The Reluctant Teacher Educator

Kate Walsh, National Council on Teacher Quality

I. Introduction

Every academic field has had its share of poppycock theories. Flat earth. Homunculi. Phrenology. Alchemy. Bloodletting. So too has every academic field at one time or another allowed popular sentiment to drive scholarship at the expense of evidence and rational thought. Trickle-down economics. Eyewitness reliability. Plessy v. Ferguson.

Whereas once it could take centuries to disprove some of these poorly supported ideas, the current problem is that the speed at which information now flows is so fast that reason, deliberation, and empiricism struggle to get heard (as evidenced by the current political climate). Perhaps the Enlightenment had it about right and the post-industrial world is just too hot.

One would like to think that the Academy is better inoculated than Facebook users from succumbing to misguided and poorly substantiated theory. Some areas of academic study do better than others, with the field of teacher education struggling more than most. The decidedly unscientific philosophy of 18th century French romantic philosopher Jean Jacques Rousseau and his 20th century disciple John Dewey live on with new generations of teacher educators (see: the whole language approach to reading instruction, learning styles, etc.), served up with a modern twist. As E.D Hirsch has observed, their common distrust of formal education for its artifice, for threatening children's true and good natural state rather than uplifting them, continues to attract quite the following from today's teacher educators.[1]

This romantic view of education has been roundly criticized for decades but there has been less focus on a related but more recent phenomenon: teacher education's reluctance to include well-supported scientific findings in its cannon. Whereas 100, 50 and even 30 years ago, romantic notions of education might have thrived in the absence of what could be scientifically known, that is just no longer true. Instead, teacher educators are committed to the idea that teaching is simply too complicated to be reduced to anything that could be studied through scientific research.

Teacher education could, if it wanted to, now lay claim to a sizable (though hardly complete) body of empirical knowledge cutting across many fronts of teacher preparation. The fact that is does not (yet, anyway) makes for a puzzling phenomenon, given that it works against its own self-interest. For a century, the field has suffered from a well-documented inferiority complex among the Academy, finding itself unable to gain colleagues' professional respect. At the root of this disrespect, say its critics, is a belief that teacher education does not respect true scholarship, that it hides behind an artificial lexicon, that it engages in studies of questionable quality while distrusting genuine experiments, that it seeks to assert rather than to know, that it eschews what can be measured to pursue the immeasurable and aspirational--and that it corrupts the peer review process to uphold these values rather than move itself forward.

This paper reviews the evidence for teacher education's antipathy towards the content and practices which would bring it greater legitimacy, and explores some of the reasons why the field is so reluctant to incorporate the findings of strong research. We also acknowledge those teacher educators who have

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[1]Hirsch Jr, E. D. (1999). *The schools we need: And why we don't have them*. Anchor.

gravitated to more research-driven content, though many remain professionally isolated from their colleagues. Much, though not all, of the evidence presented here is drawn from the National Council on Teacher Quality's 15 years studying teacher preparation, as that effort examines teacher education practices at a level rarely undertaken not just in teacher education but any field in higher education.

Owning up our own impatience with teacher education, we also suggest that a long view approach might provide a more optimistic frame with which to consider this problem. Teacher education in its current manifestation is a relatively new field, barely a century old. However, it did not begin as a blank slate, as teaching is undoubtedly one of the oldest professions in human history, with plenty of baggage, tradition, and a wellspring of experience to inform its practice. Newer fields such as cognitive psychology did not have as much to "undo" in order for scientific advances to gain traction. Teacher education has the tough job of having to unravel itself from its romantic roots. As any builder will tell you, constructing from scratch is a whole lot easier and less costly than a retrofit.

II. Teacher Education's low status within the Academy

From the start, teacher education has been seen as a lesser member of the Academy, if it was a member at all. Separate "Normal Schools" were established to train teachers, and these have morphed into many of the colleges of education of today. Now, only about a quarter of teacher preparation programs are selective in their own admissions standards or are housed in selective institutions. Many programs accept most of the students who apply.[2]

Teacher educator and education historian, David Labaree of Stanford University, describes how traditional education schools have difficulty competing with the high-status Teach for America program. "[Teacher education] programs are cursed with a deeply rooted reputation for being the safety option (I can always teach) for college students who are less talented and less ambitious."[3] Labaree elaborates,

> "[Teacher education] in the United States carries the burden of a collection of low-status associations. One is gender. Since the middle of the 19th century, teaching in the United States has been seen as women's work, a label that has never enhanced the prestige of an occupation (think social workers, nurses, secretaries). Another is class. Professional standing is in part related to the standing of the profession's clients, and teaching's clientele, as a cross-section of the population, is largely non-elite. In addition, as the largest profession, teaching has also been the most accessible, with a long history of providing access to working-class students seeking a middle-class job. A third lowly association is age. Serving clients who are adults is more prestigious than serving those who are children."

College students also hold education programs in low regard. College students with a B+ or better grade point average largely view education as an easy major (Fig. 1), and nearly half of them report that they

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[2] National Council on Teacher Quality. (2016-2018). *Selection criteria – A closer look.* Retrieved from https://www.nctq.org/review/standards#standard2

[3] Labaree, D. (2010). Teach for America and teacher ed: Heads they win, tails we lose. *Journal of teacher Education, 61*(1-2), 48-55.

would be more likely to consider teaching if teacher prep programs were more competitive (47 percent, aggregating across people who gave between a 7 and 10 on a scale of 0-10, Fig. 2).[4]
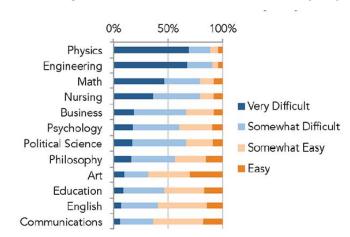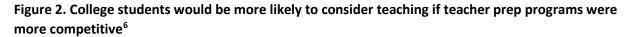
Figure 1. College students believe education is an easy major[5]

