THE UNIVERSITY of TENNESSEE KNOXVILLE
COLLEGE of ENGINEERING

The Jerry E. Stoneking engage™ ENGINEERING FUNDAMENTALS PROGRAM

Work in Progress – Enhancing On-Line Interaction with Graphical Tools

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Frontiers in Education
October 15, 2011

Work in Progress - Enhancing On-Line Interaction with Graphical Tools

Abstract **- A limitation in many on-line interaction systems (discussion boards, wikis, chat rooms, etc.) is the lack of graphical tools. When using these types of systems to provide asynchronous help for engineering classes, the lack of integrated graphical tools ignores the need to communicate with sketches and equations. Due to the nature of the material and the limitations of current technologies, students tend to work in a mixed- mode environment. That is, they will work out their solutions to problems on paper, and then they have to duplicate or describe their work in a text only mode when they go on-line for assistance. The requirements, design, and implementation of a prototype system for allowing students to seamlessly integrate images, sketches, and equations along with text in on-line discussion board environment is described.**

UT Engineering - Common First Year Curriculum

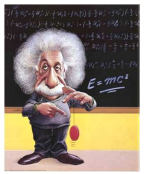
Fall Semester

- English 101 (3)
- Math 141 (4)
- Chemistry 120 (4)
- EF 151 Physics for Engineers I (4)
- EF 105 Computer Methods in Engineering Problem Solving (1)

Spring Semester

- English 102 (3)
- Math 142 (4)
- EF 152 Physics for Engineers II (4)
- Department Option

Courses Taught By Engineering Fundamentals



EF 151 Physics for Engineers I (4)

- Co-requisite is Calculus I
- Fall 2011 Enrollment: 413
  - 80 additional students in Honors
- Spring 2011 Enrollment: 136

EF 152 Physics for Engineers II (4)

- Fall 2011 Enrollment: 114
- Spring 2011 Enrollment: 324

EF 105 Computer Methods in Engineering Problem Solving (1)

- Co-requisite with EF 151

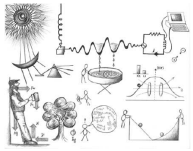
EF 230 Computer Solution of Engineering Problems (2)

- Taken by about half the departments
- Matlab

EF 402 Fundamentals of Engineering (1)

- Review of morning portion of FE exam
- Taken by most departments

EF 151 and EF 152
Physics for Engineers I & II



Physics

EF 151
- Vectors and 1D Motion
- 2D Motion; Forces
- Conservation of Energy and Momentum
- Rotational and Rigid Body Motion

EF 152
- Statics and Fluids
- Harmonic Motion, Sound, Waves
- Thermodynamics
- Electricity and Magnetism

Engineering

Communication
- Written reports
- Oral presentations
- Engineering calculations

Team Skills
- Numerous small projects
- Large end-of-semester project

Design
- Open-ended design problems

Introduction to Disciplines
- Overview of all Departments
- Departmental fair

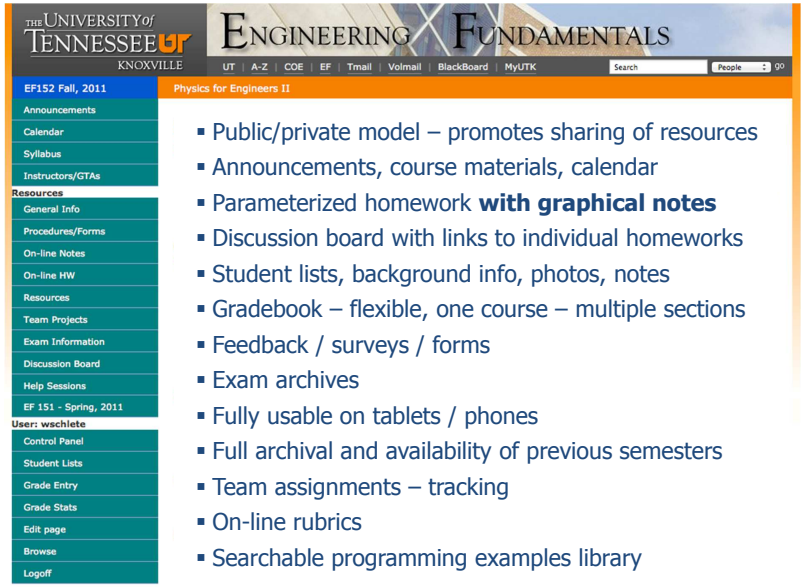
Lectures

- All students in one lecture hall
- Meet 3 times a week, MWF
- Team Taught
  - Two instructors
  - One talks, one writes/comments
  - Interaction and conversation
  - Streamlines use of technology
- Personnel Response System
  - Immediate Feedback
  - Part of grade
  - Encourage participation and thought
- Lectures are recorded
  - Available online
  - Includes video and screen contents
  - Indexed

