FEN - EDEBİYAT FAKÜLTESİ
FACULTY OF ARTS AND SCIENCES
FİZİK BÖLÜMÜ
DEPARTMENT OF PHYSICS

what to expect in my classes?

HOW A UNIVERSITY COURSE IS DIFFERENT THAN WHAT YOU MIGHT HAVE BEEN ACCUSTOMED IN HIGH SCHOOL

Summary of my philosophy

- Unlike high school, instructors' job is *not* to "teach" you the material! Their role is to guide and faciliate your learning: it is primarily student's responsibility to learn![1] [2]
- Unlike high school, you are supposed to be *unable to succeed* in a class by memorizing notes and repeating solved examples: you need to understand concepts deeply, meaning that you can apply your understanding *beyond the material covered in class*!
- In high school, exams often reflect examples done in class; in an ideal university course, exams are designed to test your understanding through unseen or novel questions.

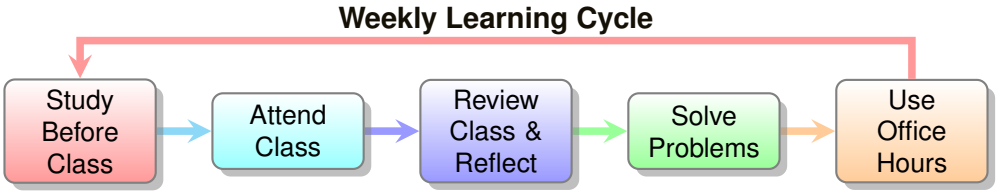
High School	Transition	**University**
Teacher-centered	→	Student-centered
Memorization	→	Deep Understanding
Predictable Exams	→	Novel Exams

The harsh reality

- High schools have the goal that all students succeed! In universities, this is not an expectation: there are international standards to have a course written in your transcript with a passing grade, hence it would even be acceptable to fail the whole class if the case is so.[5]

How to learn if the instructor is nothing more than a mentor?

- You have to find your own **independent-learning-style** if you haven't already! A reasonable starting point to discover your own study style may be this:



  Hopefully, this would be a good start and you can construct your own studying/working methodology that you shall use in the rest of your academic & professional career!

- **The above approach may not work for you!** If so, you may try various obvious-yet-potentially-helpful options:
  - Talk with your advisor: they may help you more than you might expect!

- Talk with the instructor of the courses that you struggle with! The earlier you share your learning problems for a particular course with the instructor of that course, the more probable that you can actually resolve the difficulties you are having!
- Ask your successful peers: *"What is their strategy?", "How do they study?", "What do they do to learn deeply?"*. Remember though: the approach that works for them might not work for you, but you might nevertheless learn a few tricks as well!

Examinations and trade-offs in my teaching methodology

In principle and ***if possible***, the assessments of the students should be heavily customized to the course and they should include active participation of the students. In the past, I have tried several such assessments:

- 15-minute seminar (2300777 midterm on 2024-2025 Fall)
- 40-minute oral project defence (2300778 final on 2024-2025 Spring)
- Writing journal article (2300777 final on 2024-2025 Fall)
- Writing TÜBİTAK research grant proposal (2300778 midterm on 2024-2025 Spring)

In reality, classes contain far more than 8-10 students, rendering such assessments infeasible. In such classes, I believe that three kinds of in-person written exams are reasonably valid:

- **Traditional classical exam** where the student is given problems and they do their best to work toward (and if possible) solve those problems. Exams are graded based on the effort. Students are not provided with additional material.
- **Open-book classical exam** where students are additionally given materials. It can literally be the case that they can consult their books during exam, or that they are provided with extra formulae sheet which they can freely consult during the exam.
- **Open-book multiple-choice exam** where students are given problems with multiple choices and exam is solely graded based on what options are chosen. Students are provided with additional material that they can consult during the exam.

