

A Tumultuous Decade: Ten years of Secondary School STEM Teacher Preparation at Buffalo State

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Abstract

We present graduation data from the Buffalo State Science, Engineering Technology and Mathematics teacher certification programs from 2004-2016. We comment upon the impacts of the Great Recession of 2008 and the changeover of College STEM teacher programs from undergraduate to graduate based programs in the sciences. We also describe the probable impact of providing \$1.2 million in National Science Foundation Noyce scholarships to 79 STEM teaching scholars committed to teaching in high needs school districts, including under-represented populations in STEM teaching such as women and minority candidates. Finally, we describe the needs for NYS STEM teachers, actions being taken by SUNY and NYSED to address and alleviate these needs via streamlining certification, the TeachNY initiative, and SUNY HED scholarships, and Buffalo State STEM faculty current efforts seeking new Noyce funds.

NSF DUE-0434103 and DUE-1035360, *Noyce Western NY Partnership for New Science and Mathematics Teachers Phases I and II*, \$469,200, 9/1/2004-8/31/2010 and \$750,000, 1/1/2011-12/31/2016 (both with no cost extensions). These proposals provided approximately \$1.2M in financial support to over 82 new STEM teachers for high needs school as Noyce scholars.

Background

It is difficult to understate the seismic disruptions in US, NY and Buffalo region STEM teacher needs and recruiting during the 10 years since 2007. These 'perfect storm' changes include:

- 1) the Great American Recession of 2008-2012 with an attendant 11% reduction in NY State teaching positions;
- 2) the doubling of the Buffalo refugee and immigrant population;
- 3) a 40% nationwide decline in enrollment in all traditional teacher education programs -- including a 49% decline in NYS, and closures of several teacher preparation programs in Buffalo;
- 4) a projected NYS wide demand for over 180,000 new teachers to serve the state's still-growing population of public school students;
- 5) a rapidly aging teacher population -- one third of the NYS teachers pension system are now aged 50+ and nearing retirement; and
- 6) increasing rigorous and often cumbersome NYSED teacher evaluation standards, state teacher certification requirements and CAEP teacher program accreditation requirements which have inspired public pushback from teacher candidates, working teachers, and professional teacher educators including the authors.

The Great Recession impacts have been well-documented for the US -- E.g. Evans, Schwab & Wagner (2014) report over 300,000 teachers and school personnel lost jobs, but the Great Recession had an unusually harsh impact on NY teachers, where over 11,000 (4.7% of) teaching positions were eliminated by 2011 alone (Chakrabati & Setren, 2011). As a result, *newly hired teachers without tenure were amongst the first to be let go*, aging the NYS teacher cadre, strongly impacting some of the most rigorously qualified STEM teachers, and leading to a precipitous (40% overall, almost 60% in some locations) drop in NYS teacher education program enrollments. Buffalo teacher education programs have been suspended (at Canisius College), restructured (D'Youville College closed 3+ years), and have contracted, consolidated and closed at Buffalo State -- though Noyce scholars were recruited during some of this time, helping Buffalo State STEM programs remain visible and viable (Canisius College 2017; D'Youville College 2016). In response, the Buffalo Public Schools (our largest urban district) initiated an (non-STEM) *Urban Teacher Academy* with full scholarships to Buffalo State College, and the SUNY system has initiated *TeachNY*, a statewide teacher elevation / teacher pipeline recruitment effort <www.suny.edu/teachny/>.

During this time, Buffalo was designated a "preferred community" major refugee resettlement center by US Homeland Security, and

Background (continued)

the immigrant community has doubled, with Buffalo receiving over 10,000 refugees since 2001 (NPR, 2015). The city's New Americans Study (2016) included recommendations to improve access to adult education to help immigrants receive appropriate credentials for employment. Buffalo Partnership for the Public Good (2015) reports that this includes refugees, who were credentialed, educated professionals (including STEM teachers) in their original countries -- mainly Burma (Myanmar), Bhutan, Nepal, Somalia, Iraq, Syria and Yemen.

