Inclusive Teaching in Intermediate Microeconomics:

All Flowers, No Weeds in the Hardest Core Class

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Abstract:

Intermediate microeconomics is often considered, by students and instructors alike, a "weed-out" class that winnows economics majors down to those who can cut it in the tough field of economics. We argue that this approach unnecessarily gatekeeps the economics major in a way that makes it less inclusive and, most likely, less diverse. In this paper, we argue that intermediate microeconomics instructors should maintain a growth mindset about the ability of all students to succeed in the course. We suggest some strategies for teaching this course in an inclusive way. First, we discuss sense of belonging, economics identity, ways to make students feel supported, and student growth mindset. Next, we discuss how instructors can assess students' quantitative preparation for the course early on and support students with weaker math backgrounds throughout the semester. We then encourage use of active learning in ways large and small, and suggest a variety of activities we have used successfully in our intermediate microeconomics courses. We go on to discuss how the material, which can seem abstract at times, can be made to feel relevant and compelling to undergraduates, including those from underrepresented backgrounds. We also discuss the importance of the instructor maintaining a growth mindset with regard to their students and communicating to the students that the instructor believes they can all succeed.

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1. Introduction

Intermediate microeconomics is a standard course in the undergraduate economics curriculum, but it often has a reputation of being hard, sometimes the most difficult required class in the economics undergraduate program.[1] The quantitative rigor of most schools' version of this course, whether it has calculus as a prerequisite or not, makes it the poster child of the kind of class some might be thinking about when arguing (rightly or wrongly) that the reason economics is not diverse is because of the quantitative focus or our field, with the implication that this mathematical content deters diverse communities of students. While it is true that some students from underrepresented backgrounds may have weaker preparation in mathematics, this does not mean that intermediate microeconomics must "weed out" students who are less prepared, or that it must deter diverse students from continuing in economics. In this paper, we argue that intermediate microeconomics can be taught so it is a gateway, not a barrier, for diverse students, while still being rigorous and building needed skills, and we provide suggestions to help instructors achieve this.

Economics is not a diverse field. As Barrera et al. (2024) show, for example, women and racial minorities, and especially women who identify as racial minorities, are vastly underrepresented among students who graduate with undergraduate majors in economics in the United States. While these rates have improved in some cases over time, the field lags far behind not only the rates at which these groups get undergraduate degrees in the social sciences more broadly, but even behind science, technology, engineering, and mathematics (STEM). While many STEM fields face their own diversity challenges, and there is heterogeneity across STEM disciplines, the fact that these fields are on aggregate more diverse

[1] We do not have hard data showing that it actually is the hardest core course. However, among our students, anecdotally, it has that reputation. It would not be surprising if it were true, as at our schools (like many others), it is the first heavily mathematical theory course most students take, which forces students to learn a more precise way of expressing economic ideas that will be new to most of them, and often frames ideas in an abstract way that can be harder for students to grapple with.

than economics suggests that quantitative rigor is not the reason economics has a diversity problem, nor need it be a factor that deters diverse students from succeeding in intermediate microeconomics.

Research in STEM (e.g., Bottia et al., 2021) has shown that students with underrepresented identities are more likely to arrive at college with weak quantitative preparation. Further, Avilova and Goldin (2024) note in a case study of an undergraduate institution that mathematical ability did not predict entry into or eventual majoring in economics. In STEM, research also shows that with careful efforts, weaker quantitative background need not be a barrier to student success in STEM fields (Estrada et al., 2016). Those lessons can be applied in the context of intermediate microeconomics.

Economics has certainly made progress toward teaching in ways that can better promote success of diverse students, and many of these efforts have paid off in techniques that can be easily adopted by a broader group of economics instructors (see, e.g., Barrera et al., 2024). However, most of the work promoting inclusive instruction methods in economics focuses on introductory (i.e., principles) economics courses. While this is important because students must generally enter at the principles class to stay in the major, retention is an important issue as well. Very little attention is given to how classes at higher levels are taught and the impacts that may have on diversity of graduating economics majors.

We aim to bridge that gap for intermediate microeconomics. This is a core theory class required of students in most undergraduate economics programs. Typically, it is a class second-year students take, with principles of microeconomics as a prerequisite; some schools integrate calculus-based analysis into it and thus include basic calculus as a prerequisite, while some exclude calculus, while still others offer calculus and non-calculus versions. It is typically fairly abstract and consists of learning how to solve problems in consumer theory, producer theory, and equilibrium. One might think that given that this class often differs from the rest of the courses in the major on these dimensions, including those that follow, a student who gets to intermediate microeconomics and finds the material or the way it is taught

to be difficult for them might grit their teeth to get to the other side. However, this will not happen uniformly across demographics. For example, the challenges in intermediate microeconomics may lead to lower grades, and evidence shows that women students are more elastic with regard to grades than men are, in the sense of being more likely to leave the economics major after receiving a lower grade (Avilova & Goldin, 2024).

