

Career Pathways for Physics majors: high school teaching

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UMass Amherst has recently become a member institution of the Physics Teacher Coalition, or PhysTEC. A joint venture of the American Physical Society and the American Association of Physics Teachers, the stated purpose of PhysTEC is to *"improve and promote the education of future physics teachers."*

There is a long-term, serious shortage of qualified Physics teachers in the country [1]. On average, in school districts country-wide, only 47% of Physics classes are taught by a teacher with a Physics degree (as a comparison, the number is 73% in biology) [2]. Aside from the stress this imposes on in-service teachers who have to retrain to teach Physics, it is possible that the absence of a good grounding in Physics makes it difficult for teachers to convey the joy of learning Physics to their students. This in turn makes it more difficult for high school students to contemplate a future career in the sciences, or even gain an appreciation for the physical sciences. This disparity in teacher training also leads to the greater likelihood that school districts with lower funding, which are often minority-serving in greater numbers, are unable to offer Physics classes [3], further widening the gap between those who do and those who do not have access to higher education in the Sciences.

Promoting the idea of teaching as a career option is also in the best interest of undergraduate students enrolled in a Physics Bachelor's degree program. We know from an analysis of recent graduating classes at UMass that the majority of Physics majors do not go onto to graduate school directly. Many look for employment in industries requiring technical or programming skills, but the number who know, a priori, that they wish to become Physics teachers is small. In the recent past, we have had, on average, 1 - 2 students per year who graduate with an initial license to teach in K-12 schools. We wish to increase this number by actively promoting teaching as a career option.

APS, AAPT, ACS and partners have put together a NSF-funded website called <https://getthefactsout.org/> that informs students about teaching as a career and addresses some common misconceptions about the teaching profession, pointing out that the pay, benefits, and job satisfaction associated with the profession are high.

The rest of this document describes possible pathways for Physics undergraduates and Masters students to become Physics teachers in secondary schools in the state of Massachusetts. These are summarized below and expanded upon in the next pages.

[1] American Association for Employment in Education, Inc., 2010 Executive Summary: Educator Supply and Demand in the United States (AAEE, Columbus, OH, 2010).

[2] Jason G. Hill and Kerry J. Gruber, Education and Certification Qualifications of Departmentalized Public High School-Level Teachers of Core Subjects: Evidence from the 2007-08 Schools and Staffing Survey, Statistical Analysis Report [NCES 2011-317] (National Center For Education Statistics, U.S. Department of Education, Washington, D.C., 2011). Available at: <http://nces.ed.gov/pubs2011/2011317.pdf>.

[3] A. M. Kelly and K. Sheppard, "Secondary school physics availability in an urban setting: Issues related to academic achievement and course offerings," Am. J. Phys. 77, 902-906 (2009).

becoming a licensed High School Physics Teacher in Massachusetts

I. Overview

In the Commonwealth of Massachusetts there are three levels of teacher licensure.

The first is the **Provisional license**. This is a good option for students who are uncertain if a teaching career is right for them. In principle, this can be granted once the candidate (i) completes a bachelor's degree and (ii) passes two MTEL tests. The first **MTEL** test is **Literacy and Communication**, and the second is the subject matter test, in this case, **Physics**. A provisional license is valid for **5 years** and is **not renewable**. Within 5 those years teachers must advance from a provisional license to an initial license. All initial licenses require a teacher preparatory program. So, although a Physics graduate can teach with a provisional license, they must eventually go through a State approved teacher preparatory program to advance to an **initial license**. The provisional license is discussed below after the initial license options.

The second level of licensure is the **Initial license**, which requires (i) a bachelor's degree, (ii) successfully passed MTEL tests, and (iii) successful completion of a Department of Elementary and Secondary Education approved teacher preparatory program. At UMass, we have several options for obtaining an initial license, which are highlighted below. The Initial license is valid for 5 years. Teachers are expected to secure a Professional license within this time. This is discussed in detail below.

The third level of licensure is the **Professional license**, which requires at least three years of teaching experience and additional coursework. This is not discussed here.

II. Obtaining an Initial License with a Bachelor's Degree

Students who wish to obtain an initial license as an undergraduate, may apply to the University to Schools (UTS) Undergraduate program. This is an approved teacher preparatory program which will allow candidates to receive their initial license when they graduate with a bachelor's degree, usually within 4 years. Students should ideally begin this program in their sophomore year, but this is also possible to complete if they start in their junior year.

A sample course of studies for this licensure pathway follows. Physics students interested in pursuing this option should ideally plan to meet an advisor in the College of Education at the end of their first year at UMass. It important to note that regular and frequent advising is very important. Students who have difficulty registering for a class or cannot schedule a class due to a time conflict should seek advising, as it is often the case that some classes can be substituted or rescheduled.