Figure 2. College students would be more likely to consider teaching if teacher prep programs were more competitive[6]
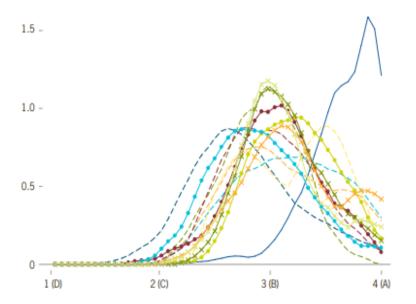
Q27R6. Raising standards for teacher preparation programs to make them more competitive - Please read the list of education reforms below. Please indicate on a 0-10 scale how much more likely it is to make you consider teaching, with "0" meaning not at al

	n=400
0 Not At All	12%
1	2%
2	3%
3	3%
4	5%
5	17%
6	11%
7	14%
8	13%
9	8%
10 Much More Likely	12%

College students' views comport with reality – teacher education is easier than other majors, by multiple measures. Average grades in education courses tend to be substantially higher than in education courses.[7]

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[4] Third Way. (2014). *National online survey of college students – education attitudes*. Retrieved April 25, 2019 from https://www.thirdway.org/polling/national-online-survey-of-college-students-education-attitudes.

[5] Ibid.

[6] Ibid.

[7] Comparison departments include "(1) math, science, and economics departments: biology, chemistry, computer science, economics, mathematics and physics; (2) social-science departments: political science, psychology, and

Figure 3. Average course grades in education (solid blue line) and other fields[8]

As NCTQ has learned, students in teacher preparation programs are fifty percent more likely to qualify for grade-based honors (e.g., cum laude) at graduation compared with all undergraduate students at an institution.[9]
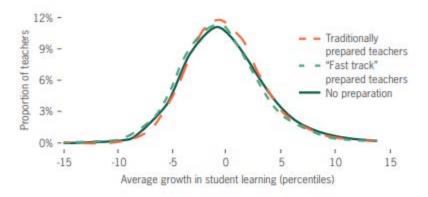
This low status may have strengthened prep programs' resolve to be a "state of the art" profession on par with the liberal arts, leading them to further avoid anything that smacks of the training given to plumbers or electricians. If teaching is an art, it cannot be reduced to a standardized set of steps. If teachers are artists, they must meld their practice to fit the medium of their unique classroom and students, rather than treating all children as interchangeable cogs.
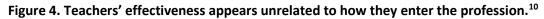
It's not clear, however, that the nuance of teaching is at odds with the science of research-based teaching practices. Other fields are able to bridge this seeming divide. Architects must design homes and office buildings that conform to the laws of gravity, the limitations of building materials, and local zoning and building codes - and yet can still bring a unique aesthetic to their work, designed with the owners and setting in mind.

III. Teacher prep programs overlook existing research

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sociology; and (3) humanities departments: English, history and philosophy." Koedel, C. (2011). Grading Standards in Education Departments at Universities. Education Policy Analysis Archives, 19(23)

[8] Ibid.

[9]Putman, H., Greenberg, J., & Walsh, K. (2014). *Training our future teachers: Easy A's and what's behind them.* National Council on Teacher Quality. Retrieved April 25, 2019 from https://www.nctq.org/publications/Training-Our-Future-Teachers:-Easy-As-and-Whats-Behind-Them.

Figure 4. Teachers' effectiveness appears unrelated to how they enter the profession.[10]

Evidence such as this from a study looking at teachers' impact on their students math scores in Los Angeles in grades four through eight delivers a disturbing message: all too often, going through the time and expense of comprehensive training before entering the classroom doesn't make someone a more effective teacher.

Unfortunately, time and time again studies have shown that teacher prep imparts little value to its participants. Critics have taken this as evidence that good teaching is innate and cannot be taught, but NCTQ does not agree. Our perusal of the best research on teaching - and our experience as teachers - show us that there is much for teachers to learn. Unfortunately, teacher prep tends to disregard the existing research and instead focus on theories supported by little more than anecdote and popular opinion.

Here we choose to focus on three areas of teacher education where the evidence is most conclusive, but which are widely ignored by teacher prep. Certainly there are many other areas to inform what new teachers should learn, but none have secured quite the level of scientific consensus these have achieved.

1.   Early Reading:

Teaching young children to read is without question an elementary teacher's most important job. Teaching students to better understand *what* they read--referred to as comprehension--is the job of every teacher, no matter what the grade or subject.

Over a couple of decades, the nation has been able to reduce the rate of abject reading failure, from 4 in 10 children down to 3 in 10.[11]However, if the right methods were genuinely embraced, that failure rate could be lower than 1 in 10.[12]

[10] Gordon, R., Kane, T. J., &Staiger, D. O. (2006). *Identifying effective teachers using performance on the job. Hamilton Project discussion paper.* Washington, DC.: Brookings Institution.

[11] In 1992, only 29 percent of 4[th]grade students scored at or above Proficient in reading, compared with 37 percent of students in 2017. U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 1992 and 2017 Reading Assessments.https://www.nationsreportcard.gov/ndecore/xplore/NDE.

[12]Lyon, G. R. (1998). Overview of reading and literacy initiatives (Report to Committee on Labor and Human Resources, US Senate). Bethesda, MD: National Institute of Child Health and Human Development, National Institutes of Health.

The development of the science: Because of great advances made towards the end of the last century, we now have settled science informing teacher practice of the approach that will yield the highest percentage of successful readers, both in decoding the notoriously tricky English language and also improving comprehension.

