

# Improving an Asynchronous Online Physics Course

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National Labs

# Agenda

- Examples of Challenges
- Organizational Rubric
- Learning Management System ideas
- Useful external tools and software
- Combating cheating in online tests
- Other ideas
- Unimplemented ideas
- Sources

# Challenges

- Implementing interactive activities (such as peer review) between students
- Easy student input of math in a quickly gradable form
- Overpriced lab kits
- Forums which are either transactional, off topic, or unwieldy to grade
- Students will be collaborating with each other and chatGPT, whether you want them to or not

# Organizational rubric –(from Quality Matters)

- Review standards from Quality Matters are available
- NC community college faculty can get a faculty stipend for a program implementing the standards in an online course
- Has some flexibility, but is still a rubric evaluating your course
- Stopped having questions from students about how the course worked

## Quality matters Review Standards

1. Course overview and introduction
  - Where to start, what are the requirements, introductions
2. Learning objectives
3. Assessment and measurement
4. Instructional Materials
5. Learning activities and learner interaction
6. Course technology
7. Learner support
  - Links to school's technical support, accessibility and accommodation policies, academic support services, and other institutional resources
8. Accessibility and usability

# Learning Management System (LMS) ideas

- It is possible to add functionality to Moodle by searching through plugins (many are free):
  - <https://moodle.org/plugins/>
    - For example, the “formula” and “freehand (ETH)” plugins can be useful
- Inserting a python shell into your LMS using trinket.io can be handy

# External tools and software

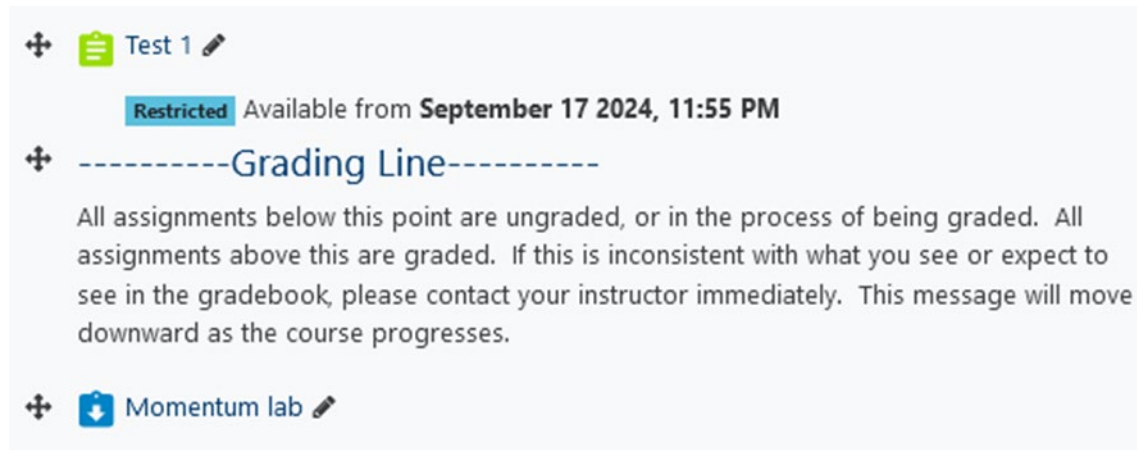
- Tracker: <https://physlets.org/tracker/>
- Noragulfa tools (by Geoff Nunes):
  - Nplot: <https://noragulfa.com/nPlot/>
  - Sigmund video analysis: <https://noragulfa.com/sigmund/>
- A free particle (by Michael Freeman):  
<https://sites.google.com/view/afreeparticle/interactives>
- Perusall:
  - <https://www.perusall.com/>
    - Using OER books (except openstax) with Perusall is free

# Combating cheating in online tests

- Change multiple things at once
- Require lockdown browser with webcam
- Include short answer questions mixed with randomized numerical questions
- Don't allow students to browse through all questions, have them work on a randomized subset of the questions
- Include similar questions (to others or past questions) with small changes
- Grades on test questions went down by about 10 percentage points as a result

# Other ideas

- Ask more sketching-related questions to better evaluate root understanding
- Grade by the argument of the question rather than the answer
- Grading line:



The screenshot shows a section of a course gradebook. At the top, there is a header for 'Test 1' with a green icon and a pencil icon. Below this, a blue box contains the text 'Restricted Available from September 17 2024, 11:55 PM'. The main part of the screenshot is a 'Grading Line' section, indicated by a blue dashed line and the text '-----Grading Line-----'. Below this line, a message explains that assignments below the line are ungraded or in progress, while those above are graded. At the bottom, there is a header for 'Momentum lab' with a blue icon and a pencil icon.



# Unimplemented ideas

- Weighting questions in a test based on the number of students getting the question correct (more students getting correct the less it's worth down to a minimum value)
  - Former colleague math teacher (Ben Doremus) did this, which removed the typical bimodal grade distribution
    - Worked well in conjunction with standards based grading
    - All grades were kept in an excel sheet
    - Gave concrete problem types for students to work on
      - Made grade report comments and parent conferences easy and objective
- Asking questions which aren't questions (context-dependent statements)
- Using H5P
  - Branching scenario using video, powerpoint, images, or text. Branching controlled by multiple choice questions (similar to "interactive video vignettes" in Compadre)

## Sources

Item	Source
Quality Matters higher education rubric	<a href="https://www.qualitymatters.org/sites/default/files/PDFs/StandardsfromtheQMHigherEducationRubric.pdf">https://www.qualitymatters.org/sites/default/files/PDFs/StandardsfromtheQMHigherEducationRubric.pdf</a>
Moodle formula plugin documentation	<a href="https://dynamiccourseware.org/course/index.php">https://dynamiccourseware.org/course/index.php</a>
Moodle freehand (ETH) plugin	<a href="https://moodle.org/plugins/qtype_drawing">https://moodle.org/plugins/qtype_drawing</a>
Trinket	<a href="http://trinket.io">trinket.io</a>
Tracker	<a href="https://physlets.org/tracker/">https://physlets.org/tracker/</a>
Noragulfa nplot	<a href="https://noragulfa.com/nPlot/">https://noragulfa.com/nPlot/</a>
Noragulfa video analysis	<a href="https://noragulfa.com/sigmund/">https://noragulfa.com/sigmund/</a>
A free particle (desmos simulations)	<a href="https://sites.google.com/view/afreeparticle/interactives">https://sites.google.com/view/afreeparticle/interactives</a>
Perusall (commenting on texts)	<a href="https://www.perusall.com/">https://www.perusall.com/</a>
Learning to Think like a Physicist: A Review of Research-based Instructional Strategies (source talks about diagrams helping physics understanding)	American Journal of Physics <b>59</b> , 891 (1991); doi: 10.1119/1.16667
Weighting questions by difficulty	Discussions with Ben Doremus in 2016
Asking questions which aren't questions	From 2023 OPTYCs NFDS workshop sessions led by Dwain and Angela
H5P branching scenario	<a href="https://h5p.org/branching-scenario">https://h5p.org/branching-scenario</a>
Interactive Video Vignettes	<a href="https://www.compadre.org/ivv/">https://www.compadre.org/ivv/</a>