Spreadsheet Templates for Creating Individualized Objective Homework Problems

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Trine University

John Wagner & Amanda Malefyt

A story of theft

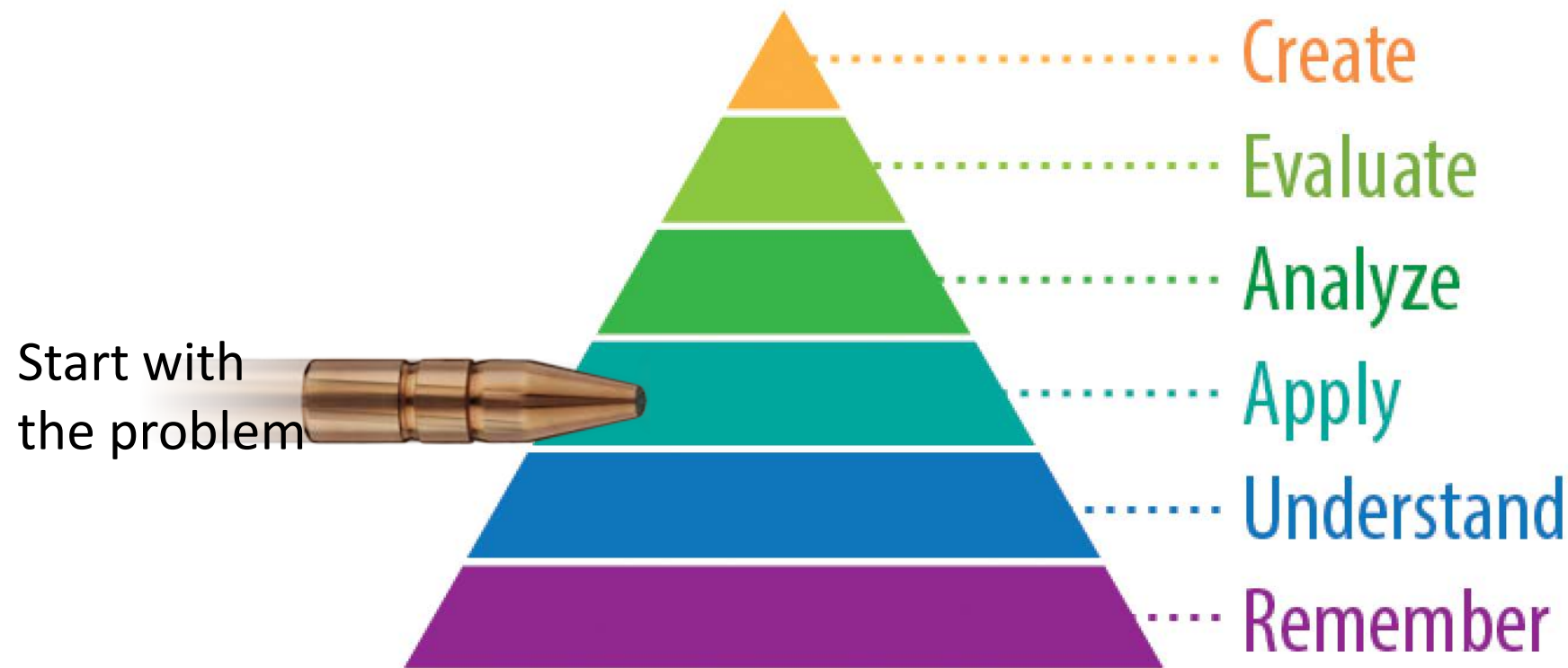so students won't copy

Practice Quiz 1 – AIChE 2016

1) (Pick One) What educational techniques or concepts did I steal from John L. Falconer?