These advances were largely made possible through a massive, five-decades-long review of research directed by the National Institutes of Health---accomplishing the educational equivalent of putting a person on the moon. Labelling America's wildly high rates of reading failure a "public health crisis," researchers studied tens of thousands of children and adults, readers and nonreaders alike. With the advent of brain imaging in the 1990s, the work really leaped forward, allowing scientists to interpret the signals sent out by a brain that can read. These brain scans serve as the smoking gun in terms of providing all the evidence anyone should want to see.

Enthusiasm over these findings may have gotten the better of the scientific community, convincing the US Congress to convene the 'National Reading Panel.' The panel was charged with combing through some 24,000 studies to summarize what had been learned. However scientific advances are not generally settled with such public fanfare and certainly not one with such political overtones. Looking back, Congress may not have the scientific community any favors, as it permitted reading science deniers to dismiss the findings for somehow being politically motivated. Unfortunately, the ties - real or imagined - between the Bush Sr. administration and the publishers of the most widely used reading curriculums approved for government funding under the NRP's standards gave additional ammunition to this argument.

Still no evidence has emerged that calls into question the results of that 2000 review, and it has been subsequently reinforced and updated by a similar but far less public panel assembled by the Institute for Education Sciences in 2016.[13] It is worth noting though that this less public strategy has not (yet) succeeded in making its content any more convincing to teacher educators. Perhaps with greater historical perspective, it will become clearer what was needed to drive change.

Common Disciplines contributing to the science:

Cognitive Psychology, Neuroscience, Developmental-Psychology, Neuro-Psychology, and Language and Reading.

Evidence that the field rejects the science: These findings should transform an academic discipline whose mission is to advance education, in the same way that medicine was revolutionized by the discovery that bacteria and viruses cause disease. The findings reported by the National Reading Panel are, in their way, no less thrilling than when archeologists unearthed Lucy and learned that human ancestors walked upright much earlier than previously thought, or when Jonas Salk developed the polio vaccine, eradicating one of the world's most frightening diseases.

Yet still only a third of elementary teacher prep programs provide minimal exposure to these findings.[14] In fact, NCTQ's work finds that two in five programs teach at most two components of reading

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[13]Foorman, B., Beyler, N., Borradaile, K., Coyne, M., Denton, C. A., Dimino, J., ... & Keating, B. (2016). Foundational Skills to Support Reading for Understanding in Kindergarten through 3rd Grade. Educator's Practice Guide. NCEE 2016-4008. *National Center for Education Evaluation and Regional Assistance.*
[14]National Council on Teacher Quality. (2016-2018). *Teacher Prep Review.* Retrieved March 4, 2019 from https://www.nctq.org/review/standards#standard17
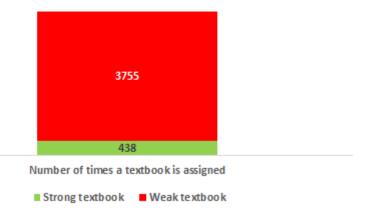
instruction, ignoring much of the evidence on how children learn to read. Few programs fall in the middle, speaking to the tremendous resistance by teacher educators to reading science.

Quality of the texts to support teacher preparation in reading:
Since 2013, NCTQ has reviewed no fewer than 859 different reading textbooks used in both undergraduate and graduate programs preparing elementary teachers. Over half are wholly inadequate, and only 11 of these textbooks provide a comprehensive overview of what a first grade teacher ought to know about teaching reading, beginning with recognizing if her students are able to correctly hear the sounds made in a spoken word, parsing out the sounds of the written alphabet, learning to decode effortlessly, growing their vocabularies and knowledge of unique domains to build comprehension skills. There are quite a few which do a fine job speaking to one or two of these essential components, but the lack of a seminal textbook in early reading instruction that is widely used is noteworthy and unusual for introductory courses in other fields of study. Of the 10 most commonly assigned textbooks, only two adequately address scientifically based reading instruction.

Because the field is so swamped by reading texts, the field has reached no consensus about which textbooks are best. Only a handful of textbooks are assigned in more than 100 courses. The modal frequency of courses assigning a textbook is only 1 course, astounding given that NCTQ analyzes some three thousand reading courses.

The good news is that strong textbooks do exist in early reading, and NCTQ has identified 10 traditional early reading textbooks and one open-source textbook that adequately address early reading

Figure 5. Reading courses assign far more weak textbooks than strong ones.

3755

438

Number of times a textbook is assigned

■ Strong textbook   ■ Weak textbook

Renegades or Pioneers: The field is not without its rebels, for how else to term the teacher educators who defy the running narrative and stick to the evidence at hand or, better yet, adapt their practices to adhere to the research. University of Wyoming stands out in this regard; their undergraduate elementary program taught a whole language approach in 2014. Two years later, the same two courses (one of them taught by the same instructor as in 2014) had completely changed the approach so that they were now teaching the science of reading. The program's dean, Dr. Ray Reutzel, likely deserves much of the credit for this change.

This program is not alone - 67 elementary programs have moved from covering next to none of the science of reading to addressing all components.[15]

Nothing about these standouts can be predicted. They can be found in public institutions (where 32 percent teach scientifically based reading instruction) or in private institutions (where 41 percent do). Something great can be happening at the undergraduate level which has no bearing at the graduate level. At 47 institutions, we look at both an undergraduate and a graduate elementary program - and at less than half of these (N=22) do undergraduate and graduate programs equally address early reading. A strong approach to early reading appears to be somewhat random.

Is change happening:

It is important to understand that the field does not reward those who turn to science, it rewards personal choice. That is why there is not a clear sense of forward momentum in the field. While programs often make changes that strengthen the quality of preparation and follow the best-available research,[16] it is not uncommon for them to take steps backward instead.