NYSUT (2017) summarized many of these "perfect storm" changes into talking points:

- More than 50,000 active State Teachers' Retirement System members are older than 55, according to the 2016 NYSTRS annual report. Within the next five years, TRS projects more than one-third of the nearly 270,000 active members could be eligible to retire (or may have delayed retirement).
- The average age of teachers in the state is 48.
- Since 2009-10, enrollment in teacher education programs in New York has decreased by roughly 49 percent -- from more than 79,000 students to about 40,000 students in 2014-15. Anecdotally, teacher education programs report those numbers have declined further in the last two years.
- An estimated 10 percent of New York teacher education graduates are leaving the state for employment elsewhere, with many blaming the state's cumbersome certification system.
- Eleven percent of New York teachers leave their school or profession annually, according to a recent report by the Learning Policy Institute. Those numbers go up for early career teachers and those working in high-poverty areas. About 55 percent cited professional frustrations, including standardized testing, administrators or too little autonomy. About 18 percent cited financial reasons and job insecurity, according to LPI.
- The U.S. Department of Education estimates that 1.6 million new teachers will be needed nationally between 2012 and 2022; LPI estimates the nation will need about 300,000 new teachers per year by 2020.
- SUNY Chancellor Nancy Zimpher predicts New York will need more than 180,000 new teachers in the next decade. Aside from filling the thousands of vacant positions, *many districts are looking to restore teacher positions and programs that were cut during the Great Recession*. A New York State School Boards Association analysis found that the number of public school teachers decreased by nearly 11 percent from 2006-07 to 2014-15.
- At the same time, the federal government projects New York's student enrollment will grow by 2 percent by 2024, with high-need school districts experiencing the largest increases.

Finally, the NYS School Boards Association (2017), while noting that teacher employment is currently rebounding with the economy (with an expected surplus of elementary teachers), nonetheless identifies STEM teacher shortages as prevalent (12/12 regions) statewide -- recommending differential pay for recruiting STEM teachers.

Changes in STEM Teacher Prep: Undergrad to Grad

STEM program initial teacher certifications strengthened from about 100 graduates per year during our first Noyce award to a high of 175 graduates per year in 2012 during our second Noyce award (a 75% increase). Then the US Great Recession of 2008 coincided with severely attenuated recruitment, with the high graduation numbers of 2012 corresponding to the expected graduation time for students who had enrolled before the Great Recession. Reacting in 2013-14 to the precipitous drop in enrollment, Buffalo State closed the undergraduate STEM teacher certification programs for Biology, Chemistry, Physics and Earth Science and consolidated these into M.S.Ed. degree program certifying STEM teachers housed in the Department of Earth Sciences and Science Education, but certifying all science subjects. During this time teacher education recruitment crashed nationwide, and even open STEM teaching jobs in NYS had vanished.

