Course Information

PHYS 2126 PHYSICS LABORATORY II, Spring 2023
Your first lab meeting is in the week of Monday January 23rd.

Professor Contact Information

Instructor:	Lamya Saleh	Instructor:	Paul Mac Alevey
Office:	SCI 3.132	Office:	SCI 3.168
Phone:	extension 5773	Phone:	extension 4634
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Instructors will send e-mail to UTD e-mail addresses **only**.

Teaching Assistants:

A teaching assistant (TA) will be assigned to each section of this course. The TA for your section will be directly in touch with you during the semester and available to answer your questions and address your concerns. **TAs should be your first person to contact about PHYS 2126 questions, submissions, or grades**. Contact information for TAs is posted on eLearning. Copy your TA on every email that you send to an instructor.

In case of any issue that cannot be resolved with your TA, you may contact one of the instructors for the class. Copy your TA on every email that you send to an instructor. Contact information for your TA is posted on eLearning.

Office hours:

TA office hours are yet to be arranged but will be posted on eLearning as soon as they are available. Office hours with Dr. MacAlevey are by appointment at SCI 3.168. Office hours with Dr. Lamya Saleh are TBA

Course Pre-requisites, Co-requisites, and/or Other Restrictions

Any student enrolling in this lab class should either have done or be doing PHYS 2326 (Electromagnetism & Waves), 1302 (College Physics II), PHYS 2422 or equivalent.

Course Description

The course includes experiments involving electrostatics, electricity in simple circuits, magnetism, and optics. As always in physics, there is interplay between the theory that you see in a class and experimental work. One is not more important than the other, but each informs the other: theoretical predictions are a natural focus of experiment and experimental results help to develop theory. That is why you need to study both. **Expect to see some topics for the first time in this lab course.**

Student Learning Objectives/Outcomes

The aims of the course are:

- Students will think critically & practice reasoning skills[1]
- Students will construct knowledge[2] themselves (rather than getting it from some authoritative source). This requires conducting their own experiments and using their observations to reach conclusions. Fitting curves to data will help analysis of data.
- Students will work in groups of three. This helps to include the thoughts & opinions of others while reaching a scientific conclusion.
- Students will communicate their conclusions by means of written lab reports.
- Students learn to build scientific models[3] (by constructing one)

Required Textbooks and Materials

We use a manual that **will be posted on eLearning.**

Questions appear in both the Introduction (if there is one) and Instructions sections of the manual. Answers to questions from the Introduction will be your pre-lab. Answers to questions from the Instructions will be your report. Notice that there is no introduction for either electrostatics I or for electricity I and so there is no prelab due for either experiment. **All questions asked have corresponding answer spaces in the templates posted on eLearning.**

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. **These materials may be downloaded during the course.** However, these materials are for registered students' use only. **Classroom materials may not be** reproduced or shared with those not in this class. Neither may the materials be **uploaded to other online environments** except to implement an approved Office of Student AccessAbility accommodation. **Failure to comply with these University requirements is a violation of the Student Code of Conduct**

[1] For those that anticipate doing the MCAT exam, "Reasoning" is regarded as particularly important among the "Scientific Inquiry and Reasoning" skills given in the AAMC document https://students-residents.aamc.org/whats-mcat-exam/scientific-inquiry-reasoning-skills-overview

[2] Those that have read the recommendations of the American Association of Physics Teachers will recognize that this goal "captures some of the overarching goals of the undergraduate lab curriculum". (From http://www.aapt.org/Resources/upload/LabGuidlinesDocument_EBendorsed_nov10.pdf)

[3] Look at skill 2 in https://students-residents.aamc.org/media/9261/download

Suggested Course Materials

You should have a calculator (only a 'scientific' one is ever needed), pencil and pen.