For example, in 2013 when NCTQ released its first national ratings of teacher preparation programs, University of Texas at Austin stood out for the quality of its reading program. Since so few programs in the nation earned high marks, this institution was notable. Two years later when we rated the program again, the strong reading course was gone, replaced by the standard fare in which the only essential reading component candidates learn about is vocabulary.

In fact, while we saw more programs trend toward teaching scientifically based reading instruction, this institution was not alone in backsliding: 18 went from earning an A grade to an F in early reading. More than a dozen other elementary programs moved from addressing all the components of reading to teaching few or none. So while the field is starting to move in the right direction, that movement is slow and inconsistent.

2.Classroom Management

Decades of study have established basic principles of classroom management that every teacher candidate should know and be able to do, such as setting rules and routines, maintaining student engagement, and using positive reinforcement to "catch kids being good" (and to nudge other students into more appropriate behavior). Classroom management epitomizes the kind of skills that teacher candidates should learn about in textbooks, but then need to put into practice in order to internalize, as well as to receive feedback that will help candidates improve their use of the strategies.

The development of the science:

Ideas about classroom management have existed as long as there have been teachers in classrooms. However, it was not until about 1970 that classroom management began to be studied in a systematic way. Considerable research has been conducted on classroom management since then, much of it

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[15] As measured by programs moving from an F or Fail to an A or Pass in NCTQ's Early Reading Standard in the *Teacher Prep Review*.

[16] Walsh, K. (2018). Is NCTQ's Teacher Prep Review actually having an impact? *Teacher Quality Bulletin*. Retrieved March 4, 2018 from https://www.nctq.org/blog/Is-NCTQs-Teacher-Prep-Review-actually-having-an-impact.

summarized in three authoritative research summaries which were published in the last 10 years but consolidate 150 studies conducted over the last six decades.[17] As a group, they emphasize five strategies that teacher candidates should learn because they have conclusive research support and are useful with all students.[18] These strategies are:

1. Establishing classroom rules and routines that set expectations for behavior;

2. Maximizing the time that students are engaged in learning by pacing lessons appropriately, managing class materials and the physical setup of the classroom, and teaching interesting lessons;

3. Using meaningful praise and other forms of positive reinforcement to encourage appropriate behavior;

4. Using unobtrusive means that do not interrupt instruction to prevent and manage off-task and minimally disruptive behavior;[19] and

5. Addressing more serious misbehavior with consistent, appropriate consequences.

Evidence that the field rejects the science.

New teachers and their principals consistently report that teacher candidates are not receiving adequate preparation in managing a classroom. For example, in a 2013 survey, new teachers identified classroom management as a "top problem."[20] Nearly every teacher preparation program includes one or more courses on classroom management, but most do not prioritize the classroom management strategies supported by research. NCTQ's *Teacher Prep Review* has found that of the five strategies listed above, student teachers may learn and practice three or four —but rarely all five, as shown Fig. 6 below, in which an A represents inclusion of all five strategies.

Figure 6: Few programs provide feedback on all five classroom management strategies[21]

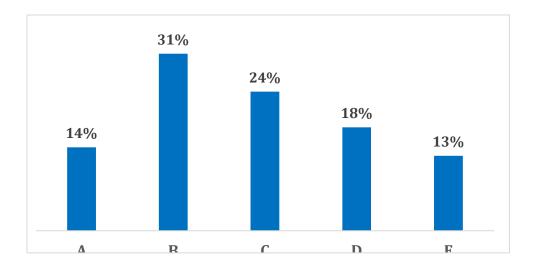(N=1,700 undergraduate, graduate, and alternative route programs)

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[17]Epstein, M., Atkins, M., Cullinan, D., Kutash, K., & Weaver, K. (2008). Reducing behavior problems in the elementary school classroom. IES Practice Guide, 20(8), 12-22; Simonsen, B., Fairbanks, S., Briesch, A., Myers, D., &Sugai, G. (2008). *Evidence-based practices in classroom management: Considerations for research to practice. Education and treatment of children,* 351-380.; Oliver, R. M., Wehby, J. H., &Reschly, D. J. (2011). Teacher classroom management practices: Effects on disruptive or aggressive student behavior. *Society for Research on Educational Effectiveness*.

[18] While developing the above list of key classroom management strategies, NCTQ did not include essential strategies that would be difficult to implement during teacher preparation, such as assessing schoolwide behavior problems.

[19]Research support for this approach was somewhat more limited than for the other strategies.

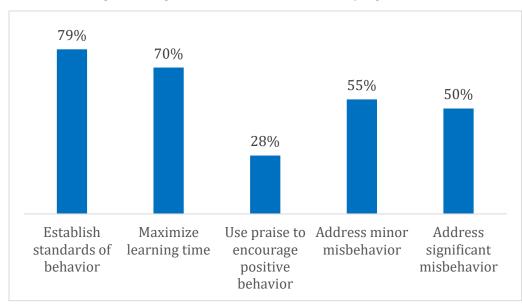[20] The New Teacher Project. (2013). Perspectives of irreplaceable teachers. Retrieved August 19, 2013, from http://tntp.org/ assets/documents/TNTP_Perspectives_2013.pdf

[21] National Council on Teacher Quality. (2016-2018). *Teacher Prep Review.* Retrieved March 4, 2019 from https://www.nctq.org/review/standards#standard1

14%	31%	24%	18%	13%
A	B	C	D	E

What's most discouraging is that the strategy with the longest and strongest history of research behind it—the benefits of praising students' good behavior more often than criticizing them—is missing from three out of four teacher preparation programs (Fig. 7). It is no wonder that school districts complain more about new teachers' classroom management skills—and that new teachers themselves cite their lack of skills as their primary struggle.

