

Survey for the Kinetics of Enzyme Reactions

CHM 103

Spring 2008

n = 37 students

Please answer the following questions honestly when considering the Kinetics of Enzyme Reactions Excellet and activity that you have used for this assignment. Select your answers by (1) clicking on the boxes if responding on a computer and then print (or save and attach to an email - ssinex@pgcc.edu) or (2) print and mark an x with a pen if on paper.

How long did it take you to work through the activity (all 13 pages)?

7.8 hours (mean) with $\sigma = 5.1$ for n = 32

7.0 hrs (median)

Consider the ease of use of the interactive spreadsheet for each tab in this Excellet as you went through the activity. You are rating each tab, such as "review" or "kinetics plot."

Check ONLY one choice in a row for each tab on the spreadsheet:

tabs	rating	real difficult 1	difficult 2	so, so 3	easy 4	real easy 5	don't know
review	3.8	1	2	7	17	9	-
kinetics plot	3.5	1	5	11	16	4	-
S, E, & P over time	3.3	1	6	14	13	3	-
Initial rate S	3.3	1	6	19	8	3	-
transformed data	2.7	3	16	10	6	2	-
Inhibitors	2.7	2	14	13	7	-	-
linear fits	2.5	7	10	11	8	-	1
non-linear fit	2.4	7	11	11	7	-	1

Ease of overall use of the interactive Excel Spreadsheet: 2.8

real difficult difficult so, so easy real easy
0 9 24 3 0

What was the most valuable part of the activity? Rank these items. Place the number in the box next to the items given below: 1 - most favored ... 5 - least favored

n = 36

mean	σ
2.7	1.4
3.6	1.3
3.3	1.5
2.3	1.1
2.0	1.3

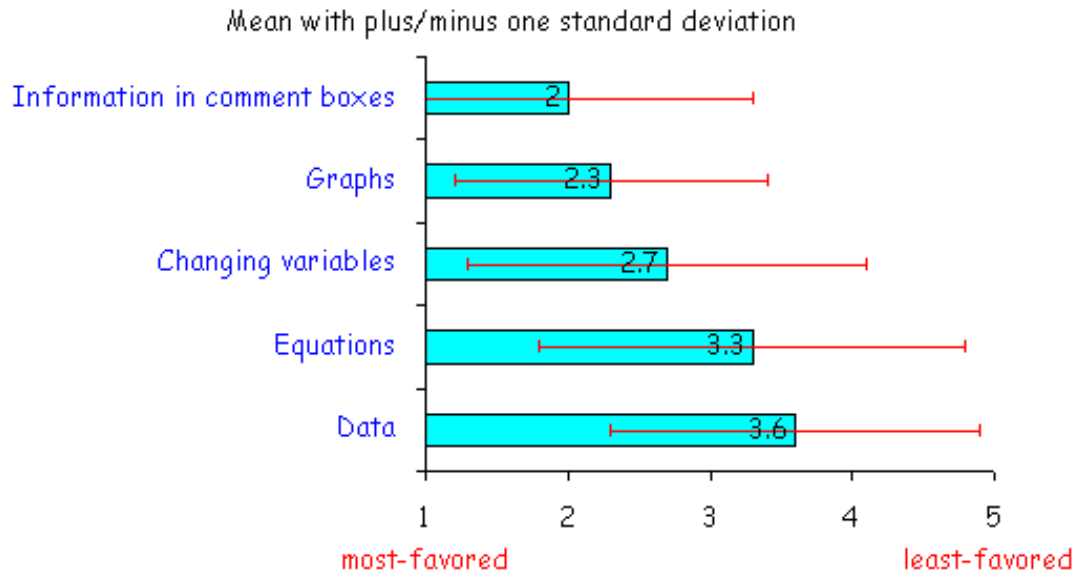
Changing variables

Data

Equations

Graphs

Information in comment boxes



Any comments especially about your #1 ranked item? (You can type in the gray areas.)

Changing variables All comments are typed verbatim including spelling!!!!