In this paper we discuss how to improve the teaching of intermediate microeconomics for all students but particularly to ensure the class does not increase demographic gaps in economics. Our suggestions are mostly based on our own personal experience; they are often backed up by peer reviewed studies, but our suggestions themselves have not been rigorously evaluated for efficacy. Our personal experiences come from teaching the course (in class sizes of 20-35 students) a combined total of two dozen times in schools that are both highly selective liberal arts schools, though with demographically different student bodies. In what follows, we first discuss how to leverage a set of interconnected ideas that relate to students feeling connected in and positive about in their economics studies: sense of belonging, economics identity, supportiveness, and growth mindset. We then show how instructors can assess students' quantitative preparation at the start of the semester and address gaps that may exist. Next, we suggest ways that active learning can be used in intermediate microeconomics classes of different sizes. We then discuss how the abstract material in the course can be made to feel more relevant to students. Finally, we discuss the role of the instructor's belief that the student is able to learn and grow, and then we conclude.

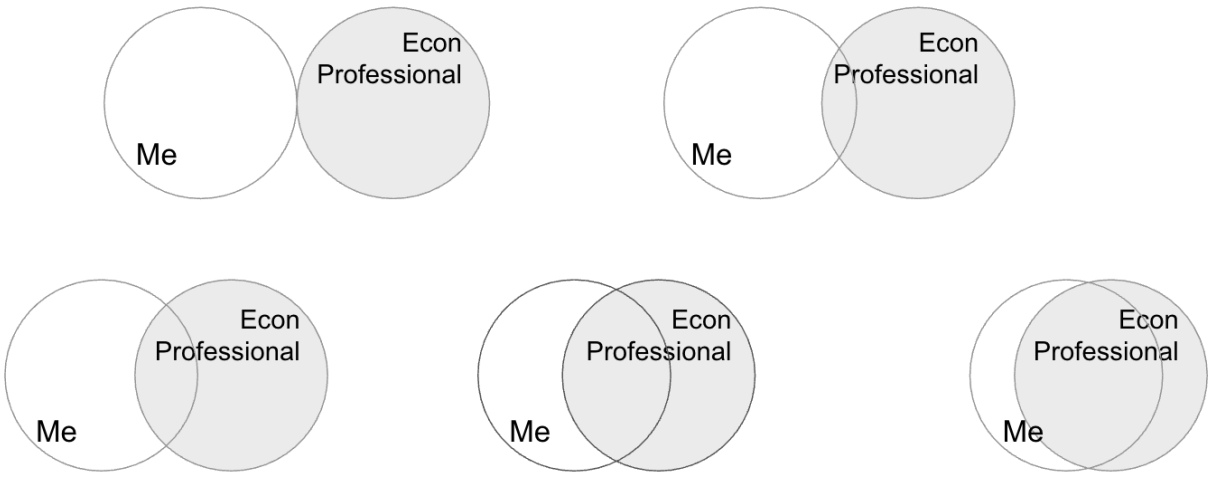
2. Belonging, Economics Identity, Support, and Growth Mindset

A sense of belonging has been shown to be an important factor in educational performance in higher education in general, and in STEM in particular. A student has a sense of belonging if they feel socially integrated into their classes and feel that they belong. In the context of economics, Bayer et al. (2020)

study relevance, belonging, and growth mindset (RBG) and show how they vary across student demographics; Krafft et al. (2023) study how these factors vary across different institution types. We will return to relevance in Section 5 and growth mindset later on in this section.

Sense of belonging in economics can be interrelated with development of an "economics identity," an idea translated from the concept of STEM identity. The STEM identity literature (as discussed in Barrera et al., 2024) studies the causes and consequences of the extent to which a student feels that their identity overlaps with that of a STEM professional, focusing on the idea of development of a discipline-specific identity like a engineering identity or a physics identity. Students with a stronger STEM identity tend to have stronger aspirations and performance in that field (e.g., Godwin et al., 2016). See Figure 1 for a visualization of an economics identity scale that lets respondents express the degree of overlap they see between their own identity and that of an economics professional, adapted from McDonald et al. (2019) and similar to the formulation of economics identity discussed in Barrera et al. (2024).

Figure 1: Economics Identity



Source: Authors' creation, based on McDonald et al. (2019).

The STEM education literature shows that weaker STEM identity for those with underrepresented identities can impede sense of belonging and success in a field (e.g., Rainey et al., 2018), and that interventions that improve STEM identity can help students aspire to and achieve greater success in the field (Hernandez et al., 2013). STEM identity development has three components: interest, performance, and recognition. There is every reason to believe these concepts would apply to economics identity. Therefore, to develop economics identity in all of our students, we need to make it interesting to them (with relevant material, which we discuss in Section 5), help them perform well (and see themselves performing well), and explicitly recognize them when they do perform well.