Figure 7. Programs rarely evaluate candidates use of praise and positive reinforcement[22]

(N=1,700 undergraduate, graduate, and alternative route programs)

Establish standards of behavior	Maximize learning time	Use praise to encourage positive behavior	Address minor misbehavior	Address significant misbehavior
79%	70%	28%	55%	50%

Quality of the texts to support teacher preparation in classroom management:
Several of the most commonly used textbooks address all five key classroom management strategies,

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[22] National Council on Teacher Quality. (2016-2018). *Teacher Prep Review.* Retrieved March 4, 2019 from https://www.nctq.org/review/standards#standard1

including Marzano's *Classroom Management that Works* and Evertson's *Classroom Management for Elementary Teachers*.[23] In general, when teacher educators assign a textbook focused on classroom management, the textbook chosen reflects the science of classroom management. However, candidates in about half of all programs either are never assigned a textbook that covers classroom management, or are only assigned textbooks that combine classroom management with other topics such as educational psychology or methods of instruction. Such textbooks are much less likely to provide an adequate introduction to key elements of classroom management, in part because they only include a few chapters on classroom management.

Renegades or pioneers: Nontraditional programs, in which participants quickly enter the classroom through residencies or as a teacher of record, tend to do a better job of addressing classroom management than traditional programs. These programs have a large incentive to teach their participants how to organize and manage students: traditional programs could learn from them.

However, some traditional programs have taken a lead in developing better classroom management instruction. University of Washington - Seattle's graduate special education program provides a bright spot: in addition to providing its candidates with feedback on using positive reinforcement, it also provides feedback on whether candidates use more positive than negative statements--including explicit guidance on the appropriate ratio (4:1). While no specific ratio is explicitly supported by research,[24] research does indicate there should be more positive than negative feedback.

Classroom management is far from theoretical: teacher candidates need plenty of practice and feedback to master the skills that will keep a class of wriggly first-graders or blasé ninth-graders on track. One promising trend is the use of video or simulations to allow candidates to practice classroom techniques virtually. Hunter College has created an impressive pre-service teacher preparation video library, with 200 video clips tagged as addressing especially powerful examples of classroom management techniques. Similarly, SimSchool and TeachLivE both offer virtual classrooms where, as the teacher presents a lesson, virtual students demonstrate the typical array of real kid behaviors, for example, one student snoozing away along the back wall and another in the front row furiously waving her hand. The player has to select appropriate tactics to engage all of her students.

Is change happening:

Small but noticeable improvements have occurred in the teaching of classroom management over the last few years. One of the most significant changes appears in Massachusetts under a new version of its statewide performance assessment, which all teacher prep programs must use to evaluate student teachers. It offers feedback on more of the key strategies of classroom management than the previous version.

In addition, programs in other states have shown a slow but steady improvement, particularly related to how their candidates learn about dealing with disruptive misbehavior. For example, Murray State (KY) illustrates how simple changes to language in an observation or evaluation form can provide much more specific and helpful feedback to candidates: In 2014 their observation form gave feedback on "Uses

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[23]Greenberg, J., Putman, H., & Walsh, K. (2014). Training Our Future Teachers: Classroom Management. Revised. *National Council on Teacher Quality*.

[24] Many studies advocate for a 3:1 or 4:1 praise to criticism ratio, but NCTQ has not been able to track the source of this to any kind of research study that established this ratio as ideal.

methods of respectful classroom discipline" which was replaced in 2016 by "Uses proximity and other non-verbal communication to redirect off-task behavior. […] Consistently applies consequences when a student misbehaves. […] Uses effective classroom management to reinforce standards of behavior through praise, rules, routines and/or procedures."

3. The Science of Learning

There is another element of effective teaching that is just as fundamental as classroom management: The strategies that teachers use to help students learn and retain what they learn. Tying new ideas to both specific examples and overall concepts, revisiting content again and again, asking students questions that get them thinking, and other strategies support students' ability to learn new information, deepen their understanding of that information, and remember what they have learned.

The development of the science:

Despite inherent differences, when it comes to learning new information, all people – including children – have brains that function in fundamentally similar ways. Over the past century, researchers have identified instructional strategies that take advantage of these fundamental brain functions.

The earliest studies looked at remembering, including the test effect and how returning to the same information over time improves the odds that it will be remembered.[25] Over the last thirty years, the field of learning sciences has exploded, and in additional to continuing to study the basis of memory, researchers have also examined the best ways to present new material.

In 2007, the Institute of Education Sciences (IES), the research arm of the U.S. Department of Education, published a practice guide that identifies proven practices that promote learning and retention for all students, regardless of grade or subject, and that are especially potent with struggling students.[26] The IES stated that six of the strategies have especially strong research support, and they include:

Two strategies that help students take in new information

       1. Presenting material through both graphics and words

       2. Linking abstract concepts with concrete representations

Two strategies which ensure that students connect information to deepen their understanding:

       3. Posing probing questions that ask "why," "how," "what if," and "how do you know"

       4. Interspersing worked examples among problems to be solved

And two strategies that help students remember what they learned

       5. Spacing practice.

       6. Assessing for retention (the "Test Effect")

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[25] See, for example, Gates, A. I. (1917). Recitation as a factor in memorizing. *Archives of Psychology*, 6(40), 104.
[26] Pashler, H. et al. (2007). *Organizing instruction and study to improve student learning: IES practice guide.* Washington, DC: National Center for Education Research.