Recitations

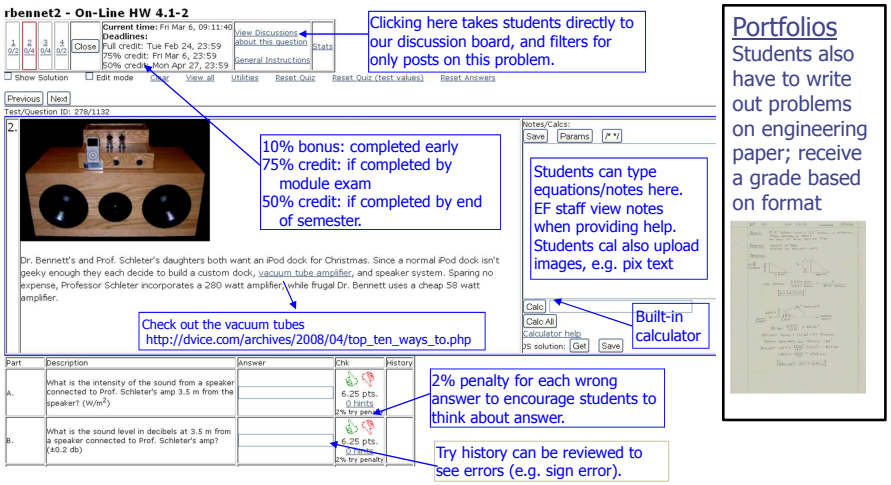
- Meet twice a week, 75 minutes
- 24 - 28 students per section
  - Students sit at tables of 4
  - White boards at each table to facilitate collaborative learning
  - Teams assigned; 1 person from each quartile
  - New teams every 3 weeks
- Led by Graduate Teaching Assistants
  - Trained by faculty
  - Weekly planning meetings
  - Faculty drop into recitations
- Variety of activities
  - Problem solving
  - Labs
  - Demonstrations
  - Team projects

Custom Course Management System



- Public/private model – promotes sharing of resources
- Announcements, course materials, calendar
- Parameterized homework **with graphical notes**
- Discussion board with links to individual homeworks
- Student lists, background info, photos, notes
- Gradebook – flexible, one course – multiple sections
- Feedback / surveys / forms
- Exam archives
- Fully usable on tablets / phones
- Full archival and availability of previous semesters
- Team assignments – tracking
- On-line rubrics
- Searchable programming examples library

Web-based Homework System



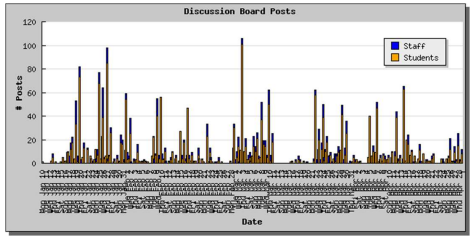
Portfolios
Students also have to write out problems on engineering paper; receive a grade based on format

Spring 2011: 161,539 tries 88,990 correct answers 274 punts

Support for EF courses

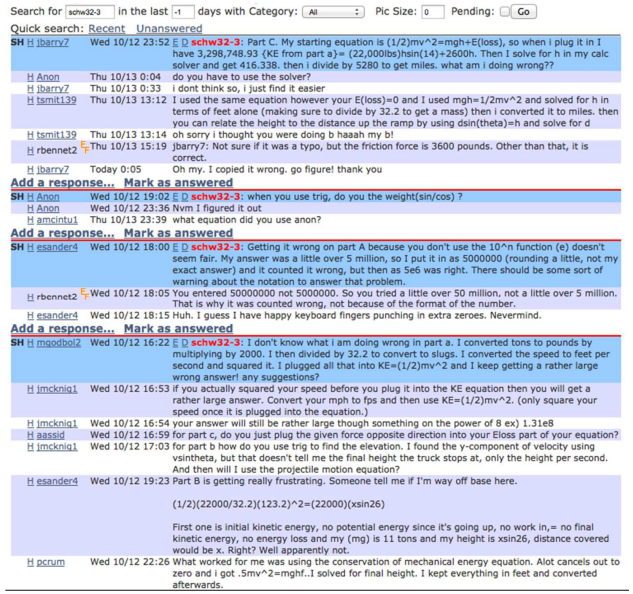
Help Sessions
Several evenings per week; answers to individual questions