Sections & Meeting Times

Sec	Time	Place	TA
101	Mon 10a	SCI 1.159	Joshua Schussler
113	Mon 10a	SCI 1.179	Seyed Hossein Hosseini
102	Mon 1p	SCI 1.169	Emmanuel Ameh
112	Mon 4p	SCI 1.179	Samyak Shrestha
114	Mon 4p	SCI 1.159	Emmanuel Ameh
103	Tue 10a	SCI 1.159	Meghraj Magadi Shivalingaiah
117	Tue 10a	SCI 1.179	Rainier Bravo
104	Tue 1p	SCI 1.169	Nash Bellow
118	Tue 1p	SCI 1.179	Samyak Shrestha
111	Tue 4p	SCI 1.159	Meghraj Magadi Shivalingaiah
106	Wed 10a	SCI 1.169	Stephen Fluckey
115	Wed 10a	SCI 1.179	Seyed Hossein Hosseini
107	Wed 1p	SCI 1.159	Shisir Ruwali
116	Wed 1p	SCI 1.169	Stephen Fluckey
108	Thu 10a	SCI 1.179	Rainier Bravo
110	Thu 10a	SCI 1.169	Matthew Lochridge
109	Thu 1p	SCI 1.159	Nash Bellow
122	Thu 4p	SCI 1.179	Shisir Ruwali
120	Fri 10a	SCI 1.159	Matthew Lochridge
121	Fri 10a	SCI 1.169	Prasoon Vishwakarma
105	Fri 1p	SCI 1.169	Prasoon Vishwakarma

Academic Calendar/Schedule

Each row of the schedule below lists Mondays only. Sections that meet on the following Tuesday, Wednesday, Thursday and Friday will be doing the same experiment as the one listed for Monday.

Lab Week	Experiment	
Week of Jan 16	*No labs scheduled this week*	
Week of Jan 23	Course information & **Pretest** (The pretest and posttest for this lab are different from the pretest and posttest for your physics lecture course.)	
Week of Jan 30	Electrostatics I	Report due at the end of your lab meeting
Week of Feb 6	Electrostatics II	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of Feb 13	Coulomb's law	Pre-Lab & Homework on '**Graphs & Trendlines'** is due at the beginning of your lab meeting. Report due at the end of your lab meeting
Week of Feb 20	Electricity I	Report due at the end of your lab meeting.
Week of Feb 27	Electricity II	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of March 6	Electricity III	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of March 13	*No labs scheduled this week. Enjoy Spring Break*	
Week of March 20	Electricity IV	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of March 27	Electricity V	Pre-Lab is due at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of April 3	Multimeters	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting
Week of April 10	RC Circuits & **Posttest**;	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting
Week of April 17	Geometric Optics	Homework on **'Analyzing a circuit' is due** at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of April 24	Helmholtz Coils	Pre-Lab due at the beginning of your lab meeting. Report due at the end of your lab meeting.
Week of May 1	*No labs scheduled this week*	

Grading Policy

In previous semesters, the following scheme has been used for generating course grades. If x is a score, then,

$x \geq 95$	A+	$70 > x \geq 65$	C+
$95 > x \geq 90$	A	$65 > x \geq 60$	C
$90 > x \geq 85$	A-	$60 > x \geq 55$	C-
$85 > x \geq 80$	B+	$55 > x \geq 50$	D+
$80 > x \geq 75$	B	$50 > x \geq 45$	D
$75 > x \geq 70$	B-	$45 > x \geq 40$	D-
		$40 > x$	F

eLearning calculates your grade as outlined above (**dropping your lowest scores as in policy** one below). Not attending the last lab of the semester can have a large effect on your grade. You can contact your TA to find out if they have finished grading so that eLearning will have the information needed to calculate your course grade. No grade is official unless given by Dr. Lamya Saleh or Dr. Paul. Mac Alevey at the end of the semester.

Course & Instructor Policies

Please contact the instructors if a question arises about these course policies. (TAs don't have permission to change these policies.)

1. Your grade is weighted as follows;

   i. The average of your grades on lab reports will contribute a maximum of 81% to your course grade. **eLearning will drop the report with the lowest percentage**.

   ii. The average of your grades on pre-labs & any homework will contribute a maximum of 11% to your course grade. **eLearning will drop the pre-lab or homework with the lowest percentage.**

   iii. 6% of your grade will be your **score in the post-test**

   iv. 2% for submitting a completed pretest. *No credit is given for incomplete tests.* The pretest must be done before electricity I and is unavailable after that. The posttest must be done at or before the last scheduled lab.