Since publication of the IES practice guide in 2007,the strategies have been further validated by additional strong research.[27]

What disciplines contribute to the science: Cognitive psychology, educational psychology, neuropsychology, and experimental psychology

Evidence that the field rejects the science: Despite the research supporting these practices and their immediate relevance for teachers, there's little evidence of programs imparting this knowledge to future teachers either in course materials or in the textbooks they are assigned to read. Teacher candidates learn at best one or two of the strategies, and almost half of programs teach none of them. *Probing questions* is the only strategy is that is consistently emphasized.[28]

One explanation for the absence of these strategies from textbooks and coursework is that the field of teacher education ignores research that counters the prevailing views of teacher educators. That hypothesis might explain why one of the six strategies (the one which also happens to be backed up by the most science) receives such short shrift. That would be the "testing" strategy which advises frequent quizzing to help students remember what they learn. *Testing* is a dirty word these days. But that does not explain the indifference on the part of teacher education to the other strategies, such as spacing review or practice of new material across weeks to promote retention of the information.

Unfortunately, lack of attention to learning science within teacher education appears to be a problem so widespread that it is not restricted to the United States. Researchers in Belgium and the Netherlands replicated part of the NCTQ study, examining how degree programs in those countries teach two of the six strategies: *distributed practice* (returning to key material weeks and months later) and *retrieval practice* (asking students to recall information without giving hints or reteaching it).[29] They found that while Dutch-language teacher preparation programs are somewhat more likely than their U.S. equivalents to at least acknowledge the strength of these two strategies, most barely skim the surface.

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[27]Pomerance, L., Greenberg, J., & Walsh, K. (2016). Appendix G: Research Inventory. *Learning about Learning: What Every New Teacher Needs to Know*. National Council on Teacher Quality.https://www.nctq.org/publications/Learning-About-Learning:-What-Every-New-Teacher-Needs-to-Know

[28]Pomerance, L., Greenberg, J., & Walsh, K. (2016). *Learning about Learning: What Every New Teacher Needs to Know*. National Council on Teacher Quality. This study examined course syllabi, textbooks, and student teaching materials for mentions of the six strategies. https://www.nctq.org/publications/Learning-About-Learning:-What-Every-New-Teacher-Needs-to-Know

[29]Surma, T., Vanhoyweghen, K., Camp, G., & Kirschner, P. A. (2018). The coverage of distributed practice and retrieval practice in Flemish and Dutch teacher education textbooks. *Teaching and Teacher Education*, *74*, 229-237.
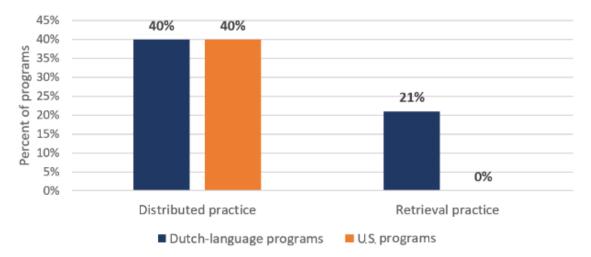
Figure 8. U.S. preparation programs are less likely than their Dutch counterparts to teach learning science

Quality of texts used to prepare teachers in science of learning:

To increase marketability, it is in the nature of textbooks to be as inclusive of content as possible—which explains why they end up being so thick. Topics related to learning and memory are most likely to be addressed in courses on educational psychology. The textbooks for these courses are usually massive tomes, hundreds of pages in length, covering topics ranging from human development to how assessments are designed and tested. Even though they tend to devote several chapters to principles of learning and instruction, the science of learning gets short shrift: Given this breadth, it is no surprise that their coverage of learning strategies gets short shrift, with only 15 percent of the textbooks in a 2015 representative sample reserving even a few paragraphs to give essential guidance on how to, for example, use graphics and words together to present new information, without making the common mistake of confusing this strategy with the debunked idea of tailoring instruction to students' learning styles.[30]

Coverage of the key instructional strategies was equally poor in methods texts, where the strategies ought to underlie everything that teachers are taught about instruction. Guillaume's *K-12 Classroom Teaching* provides a typical example of how little attention textbooks give to key instructional strategies. In its 321 pages, the textbook includes only two scattered sentences that are directly related to the strategy of pairing graphics with words. The author advises, on page 104, "Present information verbally and through graphic representations" and notes on page 118, "Additionally, using graphic organizers, diagrams, and other nonlinguistic representations of the text supports student achievement."[31]

Equally puzzling, why do principles conclusively rejected as having no scientific basis still find their way into textbooks? In fact, two-thirds of the textbooks NCTQ examined which assigned in education psychology, general methods, or secondary subject-specific methods courses dedicate space to learning

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[30]Pomerance, L., Greenberg, J., & Walsh, K. (2016).

[31] Guillaume, A. M. (2008). *K-12 classroom teaching: A primer for new professionals* (3rd ed.). Upper Saddle River, NJ: Pearson.

styles.[32]They do so because so many teacher educators insist on teaching about learning styles, clinging to its veracity. Two-thirds of programs that NCTQ examined promote this discredited idea; most even require that every lesson plan accommodate students' individual learning styles. This myth is so pervasive that *Popular Science* pronounced it as the single most untrue but commonly believed (as measured by google searches) theory, exceeding other popular myths such as that people are left- or right-brained, that the color of one's mucus reveals an infection, and that ostriches stick their heads in the sand.[33] Teacher prep programs should be ahead of the curve in pushing the science, not the science fiction, of how to teach - but instead are promoting false ideas of how students learn.

Renegades or Pioneers:

Deans for Impact (a relatively new organization dedicated to improving teacher preparation) published *The Science of Learning*, a six-page collection by Daniel Willingham, a prominent learning expert. This brief describes "what we know about learning from a scientific standpoint" and features all six of the strategies.[34] Twenty-two deans of schools of education have joined the organization, and it is to be hoped that they will ensure that their programs teach about fundamental instructional strategies.

