(New) Masters of Arts in Physics Education Degree for In-Service High School Physics Teachers

by

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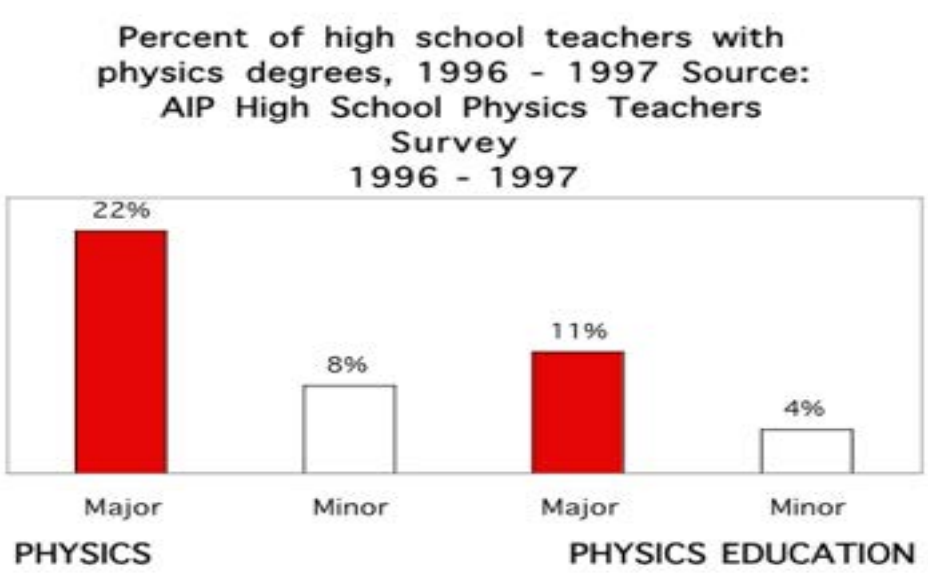
1. Why offer a Master of Arts in Physics Education Degree
2. Description of the MAPE program from 1997-2017
3. Feedback from teachers who graduated from the program.
4. Discontinuation of the MAPE program in 2017.
5. Why do we want to start it up again?
6. The NEWMAPE Program.
7. The cost of the program and affordability(Survey).

Chesapeake Section of the
American Association of Physics Teachers
Spring 2025 Semi-Virtual Meeting
April 5, 2025 @ George Mason University

1) Why offer a Master of Arts in Physics Education Degree



Physics in a New Era, National Research Council, National Academy Press 2001, Washington, D.C.

In 2000, 67% of high school physics teachers either did not have a major in physics or certification (NCES, 2002 report).

PER has concluded that the minimum standard is that you have a B.A. in Physics or Physics education to teach at the secondary level

2. The (old)Master of Arts in Physics Education Degree MAPE

- Between 2000 to 2017 the Department of Physics graduated **156** in-service High School physics teachers with the Masters degree in Physics Education from the College of Arts and Science.

- H.S. Physics teachers completed 30 cr-hrs of 6000 level "graduate" courses. The required courses include physics content that follows our physics major sequence but with a strong emphasis on pedagogy.

- Over 17 PHYS 6000 level courses were developed by Thornton and Lindgren for K-12 Teachers between late 90's and 2015

3. Feedback from teachers who graduated from the program 2000 to 2017

Teacher A: You and MAPE have been such a great asset to my life! With the support of MAPE, I was able to transition to High School Physics from middle school physics. I gained a great deal of confidence in what I was teaching.

Teacher C : Having come from a Biology background, the MAPE program was helpful in my transition to high school physics teacher. It helped with both the conceptual and mathematical perspectives of Physics and the hands-on experiences were valuable experiences I could take back to my classroom.

3. Feedback from teachers who graduated from the program 2000 to 2017

Teachers F: It helped me be a better physics teacher with sound pedagogical practices, how to guide students with an inquiry approach and how to weave demonstrations into lessons (lectures).