We use some very straightforward approaches to develop a sense of belonging and economics identity in our intermediate microeconomics students. We recognize that some of these are easier for us because our relatively small class sizes (typically 20-35 students) let us interact more personally with each of our students. The simplest thing we do on this dimension is to get to know our students as people. We call them by the name they prefer to go by, and we refer to them using the correct pronouns. (Our small schools also mean that we encounter our students outside of class in a variety of circumstances over their time in college.) We also use language in the syllabus and in class that describes the class as an inclusive community that the student reading the syllabus is absolutely part of. This can be as simple as referring to them as economists. We like to explicitly remind them that they have the prerequisites for the course, which is a form of recognition (one of the ingredients of economics identity formation).

It can also be helpful to provide as many “easy wins” as possible during the study of the challenging, rigorous material in the course. It is important to urge students to give themselves credit for the small wins – they may not see their successes until you point them out. One way we both like to create “easy wins” is that, the first time students see a particular variety of problem, we scaffold it and break it down into parts such that the students know how to do each of the parts. For example, a Lagrangian can be

broken down into constituent calculus and algebra steps, most of which students can do on their own even if the whole problem seems daunting. It helps to call explicit attention to the fact that the students know how to do these pieces. Once they've gone through it in this broken-down form and see that they really do understand each step, then they can put the pieces together in the context of new problems to solve.

The development of an economics identity requires that students see themselves succeeding, and that can be challenging if students find the material difficult and see that difficulty as a signal that they are "not good at" this kind of work. That kind of perception is at odds with a growth mindset, the idea that abilities are not fixed but can be developed and improved. STEM research shows that a growth mindset with regard to concepts learned in STEM classes is more correct than a fixed mindset, and that students with a growth mindset have stronger achievement in their STEM classes (Canning et al., 2019).

Intermediate microeconomics is often the first course of its type (abstract, mathematical) that students take in economics, so it may be difficult for some students to understand how they will learn and grow in the class. Not only are students expected to use a broad range of mathematical tools in the course (that is, graphs, algebra, and calculus), but they are also expected to apply these tools to build economic models and deriving hypotheses. Because of the range of types of intellectual work the course features, students might wonder how best to approach the course, especially when preparing for assessments. One way to pre-empt this is to set clear expectations – that is, to make the hidden curriculum[2] for the course visible.

For example, one of us (Viceisza) includes in the syllabus a section titled "How to Approach This Course", which is intended to give students a potential recipe for success. Students are encouraged to (1) watch

[2] The hidden curriculum for academia (Giroux & and Penna, 1979) is the unwritten set of things a student must learn to be able to succeed, including norms of behavior (e.g., asking for extensions or support) and resources that may be available if one knows to ask.

videos and read notes provided by the instructor before coming to lectures, (2) ask and help answer questions during lectures by, for example, solving problems on the board, (3) review all material again after lectures and visit office hours with any follow-up questions, (4) link assignments such as quizzes, research papers, and readings to material discussed during lecture, (5) attend weekly work sessions, (6) summarize material on a regular basis, and (7) review such summaries prior to exams, often in small groups. Some of these steps are further discussed in Section 5 on active learning. Generally, students are discouraged from memorizing, which tends to be a default strategy for many students. Instead, they are advised that if they follow these steps, they will grow to become very familiar with and to properly understand the material over time. This implicitly builds in and expresses the instructor's faith in the student's ability to learn and grow.

The other one of us (Jacobson) explicitly refers to growth mindset, linking it to the idea of impostor syndrome,[3] in the syllabus, which is reviewed out loud on the first day of class to pull back the curtain on how it may interfere with student learning:

> "Growth Mindset and Impostor Syndrome:
>
> Many of us struggle with these two impediments to being our best and happiest selves, in our academic pursuits and beyond. First, many people have a "fixed mindset" about learning, which in economics I often hear as something like "I'm not good at math." As it turns out, that (not being, or being, a math person) is not a thing. A more accurate model of learning is a "growth mindset," which says that intelligence can be developed and learned. Second, our "impostor syndrome" makes us feel that everyone else here belongs, but we're here by mistake and will be found out any minute. It's so common that I'm sure you already know about it; the funny

[3] Imposter (or impostor) syndrome is also worth addressing with your students, as it is intuitive to think it could interfere with a sense of belonging or formation of economics identity. A good resource you can share with your students is https://studentlearning.stanford.edu/imposter-syndrome.

> feature, though, is that some of you probably think something like, "It's a syndrome with everyone else, but I'm an actual impostor." I know I always think that. Again, as it turns out, it's not true. You are here because you are ready to be here."

