with VAX-EEN.

This way, your body can learn how to deal with that illness before you have to get sick.

The vaccine can start as early as October and last as late as May.

So, getting a flu shot will help keep you healthy when this flu season comes around!
Okay... but I got a big head year
Why should people worry... this year?

Think if Sunny hadn't practiced hard this year, he'd be in a hole... up until now, he's at all ready for a big game. His body is in the same way.

Also, flu viruses are very sneaky! They'll try whatever they can to break just your body's defense—even changing what they look like and how they act. Doctors try to handle these changes in the new flu vaccine that enters each year.

That's why doctors suggest that everyone
Over the age of 6 months
get a flu shot every year!

Stay Healthy This Flu Season!
Get Your Flu Shot Today!
Annotated Bibliography

https://docs.google.com/a/ncsu.edu/document/d/1T3A3sWg4y7yu5kmY2vHyd1UuRmMF-Hxydz8BQTFWj2s/edit?usp=sharing
**Outbreak Final Exam**

1. **Define the overall scope of your work (e.g. what is the problem you are trying to address, who is the intended audience, what are you trying to get across, what is the desired outcome, etc.).**

   My project involved the authorship and illustration of a pilot chapter of *Vicky Vax: Here with the Facts!*, a health-based comic series targeted toward elementary-school- and middle-school-aged children. Through relatable characterizations and child-friendly explanation, this comic series attempts to demystify concepts of healthcare and infectious disease (e.g. Vaccination, Medication, disease spread, etc.), approaching such elements in a context welcoming of a younger audience. The pilot chapter created for my project endeavors to enlighten children on the topic of flu shots and vaccination. In the work, vaccination is defined using child-friendly diction and analogy; the chapter takes place in the context of a morning classroom chat among friends, a setting children might find familiar and relatable. Delving into difficult yet relevant healthcare issues in a medium more welcoming of children, I hope to encourage discussion and foster further exploration of health and disease topics such as vaccination in the home and in schools, emphasizing the significance these healthcare issues have in real life, and in the lives of children.

2. **Imagine you are trying to get external funding for this project. Explain the significance of this project. Why is the problem you are addressing important and why is your approach likely to be successful?**

   The comic series *Vicky Vax: Here with the Facts!* presents difficult healthcare and disease concepts in a fun and kid-friendly way. Through vivid illustration, entertaining characterization and relatable analogy, *Vicky Vax* introduces elementary and middle-school-aged children to important and socially-relevant health topics in the hope of inciting further exploration and discussion of these topics amongst kids, their parents, and their peers. Unlike other health-informative comics targeted at this age range, *Vicky Vax: Here with the Facts!* does not depict superhero-like figures battling off bacteria and viruses as some supernatural, otherworldly villain entity. Instead, the comic brings the subject and its conversation into more relatable settings—school and sports teams, birthday parties and home life – settings that an
elementary or middle schooler would be familiar with, emphasizing the significance of these health issues in the real world. Many controversial health matters apparent in society and the media, such as vaccination, directly involve the health of children. This comic endeavors to educate children so that they, too, can partake in the societal discussion of these issues, and promote understanding.

3. **What did you consider in deciding the format of the work? Why did you choose the medium you used (brochure, game, video, song, etc.)? What other ideas did you rule out and why?**

I knew from the beginning that I wanted to create some type artistic work for my final project. Art has always been a passion of mine, and my primary form of expression. Initially, I thought of creating a symbolic work for an older audience, perhaps a satirical cartoon regarding anti-vaccination or, to incorporate my love of bones, a tri-canvas depicting the degradation of the human body from the initial stages of syphilis to the skeletal remains of a tertiary stage syphilis victim to express the historical significance of syphilis; however, I felt the message depicted in these avenues would be too abstract, and the latter would be extremely difficult to complete within the time constraints of the assignment. Thus, I settled on the idea of a comic for younger children to explore general aspects of healthcare and disease. Growing up a huge fan of comics and manga myself, I figured a comic would be a great way to introduce these concepts to younger children, as a comic is what would have appealed to me as a child. The utilization of this medium was solidified when I stumbled upon Maki Naro’s *Vaccines Work: Here are the Facts*. I really wanted to create a similar informative entity for children; thus, after a few basic character sketches, Vicky Vax was born, and the concept evolved from there.

4. **Was there an activity or assignment in this course that helped you integrate your thinking on a topic across multiple disciplinary perspectives? If so, describe the activity and how it impacted you. If not, make a specific, detailed suggestion for a new kind of activity and how you anticipate it would impact your thinking.**

The group research presentations really gave me the freedom to explore an illness utilizing an interplay of multiple disciplinary perspectives. Even though this course is, at its core, biologically and
epidemiologically based, these presentations enabled me to incorporate my anthropological interests, and explore other historical, sociological, and humanistic implications of infectious disease alongside the primary biological components. I really enjoyed the openness of these assignments; as long as the topic fit under the umbrella of the general disease, we had the freedom to research practically any sub-topic utilizing any disciplinary perspective, as to present our information in an integrated and multidimensional fashion. It was interesting as well to hear the information discovered by other groups using a different disciplinary lens.

5. Has your stance on whether/under which circumstances a parent should be permitted to opt out of vaccinating minor children changed? Describe your current thinking on the matter, and discuss how your thinking evolved (this could be either evolution of a change, or confirmation of prior thinking).

While I still recognize that this is a very complex issue and definitely a gray area of discussion, my opinions have developed quite a bit through our class dialogues during the semester. Overall, I would say that our semester-long discussion of infectious disease and vaccination has confirmed my prior thinking that all minors should be vaccinated for preventable infectious diseases such as the measles if they are medically able, regardless of the beliefs of their parents or guardians. I continue to believe that, during the liminal period in which a child is defined as a “minor,” their health regarding MMR, and the health of those that they come into contact with, is the responsibility of the healthcare system. Depriving a child of a potentially life-saving vaccination, whether it be for the personal or the religious reasons of their parents, endangers not only that child, but all people that child is to come in contact with in the public school system and elsewhere. Thus, it is in the interest of public safety that all minors should be vaccinated. Once a minor has turned 18, however, they should be given the choice to deny a standard vaccination; that is their right as a free adult individual. But until then, the decision is that of the government and its medical professionals.