- helps a lot with seeing how things change when a high or low number is put in (none of the activities were least favored)
- It is very helpful when one can change variable to approach a subject on different angle.
- I had no problem changing the variables.
- changing the variables really shows how they affect the reaction

Graphs

- It made it a lot easier to visualize the concepts we were talking about.

Equations

- need more explanation to v_{max} and K_M

Comment boxes

- The comment boxes interpreted data that I would've never grasped on my own.
- They help make clear info I didn't understand
- It was really useful. Thank you.
- Helped me to get the concept
- Information in comment boxes provided explanation to certain topics. Some comments need more detail or information.
- I found that the information in the comment boxes were very helpful. They provided extra help and information for some of the tasks we needed to perform.
- The information in the comment boxes helped me navigate through the graphs productively.
- The comment boxes had helpful information.

- They were extremely helpful in most cases.
- The information in the comment boxes was my only source of information. It is hard doing a lab when you have no clue on the subject matter.
- The information in the comment boxes was very essential in gaining a better understanding about the different parts of enzyme kinetics.
- More comment boxes in the inhibitor tab.

The enzyme kinetics information was not covered in class. You had to learn this material on your own. Learning this was **2.5**

real difficult difficult so, so easy real easy
7 **11.5** **16.5** **1** **1**

(one student rated half-way between so, so and difficult)

Do you think that this activity helped you understand the concepts involved with enzyme kinetics?

Yes No Maybe
12 (32%) **4 (11%)** **21 (57%)**

Why or why not? All comments are typed verbatim including spelling!!!!

Yes

- Because I was able to change different variables and learn what they influenced on the plots.
- Because I know now that enzyme is recovered at the end of the reaction and I have an idea about inhibitor.
- Most because I understand the math involved
- It further enhanced the knowledge or how they work with relevance to concentration.
- Well, I have a well based knowledge on enzymes and this activity refreshed my memory.
- However, the graphs were very different from what I knew, being more analytical. I had difficulties in analyzing the three graphs.
- Because several approaches were possible and I got to play and change variables at my ease.
- It showed me the purpose of enzymes and how it works and influences reactions.
- It helped me connect some "dots" that I was missing from my biology class!
- Because I got to understand all the concepts of inhibitors, linear fit, nonlinear fit, initial rate, the kinetics plot and S, E, P over time.
- The comment boxes and graphs really helped and especially the use of the Excel program.
- It (is) easy to use and easy to understand.
- Had little knowledge of topic but understood more afterwards.

Maybe

- I am still unclear about the inhibitors and Lineweaver plot.
- Maybe because I did learn a few things about enzyme kinetics, but not enough to have confidence in solving more problems on my own.
- Even after the many hours I spent trying to complete this lab, I still did not understand the subject matter. This lab does not help me understand enzyme kinetics any better.
- It helped me learn some about enzyme kinetics, but I would still need a lecture to make me feel confident about the material.
- Yes because I was able to see what goes on, but in doing experiments I learn better when I do hands on activities. I am also an auditory learner.
- I have a little bit of an understanding of the concepts, but it was hard to grasp everything from this one activity.
- It's something that you cannot remember except when using it.
- Some information was a little difficult to understand, but the majority of it was basic concepts.
- I'm in between because I didn't learn about this in lecture or prior to doing this lab.
- Because I can't tell until I see my grade.
- I don't know. I was studying by myself, so maybe I learned correctly or not. The grade of this activity will show me if I understood the concepts or not.
- Because some part of the activity was not clear to understand.
- The visual image of content in course makes it interesting.
- I had such a hard time trying to understand the material that when I was done I still didn't really understand, but I managed to work through it somehow.
- Not really sure, because it took so long and was kind of confusing at least I was at times but I tried to just get the assignment done.
- Because I never learned in lecture and it was very difficult for me to do.

No

- Answers were not given clearly. Explanations I googled and wrote down I didn't understand completely for a grade not educational future value.
- Because it was a performance lab that wasn't lectured thoroughly, the lab was completed for a grade rather than for really understanding the concepts.
- After completing the activity, I still do not know what I was exactly doing, or what was happening.