Overall Data

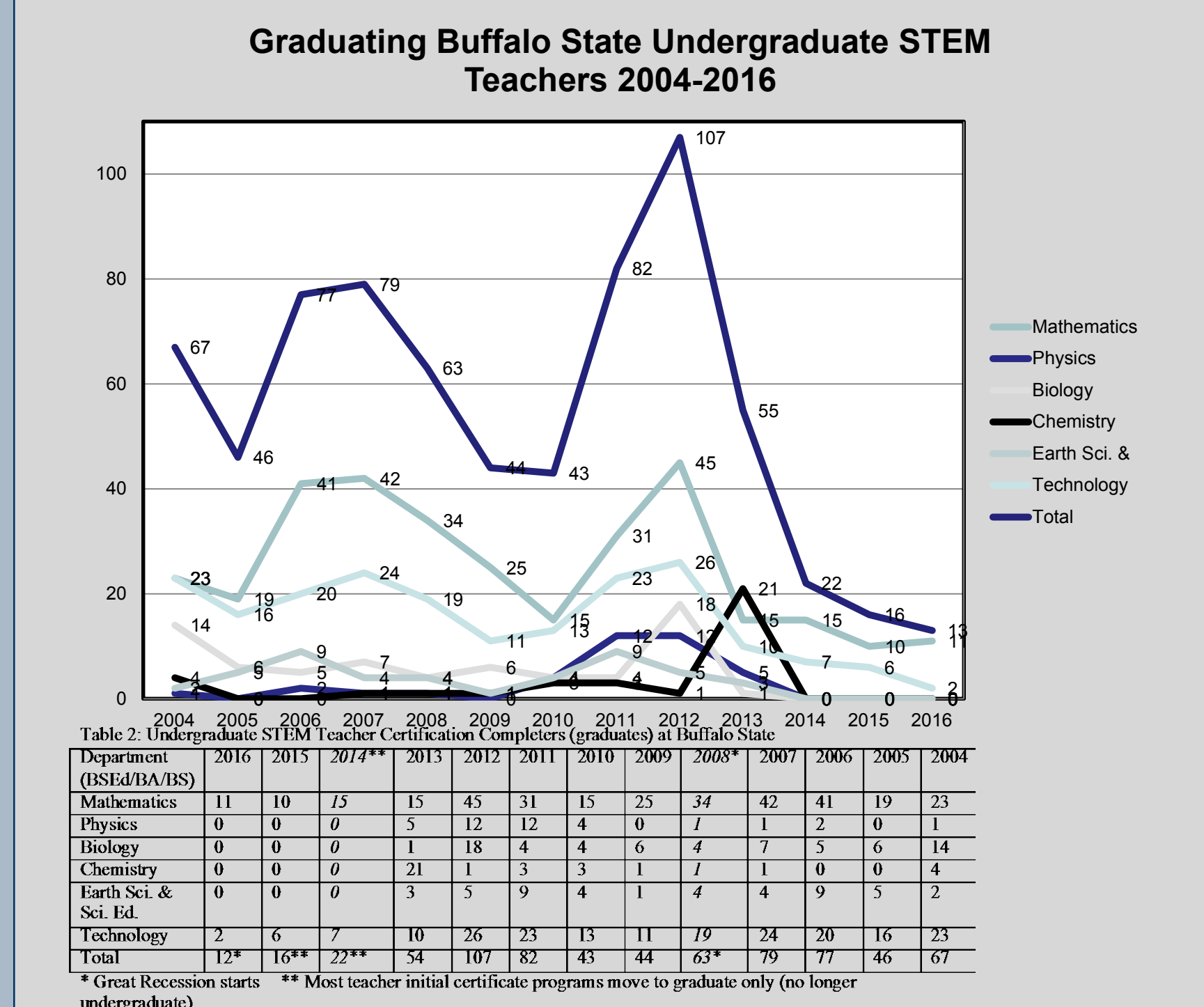