This also explicitly tells students that *they belong* in this class.

Students also need to repeatedly hear the message that support is available to them and that accessing that support is normal and expected. Again, given the focus our schools place on strong undergraduate education and access to professors, we provide a great deal of support for our students ourselves in extensive office hours consultations; support also comes from teaching assistants, who are typically more advanced undergraduates at the institution, and tutors and tutoring labs. Some students with less "hidden curriculum" knowledge of college may also not know what office hours are; for these students, a brief explanation of what that the term means and how that time may be accessed and used may help (Jacobson puts that in the syllabus as well). In addition, many students may feel intimidated visiting with professors in office hours, or may feel like their questions are not good enough to ask in some way. Office hours can be made less intimidating in a variety of ways, such as offering multiple formats (drop-in vs booked, one-on-one vs multiple students in parallel, in your office vs in the library) or giving extra credit to students who visit office hours in the first weeks of the semester. While most intermediate microeconomics students are not new to college, some are, and others may have been able to skate by in "easier" classes with less need to consult the professor for help. The instructor can mention consultation of tutors and TAs in class and other settings to normalize them as something that students are expected to do rather than a sign of weakness.

Professors can also send messages outside of class, and even after the semester, to inculcate a sense of belonging and provide students with recognition. These don't necessarily need to be fulsome soliloquies; however, the more explicit and genuine they are in recognizing the economist in the student

and the student's accomplishments, the better. Professors often see particular students as much more competent than those students see themselves as, so it is important not to assume that a student knows that they are great just because it's obvious to you. Our informal observation is that this disconnect is more common for women students.

Reinforcement messages can take the form of emails that are sent out after exams or after the semester either to praise a student who did well or encourage a student who struggled. They can recognize either achievement or effort. Sometimes messages are sent during the semester, saying things like, "You did very well on that midterm exam!" However, in such a case it is obviously important to avoid writing anything that could be read as an implicit promise of a particular course grade. Messages of this type can be brief or even formulaic – for example, a colleague sends a stock email to all women students who perform above a certain percentile. One of us (Jacobson) sends a short custom email after the end of the semester to a set of students who either did well, worked hard, grew a lot, or any combination thereof. Students often express surprise and delight at receiving this recognition. There is evidence that this kind of intervention can retain diverse students: Bedard et al. (2021) show that sent positive feedback sent by the economics department to top-scoring students in principles classes increases retention of diverse students in the economics major.

Many of us also often have informal or formal advising meetings with our students, where we talk about their future in college and beyond. It is important to not assume that any particular student will not be interested in any particular future; for example, if you bring up the possibility of an honors thesis or economics graduate school for some students, you should bring those topics up for students more generally. Students are often eager to learn about the possible pathways ahead of them, and even if they don't take these particular paths, it means a lot to some students to learn that their professor sees them as someone who is capable of navigating exciting and challenging careers.

3. Assessing and Addressing Uneven Quantitative Preparation

As noted above, uneven quantitative preparation can be correlated with demographics in ways that make intermediate microeconomics more challenging for students from underrepresented backgrounds. One approach to addressing uneven quantitative preparation is to require a course such as mathematical economics or calculus before enrolling into intermediate microeconomics. This ensures that students have been exposed to concepts such as multivariable calculus and optimization. Depending on one's institution, this goal can also be achieved by requiring a specific course (or set of courses) from the mathematics department, or one that is offered in-house in the economics department. Of course, prerequisites can also serve as barriers to the study of economics, so they should be adopted in moderation, and the appropriate set of prerequisites will likely vary from institution to institution.

An alternative approach to dealing with uneven quantitative preparation is to teach a version of intermediate microeconomics that does not rely on as much math, assuming that this version of the course is accepted at the institution for completion of the economics major. This has its downsides if a student later ends up in a context where they are expected to have been exposed significant math, for example, in graduate school. Some ways to design less math-intensive courses could be to (1) emphasize graphs and applications over algebra and calculus, (2) prioritize univariate examples over multivariate examples, (3) highlight fundamental relationships such as $\frac{MU_x}{MU_y} = \frac{p_x}{p_y}$ over the first-order conditions for utility maximization that lead to them, and (4) frame problems in a more applied manner, for example, by using actual numbers instead of Greek letters.

The latter approach can be used even in intermediate microeconomics courses taught at a higher mathematical level. We have found that students sometimes struggle with thinking of αs and βs as numbers. So, rather than presenting a problem as $\max x^{\alpha}y^{\beta} \;\; s.t. p_x x + p_y y = I$, one might alternate

between such formulations and more specific parameterizations such as $\max x^{0.5}y^{0.5}\ s.t. 2x + 4y = 50$. In fact, the setup of the problem might even go a step further by contextualizing it with a consumer's name, specific types of goods, and so on.