   When calculating your average results, **eLearning drops the lowest scores right from the beginning of the semester**. The grade on eLearning is not a predictor of your course grade if you don't submit work from the last lab.

2. Manuals are in an eLearning folder on the homepage called "Manual". This manual will contain a folder corresponding to each experiment on the schedule. The folder for each experiment will contain a description of the experiment, photos of apparatus and templates for reports and pre-labs (if due). Due dates for pre-labs, reports and homework assignments are given in the schedule above.

3. **Any work submitted for a grade must be written by the individual student named at the top of the work submitted. You must use your own voice to answer any question that is asked. No student is allowed to copy or paraphrase work from any other source and turn it in for a grade.** (See policy #9 for more on scholastic dishonesty.) Names & section numbers must appear on any work that is submitted in order that credit can be attributed properly. Your TA is free to insist on this when assigning a grade.

4. Each description of an experiment in the manual includes an *Introduction* and *Instructions*. **Questions that are asked (in bold unitalicized type) in the *Introduction* must be answered in your pre-lab. Questions that are asked (in bold unitalicized type) in the *Instructions* must be answered in your Report. Templates for pre-labs, reports and homework assignments are posted on eLearning. The template that is posted must be used.** The amount of credit for each question is indicated in brackets after each question in the corresponding template.

5. Pre-labs & homework assignments (if any) are due at the beginning of your lab meeting**.** You will work through the section of the manual called *Instructions* during the lab meeting. Use the computers in the labs that are provided by UTD. No student of PHYS 2126 is allowed to use a phone, laptop, tablet, or any device capable of communication in the physics labs. **Remember to print the template before an in-person lab**: the 2126 labs don't have printers for you to use**.** Hard-copy reports are due at the end of your lab meeting.

6. **Any late work will only be accepted at the instructor's discretion.**

7. It is of great importance that others perceive your degree as having value. That value is diminished if it is suspected that a grade can be obtained through dishonest means. Academic dishonesty also gives a false picture of the capabilities of the individual that is being dishonest. In a wider context, it gives a false picture of what can be reasonably expected of students.

   In order to further the objective of eliminating scholastic dishonesty, the University has a student code of conduct at https://policy.utdallas.edu/pdf/utdsp5003. **Students enrolling in the course are bound by this policy**. **Any suspected cases of scholastic dishonesty will be passed along to the Office of Community Standards and Conduct.**

8. **In the event of closure due to inclement weather:** check the UTD Web page http://www.utdallas.edu/ for notice of any unexpected closure of the university (in which case, lab will not meet). The university expects to post information about closures by 6:00 am on any day that classes are suspended. **After UTD has announced the reopening** of the campus, **look for an *announcement on eLearning*** that will tell you about the schedule for this lab.

9. Experiments are to be done in **groups of three**. Your TA may ask any student to work with a different group so that groups will be roughly the same size (or for any other reason that the TA thinks appropriate).

10. **Attend the lab section for which you registered**.

11. **Missing a lab:** in case you miss an in-person lab and wish to makeup, you must follow the procedure listed below. The makeup *must be done withing two weeks of your absence* (Suppose that your section is scheduled to meet on the 1st, 8th, 15th, etc. If you miss a lab that was scheduled on the 1st, then you have until the 15th to make up the lab that you missed). The following policies only refer to makeup labs conducted in labs that are scheduled in the schedule

for this course. Aside from absences that are documented to the satisfaction of an instructor, no makeup labs will be scheduled after the last lab that is listed in the schedule for the course.

i) Identify a **scheduled** section of PHYS 2126 that you can attend. Use coursebook to find a section with fewer than 30 students.