    a) Start with a problem

    b) Make sure students put forth some initial effort

    c) Test understanding of concepts
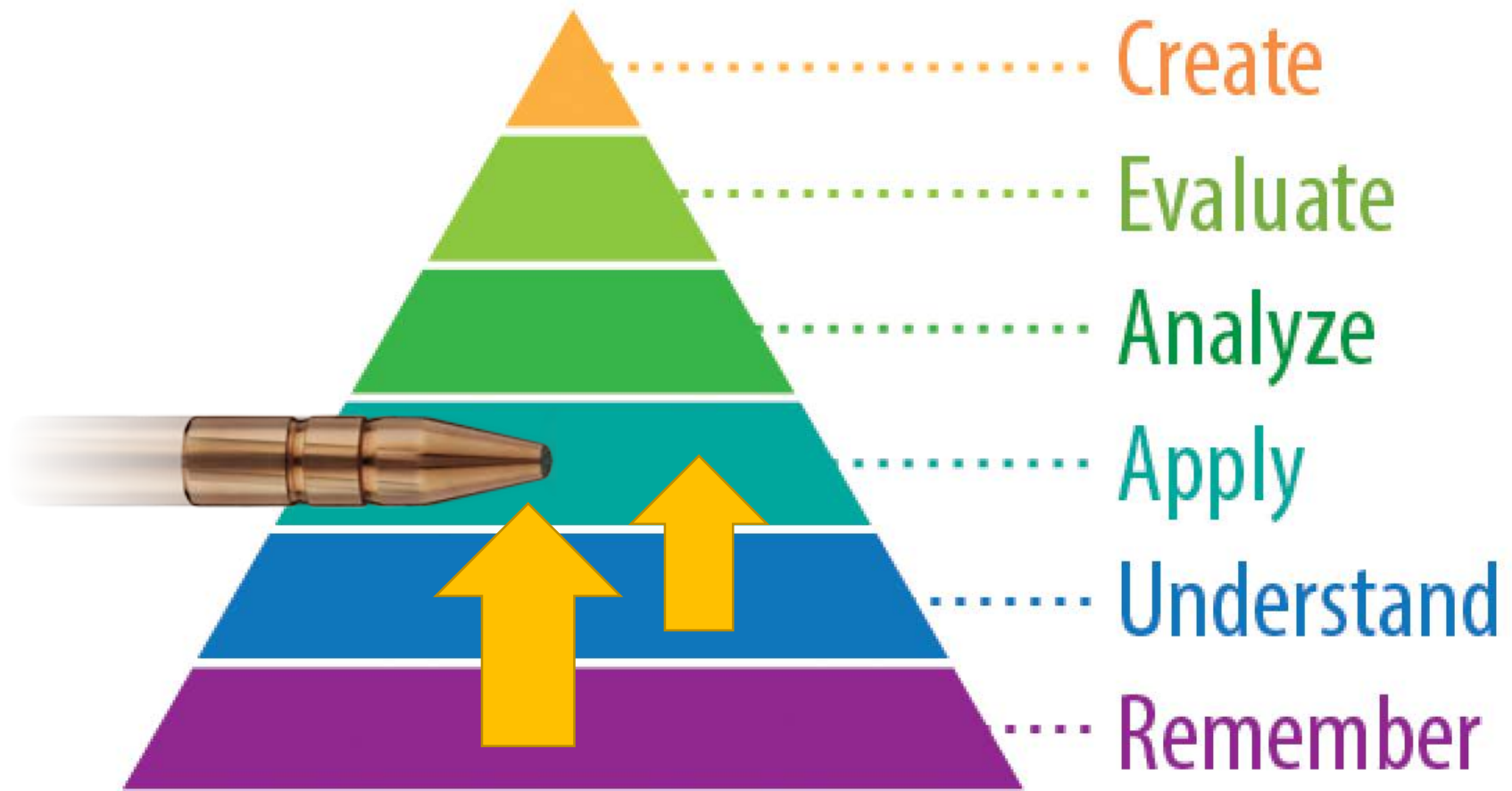
    d) Active learning

    e) All of the above

Practice Quiz 1 – AIChE 2016

1) (Pick One) What educational techniques or concepts did I steal from John L. Falconer?

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    c) Test understanding of concepts

    d) Active learning

    e) All of the above

Start with the problem

Create

Evaluate

Analyze

Apply

Understand

Remember

BLOOM'S TAXONOMY

Create

Evaluate

Analyze

Apply

Understand

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Create

Evaluate

Analyze

Practice Quiz 1 – AIChE 2016

2) (Pick One)What is indispensable in educating engineering students?

    a) Professors

    b) Laboratories

    c) Problems

    d) Computers / Technology

    e) References / Text books

Practice Quiz 1 – AIChE 2016

2) (Pick One)What is indispensable in educating engineering students?

    a) Professors

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    c) Problems

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    e) References / Text books