Holding constant the course prerequisites, it is important to continue addressing uneven quantitative preparation throughout the course. Of course, the time you take to do this has an opportunity cost: you get to cover less material. Still, if a portion of your students are simply not following you because they don't have sufficient facility with the math you are using, the material isn't helping them anyway. We achieve different balances in this regard, with one of us (Viceisza) doing more of this review in class, and the other (Jacobson, whose semesters are shorter) providing more outside-of-class opportunities for review. Here are some examples of our approaches.

First, we summarize key math concepts at the start of the semester. In Viceisza's course, during the first two weeks of class, quizzes and handouts are aimed at refreshing concepts such as partial derivatives, the Lagrangian technique, and probability and statistics. Their economic applications are then deepened out throughout the semester.

Second, we slow down considerably when discussing economic applications of these math concepts. For example, when explaining utility maximization, we take ample time to cover the Cobb-Douglas case. We start with the graphical exposition and then connect it to the math of indifference curves and budget constraints. Once the Cobb-Douglas case has been exhausted, we expand to other types of preferences, specifically, perfect substitutes, perfect complements, constant elasticity of substitution, and quasilinear. We then follow the same detailed process to cover other economic applications such as expenditure minimization, cost minimization, profit maximization, game theory, and risk and uncertainty.

Third, we do our best to bring all students along. Sometimes this requires going down into the weeds and back to the basics. For example, a student might not remember that $x^{-\alpha} = \frac{1}{x^{\alpha}}$, so skipping such a "minor" step during the process of derivation can lead to unnecessary confusion. This is also why having students solving problems collaboratively or on the board is beneficial (also see Section 5 on Active Learning) – the class is forced to move at the pace of student learning. Bringing all students along cannot always be achieved during lecture alone. Sometimes, a student needs additional time to reflect and process information. So, we generally encourage students to (1) visit office hours, (2) attend work or recitation sessions, and (3) use additional resources such as peer-tutoring and math labs, tutor.com, and artificial intelligence (AI). In the latter case, we encourage responsible use of AI, such as to refresh the student on material from a prerequisite course or to create practice problems. We cite literature on the mixed effectiveness of AI to warn students against AI becoming a crutch (for example, Bastani et al., 2024; Otis et al., 2023), especially in cases where their use is forbidden during assignments.

Fourth, we provide diagnostics and learning materials related to the math that will be used in the course, and we do this early in the semester. One of us (Jacobson) teaches an intermediate microeconomics class that has univariate, but not multivariate, calculus as a prerequisite, although we use simple partial derivatives in the course. The students receive a handout explaining partial derivatives in a very simple way that relates them to the univariate calculus the students have learned in the past, to assure them that they are not being asked to do any math they are not capable of. Students also have an optional extra credit assignment, "problem set zero," due in the first week of the class, which walks students through every math skill they will need in the course. The problems are framed as simple math problems, to aid in transferability of the knowledge they have already accumulated into this setting. Students are explicitly told the pedagogical value of this as a diagnostic tool, and nearly every student chooses to complete it.

4. Active Learning

As discussed in Barrera et al. (2024), there is a tremendous amount of evidence that active learning activities, in which students are actively engaged in constructing their own understanding of the concepts being studied rather than passively receiving them, are not only more effective overall than passive learning, but can also reduce demographic achievement gaps in STEM education. In economics, many have proposed active learning activities for principles of microeconomics classes and for electives (e.g., Abidoye et al., 2021). Some may feel the abstract nature of the subject matter of intermediate microeconomics make it unfriendly to such approaches, but we beg to differ.

Both authors of this paper engage students actively in solving math problems in the classroom, as discussed in Section 3 (on quantitative preparation). Problems amenable to this type of work include finding the demand functions for a given utility function, finding the competitive supply curve for a production function, and finding probabilities for mixed strategies in game theory.

The process for one of us (Viceisza) is as follows. Students first work on a problem in small groups. We then ask for volunteers to come to the board and explain their derivation. This type of reciprocal teaching makes students more metacognitive in their learning (for example, Gajria et al., 2007; Takala, 2006). Student involvement is key because they are better able to relate to their peers' recollection and level of understanding of certain concepts from this class and past classes. In this way, reciprocal teaching is also an opportunity to connect the dots with courses such as mathematical economics. For example, the professor in another course might have used terminology such as "concave down" instead of "concave," or the course might have consistently appealed to a specific example. As professors of intermediate microeconomics, we would not be aware of such nuances, which in turn can stifle transfer of learning across courses. (On this note, there may be a benefit to coordinating on terminology with other instructors, those of prerequisite courses and of courses to which intermediate micro is a

prerequisite; even if it is not possible to use the same language, at least signposting to the students the different phrases used for the same concept is helpful.)