ii) Email the TA **in charge of the lab section that you enrolled in to say why you were absent**. If your TA accepts your reason for not attending, then they will reply to your email saying so. ***You must wait for this written reply.***

iii) **Email the TA in charge of the section that you would like to attend and cc** (send a copy of the email to) **the TA in charge of the lab section that you enrolled in.** Ask if there is room for you to attend. If there is enough apparatus to accommodate you, then the **TA in charge of that section will reply** saying that the change is possible**.** ***You must also wait for this written reply***.

iv) **Turn-in any pre-lab or homework exercise that was due at the lab meeting that you missed. Give these to the TA in whose section you make-up the lab**. Both the name of your usual TA for PHYS 2126 and your section number must be on anything that you turn in. This TA will pass along your report etc. to the TA in charge of the lab section that you enrolled in so that they can be graded.

Make up any labs in the order in which they are presented in the manual. Please don't abuse this system. The guidance given to TAs is that a student **can only go to another section three times before instructors require formal documentation** (doctor's notes with verifiable contact information etc).

If more than two meetings of your section have happened since an absence, make up labs will only be scheduled if formally documentation (doctor's notes with verifiable contact information etc.) has been sent to instructors before the last scheduled lab.

Preface

The most important goals of these labs are to;

- Give you a chance to construct knowledge[4] yourself rather than getting it from some authoritative source
    - Let you think critically & practice your reasoning skills[5]
- Learn to build scientific models[6] by constructing one

The starting point for this lab is observations made in PHYS 2126 labs. You will have to pay particular attention to your actual observations because the model of electricity that you construct will be based on them. The Model of Electricity will eventually involve a formula or two, but the formulae aren't physics. In fact, it is quite likely in your previous courses, that some formulae were used to introduce concepts in the model even if this is a little back-to-front. However, *I won't assume that the basic ideas behind an adequate model of electricity have been introduced in a way that shows the interdependence and coherence of these basic ideas. But I will assume that the student can reflect on the process of their own learning.* What we are doing in the next series of experiments is not just developing a Model of Electricity. We are illustrating how any physical phenomenon can be investigated, analyzed, and understood.

What are scientific models?

Scientific models are arrangements of fundamental ideas that explain physical phenomena. The fundamental ideas in the model must be suggested by physical observation. The model must have some predictive power.

I want you to do more than use a model that someone else made. I want you to be involved in coming up with a model. You will do this by making observations and thinking about their significance in relation to other observations that you have made.

An example of a model that you have encountered in physics I, is Newtonian model of mechanics. It probably wasn't presented as a model in your class but is a model nonetheless. It contains three laws that are suggested by observations. (Newton's three laws are the 'fundamental[7] ideas' that are part of any scientific model.) It is an extremely successful model in that Newton's model explains the motion of objects in many circumstances.

Models are built by asking ourselves questions and suggesting tentative answers/hypotheses. The hypothesis is scientific if it is subject to comparison with physical reality. (While it may be interesting, any non-testable hypothesis is outside the realm of natural science.) There must at least be approximate agreement between physical reality and predictions made using the hypothesis if we are to accept it as not being false.

Why/How do we practice reasoning and critical thinking skills?

[4] Those that have read the recommendations of the American Association of Physics Teachers will recognize that the goal of 'Constructing Knowledge, "captures some of the overarching goals of the undergraduate lab curriculum". (From http://www.aapt.org/Resources/upload/LabGuidlinesDocument_EBendorsed_nov10.pdf)

[5] For those of you that anticipate doing the MCAT exam, see the discussion of skill 2: "Scientific Reasoning and Problem-Solving" in the PDF at https://students-residents.aamc.org/prepare-mcat-exam/whats-mcat-exam

[6] This goal is mentioned in the executive summary of the AAPT document mentioned in footnote 1.

[7] Remember that 'fundamental' doesn't mean 'easy'!

Even if you don't usually think about scientific models, you will still need to think critically about the information that you encounter. You practice critical thinking when you put things together for yourself rather than just going along with conclusions made by other people. (Even though you might set out to reach your own conclusions, you might end up agreeing with the conclusions of other people.)