Practice Quiz 1 – AIChE 2016

3) (Pick One) What is the **absolutely essential** for student learning?

   a) Effort by the learner

   b) Guidance by the instructor

   c) Interaction with others

   d) Creativity

   e) Course Design

Practice Quiz 1 – AIChE 2016

3) (Pick One) What is the **absolutely essential** for student learning?

    a) Effort by the learner

    b) Guidance by the instructor

    c) Interaction with others

    d) Creativity

    e) Course Design

Practice Quiz 1 – AIChE 2016

4) (Pick One) What is wrong with the current homework system?

a) Many students misuse the solutions

b) Instructors spend to much time writing problems

c) Students don't spend enough time reflecting

d) Students start too late so there is no incubation time

e) All of the above

Can We Do Better?

Back to Stealing

This time from the Publishers and Course Designers

	response	correct	pts
a)			30.0
b)			30.0
c)			30.0

Failure is success if we learn from it. Malcolm Forbes

Please replace this text with your name

Finished?   No

Try   Machine
0   Score ↓

max try   4   0

0

0%

ID 0.00/000/0.000/798430.111-LC000 t00.00.00-C1000-RD2-TValpha1_1-

Total machine pblm pts   90.0

Total Refect pts   10

To Initialize:
Press the Function 9 key (F9) until
problem appears

To check responses press F9

When satisfied:
change "Finished?" to "Yes" and
press F9,
then see below

Finished? No

	response	correct	pts
a)			30.0
b)			30.0
c)			30.0

Nothing will work unless you do. John Wooden

Please replace this text with your name

max try   4

Try   1

Machine
Score ↓

0

Total machine pblm pts   90.0

0%

ID 0.00/000/0.000/574416.117-LC000 t00.00.00-C1000-RD2-TValpha1_1-

To Initialize:
Press the Function 9 key (F9) until
problem appears

To check responses press F9

When satisfied:
change "Finished?" to "Yes" and
press F9,
then see below

John L. Falconer produces both thermodynamics (TD) and reactor design (RD) videos. Based on thousands of previous videos

Total Refect pts   10

	Mean time minutes	Standard Deviation minutes
TD	385	44
RD	239	42

John will produce 13 TD videos and 12 RD videos next year. For next year find the best estimate for the:

a) upper bound (hrs) to the 95% confidence interval for Johns TD videos
b) total time (hrs) John will be making both TD and RD videos
c) amount of time (hrs) John will spend playing in the Colorado sunshine next year using the graph below?

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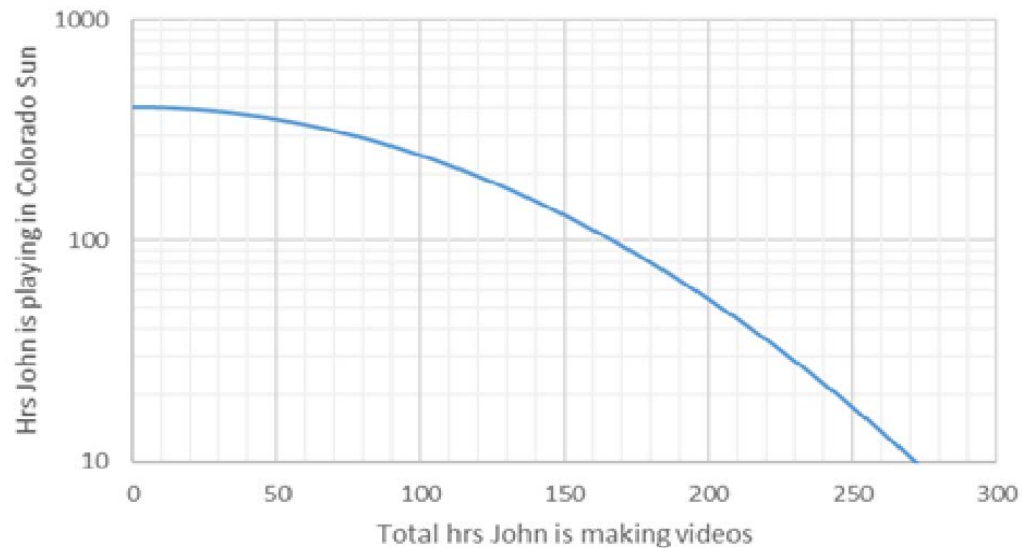c) amount of time (hrs) John will spend playing in the Colorado sunshine next year using the graph below?

