

# Comparing Physics Teacher Preparation in Canada, China, Germany and NY

Dan MacIsaac, Weining Wu, Kathleen Falconer & Richard Hechter

SUNY- Buffalo State College, Hubei University, Universität zu Köln, University of Manitoba

This poster available from <http://physicsed.buffalostate.edu/pubs/AAPTmtgs/> <macisadl@buffalostate.edu>

We juxtapose, compare and contrast standard physics teacher preparation programs from Manitoba Canada, Hubei China, Cologne Germany, and Buffalo, NY USA. Program lengths and scopes, admissions criteria, physics and education course content and durations, field work, student teaching, state exams, graduation requirements are briefly described. Commonalities are described and discussed. Notable features and brief comments on strengths and weaknesses are proffered by experienced faculty associated with programs from all four locations.

## Physics Teacher Preparation programs at a glance

International Physics Teacher Preparation Comparison Table Bresges, A., Falconer, K.A., Genz, F., Hechter, R., Hoffmann, S., MacIsaac, D.L., Wu, W.,				
Country	USA	Germany (Deutschland)	China (Hubei)	Canada (Manitoba)
School URL	State University of NY Buffalo State College <a href="http://physics.buffalostate.edu/physics-ba-0">http://physics.buffalostate.edu/physics-ba-0</a> <a href="http://earthsciences.buffalostate.edu/science-education">http://earthsciences.buffalostate.edu/science-education</a>	Universität zu Köln; North Rhine Westphalia (NRW) <a href="https://zfl.uni-koeln.de/sites/zfl-Navi/Modulhandbuecher/Bach">https://zfl.uni-koeln.de/sites/zfl-Navi/Modulhandbuecher/Bach</a> <a href="https://zfl.uni-koeln.de/sites/zfl-Navi/Modulhandbuecher/Mas">https://zfl.uni-koeln.de/sites/zfl-Navi/Modulhandbuecher/Mas</a>	Hubei University <a href="http://wdxxy.hubu.edu.cn/info/1026/1415.htm">http://wdxxy.hubu.edu.cn/info/1026/1415.htm</a>	University of Manitoba <a href="http://umanitoba.ca/education/">http://umanitoba.ca/education/</a>
State / Agency URL	New York SED <a href="https://www.teachercertificationdegrees.com/certification">https://www.teachercertificationdegrees.com/certification</a>	Ministerium für Schule und Bildung des Landes NRW <a href="https://www.schulministerium.nrw.de">https://www.schulministerium.nrw.de</a>	Hubei Province	Manitoba Province
Program Overview	BA Phy (4y)+MSEd SciEd (2y)=6y	BA Phy + 2nd subj (3y) + MEd (2y) = 6y	BA Phy (4y) OR +MSEd (2y)	B.Ed (after degree, 2 year), M.Ed (varies), Ph.d (varies)
Undergrad	127-140 credit hours (8 *4mo semesters) 35cr PHY (intro sequence, modern, computation & the 9-10cr PHY electives (lab encouraged) 15+cr MAT 8cr CHM 36-42cr general electives no dissertation (capstone course required) must include 1 yr Foreign Language	180LP (6 *6mo semesters) PHY+1 other cert area 69LP PHY (50+ cr equiv) intro seq, lab, theor, math, NOS 12LP lab reqd (included above)  69LP one other certification subject 30LP Bildung + Praxis (general studies) 12LP Bachelor-Arbeit dissertation	154 credit hours (8 *4mo semesters) 39cr PHY (intro sequence, modern, computation & theoretic 11cr PHY electives (lab included) 20cr MAT no CHM 4cr general electives, 35 professional electives thesis required must include 2 yr Foreign Language (English)	All studentrs enter with a B.xx prior to arriving in our program In our B.Ed progam (60 credit hours over 2 years): C&I Physics (3 credit hours) Senior Years Science Cluster (3 credit hours) 12 hours of practicum (3 per term for 4 terms) 12 hours from electives 30 hours from other requiried courses
Grad	31-37 credit hours (4 * 4mo semesters) 0 cr PHY required (but encouraged) 15-21cr courses (educ psych, exceptional ed, literacy, p 13cr (one semester) student teaching 3cr dissertation	120LP (4* 6mo semesters) 30LP each PHY and one other cert area 20LP didactics 6mo PraxisSomester (25LP) 15LP masters thesis (PraxisSomester related)	36 credit hours (4 * 4mo semesters) 0 cr PHY required (but encouraged) 28cr courses (educ psych, PER, pedagogy & technology etc. 6cr (one semester) student teaching thesis required but not credited	3 credit hours in advanced Research methods 6 credit hours in Curriculum theory/history/development/Study of Teaching 6 grad level credit hours in physics/science education Thesis (18 credit hours) Note: If pursuing "non-thesis route"/"coursework based" Add three additional courses (above is for M.Ed, PH.d varies on student interest and intent)
Admissions	HS Diploma for BA NYS Physics Content Exam (like Praxis II) to enter masters NYS EAS (General teaching knowledge exam) GRE general exam (no cutoff) to enter masters	Abitur (HS leaving; calc + Phy equiv to IB) to enter BA	national entrance exam for BA national exam (educ.phych, English etc.) to enter masters audition (introductory physics, oral English) to enter masters	Need a B.xx from a recognized institution. (Most have B.Sc) For Physics "majors" - they have at least 18 credit hours in physics course
GPA cutoffs	3.0 to enter masters		no GPA requirement	Generally 3.0 Cut off
Leaving Performance	Master's thesis or project edTPA teaching video and portfolio evaluation	Bachelors and Master thesis BOTH required	Master's thesis required	Master's thesis/project, Ph.d is a dissertation Sadly, none.
Mentoring/additional	initial license for 5yrs then review by state			
other	4 legal reporting / safety workshops NCATE / CAEP accredited	for gymnasium level HS all teachers have 2 cert areas  180LP+120LP = Euro Cr Tran Sys (ECTS) 1CP ca. 2 ECTS Bologna system 25-35 working hrs / LP source: <a href="https://www.academic-embassy.de/blog/umrechnung-unc">https://www.academic-embassy.de/blog/umrechnung-unc</a>		