Can you suggest a way to improve the activity? If so, explain.

- No, it's fine the way it is.
- By changing the values of the plots and the graphs, so better K_M , v_{max} values can be obtained.
- If there could be less tabs, I believe I would make learning a bit less tedious.
- The excel is only helpful to those who are really good with it for some frustration interfered with what could have been learned.

➤No

➤In essence, I hardly understand the exact significance of the Lineweaver-Burk, Wolf Hanes and Edie-Hofstee graphs and I think more effort should be made in explaining them, especially as these materials have hardly been encountered before.

➤If there was a way to change the enzyme concentration and not just the substrate.

➤More math explaining v_{max} and K_M . I eventually resorted to checking what you did to find v_{max} in the spreadsheet.

➤Yes, the computers in the lab are slow and the mouse is somewhat hard to manipulate. We need also better monitors.

➤Lecture first before giving to students. Makes understanding faster and easier.

➤Lecture and practice this topic before do as a lab performance.

➤Do a lecture before lab for this lab!

➤Have a lecture on the material before the lab so that students wouldn't have to struggle so much.

➤Have a little tutorial in lecture.

➤I think, the teacher should discuss enzyme kinetics with the student in lecture to give them information that helps them in this activity.

➤I don't think it needs to be improved.

➤I can't really suggest any improvements because I have no background knowledge on this topic.

➤Have the teacher participate or lecture on certain topics to assure the students retain the information needed so some of it doesn't become confusing.

➤By also providing lecture before the activity.

➤Discuss certain aspects of enzyme kinetics in class.

➤It could be improved by shortening the length of the activity. The activity could maybe be two parts, especially because this was new material.

➤This was my first time doing this activity so I would appreciate it if I had a better understanding with the excel. If I probably would have learned it in CHM 101, I would have had a better understanding.

➤When I was on p. 13, I could not answer several questions because I could not find where I was supposed to click on "solver". It would be helpful if the solver button was on the screen. It is frustrating to leave questions blank.

➤Maybe done over two labs would help me absorb the concepts of enzyme kinetics, but trying to teach yourself and follow along does not help me retain and/or grasp the information given.

➤Yes, please teach the material in sections before using giving the class a performance task on it. A lecture on Friday would also help to make learning this more effective

➤Have more help doing the inhibitor section like more comment boxes and better analysis of equations.

➤I would suggest giving the lesson before a performance test (task).

➤Covering the topic in class would have helped.

- Spend at least 2 lectures discussing enzyme kinetics and its importance before assigning for a grade.
- Take more time to explain info as well as the computer based portions in class.

If given the option of doing this activity or having your instructor just lecture on the material, which would you select?

<input type="checkbox"/> Activity	<input type="checkbox"/> Lecture	<input type="checkbox"/> Combination of both
0	6 (17%)	30 (83%)

Please explain your choice. All comments are typed verbatim including spelling!!!!

Lecture

- I'm not very computer literate, I'm old school.
- Lecture is just one hour but the activity needs hours to do it.
- Because we could understand the material more better by examples and the instructor make more easier to understandable.
- I am an auditory learner so when I hear how to do something I can function better.
- I find lectures more clear and informative.
- Going directly into an activity without teaching a little about a topic didn't really teach me.

Combination of both

- instructors brain + hands on work = good understanding
- I would rather hear the instructor and do the material together. Because that way I can get clarification and it will be easy to learn.
- Even though one can learn by activity alone, it is always better for the teacher to lecture.
- A combination is better because one can understand the concepts then apply it to the activity.
- The activity just by itself may not help understand all the mechanism involved. Or you may some faulty conclusions which a lecture will help eliminate.
- By doing it on my own I learn more because I have to teach myself and the lecture would help reinforce the things that I learned or didn't quite understand.
- I will gain a lot by having both. With the lecture, I get the assistance of a professional and I get to ask questions about everything I don't understand. With the activity, I have the possibility to extend my knowledge probably cover what couldn't be done in class because if time and also spend as much time that I need on it.
- Doing the activity explains less. If I do not understand and I try to reason more, I get confused. The teacher giving all to me without any practicing also yields no good result. Combination of both will be best.
- The activity allowed us to learn by ourselves which was really good but when the activity got to the different graphs, especially at the end understanding was really hard.