Critical thinking is easier if you ***make observations yourself*** *because* you'll know exactly what happened etc. (I try to avoid indirect 'observation' where I ask you take my word for it that a certain result/observation is what happens. In this manual, 'observation' always means 'direct observation'.) ***I hope that you don't think that I am underestimating your abilities when observations are simple***. I'm not. I want you to be thorough and to be sure of the fundamental observations before you use them to make conclusions. Even though the observations might be simple, it is not easy to use them to make conclusions that help us construct a model.

Implications:

The goals above have certain implications.

- *Lab Apparatus must be simple*. This reduces the time needed to figure out how any particular device works. Needlessly complicated equipment just puts you in the position of taking the word of someone else that the equipment operates as you are told. Needless complexity makes it very hard to think critically

- *Lab reports have a simple structure*: *in this lab, reports involve writing answers to questions*. Questions on lab reports often involve 'pulling together' several observations so that a useful idea is seen more clearly. The simple structure is intended *to give you time to think critically* and think about the significance of your observations

- We'll concentrate on *systems* (electrostatics & DC circuits) *in which a small number of fundamental ideas is enough to make a model* that can explain your observations. These systems also have the advantage that it is possible for us to make all the necessary observations with the simple apparatus that we'll use

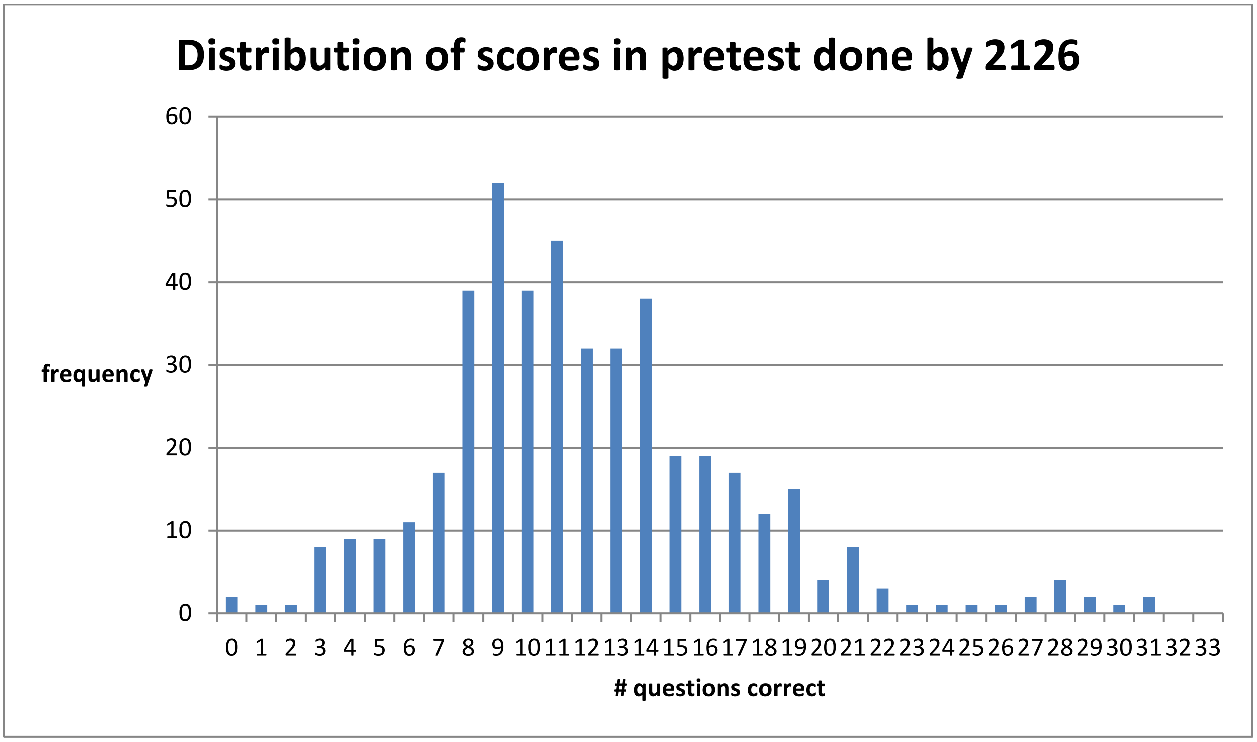
- *'Covering' new material is not a very important goal in these labs*. The involvement of lots of unfamiliar material makes it difficult to think critically and to build models