Finished? No

	response	correct	pts
a)	70	No	30.0
b)	131.2	YES	30.0
c)	168.7	YES	30.0

Nothing will work unless you do. John Wooden

Please replace this text with your name

Try   Machine

max try   4   2   Score ↓

60

Total machine pblm pts   90.0

ID 60.00/000/240.000/853728.117-LC000 t00.00.12-C1000-RD2-TValpha1_1-

67%

To Initialize:
Press the Function 9 key (F9) until
problem appears

To check responses press F9

When satisfied:
change "Finished?" to "Yes" and
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then see below

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	response	correct	pts	Ans
a)			30.0	7.87E+01
b)			30.0	1.25E+02
c)			30.0	1.83E+02

Nothing will work unless you do. John Wooden

Please replace this text with your name

To Initialize:

Press the Function 9 key (F9) until problem appears

To check responses press F9

When satisfied:

change "Finished?" to "Yes" and press F9,

then see below

John L. Falconer produces both thermodynamics (TD) and reactor design (RD)

	Mean time minutes	Standard Deviation minutes
TD	250	25
RD	300	30

John will produce 18 TD videos and 10 RD videos next year. For next year find

a) upper bound (hrs) to the 95% confidence interval for Johns TD videos

b) total time (hrs) John will be making both TD and RD videos

c) amount of time (hrs) John will spend playing in the Colorado sunshine nex

Initial Feedback from the Students
(5 pt scale)

	MEB SP/SU 16 n=5	MB Fall 16 n=18	Design I Fall 16 n = 20
Liked Immediate Feedback	4.5	4.4	4.5
Rated effectiveness	4.5	4.6	4.0
Liked and used base-case		4.0	4.0
Work with others		3.0	

Practice Quiz 1 – AIChE 2016

5) (Pick One) How will we know we have good problems?

    a) Problem Creators Judgement

    b) Instructors Judgement

    c) Rating by the Instructors

    d) Ratings by the Students

    e) All of the above

Practice Quiz 1 – AIChE 2016

5) (Pick One) How will we know we have good problems?

    a) Problem Creators Judgement

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How about Stealing from Yelp?

Wooden   Try

max try   4   1

Total machine pblm pts   9(

)/0.000/574416.117-LC000 t00.00.00-C1000-RD2-TValpha1_1-

dynamics (TD) and reactor design (RD) videos. Based on thousands of previous videos   Total Refect pts
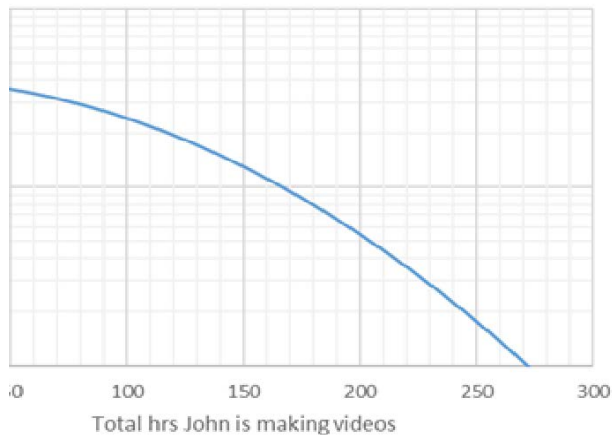
tion

RD videos next year. For next year find the best estimate for the:

lence interval for Johns TD videos
both TD and RD videos
I playing in the Colorado sunshine next year using the graph below?

Total hrs John is making videos

Please select the statement that best describes the following, then Press F9

A. difficulty of the problem

B. effectivness of the problem

C. your performance on the problem

Respond to all of the following queries labeled with upper case Roman numbers then ctrl-P to Print

I. What part of this problem gave you the most difficulties and why?

II.
What engineering principles were involved in solving this problem?

III. When solving this type of problem, what do you think the most common errors are? Did you make any of these errors? How can they be avoided in the future?