Sophomore Year Fall

EDUC 305 Educational Psychology (3cr), or PSYCH 355 Adolescent Psychology (3cr)

EDUC 524 Work of the Middle and High School Teacher (3cr)

Sophomore Year Spring

EDUC 325 Introduction to Special Education or Educ 560 Iss Instr Meth Sp Ed (3cr)

Junior Year Fall

EDUC 497I Tutoring in Schools (3cr) or, EDUC Social Diversity in Ed (3cr)

EDUC 593A Seminar- Teaching and Learning in Technology (3cr)

Junior Year Spring

EDUC 706 Science Workshop (highly recommended, not required)

Senior year Fall

Educ 503 Sheltered English Immersion (3cr)

Educ 592S (2cr) S-Microteaching Lab (2cr)

Educ 512 Tchg Sci In Mid&Hs (3cr)

Senior year Spring

Educ 777 Advanced Principles and Methods of Teaching Science in the Middle and High School (3cr)

Educ 510 Teacher Mid/Hs Cls (2cr)

EDUC 500M (Middle School) or 500S (High School) Student Teaching (12cr)

It is critical that the students interested in this licensure pathway complete a Secondary Teacher Education Program, UTS Undergraduate application. Here is the link:

https://umassamherst.co1.qualtrics.com/jfe/form/SV_5i2FtEBJhmknbBH

Acceptance into the Secondary Teacher Education Program (STEP) will automatically notify our Licensure Office, and the student will be placed “in the pipeline” for licensure.

III. Obtaining an Initial License with a Masters in Education Degree (after a Bachelor’s)

Students who are graduating with bachelor’s degree in Physics and are interested in a Masters of Education degree with initial licensure to teach Physics have three options highlighted below, all part of STEP (Secondary Teacher Education Programs) at the UMass Amherst College of Education.

1. **University to Schools Graduate Program** offers a Master’s degree in Education along with initial licensure. This pathway, which generally takes two years to complete, involves on-campus coursework, pre-student teaching experience in schools, and student teaching at the middle or high school level for one semester. University to Schools also offers the opportunity to take additional graduate-level subject matter coursework as well as access to all University resources.
2. **180 Days in Springfield** is a one-year immersion pathway leading to initial licensure and a Master’s degree in Education. 180 Days focuses on urban Education; students in the program have experiences at various schools in Springfield, Massachusetts, such as Central High School, Chestnut Accelerated Middle School, Duggan Middle school, and the Springfield Expeditionary Learning School. 180 Days students work in an energetic and diverse school environment while developing Legacy Projects outside of the school day.
3. **Bridges to the Future** is a one-year immersion pathway leading to initial licensure and a Master’s degree in Education. Bridges has an emphasis on rural Education and Community Service Learning; students in the program have practicum experiences in Greenfield, Orange, and Turners Falls.

Admissions

Applications for admission for all **STEP** pathways can be made through the College of Education Website, <https://www.umass.edu/Education/>

The deadline for application submissions is January 15th for admission to the following fall semester. Applications received beyond January 25 may be reviewed on a case by case basis.

Science Education Faculty are available for advising regarding all STEP science pathways, course selection, and licensure. Please contact either Dr. John Kudukey (jkudukey@educ.umass.edu) or Dr. Enrique Suarez (easuarez@umass.edu)

IV. Provisional License Pathway (mainly for Juniors and Seniors)

As described in the Overview, it is possible to get a provisional license to teach after completing a Bachelor's degree and passing two MTEL exams. However, students who have had no training in pedagogy, and have no experience teaching in a middle or high school, might have a slight disadvantage going into the job. What we propose is here is a way for students who wish to explore a career in teaching to do so in a way that better sets them up for success in this endeavour, and allows them to be energized by the challenge rather than defeated by it. This pathway is one of two options for physics and astronomy majors who decide in years 3 and 4 of their bachelor's degree, or in the months right before they graduate, that they would like to try out teaching.

Undergraduate students in Physics who do not wish to enter the University to Schools preparatory program for an Initial license, and instead seek a Provisional license, have the option of taking any or all of the following Education courses to help prepare for a teaching position. It should be noted that this is not a teacher preparatory program.

EDUC 512

EDUC 777

EDUC 325 Introduction to Special Education

EDUC 305 Educational Psychology, or PSYCH 355 Adolescent Psychology

EDUC 497I Tutoring in Schools

Note that students who come into college already certain they want to teach K-12 (or decide this in their first two years) are better served by following the existing pathway for an **initial license**, described earlier.

V. Provisional License Pathway (for Masters students)

Physics students who are currently in a terminal Master's program in Physics and are considering high school teaching, can obtain a Provisional license by taking the two required MTEL tests (Communication & Literacy, and the Physics MTEL) and applying for a Provisional license through the Department of Elementary and Secondary Education.

In addition, all candidates in the terminal Physics Master's program have the option of taking any or all of the following Education courses to help prepare for a teaching position. It should be noted that this is not a teacher preparatory program.

EDUC 512

EDUC 777

EDUC 560 Iss Instr Meth Sp Ed

EDUC 503 Sheltered English Immersion

Please contact either Dr. John Kudukey (jkudukey@educ.umass.edu) or Dr. Enrique Suarez (easuarez@umass.edu) at the UMass Amherst College of Education for further information about these options.