The other one of us (Jacobson) introduces problems of varying lengths and complexities in lecture and provides a set of steps for students to take, and tells students to work on their own or with other students to complete the steps for a chunk of the lecture period; students are repeatedly reminded to check in with each other if they have results or if they don't, to compare their processes and outcomes. Students' work is periodically stopped and students are asked to give the answer for each step, which the instructor steps through the algebra of so that all students can catch up, before letting the students proceed to the next step.

Games are another way that active learning can be brought into the classroom, which one of us (Jacobson) uses extensively in intermediate microeconomics. In fact, on the very first day of class, a game is played to show students that the class can help them think about modeling interesting phenomena from real life. For example, two students may be invited up to play a dictator game, where one student is given an odd number of dollar bills and must decide how much, if any, to give the other student; then, the students sit down with their earnings and the whole class discusses why the dictator made their decision and therefore how the behavior could be modeled in a utility function. At the start of producer theory, students play a game where teams of workers must produce a good (stapled packets of paper), with different amounts of labor but no increase in capital as the labor increases, so that students can think about models of production functions and diminishing marginal product (Anderson, 1986). When studying oligopoly, a very simple Bertrand game can be played: students can be given a marginal cost of production and a demand curve for the entire class, and be told that they can 1) take the whole profit if they have the unique lowest price or 2) split the market if they are tied at the lowest price. Then students must declare their prices all at once (either through an online form, by writing down their price and covering it with their hand until they are told to reveal it, or some other

means). In a unit on risk and uncertainty, many different kinds of lotteries can be played to demonstrate concepts like risk aversion and loss aversion.

Many games can be played in a segment on game theory, often with minimal planning or overhead and no materials. The simplest example is that, to introduce mixed strategies, students can be asked to play rock-paper-scissors with their neighbor a few times, and then strategies can be discussed to discern whether there is a "winning" (dominant) strategy. Games can also be played with decisions on paper – for example, students can be asked to play a prisoner's dilemma game (Jacobson frames it as a work/shirk game for collaboration on a group project) with a neighbor student, each writing down their decision privately and covering it with their hand until the instructor counts down the moment when decisions should be revealed. Online forms, such as Google Forms, can be used as well – for example, to introduce game theory, Jacobson uses a Google Form to have the whole class play a weakest link game together. The students' favorite game is usually the "divide the cookie" game, used to introduce backward induction: the instructor gives each pair of students a cookie and a plastic knife; the first mover cuts the cookie, and the second mover chooses which piece to take.

We also use several active learning strategies outside of the classroom. First, one of us (Viceisza) flips the classroom by posting detailed notes and assigning related videos from the Intermediate Microeconomics Video Handbook produced by the Economics Department at University of California, San Diego.[4] Students are encouraged to consume all material (that is, notes, videos, and readings) prior to class and reflect on it after class. This is partly incentivized by (1) assigning take-home quizzes on the lecture material to be completed before class and (2) an in-class participation grade that depends on questions asked and answered during lecture, including coming to the board to solve problems. Since the course can be quite reading intensive, students are encouraged to use the detailed notes as a road

[4] https://econvideos.ucsd.edu/

map, that is, the starting point and study plan, for navigating all course materials (readings, quizzes, videos, research papers, etc.).

Second, at both of our schools, students have access to work sessions for the material with teaching assistants. For all practical purposes, the work sessions are run by students. The teaching assistant, who might be an advanced undergraduate or a graduate student, organizes the session, but ideally, the students are the teachers. In Jacobson's class, the TA generally just help students learn how to answer questions on homeworks; they are carefully trained on how to give the best advice on any particular problem rather than to simply check, or give, answers. In Viceisza's class, not only do the TA's determine what problems and concepts should be discussed, but they also solve those in small groups and lead their discussion. For this to function well, the session requires a critical mass of attendance. So, to the extent feasible, the professor or department should make any type of work or recitation session mandatory. If it is not feasible (which it often is not), strong normative messages should be sent that going to work sessions and tutoring labs is expected for everyone and is not a sign of failure. In both of our settings, TA sessions end up being a high-energy setting in which students in the course work together on problems with the support of the instructor.

5. Making Intermediate Microeconomics Relevant

Perhaps the best way to make intermediate microeconomics relevant is by having students come up with day-to-day examples and applications that are meaningful to them. This starts in the classroom. For example, when teaching we often ask students to think of examples. In a recent class of Viceisza's, when discussing production functions, a student applied it to their juicing process. The blender was an example of capital while they were an example of labor. The class then used the same example to illustrate the concept of returns to scale. Let us say that a friend and a mixer were added to the production process; how would that change the number of juices they could make? Another case has

been to use the university as an example of a firm that produces college graduates and knowledge. This in turn leads to a discussion of how the firm chooses how many students to admit and thus, how much labor and capital to employ.