If we restrict ourselves to observations that we have made, then **some familiar terminology will be out of our reach**. Good examples are the terms; **'electrons', 'protons' and 'neutrons'**. Observations come before any terminology that explains the observations. Since we won't be directly observing these fundamental particles in this lab, you won't need to use these terms. ***Put these terms aside when you need to explain an observation in this course***. From another perspective, not using these terms won't hinder your explanation of anything that you'll see in these labs. (Of course, all your conclusions will be consistent with electrons, protons, and neutrons when you want to explain these 'microscopic' observations later.)

Another difficulty with terminology occurs when we observe electric circuits. All of us have heard of voltage, current and resistance though the meaning of these terms may not be totally clear. The root of this difficulty is probably that you haven't observed circuits directly yourself. Part of the solution involves not using ***the terms voltage, current and resistance to explain anything in these labs***. As above, it will be difficult for most of us to avoid using familiar terminology when trying to describe DC circuits.

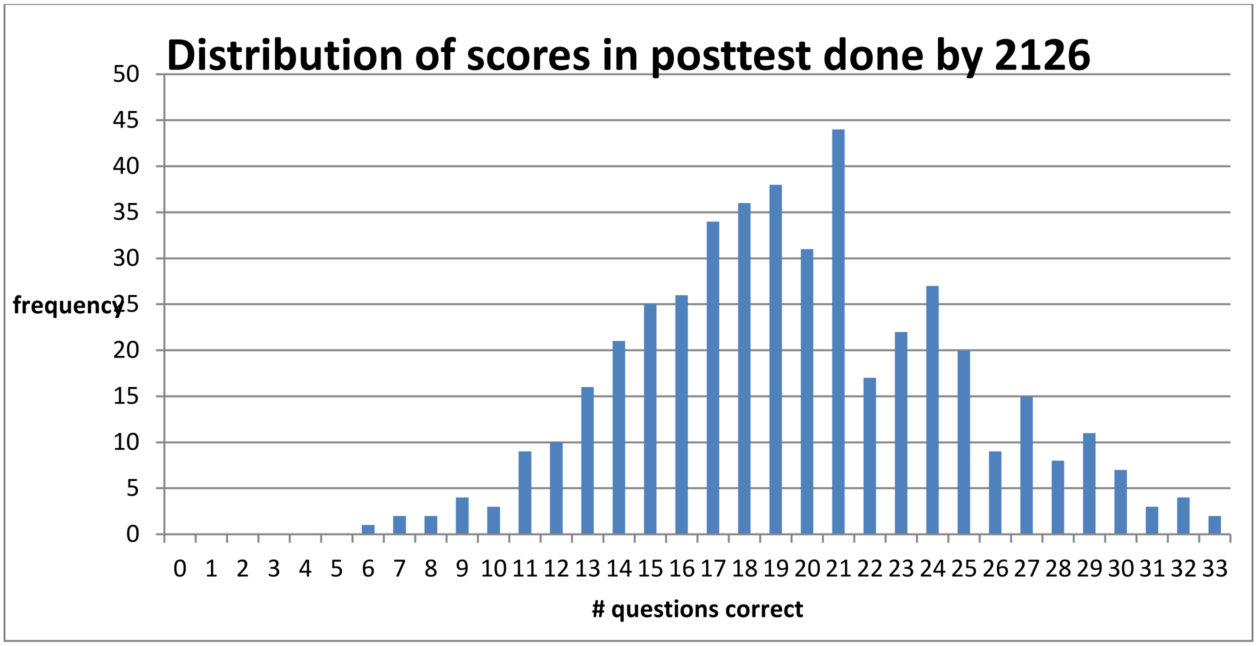
But should we? **Students often ask me why they can't use concepts (such as voltage, current and resistance) that they are already familiar with. The answer is simple: it is frequently the case that the student is familiar with the terminology but doesn't really know much about the underlying concept**. The only way around this is to build the concept yourself from 'scratch'.