- We need both to truly understand the significance of the data were working on.
- I get better the concept when I do both.
- Instructor would explain better where students have to guess or be confused. For some places all I needed was to understand the graph but if I could not understand the graph, I cannot answer the questions. Here the instructor could have explained graph better to me.
- Because I think that this topic needs to be lectured us in order for us to do it as lab performance. We also need to practice this same lab in order for us to do. If not, I had why we spent lot of hours in this lab.
- Doing this exercise while getting help from instructor when stuck or lost will help me understand the material better.
- If do both it help you understand more.
- Having both would help the student better on the lab when it come to understanding the material.
- The activity helped us to see how the things were but some lecture could have helped.
- A combination of both because for me, I learn best when I'm lectured then I can apply what I learn to different situations.
- Since some things were harder to comprehend it would have facilitated our job to really have someone break it down into a simplistic topic, rather than try to figure it out and be unsure, or little tentative about the accuracy of our answer.
- It makes us understand it better.
- A lecture would provide me with information and unanswered questions. An activity would help reinforce the discussion of the lecture.
- I think both would be helpful in learning the material. The lecture would provide some background on the topic and the activity would give the students a chance to have the hands on experience.
- A lecture would have been a great introduction to enzyme kinetics. Its hard to understand what your being told to do when you have no knowledge of the subject matter.
- I picked both because I learn well by taking notes from a lecture and then applying what I've heard in class in a lab activity.
- The activity was helpful but still need a lecture to explain some points mainly on inhibitors.
- I am a visual learner yet a lecture is need before hands so that I may be sure that I properly interpret what I see visually.
- Hands-on work is only beneficial when there is prior knowledge on the work being done.
- If I had more class time as well as time to answer questions during class time.

Any general comments or suggestions?

All comments are typed verbatim including spelling!!!!

- It was an interesting lab but very tedious. I enjoy working with the graphs, just would have liked a lecture on the importance of material.
- too tedious

- more explanation of E_o , K_M , k_1 , k_2 , k_{cat} and v_{max} !
- No
- I think that instructor should lecture this topic before we do the lab. It was too long.
- very fun but very complicated
- No
- Lecture first! None whatsoever.
- The lab or activity is good because of the material but just a little too long.
- For the class activity, begin this activity with the second half (starting with the Michaelis-Menten equation) so that as it is quite long to finish in an entire lab section, students as it was a group work may work on it first and could more easily finish the rest individually.
- Because its so long, sometimes the end will get done at home where help is not available.
- No
- Cover the topic in class or make lab shorter and easier.
- I like to do the lab more than this activity some of the questions were not clear to me. especially assessment #2.
- Where was the "solver" button? Was there a problem with excel or am I blind? (You missed reading the instructions to get to the solver!!!!)
- Make it more more short took me long time to finish it and some of the equations are not clear especially the assessment equations.
- This lab was entirely too long and contained too much information not to have a lecture attached with it. This is not an effective way to teach enzyme kinetics.
- This assignment shouldn't have been given as a 50 point performance task because we're learning the material on our own as we go along. When you don't understand the material it's very difficult to complete all the parts of the assignment.
- Inhibitors needs work!
- Please make sure that the solver works outside of the lab since the lab is too long to finish during lab hours. The excelet tabs did not function properly at home or in the computer labs.
- too long!!!
- No
- My main problem was that I am using Microsoft Office 2007 excel and many things on the excel version in class are misplaced or missing. I could hardly follow some portions and Help did no good at all. The regular dropdown menus existing in the earlier versions are COMPLETELY ABSCENT in the 2007 version, replaced by simplified options without as much information. This was frustrating to me since a great portion of the activity was to be done independently, out of class. (This will be resolved by providing instructions for Excel 2007)

...and thanks for taking time to provide feedback!