Of course, to keep material moving forward and to ensure a diversity of examples, the instructor often has to come up with examples. It is important that these examples either represent diverse identities or be so clearly fabulized that they can't make anyone feel excluded. For example, to represent diverse identities, rather than continually using European names and the pronouns he and she, an instructor can mix in names of a variety of backgrounds and the pronoun "they." Sports examples can resonate with many students, but can make some students feel excluded, so they can be used but only in combination with other things. The same is true for pop culture references (e.g., Taylor Swift or Beyonce); it can be easy to blunder into using in examples a famous person who has misbehaved in a way that is better not to introduce into class discussion. If food examples are used, it is important to make sure that Western food is not implied to be the normative food, e.g., by implying that certain tastes should not go together in discussing preferences, if those tastes are routinely combined in some food cultures.

Examples and applications that are clearly fictional or ridiculous can feel surprisingly engaging. These can refer to beloved cultural staples like the Lord of the Rings (with the same cautions noted as above, as their authors / creators can be problematic), or they can be of the instructor's creation (Jacobson often shapes problems around cats and dogs she knows, such as the neighbor's cat, Mabel, who produces biscuits).

Some students may particularly enjoy applications that feel relevant to social issues they want to solve. For example, students interested in justice and gender dynamics always seem to enjoy the game theory lesson one of us (Jacobson) teaches to introduce Nash equilibrium in the absence of a dominant strategy. The game is essentially a reframing of the not-great-on-gender-dimensions bar scene from *A*

Beautiful Mind (the 2001 film about John Nash) as a game called "Overturning the Patriarchy" which revolves around a flamboyantly silly story about two young idealistic liberal arts alumni who want to convince members of the patriarchy to change their patriarchal ways.

Supplemental readings can also augment the relevance of the course by introducing applications that students may not have thought of. For example, one of us (Jacobson) uses readings on topics like the "deadweight loss of Christmas" (Waldfogel, 1993), the NCAA (Kahn, 2007), markets for textbooks (Pecorino, 2006), and public health (Bjorkman Nyqvist et al., 2015). Students must do collaborative markup (using the tool Perusall) on three readings over the course of the semester, and readings also are very briefly discussed in class and can inspire homework problems.

Outside of the classroom, we both encourage students to explore additional applications.

In one of our courses (Viceisza's), students must write a group-based research paper in a topic of their choosing. They start with the development of an innovative research question relative to existing literature. So, they are required to review related literature, primarily in economics, by doing keyword searches among the National Bureau of Economic Research working paper series and peer-reviewed journals. A broad list of potential journals is included on the syllabus, and students are also encouraged to contact the relevant (business/economics) librarian who can assist with accessing papers. Once the research question is approved (mostly for clarity and novelty), students are expected to construct (1) a theoretical model that mathematically derives the testable hypothesis underlying the research question and (2) an empirical strategy (regression equation) to test the question. To keep the focus on application of math tools discussed in the course, the main crux of the paper is the theoretical model; students are not asked to analyze data, as would be the case in a typical empirical research project.

The other of us (Jacobson) has a much shorter and less substantial individual written assignment: each student must write a post on the class discussion board providing a link to, and discussing, a news article

related to a microeconomic idea. There are also many optional extra credit assignments that allow students to get a small increase in their grade by watching movies, listening to podcasts, going to talks on campus, or even playing board games such as Settlers of Catan (which demonstrates general equilibrium concepts, among other ideas) – students simply need to submit an informal write-up about how they saw microeconomics in the event or activity.[5]

The point is, students should be given multiple entry points to the material's relevance to increase the odds that something resonates with them, and be encouraged to make these connections themselves.

6. Instructor Growth Mindset

As noted above, growth mindset (in contrast to fixed mindset) is the belief that ability to succeed in the academic work at hand is not a fixed, innate quality of a person, but rather is something that can be developed and cultivated.

While most people have heard of growth mindset, we often think of the mindset of the student, but the mindset of the instructor turns out to matter significantly. Canning et al. (2019) survey STEM faculty to find whether they held a growth mindset with regard to students. Using administrative data, they find that students perform better (in terms of course grades) when their professors have a growth mindset, and they find that racial performance gaps (in grades) are about half the size for faculty with a growth mindset as they are for faculty with a fixed mindset. Students in classes with fixed mindset professors spent as much time working on their classes but reported lower motivation and were less likely to report their profs used pedagogical practices conducive to learning (and were less likely to recommend the prof to future students).

[5] A potential hazard with extra credit assignments is that in some settings, students who are minoritized in some ways may be less able to complete them, so they may increase inequities. In our settings, the maximum grade boost extra credit provides is small enough that this is a minor issue, and students are even told that the best way to get a better grade is to work with the material and that the extra credit assignments are basically just for fun.