Few students have asked me to justify this claim but (true to the spirit of the course) I use observations that I have made myself. Here is a graph of the number of students (the frequency on the y-axis) that get a given number of questions correct in the pretest.



The first thing that you should notice is that the average number of questions answered correctly is about 12 out of 33. (The average is 36.7% $\pm$ 0.7%.) If someone is really familiar with the concepts behind DC circuits, then it is quite possible to get all of the questions right. However, only 15 students out of the 447 got more than 22 questions right. The fact that only 15/447 = 3.35% got more than 66% does not suggest mastery of the underlying concepts. ***Be careful; familiarity with terminology is not the same as familiarity with the underlying concepts***.

I don't like pointing out a problem unless I know of a solution. This course can address the problem. Here is a graph of the results in the posttest done by the same 447 students that did the pretest above,



The average is much higher now: 60.0% $\pm$ 0.7% (almost 20 questions correct) with almost half getting 20 or more questions right. (Nobody got fewer than 6 questions right.)

This won't be enough. You'll be refining ideas that underlie these terms as you develop a model of electricity. Unfortunately, half-understood ideas about voltage, current and resistance delay your understanding. Using jargon puts you in the awkward position of not knowing if something is really true or if there is a problem with the terminology to make the statement. It is very easy to confuse a fundamental idea with a piece of technical terminology that is often used to describe the fundamental idea. ***A solution is to leave those terms aside and for us to (temporarily) develop a set of 'home-made' terms***. (I'll help through suggestions and instructions in the manual.) This will put enough 'distance' between the familiar terms and your understanding, so that a better understanding can develop unhindered. After we are sure of our understanding, it will be easy to exchange our home-made terms for the more usual ones. Since you'll have been involved in defining our home-made terms from the beginning, you'll know exactly what they mean. We'll use these home-made terms until we do the lab called Multimeters.

Practicalities

You will do a quiz about DC circuits at your first lab meeting. This quiz contributes to your course grade. (See the course policies for details.) The quiz gives you the opportunity to tell us about your initial understanding of DC circuits and will involve the usual terms of voltage, current & resistance. The test is about batteries and the brightness of one bulb in a circuit compared with the brightness of other bulbs.

A feature of this ***multiple-choice quiz*** might be new to you. Each question contains a neutral option ***that allows you not to choose an answer*** but shows that you thought about the question and took the quiz seriously. The idea is not to force you to choose when you haven't seen the topic of the question or are genuinely unsure of the answer. Of course, you can use anything that you know and any convictions about how circuits work. ***If you can't reason your way to an answer after considering the question for a minute or so, then choose this neutral option instead of making a guess*** at the answer. ***Don't spend time trying to eliminate answers that you think 'must be wrong' and guessing*** among the ones you find most plausible. Remember that the point of the pretest is to give you a chance to say what you know. The purpose isn't to guess your way to an inflated score that doesn't represent what you really know.

Even though these topics have technically been 'covered' in your previous courses, the reality is that the average student doesn't do particularly well with this pretest. That is OK. I choose to take this result seriously and use a large fraction of the course to give you the opportunity to do something about this. Please take the opportunity.

In the past, I have found it to be useful to return right to the beginning of DC circuits and to take as little as possible for granted. Rather than tell you (again) how DC circuits work, I invite you to put things together for yourself. ***Please have patience with yourself: it is not easy to put ideas together if you haven't had to do this before.*** (This is just as true if the subject matter is dismissed as being 'simple'). I hope that learning the skill in this context will help you to put ideas together in other contexts later.

Make good use of ***office hours***. A quick ***question asked early*** is often all that is needed to make progress on a Pre-lab. Tell your TA if you don't understand something. However, ***complete answers to questions are not helpful unless you have grappled with the questions yourself***. Expect any of us to ask you what you think (and why) before saying much more.