Teacher G: Because of the MAPE degree I was able to teach dual enrollment physics at my high school became an instructor at JMU in intro physics and physical science for future elementary and middle school teachers

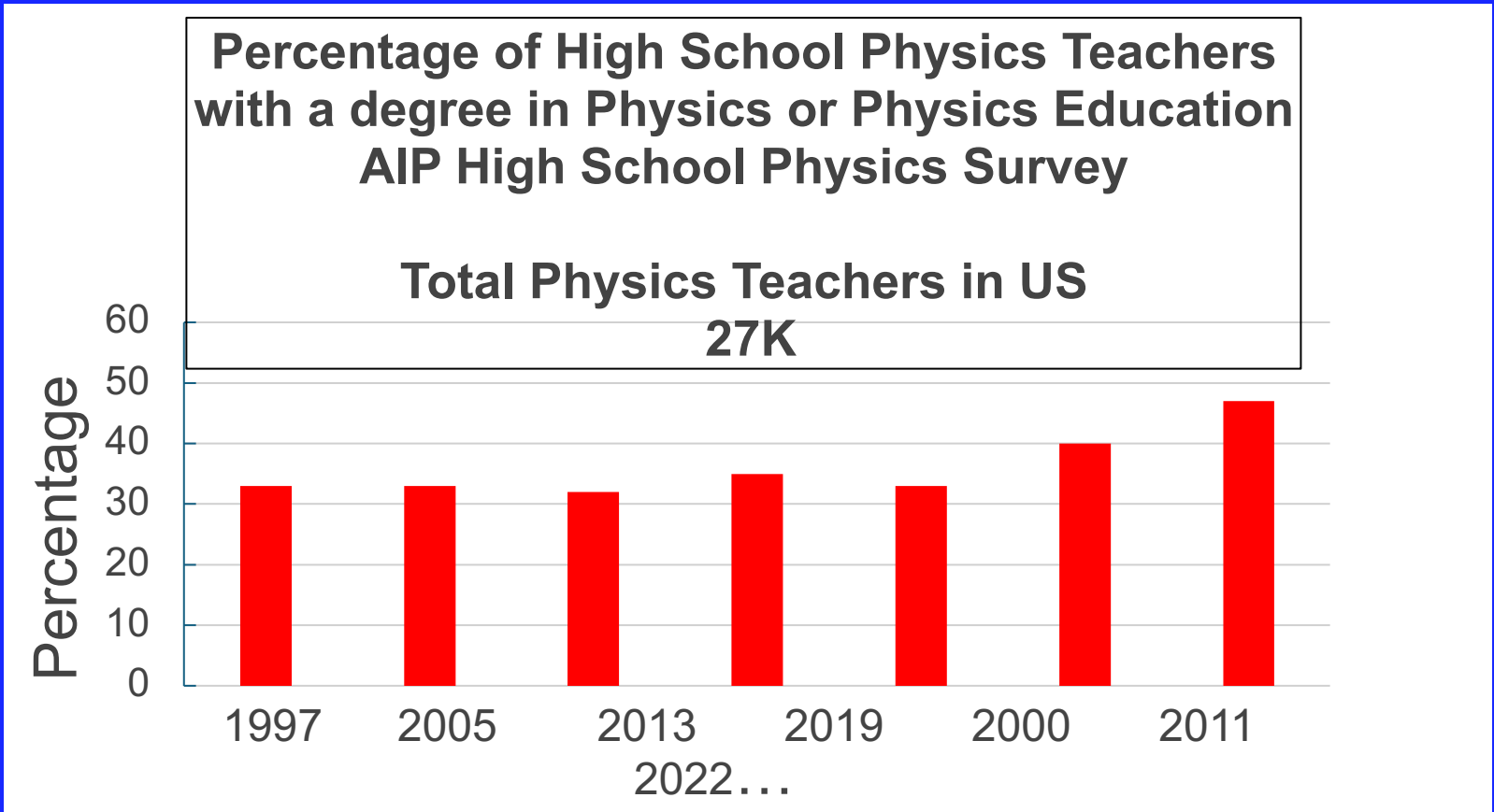
4. Why did we discontinue the program?