We find it striking and instructive that Canning et al. (2019) show that economics professors were far less likely than faculty in almost any of the other STEM disciplines to have a growth mindset. In other words, our own attitudes, as economics instructors, about our students' ability to learn the material may be part of the reason we have demographic gaps in economics. Indeed, the very idea of intermediate microeconomics as a "weed-out" class evinces a fixed mindset about students. One of us heard a senior economist speak with some admiration of another instructor of intermediate microeconomics, who was seen as highly rigorous, by quoting him as saying to a student, "This is a weed-out course, and you, my friend, are a weed." If we had a growth mindset about our students, we would never see any of them as weeds, but rather instead see all of them as flowers whose abilities we can help to cultivate and grow.

This evidence indicates that intermediate microeconomics instructors should look within ourselves to ensure that they truly do believe that students can grow and develop, and that we should communicate that belief in their ability to grow explicitly to the students. With this mindset, the purpose of the class is not to identify the "best" students, because no student is fixed on a distribution; rather, each student is at a different waypoint on a different journey.

Given that, we should seek to help all students learn and grow as much as they are able to given the time they are able to put in to the course and other parameters they are subject to. Here are some ways to do that.

First, have, and communicate, high expectations for all of your students. If you have lowered expectations even at a subconscious level, that can affect how you interact with a student. It is important to not form pre-suppositions about students. For example, one of us was advised, when we were a new faculty member, that one should pull the transcripts of all students in a course at the beginning of the semester to learn who one is dealing with; we now think this is terrible advice. Disparate expectations can come out in how we talk to our students about matters adjacent to the class

as well as course material; for example, we try to ask all students if they are interested in research, thesis, or grad school rather than presuming, as previously discussed.

Next, in the structures of your class, call attention to pathways that students can use to come back from challenges, and make those as wide as possible. Grade bonuses for improvements over the course of the semester take no extra effort on the instructor's part and can help students feel that you believe that they can improve: for example, if you have two midterm exams, you can place a heavier grade weight on the exam the student got a higher grade on. Consider offering students who perform poorly on an exam the opportunity to submit a revised version of the exam in which they re-attempt questions and/or explain why what they had done before was wrong or why the new answer is correct. That can be a genuine learning opportunity for students, though it can take a great deal of the instructor's time. We don't always offer this because at our schools, students are very competitive and we don't want students with perfectly acceptable grades to feel that they have to do exam revisions for fear of being "leapfrogged" by students who want to improve.

There are many ways to communicate your growth mindset beyond these structural measures. First, any way that you can encourage students to have a growth mindset will also communicate your growth mindset. For example, we make sure to "correct" any student who says "I'm bad at math." We hear this often, especially from students with underrepresented identities, and it is at odds with a growth mindset. Similarly, any steps we take to demystify the learning process (e.g., the "How to Approach this Course" section Viceisza includes in his syllabus, as discussed in Section 2) imply that we believe the students can follow this advice and succeed. It is also useful to tell stories about times that you, or other students, have encountered and overcome challenges in this class. In addition, it is always a good idea to call out and praise growth when you see it. You may assume that the student will simply feel good about an improved grade, but they will feel much more validated if you make a point of reaching out and

commending them on their hard work and the success that it led to. The emails discussed in Section 2 can serve this function.

Finally, encourage your teaching assistants to have growth mindsets with regard to the students and to practice these methods as well. Indeed, for this reason, it may be particularly effective to choose teaching assistants who did not have perfect grades but who struggled through the material and experienced a great deal of growth. If your department doesn't currently include inclusive teaching training in the beginning-of-semester training your TAs get, or if they don't get any training, you may be able to arrange such a session with the support of resources on campus like a center on teaching and learning.

7. Conclusion

Intermediate microeconomics, as a required course in the economics curriculum, often has a reputation. We argue that while it is important to retain a level of rigor that allows students in the course to be prepared for higher level courses and further study, that level of rigor can be maintained while instructors teach in ways that are more inclusive.

While we are eager to see intermediate microeconomics improved by well-designed and evidence-based teaching methods, we do caution readers to conduct a careful cost benefit analysis on each intervention they are considering for the course. While some of our suggestions are about changing the instructor attitude or reframing existing content, others can add content or workload for the instructor. In our experience, the content that already exists in the course is typically so voluminous as to make the semester feel rushed as is; therefore, instructors should consider the class time any particular innovation would require. Similarly, instructors are, in general, overworked, so each must choose the interventions they feel work for them.

To close, we want to encourage other intermediate microeconomics instructors to think creatively about how the class can be made more engaging and positive and can make all students feel like it is a place for them to learn and grow. We have shared some ideas, but there are countless others. We'd love to hear what you do to help your diverse learners embrace microeconomic modeling!

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