

"I'm fine with having to think
as long as I still get an 'A'"

*What students
in a modified physics class
think about learning*

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Purpose of Study

What do students report
about their thinking and learning?



More details than MPEX

- Evaluation of class
- Contrast with other classes
- Change over semester
- Base level of student

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Sources

Traditional algebra based intro physics

- 10 interviews
- After first exam in first semester

Meta-learning class

- 13 interviews at end of year
- pre and post surveys
- videotapes of lab and tutorial

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Once upon a time, in a tutorial room far, far away....



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Thoughts on thinking

by meta-learning students

Thinking is good (9 / 13)

"it's good to think about the things too...not have them just
presented to you." Henry (*commenting on lecture*)

Thinking is not normal (3 / 13)

"You have to be ready to think, be ready to apply, everything.
Whereas in other classes it's kind of like okay that's the
answer. But [in this class] you have to think and apply."
Sharon (*commenting on exams*)

Thinking is not positively correlated to grades (2 / 13)

"[First semester] I got an A on that class but I didn't feel I was
learning anything ... And that's what I wanted to get, that way
of thinking about things without just using straight equations
and memorizing them. ...I'm learning more this semester than I
did last semester but I don't think grade wise I'm doing better."
Joshua (*explaining why he switched*)

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When are students willing to think?

In meta-learning class...

Physics is useful \longleftrightarrow willing to think (10 interviews)

Physics is useless \longleftrightarrow unwilling to think (2 interviews)

"Because it's required for our major but it's one of those classes
we're only going to use a very little bit of it, so I might have gone
with a professor who required less, just because
I can't lie." Brian (*whether he would take this course again*)

"I put a lot of effort into this class, more than I've ever put into any
other college class. But I learned a lot more, I took more from it
than I have any other college class too, so it was worth it."
Sharon (*initial comments*)

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Will you use any of this in two years?

According to traditional students...

No (6 / 10)

"physics has nothing to do with my major, I know I'm just going to take the class, and that's about it.... I know it's not going to help me in my later career, but biochem, at least it has some applications"
Beach

It's possible (1 / 10)

"like biomechanics, with the torque around your wrists and the pressure that you put on a bone that causes it to break.... I could see how this could be relevant if I know it, but since I don't, I'm just praying that it's not going to be relevant."
Liz

They tell me I will (1 / 10)

"So I believe that people that planned the physics, they know that one day these people are going to use physics, that's why it's there. So I think it will be very helpful, because they've planned it like that."
Uta

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Will you use any of this in two years?

According to our new and improved students...

Content Useful (7 / 13)

"a lot of things I learned here that are biology related obviously have immediate benefits....the homework problem we just returned this week with the radioactive nuclei of the gold, the cancer, I can see how that relates and I can understand from the physics there and the biology that I've learned..."
Thomas

Communication Skills (2 / 13)

"unlike a lot of chemistry and stuff like that, you're always working with other people, so I felt like this class really helped me to be able to communicate about science with other people... sometimes talking about science can be kind of complicated and everybody has their own ways of looking at things sometimes, and being able to express the way that I justify a situation both helps me to understand it and sometimes helps other people to understand more."
Jacob

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Will you use any of this in two years?

According to our new and improved students...

Problem Solving (7 / 13)

"I now have the ability to look back at different problems and divulge more, to kind of step back from them and overall look at it and see if there's a way I can solve it using what I know, not having to ask for help.... Because I was actually able to solve problems in other classes..."
Arnold

MCAT (2 / 13)

"My friends in the other classes they sit there and memorize formulas and I would just look at something and try to understand what's behind it and I find that I do better on the [MCAT] diagnostic tests than they are, and they're just like whoa, because I used to be really bad at physics..."
Joshua

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Group Learning

Taught by others (7 / 13)

■ "Sometimes other students can explain it to you because they understand how you think more than the professor."
Brian

Helps to teach others (8 / 13)

■ "at that point I was teaching them that particular situation and that made me understand it better and that made them understand it better too, and I think that's just a better way of learning."
David

Illuminates thought process (3 / 13)

■ "In my group I had to defend every answer I gave because no one agreed with me on anything....And it helped to see, even if I was wrong, what my thought process was to get me to that wrong answer so I don't make that mistake again."
Joshua

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Group Learning

Don't have answer (2 / 13)

"[Working in my group] was good when somebody had the answer. When nobody had the answer then that was bad because we were all fumbling around in the dark..."
Thomas

Don't know if correct (5 / 13)

"either you goof off and you don't do your problems, or you're doing them but you're not sure that you're doing them right, so then you could be doing them completely wrong....I'm more of a someone teaches I learn."
Maggie

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Conclusion

Students in the traditional class

- rarely see the relevance of physics to their work

Students in the modified class

- have a better appreciation for the role of physics in their profession
- may be more likely to approach physics as a thinking and understanding activity rather than just as a memorization task
- often value group learning

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