The Community of Inquiry Model for an Inverted Math Classroom

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Outline

- Traditional Lecture vs Video Lecture
- First Experience Learning
  - How to get students to “do the reading”
- Classtime
  - Concept Workshop, Activities, Boardwork, etc.
- Video Lectures
- Making Videos/Podcasting
  - Needed software:
    - Camtasia—Records the screen
    - SnagIT—ScreenCapture

Community of Inquiry

Garrison, Anderson, & Archer, 2001

- Social presence
  “the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities.” (Garrison, 2009)
Community of Inquiry

- **Teaching presence**
  is the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes (Anderson, Rourke, Garrison, & Archer, 2001).

- **Cognitive Presence**
  the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson, & Archer, 2001).
Traditional Class (Clip)

1. Come to class and listen to lecture and take notes.
2. Some time allowed for class work and questions.
3. Go home and attempt the homework (probably get stuck on the more difficult problems)
4. Come to class and perhaps there is time to go over a couple of questions
5. The class moves on to a different section. If you were lost, you had to get caught up.

New (and improved!) way

• PDF What’s this prof. up to?

The Inverted Classroom

• An inverted class takes events that used to take place outside of the classroom (e.g. homework), are now done in the classroom, while things traditionally done during class (e.g. the lecture) are done outside of class.
Concept Workshop

Boardwork?

First Experience Homework

- How to get students to come to class prepared
  - Created video lectures using Camtasia and a Tablet PC
  - Required them to do 4-10 problems from MML
  - Embed quizzes in the videos. (Or do a 1 question VL Quiz.)
  - Go around and review their notes.
Advantages

◦ Can spend a greater proportion of class time doing the critical thinking and actively analyze/synthesize problems that are based on the assigned videos.
◦ Class time is used mostly for the “Processing” part of learning (Walvoord, 1998).
◦ Students can pause/rewind the lecture as often as needed

Valuable time together

• Most important time together?
  • When students have questions
• When does this occur?
  • when listening to a lecture?
  • When trying to apply the principles?

Lecture vs. Process

<table>
<thead>
<tr>
<th></th>
<th>Lecture-based teaching</th>
<th>Process-based teaching</th>
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</thead>
<tbody>
<tr>
<td>Class time</td>
<td>First Exposure</td>
<td>Process</td>
</tr>
<tr>
<td></td>
<td>(Students first hear or observes facts, ideas)</td>
<td>(student applies, analyzes, argues, solves problems using first-exposure material)</td>
</tr>
<tr>
<td>Student Study Time</td>
<td>Process</td>
<td>First exposure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Video Lectures)</td>
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(Walvoord, 1998)
Class time?

- So what do we do in class?
  - Concept workshops (in groups)
  - Activities
    - Projects: http://mrmathtutor.wordpress.com/math1000projects/
    - Applets: http://www.shodor.org/interactivate/activities/FunctionFlyer/
    - Movies w/ Activities: http://www.thefutureschannel.com/algebra/algebra_real_world_movies.php
    - Textbook Activities
      - Graded Boardwork (Rubric)

Textbook Activities

Collaborative Corner

Step-by-Step Solutions

Focus: Solving linear equations
Time: 20 minutes
Group size: 3

In general, there is more than one correct sequence of steps for solving an equation. This makes it important that you write your steps clearly and logically so that others can follow your approach.

ACTIVITY

1. Each group member should select a different one of the following equations and, on a sheet of paper, perform the first step of the solution:

   \[
   \begin{align*}
   4 \times (y - 3) & = 7y + 6(2 - y) \\
   5 \times (y - 3(2 - 6)) & = 3y + 4(2y - 7) + 9 \\
   4y - 72 & = 3y - 5y + y + 4 - 46 - 2y - 119
   \end{align*}
   \]

   2. Pass the pages around so that the second and third steps of each solution are performed by the other two group members. Before writing, make sure that the previous step is correct. If a mistake is discovered, return the problem to the person who made the mistake for repairs. Continue passing the problems around until all equations have been solved.

   3. Each group should reach a consensus on what the three solutions are and then compare their answers to those of other groups.

Group Activity

Computing Body Mass Index (BMI)

Method: Calculator
Estimated Time: 10 minutes
Group Size: 2

Body mass index is a continual measure of an individual’s weight relative to his or her height. It is computed by

\[
\text{BMI} = \frac{705 \times \text{weight in pounds}}{\text{height in inches}^2}
\]

The BMI on a certain body mass index is as follows:

1. Compute the body mass index for a person 1’9” tall weighing 100 lbs. If the person’s weight is comparable, should the person be concerned about obesity?