Please select the statement that best describes the follov

A. difficulty of the problem

B.
5. Extremely difficult - I needed a lot of help on this problem
4. Difficult - I needed some help in solving the problem
3. Moderately difficult - I struggled a little but could work the problem on my own
C. 2. Fairly Easy - Solution path was straight forward but had several opportunities for mistakes
1. Extremely easy - I did not have to think very much when I solved this problem

Respond to all of the following queries labeled with upper case Roma

I. What part of this problem gave you the most difficulties and why?

II. What engineering principles were involved in solving this problem?

III. When solving this type of problem, what do you think the most common errors are? Did you
be avoided in the future?

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	MEB SP/SU 16 n=5	MB Fall 16 n=18	Design I Fall 16 n = 20
Like rating and reflecting		2.8	2.7
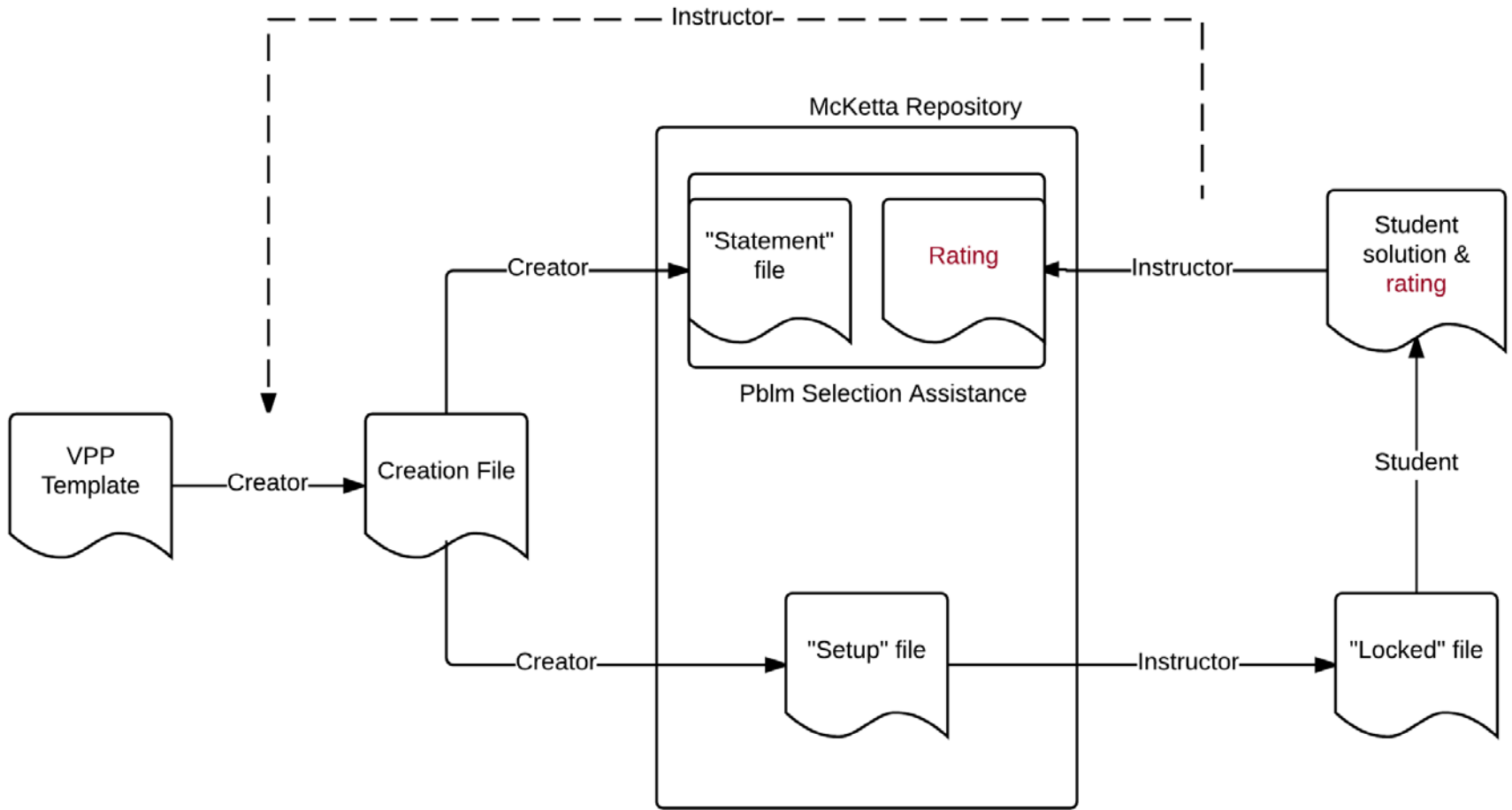
Practice Quiz 1 – AIChE 2016