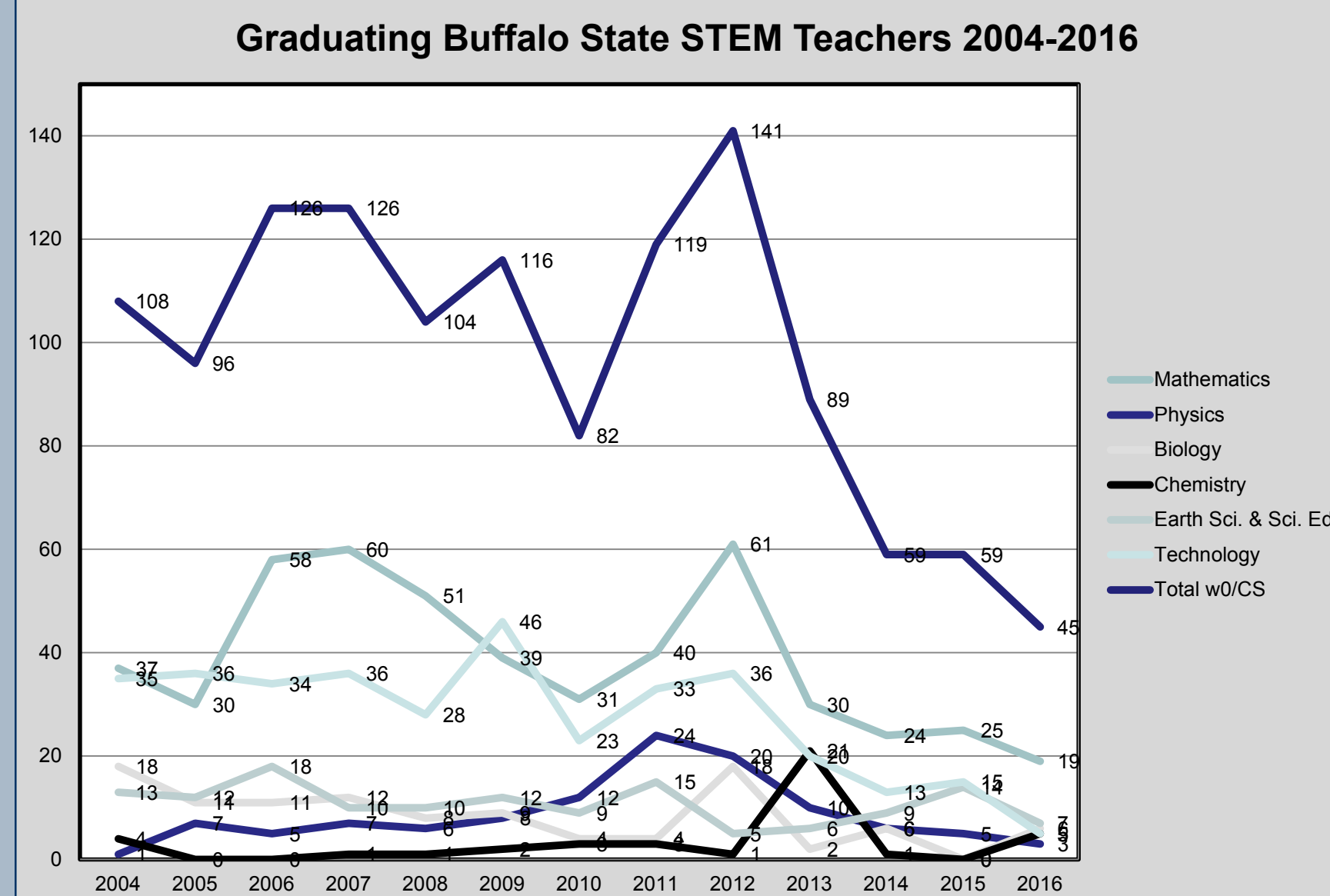