Traditional Classical	Open-book Classical	Open-book Multiple-Choice
Partial credit	Partial credit	No partial credit
Potentially easy question	No potentially easy question	Potentially easy question
Rewards memorization	Does not reward memorization	Does not reward memorization
Gambling students would not be rewarded	Gambling students would not be rewarded	Gambling students might be rewarded
Fewer total number of questions per semester	Fewer total number of questions per semester	More total number of questions per semester
Late feedback on exams	Late feedback on exams	Prompt feedback on exams

See this note for some comments.[6]

I currently prefer open-book multiple-choice style where I provide a custom formula sheet, but I am open to suggestions and might change my preference in the future!

The exams are *cumulative*: you are responsible for everything covered from the start of the semester till that exam date.[7]

Student evaluation and constructive feedback

- An upfront honest request: ***please fill out the "course evaluation forms"!*** Only a very small percentage of overall roster ever fills out these forms...

  3/103, 9/149, 6/147, 9/126, 13/139, and 13/122 in the must courses that I taught in my first 2 years at METU.

- The brutal truth is that **not everyone in a class is supposed to like it.**[8] However, the classes (at least my classes, considering that I am a rather inexperienced instructor) *might* improve for everyone's benefit and this would be largely possibly through constructive feedback provided in the evaluations!

- If you find the schedule of the official course evaluations to be too late, feel free to personally give me constructive feedback during the semester as well![9]

- Students (understandably) can also use official course evaluations to ***vent their feelings*** or to ***complain about the course/instructor hoping that some action would be taken by department/faculty/university***. For my purposes, such feedback is useless although it may serve its intended purposes well. Below are some examples of actual feedback from evaluations of my courses and how I view them:

  - *...Sometimes when we were moving between subjects, this transition was not clear and was not explained well as in terms of how subjects were related to each other...*[10]

  - *...the general operation of this course is terrible. I attempted all classes, solved all suggested problems, took notes and listened carefully. Also, I learned and understood the topics which are covered in class. However, the examination and grading system was not fair...*[11]

  - *...Not an educational course because of the style of instructor. Also, the examinations were not measuring our grasp of the material. Should be more teaching in the class and appropriate questions must be solved in class since we see what is wanted from us at the exam even tho we've checked every book and questions suggested and attended classes or checked the taken notes after class...*[12]

  - *...Really good course. The exams are good, though i expected more topics to be covered. The lectures are also really good and clear, with more than enough opportunities to ask questions...*[13]

  - *...To improve this course, it would be nice to maybe have additional recitations and/or some exam style problem sets (I am aware that there are past exams, but I do not think that they are sufficient). I would also prefer having a structured syllabus beforehand to do some reading and to follow the course better....*[14]

  - *...The exam designs are also horrible what was those? Making exams tests is one of the most stupidest thing I ever witnessed in ODTÜ. The reason is pretty obvious you solve the solution to 90% percent and then stuck at one point oh what you get a big 0. What a great way to measure what a student learnt throughout the course right?...*[15]

  - *...The thing about the course is how bad designed it was. It does not make any sense to mix up 3 different math topics and make a course out of it...*[16]

TL;DR - *to sum up...*

- It is student's responsibility to become a self-directed learner! To achive this, *"students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed."* [1]. **This is the main job of universities: fostering an environment in which you might become such a learner!**

- Please give feedback, either in person or through formal course evaluation! However, know that any non-constructive comment will have little to no effect on my teaching!

- At the end of the day, everything is an optimization problem, and all different approaches (such as choosing among different exam types) contain their own trade-offs. You should learn how to conduct yourselves in non-idealistic (yet realistic) situations bounded by hard-to-change external constraints.

Notes

[1]There is no universally accepted methodology which all students can utilize to learn a subject! Among many other techniques, it has been suggested in *"higher education literature"* that students should do the lower levels of cognitive work (gaining knowledge and comprehension) outside of class (for instance by reading the textbooks before and after the lectures) and that they focus on the higher forms of cognitive work (analysis, synthesis, etc.) in class with the support of the instructor. This particular thesis goes under the name ***"Flipping the Classroom"*** (for instance, see [2] or [3]).