6) (Pick One) What is the **biggest** problem with the spreadsheet?

    a) Variety of problems that can be put in this format

    b) Security of the solutions

    c) Time it takes to create & check a good problem

    d) Ability of the students to submit their solutions

Practice Quiz 1 – AIChE 2016

6) (Pick One) What is the **biggest** problem with the variable parameter problem template?

    a) Variety of problems I could put in this format

    b) Security of the solutions

    c) Time it takes to create & check a good problem

    d) Ability of the students to submit their solutions

How about Stealing from Wikipedia?

Senior Students

Educators — Problem of the week → Working Engineers

Publish Problems

Problem Contest

Continueing Ed Credit??

McKetta Problem Repository

Query Repository

Rate Problem

Educators

Select Options

Rate Problem
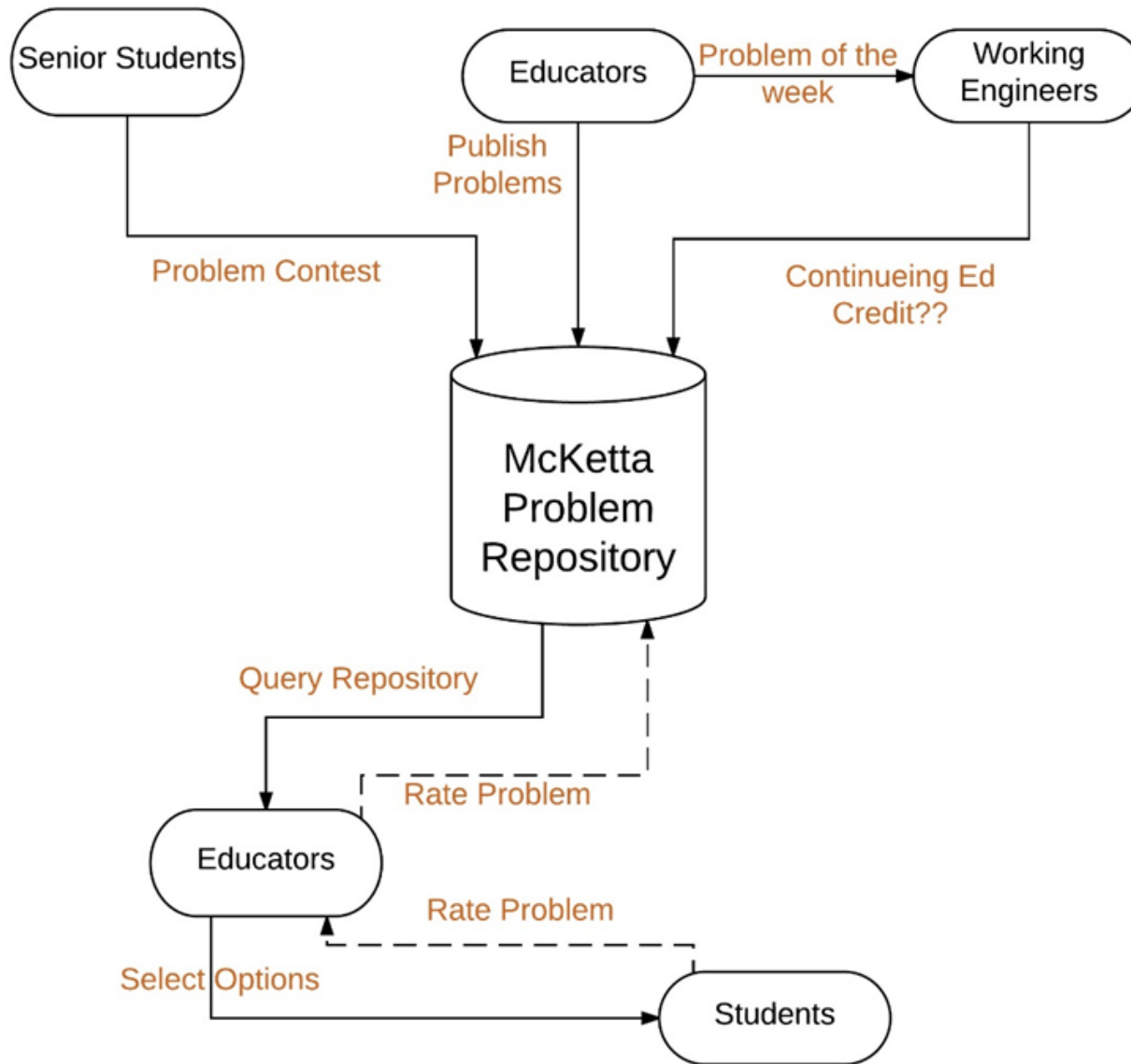
Students

Senior Students rate the **Difficulty of creating** variable parameter problems using the template

Response	Average
Very Difficult	5%
Difficult	29%
OK after some effort	62%
Easy	5%

Senior Students rate the **Time** it took to creating variable parameter problems using the template

Response	Average	
Longer than expected		32%
About as long as expected		53%
Shorter than expected		16%

Senior Students rate the **Enjoyment in creating** variable parameter problems using the template

Response	Average
I enjoyed creating variable parameter problems	11%