Table 2: Undergraduate STEM Teacher Certification Completers (graduating) at Buffalo State

Department (BS/BA/BS)	2016	2015	2014**	2013**	2012**	2011**	2010**	2009**	2008**	2007	2006	2005	2004
Mathematics	11	10	75	15	45	31	15	25	34	42	41	19	23
Physics	0	0	0	5	12	12	4	0	7	1	2	0	1
Biology	0	0	0	1	18	4	4	6	4	7	5	6	14
Chemistry	0	0	0	21	1	3	3	1	7	1	0	0	4
Earth Sci. & Sci. Ed.	0	0	0	3	5	9	4	1	4	4	9	5	2
Technology	2	6	7	10	26	23	13	11	79	24	20	16	23
Total	12*	16**	22**	54	107	82	43	44	63*	79	77	46	67

* Great Recession starts undergraduate ** Most teacher initial certificate programs move to graduate only (no longer undergraduate)

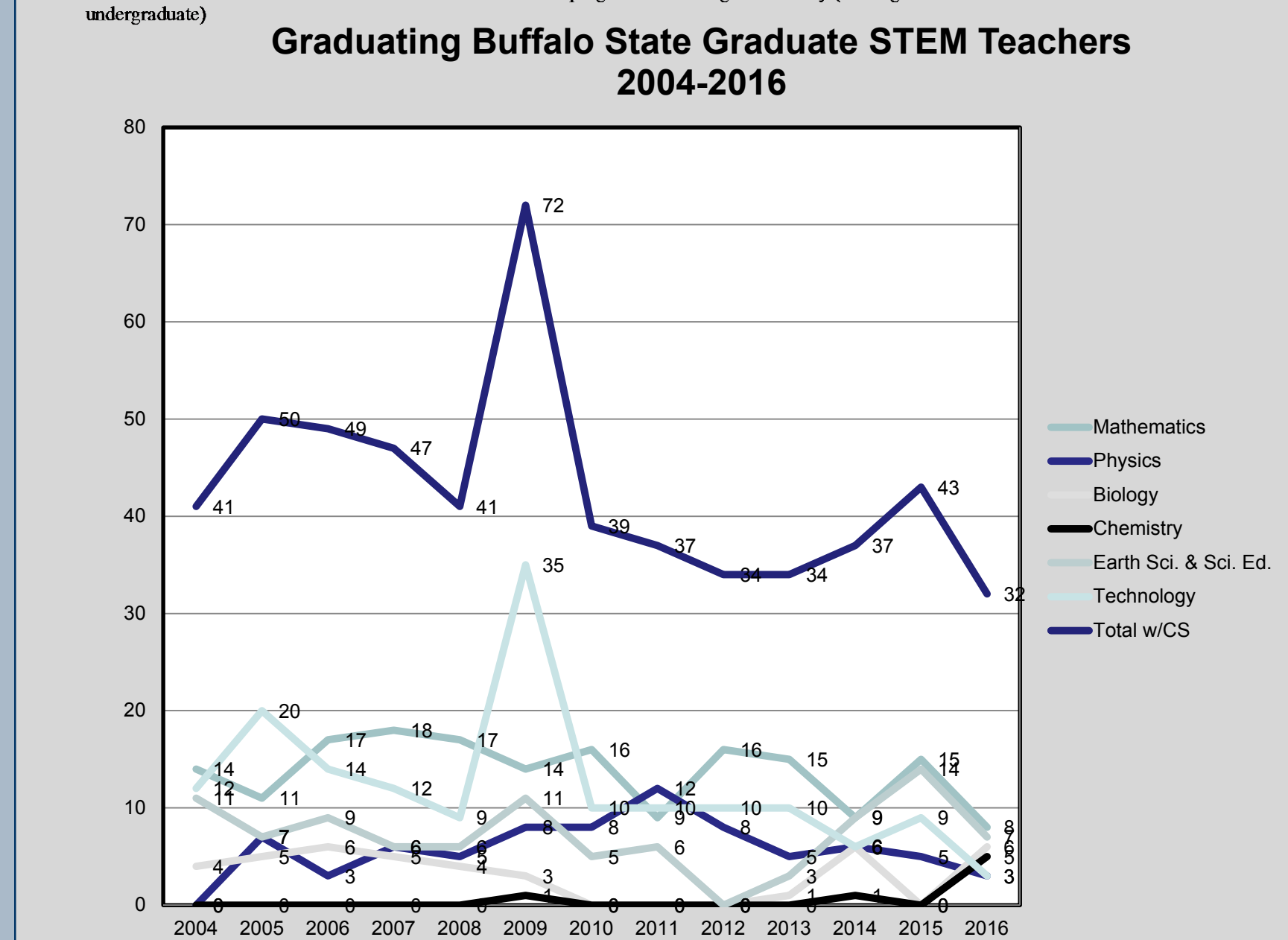


Table 3: Graduate STEM Teacher Certification Program Completers (graduating) at Buffalo State

Department (MSEd)	2016	2015	2014**	2013**	2012**	2011**	2010**	2009**	2008**	2007	2006	2005	2004
Mathematics	8	15	9	15	16	9	16	14	17	18	17	11	14
Physics	3	3	6	5	8	12	8	8	5	6	3	7	0
Biology	6	0	6	1	0	0	0	3	4	5	6	5	4
Chemistry	5	0	7	0	0	0	0	1	0	0	0	0	0
Earth Sci. & Sci. Ed.	7	14	9	3	0	6	5	11	6	6	9	7	11
Comp. Sci.	3	9	6	10	10	10	10	35	9	12	14	20	12
Total w/CS	32**	47**	34**	34**	55**	68	72	72	113	72*	103	67	110

* Great Recession starts ** Most teacher initial certificate programs move to graduate only (no longer undergraduate)

Discussion & Lessons Learned

The Noyce grant requires tracking of students after they leave Buffalo State. Bringing some of the Noyce awardees back to attend professional Development has been a great eye-opener for us because they provide antidotal and survey responses that give us information about the things that they are asking questions about relevant classroom issues. If we want them to be effective teachers to see the return on the ideology of Noyce, we need to "listen" to our scholars.

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