[2]A fundamental reason why the instructor is not supposed to "teach" students the course material is that this task is not even remotely achievable! First of all, teaching someone something is too vague to begin with because there are actually different kinds of knowledge[3] and the "teaching" approach has to drastically change depending on the ultimate goal of what kind of knowledge we would like to convey.[4] Secondly, students in higher education (unlike in preliminary or secondary education) are already expected to master independent learning so assigning instructors *the mentor role* is perfectly natural. And lastly, it is simply not realistic to expect an average instructor to master a proper teacher role for a particular course without a long time of consistent instructor experience for that course (and for an established unchanging material). As this conflicts with the universal academic tradition that the faculty regularly change which course they teach (with the course material itself getting regularly updated), instructors acting as "proper teachers" in universities is simply unrealistic for most cases.

[3]Conceptual knowledge, conditional knowledge, content knowledge, declarative knowledge, disciplinary knowledge, discourse knowledge, domain knowledge, episodic knowledge, explicit knowledge, factual knowledge, metacognitive knowledge, prior knowledge, procedural knowledge, semantic knowledge, situational knowledge, sociocultural knowledge, strategic knowledge, tacit knowledge, and so on.

[4]This is discussed in depth in one of the *holy books* of educational science, ***Taxonomy for Learning, Teaching, and Assessing, A: A Revision of Bloom's Taxonomy of Educational Objectives*** [4]. Even though one can actually reduce all of different kinds of knowledge broadly to four types (factual, conceptual, procedural, and metacognitive), it is simply infeasible to prepare a consistent "teaching" environment unless **(1)** a rigorous consistent course scheme is prepared by those who are both proficient in the subject and in the modern education theories, and **(2)** all the instructors of the course are trained in the relevant methodology to ensure that they deliver the same consistent teaching experience with the intended knowledge types. In practice, all around the world, it makes much more sense to assign the *mentor* role to the instructors instead of a *teacher* role, which affectively shifts the burden more towards the student, who are supposed to learn independent-learning through their undergraduate education anyway.

[5]It is interesting to note that having high expectations from students is known to actually help them achieve more! Even though one should avoid grade inflation out of respect to the international academic world (among other things) anyway, keeping high expectations for students is already listed as a good practice for undergraduate education in the literature, see for instance [5].

[6]Let's enumerate some points:

- The students would understandably prefer partial credits, which is why I presented "no partial credit" as a disadvantage. In my honest opinion however, this is not so obvious. In research life (be it in academia or in R&D of several sectors), you do not a priori know what to get in the end, and in many cases there is no simple way to check if your findings are correct or not. This is in contrast to school where there is at least someone (your instructor) who can confidently tell if your result for a problem is correct or not. Therefore, during their undergraduate studies students ***should get the habit of double-checking their computations and working in a manner that debugging their derivation is easy***. Multiple-choice questions heavily encourage this habit as a single typo in the derivation costs the full grade of the question, forcing students (understandably very annoyingly) to work in a manner that will be extremely useful after their graduation.
- In an open book classical exam, where students are provided all the information (such as various formulae) ***and*** where they can receive partial credit for their incomplete work, all questions should be as novel as possible to ensure that students only get well-deserved points. As it is really hard for the instructor to come up with questions that are both novel and easy, the likely end-result will be such that the questions in an open-book classical exams will be quiet challenging!
- A gambling student can select a choice for a question that they did not solve and then get points for it if they are lucky, which is why I wrote the disadvantage *"Gambling students might be rewarded"*. To be fair, in a multiple-choice question where wrong answers are of negative points, statistics dictate that the net effect of gambling students to the average can be made negligible. Therefore, I do not believe that this is a real issue in any sense to affects the grades of the majority of the class; however, even the existence of *some* students getting higher grades than what they deserved is sufficient for a negative psychological effect, hence I fully acknowledge this as a disadvantage in the end.
- The maximum time per course per week (along with total time per course per semester) that I would allocate to a course is fixed. Therefore, if the exam questions are classical, I would have fewer exams in a semester and it would take far more days before I can grade the exams. Having fewer exams means that each exam will play a larger part in the total grade, which is undoubtedly a negative result (more stress for the student, less chance to get a good grade once one exam score is low, etc.). Getting a late feedback is similarly a negative result, arguably a worse one: the importance of receiving prompt feedback has been emphasized universally and is even listed as one of the *seven principles for good practice in undergraduate education* [5].