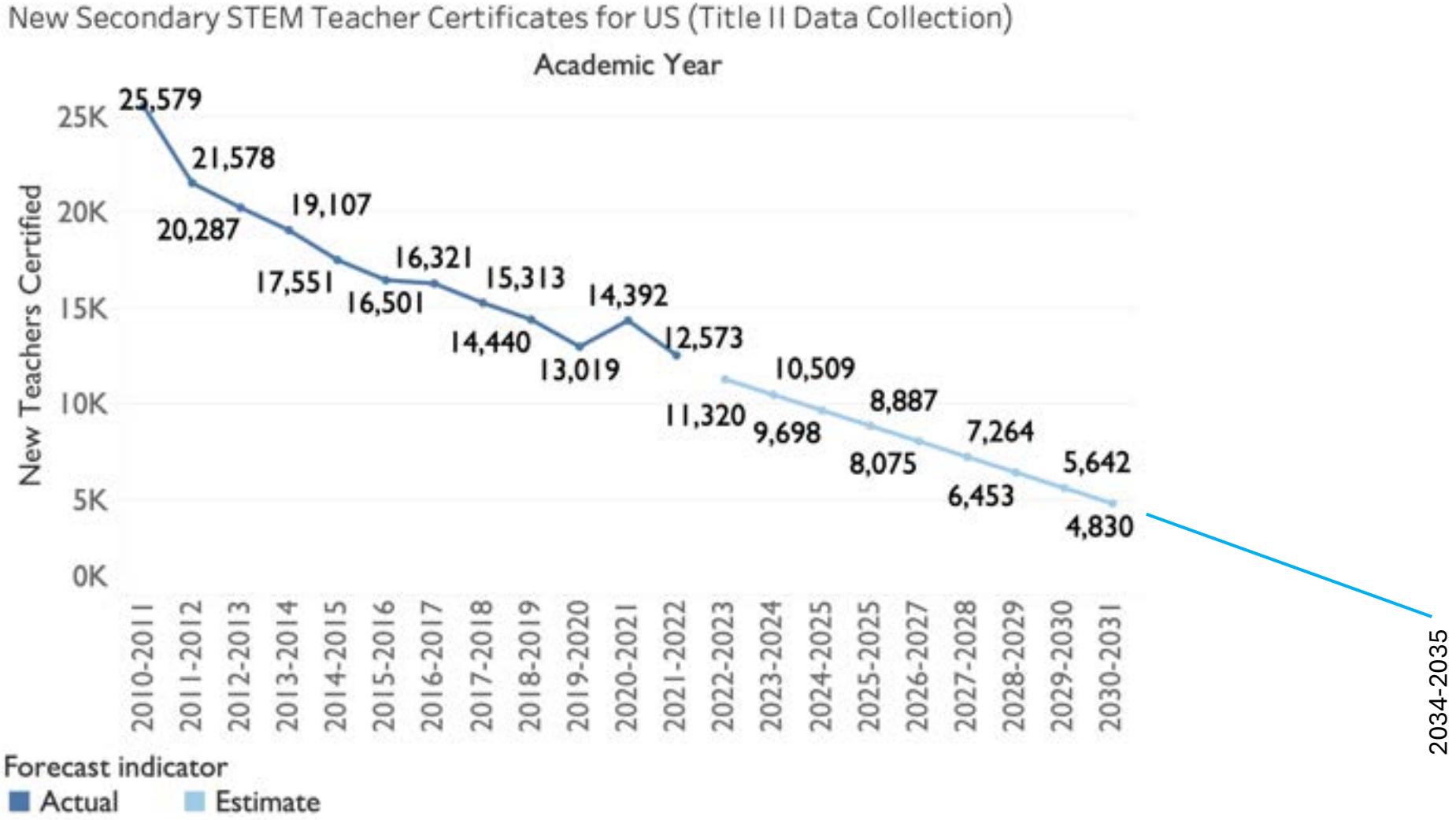
- Program was funded by a variety of sources. Mainly Eisenhower funding, Physics department, and other UVa funds, and teacher tuition was reimbursed from their schools

- After Trump came into office in 2016, Eisenhower funds were eliminated, and one of the programs founding professors (Thornton) retired. Funding from school systems was tight, enrollment dwindled and the program was discontined.

5. Why do we want to start it up again?

There is still a need to provide a strong and consequential professional development program for H.S. physics teachers




New Secondary STEM Teacher Certificates for US (Title II Data Collection)
Academic Year
New Teachers Certified
25K
20K
15K
10K
5K
0K
25,579
21,578
20,287
19,107
17,551
16,501
16,321
15,313
14,440
13,019
14,392
12,573
11,320
10,509
9,698
8,887
8,075
7,264
6,453
5,642
4,830
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
2017-2018
2018-2019
2019-2020
2020-2021
2021-2022
2022-2023
2023-2024
2024-2025
2025-2025
2026-2027
2027-2028
2028-2029
2029-2030
2030-2031
2034-2035
Forecast indicator
Actual
Estimate

6. The NEWMAPE Program is similar to the old program but with some important improvements

10 courses of 3 cr-hr each are required to complete the degree

- 6 of the courses are required (B average is required)
- 4 courses are electives