4.A few other areas (not intended to be comprehensive) of teacher preparation where there is some guiding research but with many open ended questions:

- Elementary mathematics: Recommendations by the National Mathematics Advisory Panel, the National Council of Teachers of Mathematics, and the Conference Board of the Mathematical Sciences all assert that elementary teachers must develop a deep understanding of the mathematics content they will teach, and will need to take several courses on the subject to support this learning. The areas of mathematics that candidates need include numbers and operations, algebra, geometry and measurement, and data analysis.[35]

- Reading comprehension: More and more, the research community is converging on the understanding that reading comprehension comprises far more than a set of skills like making inferences and finding the main idea. Instead, children's comprehension is powered by their background knowledge about a topic.[36]Teachers who lack essential background knowledge are less likely to be in a position to boost comprehension in their students.[37]

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[32]Pomerance, L., Greenberg, J., & Walsh, K. (2016). Learning about Learning: What Every New Teacher Needs to Know. *National Council on Teacher Quality*.

[33]Chodosh, S. (2018, April). The most common misconceptions, debunked. *Popular Science*. Spring 2018. p. 12.

[34]*Science of Learning.* (2015). Austin, TX: Deans for Impact.

[35]Greenberg, J., & Walsh, K. (2008). No Common Denominator: The Preparation of Elementary Teachers in Mathematics by America's Education Schools. *National Council on Teacher Quality*. Retrieved from https://www.nctq.org/dmsView/No_Common_Denominator_NCTQ_Report.

[36]Hirsch, E.D. [2006]. *The knowledge deficit.* New York: Houghton Mifflin Harcourt Publishing Company. Willingham, D. T. [2006]. How knowledge helps: It speeds and strengthens comprehension, learning — and thinking. *American Educator, 30*(1), 30-37. Recht, D. R., & Leslie, L. (1988). Effect of prior knowledge on good and poor readers' memory of text. *Journal of Educational Psychology, 80*(1), 16; Schneider, W., Körkel, J., &Weinert, F. E. (1989). Domain-specific knowledge and memory performance: A comparison of high- and low-aptitude children. *Journal of educational psychology, 81*(3), 306

[37] For example, see (Diamond, B. S., Maerten-Rivera, J., Rohrer, R. E., & Lee, O. [2014]. Effectiveness of a curricular and professional development intervention at improving elementary teachers' science content knowledge and student achievement outcomes: Year 1 results. *Journal of Research in Science Teaching, 51*(5), 635-658; and Heller,

- Data analysis: To effectively meet their students where they are and bring them to where they need to be, teachers need to be able to assess their students' knowledge and skills, interpret those data, and tailor their instruction accordingly.[38] This practice goes far beyond the use of formal standardized tests – even countries that place little emphasis on standardized tests place a heavy focus on the importance of assessment.[39]

- Clinical practice: Research is nascent with only recent studies finding the importance of assigning student teachers to effective cooperating teachers[40] and establishing the importance of the student teacher being observed frequently throughout the semester.[41] While research may be lacking, there is plenty of wisdom that has been collected over the years about what a high quality student teaching experience should look like.

- Subject matter knowledge: Research is not conclusive, but suggests a relationship between taking teachers' content knowledge or relevant coursework in a subject and their students' achievement in that subject.[42]

- English learners: While there is scant research looking at teacher training, several new literature reviews have synthesized research on effective practices for teaching English learners, including building students' oral and written language skills, teaching grade-level content using grade-level materials, respecting and integrating students' home languages, and providing explicit instruction in literacy components.[43]

J. I., Daehler, K. R., Wong, N., Shinohara, M., & Miratrix, L. W. [2012]. Differential effects of three professional development models on teacher knowledge and student achievement in elementary science. *Journal of Research in Science Training, 49*(3), 333-362.

[38]Greenberg, J., & Walsh, K. (2012). *What Teacher Preparation Programs Teach about K-12 Assessment: A Review*. National Council on Teacher Quality. Retrieved from https://www.nctq.org/dmsView/What_Teacher_Prep_Programs_Teach_K-12_Assessment_NCTQ_Report.

[39]Sahlberg, P. (2011). *Finnish lessons: What can the world learn from educational change in Finland?* New York: Teachers College Press. See p. 66 for a discussion of assessment.

[40]Ronfeldt, M., Brockman, S. L., & Campbell, S. L. (2018). Does Cooperating Teachers' Instructional Effectiveness Improve Preservice Teachers' Future Performance?. *Educational Researcher*, *47*(7), 405-418.

[41]Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis, 31*(4), 416-440.

[42]Monk, D. (1994). Subject-area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review, 13*(2), 125-145; Goldhaber, D. D., & Brewer, D. J. (1997). Why don't schools and teachers seem to matter? Assessing the impact of unobservables or eduational productivity. *Journal of Human Research, 32*(3), 505-523; Valetta, R., Hoff, K.J., &Lopus, J.S. (2014). Lost in translation? Teacher training and outcomes in high schools economics classes. Contemporary Economic Policy, 32(4), 695-709; Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009). Teacher preparation and student achievement. Educational Evaluation and Policy Analysis, 31(4), 416-440.

[43]Gersten, R., Baker, S. K., Shanahan, T., Linan-Thompson, S., Collins, P., &Scarcella, R. (2007). Effective literacy and English language instruction for English learners in the elementary grades. National Center for Education Evaluation and Regional Assistance. Institute of Education Sciences, US Department of Education; Baker, S., Lesaux, N., Jayanthi, M., Dimino, J., Proctor, C. P., Morris, J., ... & Newman-Gonchar, R. (2014). Teaching Academic Content and Literacy to English Learners in Elementary and Middle School. IES Practice Guide. NCEE 2014-4012. *What Works Clearinghouse*; National Academies of Sciences, Engineering, and Medicine. (2017). *Promoting the educational success of children and youth learning English: Promising futures*. National Academies Press.