[7] *"By making each examination cumulative, professors convey to the students that learning is supposed to be permanent and not just something done to get through a single examination. At the same time, they encourage all students (even those who fail the first or second examination) to keep learning, right up to the final. Furthermore, with such a system, they can use examinations that require sophisticated reasoning skills that stretch the students' abilities and encourage them to improve, making each test more sophisticated than the last one."* [6].

[8] It is generally expected that, especially in a large class, there will be different kind of learners and they evaluate the same course differently: *"Noel Entwistle and Hilary Tait [...] found that different kinds of learners might give the same experience conflicting ratings. Deep learners said they liked courses that pushed them to explore conceptual meanings and implications, whereas their classmates who were surface learners hated such experiences. Students who thought learning meant memorization praised courses that valued recall while those who expected to reason on a higher level reported that they didn't learn much."* [6].

[9] Such valuable feedback had helped me shape my exams in various ways; for instance:

- I always design a multiple-choice question such that the expected value of grade obtained for a random choice is zero, meaning that *gambling students*' affect on the mean of the exam is negligible. Despite that, students informed me that they are psychologically effected more by how many students can get the point by randomly choosing (independent of how many other students actually get negative points). Therefore, I increased the number of choices for the exams to ensure that fewer students can actually randomly guess the correct choice.
- I was told by students that they find it stressful during the exam if the questions have choices such as "all of them" or "none of them". I no longer add such options.

[10] This is a genuine constructive feedback. I will try to be more careful to explain transitions in future classes.

[11] I treat this evaluation as a *venting*. Even if the student was (and maybe is) right, the evaluation neither brings attention to a *concrete* problem nor makes a *specific* request. In the end, this evaluation will not affect how I carry out my classes.

[12] I would say that this is a mixture; but importantly, it contains constructive feedback: *the student roughly requests that some example questions that reflect exam questions are solved in the class*. Although this is a reasonable request, I believe that it is based on a poor understanding of university education: as emphasized at the beginning of this document, exam questions are *supposed to be* novel and unseen. Therefore, I appreciate the feedback but there is little that I'll change based on this comment.

[13] This is also a mixture: although I am personally happy that it has the general positive tone, there is little feedback here that I can reflect upon as the statements are too generic. The exception is the mention of the topics to be covered: if it was only in my control, I could reflect upon this and may potentially increase the contents. However, these are largely fixed in METU Catalog, and instructors might only slightly vary them.

[14] This is a genuine constructive feedback. For applicable courses (such as the one for which this comment was made), I plan to request a teaching assistant in the future so that we can have regular recitations.

[15] This is simply venting. As there is no constructive feedback here, I simply ignore this one.

[16] This is a comment made for the course Phys210, which contains somewhat independent topics *vector calculus* and *complex analysis* (I'm not sure why the student said 3 instead of 2). I would say this is partially a constructive feedback as the contents of the course may need to be rearranged. However, as the arrangement of topics between courses is not in my control, this is a feedback not for me but for the department.

References

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[3] A. Hutton, "The efficacy of the flipped classroom technique in undergraduate mathematics education: A review," *arXiv preprint arXiv:2010.11393* (2020) .

[4] L. Anderson and D. Krathwohl, *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Longman, 2001. https://books.google.com.tr/books?id=bcQlAQAAIAAJ.

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[6] K. Bain, *What the Best College Teachers Do*. Harvard University Press, 2011. https://books.google.com.tr/books?id=0eELf98Txw4C.