Courses focus on:

- Physics Content - follows physics major curriculum
- Physics Pedagogy - active learning, cooperative problem solving, peer instruction as described in previous talk
- Labs – use Discovery oriented (sensors, probes) , lots of data taking and analysis using Pasco, some experiments are of the type you can take back to your own class

Our newly renovated physics bldg and banquet style Class Room

Year 1 (12 cr-hrs)

Total 12 cr-hrs

Summer 2025 Required

PHYS 6310 9:00 – 10:30 am Classical and Modern Physics I Mech, Heat,Thermo, Waves

Discussion 11:00 am

PHYS 6350 1:00 pm - 4:00 pm Lab

Fall 2025 Elective

PHYS 6050 3 cr-hrs

Online course 3 cr-hrs selected from electives, Exams are on a lockdown browser and monitored by Department Chair, Librarian,etc

Spring 2026 Elective

PHYS 6090 3 cr-hrs

Online course 3 cr-hrs selected from electives. Exams are on a lockdown browser and monitored by Department Chair, Librarian,etc

Year 2 - Earn 12 cr-hrs

Total 24 cr-hrs

Summer 2026 Required

PHYS 6320 3cr-hrs, 9:00-10:30 am Classical and Modern Physics II Electricity, Magnetism, and Optics

Discussion 11:00 am

PHYS 6360 Lab 1:00 pm - 4:00 pm

Fall 2026 Elective

PHYS 1130 3 cr-hrs

Online course 3 cr-hrs selected from electives, Exams are on a lockdown browser and monitored by an appropriate colleague

Spring 2027 Elective

PHYS 0000 3 cr-hrs

Online course 3 cr-hrs selected from electives. Exams are on a lockdown browser and monitored by an appropriate colleague

Year 6 cr-hrs

Total 30 cr-hrs

Summer 2026 Required Online

PHYS 6350 Classical and Modern Physics III Modern Physics

PHYS 6410 Physics Pedagogy - Capstone Course

Complete the degree in .5 years

Graduation Date Jan 2027

Instructors for the New Masters Program

- The Department of Physics added two new teaching faculty to teach undergraduate physics who are also available to teach in the Masters program.
- There are also other teaching faculty interested in teaching summer/online courses as well and there is me to fill in.
- We have 5 new faculty to teach and run the program. In addition, selective MAPE graduates are available as teaching assistants..

8 Possible Online electives

New Physics Electives (3 cr-hrs.) Online/In-person

PHYS 6253 Light/Optics Home labs over 100 activities

PHYS 6263 Electricity/Magnetism Home labs over 100 activities

PHYS 0000 Physics of Sport: Uses spread sheets to include drag and Magnus forces in projectile calculations.

PHYS 0000 Energy, relativity, black holes, expanding universe, gravity

PHYS 0000 Practical Computing for Physical Sciences

Original Physics Electives Online (3 cr-hrs)

PHYS 6050 How Things Work I

PHYS 6060 How Things Work II

PHYS 6090 Galileo, Newton, and Einstein

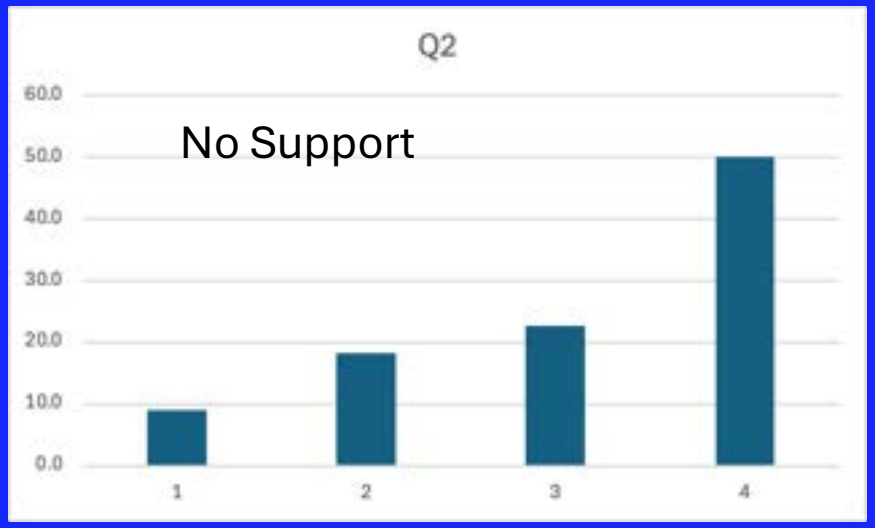
7. Cost of the program and affordability (Survey)