Discussion Board
Available 24/7; monitored at specific times

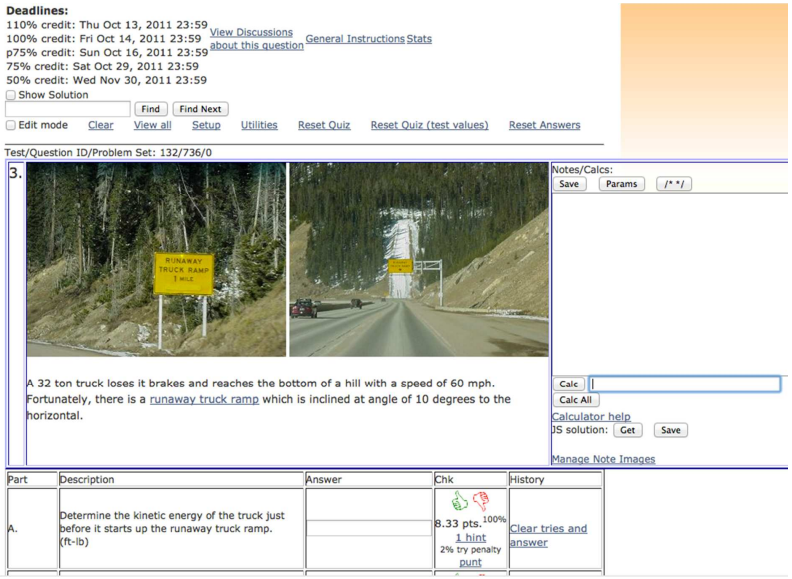


EF 152, Spring 2011
657 questions
2418 answers
78,924 page views

Discussion Board



Sample On-Line Homework



Getting the Pictures . . . Setup

EF Note Image Manager

Current Files assocated with !hw 3-2-3 for wschlete

Selected image(s): Delete

Refresh the Page OR Return to the previous page OR Admin Browse

Loading Files

- Create a new sketch (svg file)
- Send a pix message or email with attachment to **EF151@ef.engr.utk.edu**.
  Include **!hw 3-2-3** in the subject or body of the message.
  Getting set up to send images to the web site.
- Webfolder - send a pix message or email with an image attachment to **EF151@ef.engr.utk.edu**

  No webfolder files available.
- From local file:
  Browse...
  Load from local file
- From URL:
  Load from URL

Device Registration

EF Mail Manager

This utility facilitates the texting and/or emailing of images to the EF web site. To make this work, you must register your account as follows.

1. Use the desired source to send a message to the address **EF151@ef.engr.utk.edu** with the subject **!reg wschlete**. This tells the system that you want image attachments to messages from this source to be stored in your EF web folder.
2. After sending the registration message, you should see an entry in the list below with the status of 'pending'.
3. Use this page to enable the entry.
4. After this is done attachements to messages from the source will be stored in your EF web folder where they will be accessible from the ef web site utilities.

NetID	Email	Status	Action
wschlete	wschleter@utk.edu	Enabled,Confirm On	Disable Enable Block Delete Confirm Off
wschlete	wschleter@gmail.com	Enabled,Confirm On	Disable Enable Block Delete Confirm Off
wschlete	8653842813@mms.att.net	Enabled,Confirm On	Disable Enable Block Delete Confirm Off

Adjusting Pictures . . . More Open Source JCrop and ImageMagick

Image Editor

convert -rotate -90 /www/c/ef151-2011-08/dropbox/webfolder/wschlete/hw/3-2-3-truck.jpg /www/c/ef151-2011-08/tmp/IE_AQ1ZQI.1; chmod 755 '/www/c/ef151-2011-08/tmp/IE_AQ1ZQI.1';
Original Image: dropbox/webfolder/wschlete/hw/3-2-3-truck.jpg
Current Image: tmp/IE_AQ1ZQI.1