## Notable Aspects

Some notable aspects to these programs / local regimes

### New York: edTPA and "Graduated" teacher certification

New York State has adopted the **Stanford-developed edTPA** ([www.edtpa.com](http://www.edtpa.com)), a commercial (Pearson, \$300) online-administrated student teaching portfolio assessment that requires sample teaching video recordings, lesson plans, student assessments, reflection and lesson refinement documentation. There is not a physics-specific rubric, rather general science rubrics and handbooks for either middle school science and/or secondary science are used. NYS has the most participating programs in the US, and requires edTPA for new initial physics certifications.

**Graduated teacher certification:** Permanent certificates are no longer issued in NY State ([www.highered.nysed.gov](http://www.highered.nysed.gov)). NYSED initial teacher certification (valid for 5 years only) is intended to lead to NYSED professional certification after initial cert holders complete two years full time teaching experience, complete an appropriate masters degree and 175 hours of professional development. Professional certificates are renewed every five years subject to applicants documenting an additional 175 hours of approved professional development.

### Germany: PraxisSomester and Referendariat

**PraxisSomester** is a one semester (6 month long) student-teaching-like experience completing masters' degree study before certification. During this semester teacher candidates team-teach a sharply reduced load with a regular classroom teacher, and work on their masters thesis, usually collecting, reporting and analyzing data from their own classroom instruction or the instruction of a particular topic. This thesis must be published as a university internal report, and is evaluated as 25/120LP (≈20%) of the masters' degree load.

**Referendariat** is an 18 month long mentored initial teacher employment experience contracted with the county, akin to a professional apprenticeship for newly graduated (BA+MS) teachers. During this period the new teacher teaches a reduced 16 hour week load rather than the standard 28. New teachers meet regularly with professional full-time mentors and must provide detailed documentation (lessons plans with scholarly citations, a written reflective analysis after instruction debrief etc) to a university supervisor, mentor teachers and their principal. In the province of North Rhine Westfalia, referendariat is scored by the principal, and mentor teachers and is documented in teacher licensure.

### China: National Teaching Video Competitions Online

**Video competitions for the best lessons** presented by preservice teacher candidates are very popular in China, and about 50% of the physics teachers from Hubei University participate in these competitions, which are scored by a panel of expert pedagogues. Some examples of these "America's Got Talent" like student teacher lesson presentation competition videos from the physics division can be seen at ([tinyurl.com/StuTchgCompPhysics2018](http://tinyurl.com/StuTchgCompPhysics2018)); note that your browser can possibly provide simple test translation for lesson notes.

### Manitoba: Physics, Indigenous Culture and Reconciliation

In Manitoba, a two year post-bachelor second teaching bachelors degree leads to a K-12 nonspecific cert, focused on age bands K-4, 5-8 and 9-12. So most teachers take two bachelor's degrees, the second a B.Ed. This can lead to severe issues regarding discipline-specific (SCK and PCK) for teaching assignments. There is a widespread movement to infuse indigenous perspectives across all disciplines, particularly in teacher preparation. Culturally Responsive Teaching, Archaeoastronomy, land-based education, story-centered and place-based education are all featured. National Center for Truth and Reconciliation ([nctr.ca](http://nctr.ca)) is eminent on campus, and contributions to literature on best practices and reconciliation with indigenous people is strongly encouraged. Compare experiences in South Africa, New Zealand Maori, Australian Aborigine, Papua New Guinea, Somalia.

## Discussion

Overall requirements are very similar from country to country as shown by the table. The equivalent of a Bachelor degree in physics (or science with a physics major) is preferred followed with either a Masters degree or a second Bachelor degree in education, perhaps containing additional physics content. Most countries are moving towards two degree combined program, including 4+1 and 3+2 bachelors plus master programs, with the European Credit Transfer System (ECTS or Bologna system) becoming noteworthy.

Every group worries about insufficient physics content and pedagogical preparation even though every group has theses or projects and student teaching etc.

It is not clear that communication and exchange is happening at the even within countries between government and the universities let alone between countries at a level beyond the Bologna accord, and international physics teaching licensure reciprocity seems nonexistent.