Expect something similar during the labs: ***expect TAs to ask you questions about what you are thinking or doing***. Their questions are intended to *encourage you to think about things* in useful ways while leaving the implications and conclusion to you! During the lab, the TA may also ask any person to explain something or repeat any part of the procedure if they feel it might be helpful.

TAs do all the face-to-face instruction in these labs. Several of the lab sections will meet during my other classes and office hours for those other classes. Lab sections also meet during my other activities for the department; faculty meetings etc. I may pop-in for a few minutes and talk to the TA and you may not even notice.

Beware of blindly following instructions in the manual. ***You are not being asked to follow a recipe so don't expect my instructions to be a detailed list of directions. Expect to have to read ahead and think about my instructions before doing anything.***

If a question asks you to explain something, then an answer of "yes/no" or "I can't explain" is not sufficient. Don't move on until you find explanations for things. Please write neat answers for your TA. This should be easy for questions that involve simple observations or data items. ***For more complicated questions, consider writing your first answer on another piece of paper. Only write your answer on the Report that you'll give the TA after you have thought about your 'draft' answer and are sure that it answers the question that was asked***.

Does this approach work?

Yes. You will do another quiz towards the end of the course. (As with the first one, this quiz also contributes to your course grade. See course policy #2 for details.) Comparison of the two results has indicated significant improvement in every semester. As above, I invite you to compare the pre- and posttest results so that you can see that there is quite a change. While most students gain significantly from the course, the amount that you gain is totally in your hands and is highly dependent on the thinking that you do to develop your understanding.

Format of Questions for Lab Reports.

I mentioned earlier that the format for reports is simple in PHYS 2126: you just write *answers to questions*. These questions are designed to lead you through the thought process that I'd lead you through if we were talking to each other. Some questions are about observations that you have made and are not difficult. However, the function of these questions is to remind you of something helpful just before I ask a more difficult question. This is the reason that marks offered for different questions vary so much.

I don't want to put words in your mouth while leading you through a thought process. In many instances I could be more specific in the way a question is asked but only at the cost of telling you the answer to a later question. This puts some limitations of the specificity of my questions.

The requirement that you learn actively means that I have to phrase my questions in terms I know that you are familiar with. Of course, it is easier to ask a question when we have access to a set of well-defined & physically useful terms. Those terms will often be unavailable since we will be in the process of approaching an understanding of those useful terms!

At the same time, if you find a better way of asking a particular question then please email it to me.

Please read the preface posted on eLearning before labs begin. No prior familiarity with physics labs is assumed. Ask questions during office hours before your lab meeting if needed.

Implications

I have found it to be useful to return right to the beginning of DC circuits and to take as little as possible for granted. Rather than tell you (again) how DC circuits work, I invite you to put things together for yourself. ***Please have patience with yourself: it is not easy to put ideas together if you haven't had to do this before. Some students find it hard to distinguish between things with which they are merely familiar*** *(because they heard about them somewhere)* ***and things that really make sense to them*** *(because they have made the necessary observations and have taken the time to find the implications of their observations)****.*** This is just as true if the subject matter is dismissed as being 'simple'. I hope that learning the skill in this context will help you to put ideas together in other contexts later.

Make good use of ***office hours***. A quick ***question asked early*** is often all that is needed to make progress on a Pre-Lab. Tell your TA or an instructor if you don't understand something. However, ***complete answers to questions are not helpful. It is important that you grapple with the questions yourself***. Expect any of us to ask you what you think (and why) before saying much more.

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I don't want to put words in your mouth while leading you through a thought process. In many instances I could be more specific in the way a question is asked but only at the cost of telling you the answer to a later question. This puts some limitations of the specificity of my questions.

The requirement that you learn actively means that I must phrase my questions in terms I know that you are familiar with. Of course, it is easier to ask questions when we have access to a set of well-defined & physically useful terms. Those terms will often be unavailable since we will be in the process of approaching an understanding of those useful terms!

At the same time, if you find a better way of asking a particular question then please email it to me.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.