2. At the time that basketball player Michael Jordan played for the Chicago Bulls, he was 6’6” and weighed 220 lbs. What was Michael Jordan’s body mass index?

3. For a fixed height, body mass index is a function of a person’s weight only. For example, for a person 7’2”, find the body mass index for the following weight ranges:

   - 240 lbs to 250 lbs
   - 250 lbs to 260 lbs
   - 260 lbs to 270 lbs

4. The time that professional bodybuilder, Jay Cutler, won the Mr. Olympia contest he was 6’1” and weighed 310 lbs. What was Jay Cutler’s body mass index?

5. A bodybuilder, Jay Cutler has an extremely small percentage of body fat. Yet, according to the chart would he be considered overweight or obese? Why do you think that the formula is not an accurate measurement of Mr. Cutler’s weight status?
Concept Workshops and in-class activities

- **Example 1** (College Algebra—Linear Functions)
- **Example 2** (College Algebra—Quadratic Functions)
- **Tell me what you know**—Quad/Rational

Stats Activity 1 (M&Ms)
Stats Activity 2 (Sampling Variability-computer sim)
Stats Activity 3 (Ghostbusters-video)

Video Lectures

- First Experience learning comes from the videos.
- Students should watch these prior to coming to class.
  - Bring copy of the “notes” to class
  - Work a handful of problems in MML

Video Lecture (cont.)

- **Camtasia**
  - Allows one to easily add audio and publish as SWF/mp4
  - Can be used with Tablet PC to easily audio-annotate.
  - Example 1 (CA 2.1) | Example 2 (CA 3.1) | Example 3 (CA 8.3)
  - Live Video (next slide)
Live Video

The process

1. Identify the learning outcomes for the course. You should have at least 1 per section
   Ex: Students will demonstrate the ability to solve linear equations, inequalities, and compound inequalities, and to represent solutions in set, interval, and graphical notations.
2. Create the in-class “experience.”
3. Create the out-of-class “experience.”

Advantages (recap)

• Interacting with students (what we like best!)
  – Can spot struggling students
  – Students can get immediate feedback
• Instructor can engage more with students
• No strict time limit for covering material
• Students work at own pace
• Students engaged with other students
  – Reinforces concepts when talking about it
• Students are more comfortable asking questions
• Releases instructor from the “tyranny of the content.” (Bowen)
Disadvantages/Issues

- Getting students to come prepared
- Time
- Bandwidth/Plug-ins
- Scapegoat for the unsuccessful
- If they replay the video, they get the same explanation
- Questions are delayed until class time
- Strange conversations

Students are now responsible for their first experience learning outside of class; this in fact is their homework.

Right for you?

- Do you already have a highly interactive class where students come prepared?
- Does your course content change often?
- If you don’t lecture during class, are there activities you can do in the classroom that will engage the student?
- Do you already have content in a digital format?

Student reactions

“I think that it not only gives the students an opportunity to take responsibility to learn on their own but gives the teacher time to explain the trouble problems in class. I love the method! “—Anonymous student 1530 Fall 2007
Student reactions

“I think it’s an excellent way to do a math course because you don’t need help with listening to the lecture, but you do need help applying the concepts and working through the problems. I believe if the class had been done as a traditional course is taught then it would’ve been much more difficult to learn the subject matter.” –Anonymous student 1530 Fall 2007

Student reactions

• “I loved it. I learned very well that way because you can rewind the video and you can take as long as it takes you to get it. But in class you cannot rewind what the teacher just said and you have a limited amount of time to go over everything.” –Anonymous student 1010 Fall 2007

Student reactions

“I think that it was awesome!! I have never been able to comprehend math until it was taught this way.” –Anonymous student 1010 Fall 2007
Student reactions

“It was so fabulous that I sold everything I owned to become a stats teacher and follow in Dr. McD's footsteps.” — Nobody...yet!

Online format

- I use www.coursecompass.com (MyMathLab), but you could use any LMS (e.g. Blackboard, D2L, Moodle)
- If time allows, you will be shown how this is set up in coursecompass.
- Teaching Naked (or just Google “NPR Teach Naked”)

Useful Links

- http://mast.unco.edu/programs/vodcasting/
- http://vodcasting.ning.com/
- http://www.ted.com/talks/salman_khan_let_s_use_video_to_reinvent_education.html
- http://projecteuler.net/
- http://khanacademy.org/
- http://ibvodcasting.com/
References and Software


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Software/Hardware Used

- **Software**
  - Camtasia Studio, SnagIt, Winplot, Virtual TI,
- **Hardware**
  - Tablet PC (Gateway and Dell)
  - Blue Snowball Microphone