Neutral	32%
I did not like creating variable parameter problems	58%
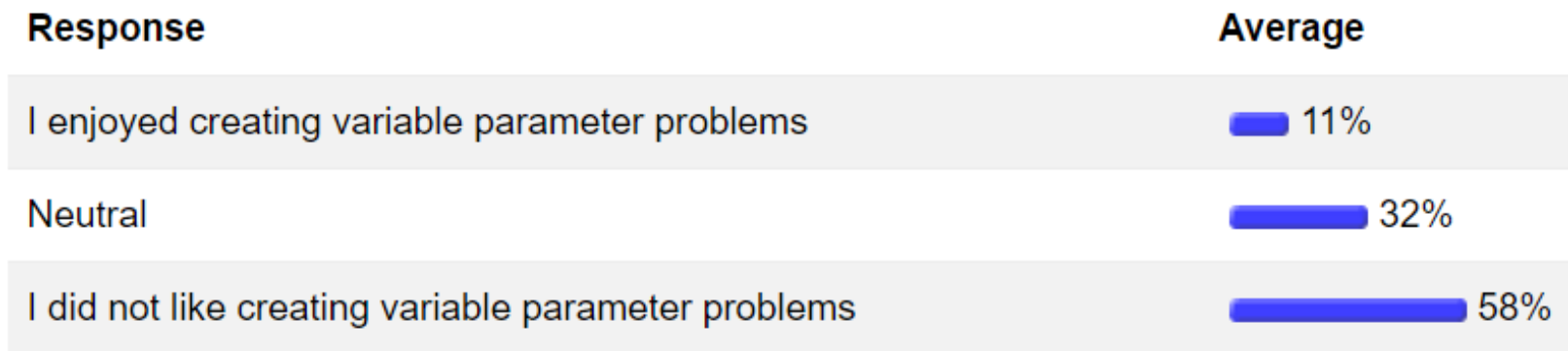
Summary

The center and sole of Engineering Education should be the problem – John taught me that

The deficiencies we have with the current homework system are too important to leave to someone else to solve

Together we can make a system that works

One way is to select homework problems the way we select books on Amazon

? ? ?

Write Base-case problem → **Open Template** → Fill out "info" Sheet → **Ctrl i macro** → Paste the problem in the dark yellow box in the "Create VPP" Sheet and follow V_steps 1-3 → **Ctrl Shift T** → Solve the problem following V_steps 4-6 → **Ctrl Shift W** → Create A PDF document of Base-Case

"Create" XLMT file

Save updated "Create" XLMT file

Save updated "Create" XLMT file — Used and kept by the Creator

Create A PDF document of Base-Case — **Yes** → Save "Statement" file - a PDF file

Used by other educators to select potential problems

No → Overirde the Set-up Defaults?

Overirde the Set-up Defaults? — **No** → Break Links to "Create Sheet" → ⊗

Overirde the Set-up Defaults? — **Yes** → Proceed to "Setup" worksheet S_Steps 1-4 → **Ctrl Shift S** → "Setup" S_Steps 5-6 → **Ctrl Shift L** → Save "Locked" file macro free xlsx

Save "Setup" file - a XLMT File — Used by other educators to select problem options

Save "Locked" file macro free xlsx — Used by Students