Rotate
CCW 180 CW

Crop - specify crop area on the image
Crop Image

Size: 1296 x 968 pixels
49 %
Resize

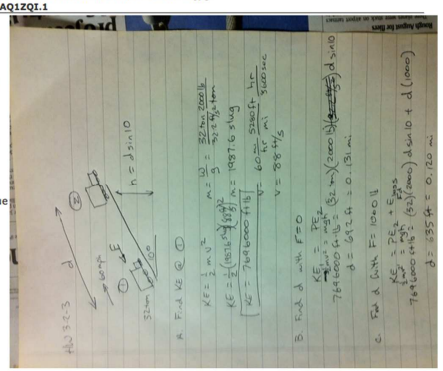
Brightness,Saturation,Hue
0 0 0
Adjust

Convert to
jpg png

Other ImageMagick Operations
Other

Undo Redo

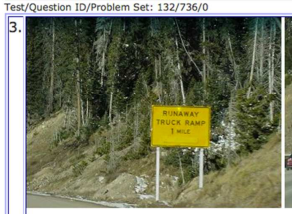
Save Save As New
Cancel



Picture Associated with Homework

p75% credit: Sun Oct 16, 2011 23:59
75% credit: Sat Oct 29, 2011 23:59
50% credit: Wed Nov 30, 2011 23:59
Show Solution
Find Find Next
Edit mode Clear View all Setup Utilities Reset Quiz Reset Quiz (test values) Reset Answers
Test/Question ID/Problem Set: 132/736/0

3.

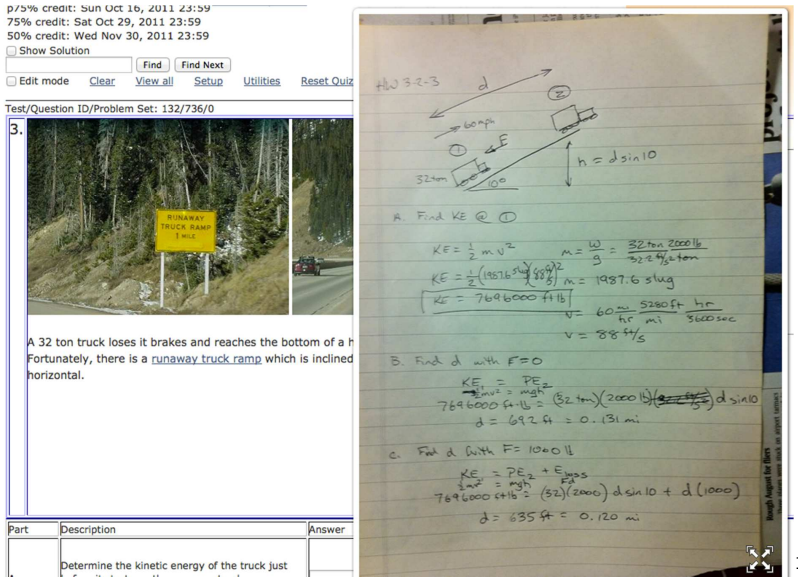


A 32 ton truck loses it brakes and reaches the bottom of a hill with a speed of 60 mph. Fortunately, there is a runaway truck ramp which is inclined at angle of 10 degrees to the horizontal.

Notes/Calcs:
Save Params /* */
Calc
Calc All
Calculator help
IS solution: Get Save
edit
edit
annotate
Manage Note Images

Part	Description	Answer	Chk	History
a	Determine the kinetic energy of the truck just before it starts up the runaway truck ramp		8.33 pts. 100%	Clear tries and