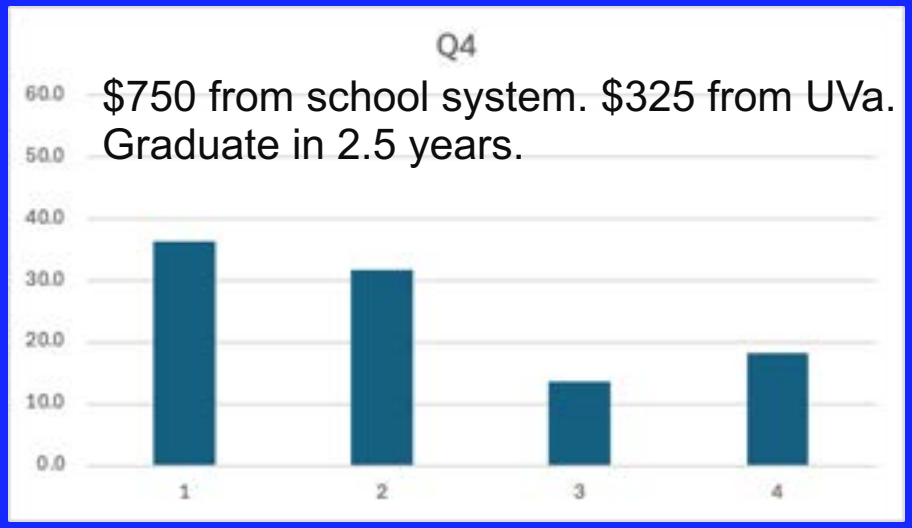
Q2) Total Cost $18,000, 30 cr-hrs $550 per cr-hr, housing for 2 summers. No support from school system. No support from UVa. Graduate in 2.5 years.
How likely are you in signing up to earn a Masters degree?

Q4) Total Cost $18,000, 30 cr-hrs $550 per cr-hr, housing for 2 summers. $750 from school system. $325 from Physics. Graduate in 2.5 years.
How likely are you in signing up to earn a Masters degree?

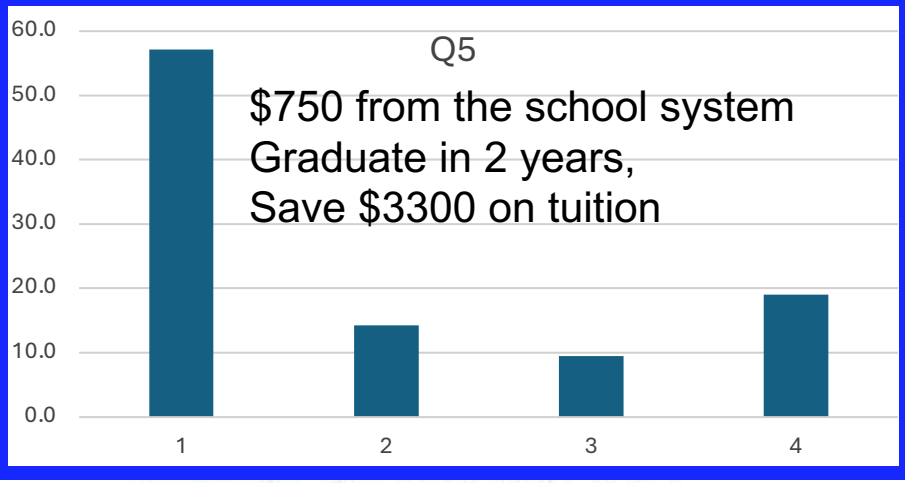
Q5) Total Cost $14,700, 24 cr-hrs $550 per cr-hr, housing for 2 summers. $750. from school system. Save $3300 on tuition. No support from UVa. Graduate in 2 years.
How likely are you in signing up to earn a Masters degree?

Total Cost $18,000, 30 cr-hrs $550 per cr-hr, $1500 for housing for 2 summers.





Total Cost $14,700, 24 cr-hrs $550 per cr-hr, $1500 for housing Save $3300 on tuition



1. very likely
2. likely
3. unlikely
4. very unlikely

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Thank you

Questions?

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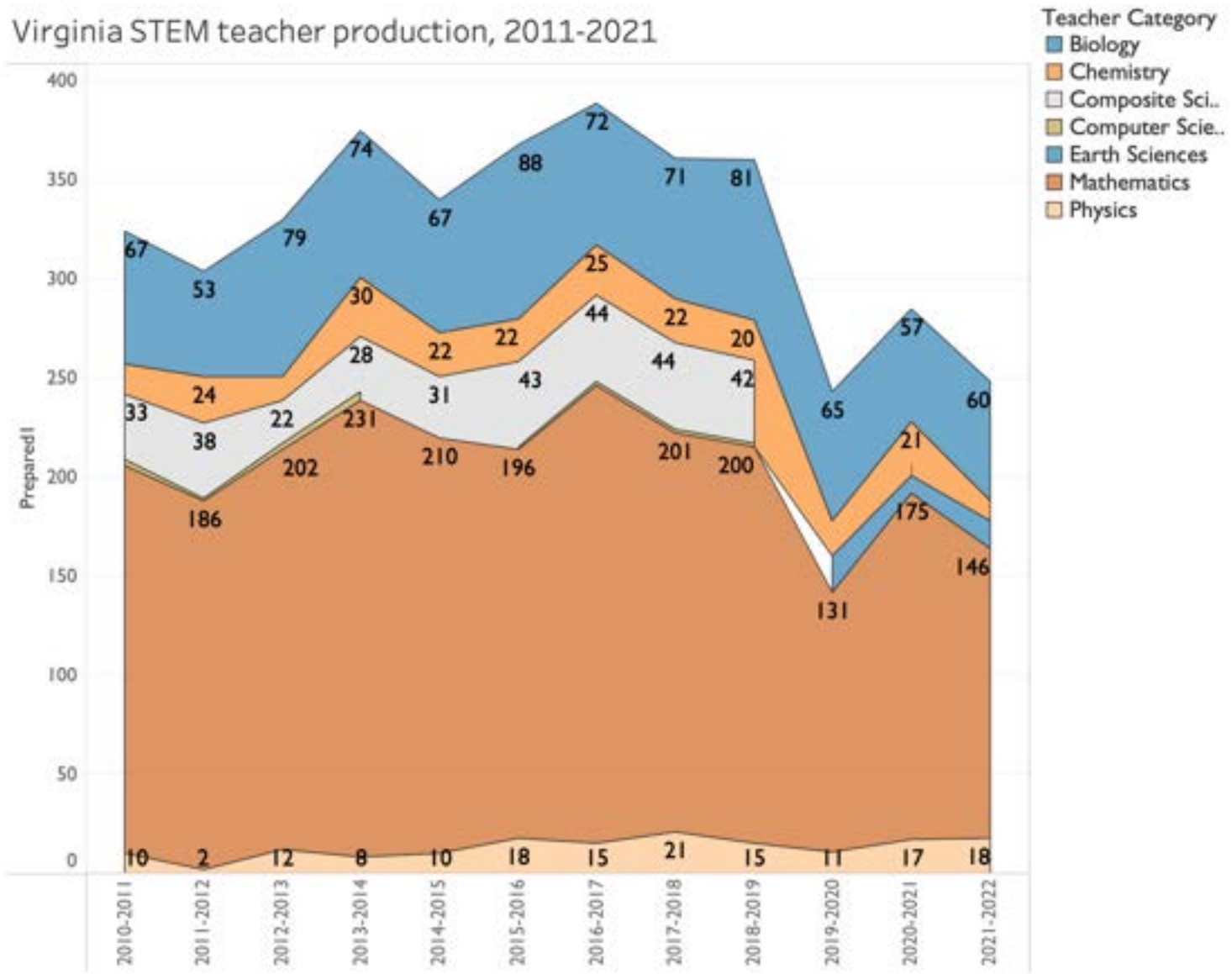
Virginia STEM teacher production, 2011-2021
Teacher Category
Biology
Chemistry
Composite Sci..
Computer Scie..
Earth Sciences
Mathematics
Physics
Prepared
400
350
300
250
200
150
100
50
0
2010-2011
2011-2012
2012-2013
2013-2014
2014-2015
2015-2016
2016-2017
2017-2018
2018-2019
2019-2020
2020-2021
2021-2022
67 53 79 74 67 88 72 71 81 65 57 60
24 38 22 30 22 22 25 22 20 131 21 175
33 186 202 231 210 196 44 44 42 201 200 146
10 2 12 8 10 18 15 21 15 11 17 18