Picture Associated with Homework



Getting the Pictures . . . Sketching

EF Note Image Manager

Current Files assocated with !hw 3-2-3 for wschlete

Selected image(s): Delete

Refresh the Page OR Return to the previous page OR Admin Browse

Loading Files

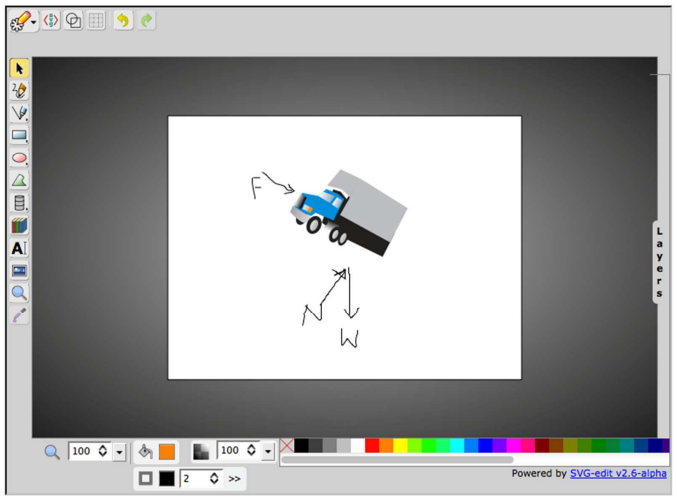
- Create a new sketch (svg file)
- Send a pix message or email with attachment to **EF151@ef.engr.utk.edu**.
  Include **!hw 3-2-3** in the subject or body of the message.
  Getting set up to send images to the web site.
- Webfolder - send a pix message or email with an image attachment to **EF151@ef.engr.utk.edu**

  No webfolder files available.
- From local file:
  Browse...
  Load from local file
- From URL:
  Load from URL

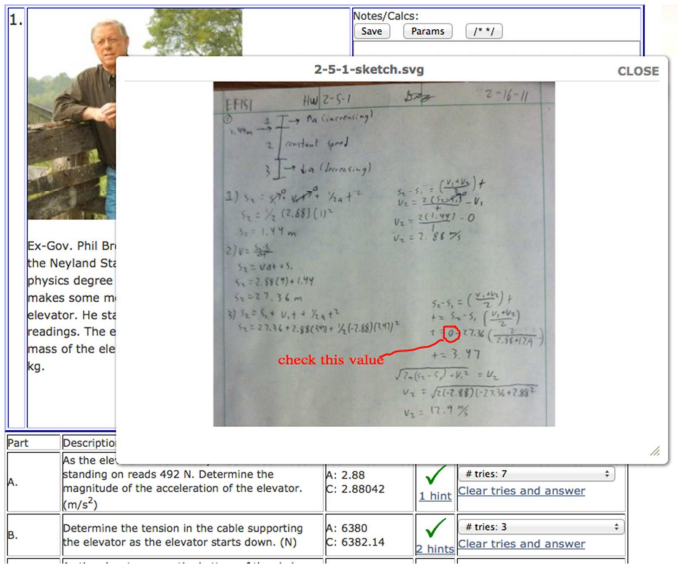
SVG-Edit – More Open Source Coolness

EF Sketcher

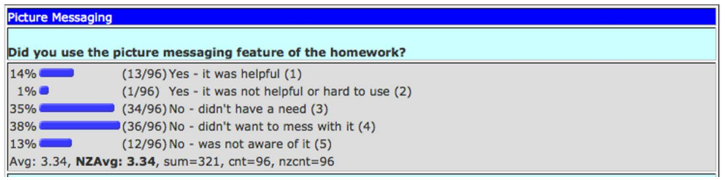
Save | Save Copy | Cancel | dropbox/webfolder/wschlete/hw/3-2-3-sketch.svg



SVG-Edit – Annotation



The Survey Says . . .



Picture Messaging

Did you use the picture messaging feature of the homework?

14%	(13/96)	Yes - it was helpful (1)
1%	(1/96)	Yes - it was not helpful or hard to use (2)
35%	(34/96)	No - didn't have a need (3)
38%	(36/96)	No - didn't want to mess with it (4)
13%	(12/96)	No - was not aware of it (5)

Avg: 3.34, **NZAvg: 3.34**, sum=321, cnt=96, nzcnt=96

- It is a good feature I should have taken more advantage of.
- that was the best thing about the homework. it really helped being able to have the professors instruct us on where we went wrong.
- cool feature
- Never got around to it
- good idea!
- Didn't know we had one
- I never figured it out.
- Good feature.
- I didn't use it but I will say I think it is a fantastic idea and should be kept in the course and improved upon.
- I'm sure it will be very helpful to next falls EF 151 class.
- That seemed like more trouble than it is worth.
- I never knew how to do the picture feature and didn't really have the urge to try and figure it out.
- I used my wacom drawing tablet with it. It was awesome.
- Technology is crazy.
- I found it was easier to just go to help session if you needed to show your work
- I figured out about it by the end of the year.
- the pictures and videos really help to bring some explanation to questions being asked.

Summary and the Future

- Greatly reduces time to provide help
- Student adoption has been slow
- Can expand the concept
  - Discussion Board (too much sharing?)
  - Other file types (Matlab, Word, Excel, One Note)
- Facebook link?
- E-portfolio