Other areas, also by no means conclusive, while considered critical to a teacher's ability to be effective have no or limited science to better inform the content of teacher preparation programs. These are areas where perhaps many flowers need to bloom:

1. Cultural competence

2. Anti-bias training

3. Engaging with parents and caregivers

4. Improving executive function

IV. Theories on why teacher prep programs have resisted the research

Redefining "Research"

If you asked a group of typical professors of education why their field ignores well-established research, their response would be to ask why anyone could suggest such a thing. The Association of Teacher Educators holds research conferences twice a year and publishes two peer-reviewed journals. As part of accreditation reviews, professors provide a lengthy bibliography for each course, showing the research basis of the material addressed in the class. Professors, teachers and even student teachers frequently conduct and publish research.
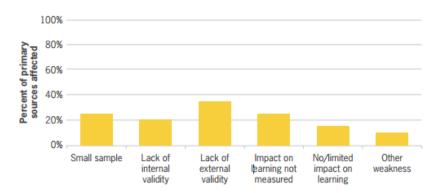
However, as you talked to the group, the conversation might reveal that "research" has a different meaning within the field of teacher education than it does in fields like biology, math, or public health. The desired outcome of educational research, like research in other fields, is often focused on understanding why or how something happened, or identifying how much a particular intervention influences outcomes. In contrast, the techniques of educational research are different from those that are accepted in other fields.

Faculty from education schools do publish research about teacher preparation, but much of this is grounded in their own experiences and often is focused on very small sample sizes. It's not uncommon to find studies by education faculty that explore the experiences of just two or three teacher candidates, or look at outcomes from a single class – likely one that they taught. While exploring the nuanced lived experiences of teacher candidates offers value and can deepen people's understandings of teacher preparation, findings from such a small sample cannot be generalized to a broader population with any degree of confidence. Similarly, many studies by education faculty relies on candidates' self-reported feelings of efficacy and preparedness, which often do not correlate with their actual effectiveness once they reach the classroom.[44] In a sample of journal articles referenced in popular education psychology and instructional methods textbooks, three quarters have clear problems in their design that limit or negate the validity of their conclusions.[45]

Figure 9. Why textbook sources do not meet the IES' standards

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[44]Ronfeldt, M., Matsko, K.K., Greene Nolan, H.L., & Reininger, M. (2018). *Who knows if our teachers are prepared? Three different perspectives on graduates' instructional readiness and the features of preservice preparation that predict them.* Stanford, CA: Center for Education Policy Analysis.

[45]Pomerance, L., Greenberg, J., & Walsh, K. (2016). Appendix J. *Learning about Learning: What Every New Teacher Needs to Know.* National Council on Teacher Quality.

The bars sum to greater than 100 percent because we identified as many as three reasons that a single reference did not meet the IES panel's standards.

In contrast, much of the research that makes use of large samples, trends over time, and analysis of trends in student outcomes, comes from economists – people with expertise in research methods, but often without a background in K-12 teaching or teacher preparation. Similarly, much of the research on how children learn comes from psychologists and neuroscientists, rather than teacher educators. For the IES practice guide *Organizing instruction and study to improve student learning*, a sample of 150 of the 250 authors whose work is cited shows that only 16 percent of these authors are teacher educators or work in the field of education, while two-thirds are in the field of psychology or psychiatry.

On a related note, much of the current focus is teacher education research is on "rapid-cycle evaluations," intended to offer near-immediate feedback on smaller-scale research questions, such as whether prep programs see better attendance with an online course or an in-person one.[46] The risk with these is that the outcomes that can be measured in a short timespan may not be the ones that matter most for preparing teachers and, ultimately, for educating students.

Attitudes toward Traditional Research

A number of circumstances have motivated teacher education to turn away from a more rigorous definition of research. One influence is historical: Thomas Cook explains that education researchers were deeply disappointed by research conducted from the late 60s through the 70s which found that programs the researchers held dear - including Head Start, Project Follow Through, and Title I - did not have replicable long-term effects. As a result, many educational researchers decided that quantitative research could not provide meaningful results, and turned to a research model based in management consulting which presumes that

> "1) each organization possesses a unique culture and set of goals; therefore, the same intervention is likely to elicit different results depending on a school's history, organization, personnel, and politics; and 2) suggestions for change should creatively blend knowledge from many different sources—from general organizational theories, from deep insight into the district

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[46]Mitchel, A. L., & King, M. S. (2016). A New Agenda: Research to Build a Better Teacher Preparation Program. *Bellwether Education Partners*. Retrieved from https://bellwethereducation.org/sites/default/files/Bellwether_NewAgenda-GPLP_Final-101316.pdf

or schools under study, and from "craft" knowledge of what is likely to improve schools or districts with particular characteristics."[47]

 As a result, in Cook's words,

"Most education evaluators see themselves as the vanguard of a post-positivist, democratic, and craft-based model of knowledge growth that is superior to the elitist scientific model that, they believe, has failed to create useful and valid knowledge about improving schools."

Preparing for a profession, not training

The desire for greater prestige may have also motivated teacher education to redefine research. An analysis of how research on teacher education has changed over time describes the move from viewing teacher preparation as "training" to viewing it as preparing teachers for a "state of the art" profession.[48] Cochran-Smith and Fries describe how several decades ago,

> "teaching was regarded largely as a technical transmission activity, and teaching and learning were assumed to be related in a linear way. Teacher behavior was the beginning point and pupil learning the endpoint of classroom exchanges. Building on these premises, research on teacher education assumed that teacher training was a technical transmission activity and that teacher training and teacher behavior were related to one another in a linear way."

This approach assumed a common understanding of effective teaching practices, although some researchers questioned whether this clear research foundation existed, or whether research could establish a causal relationship between activities in teacher training programs' and teachers' performance in the classroom, given the many intervening variables. Given these concerns that "the training research did not connect the technical aspects of teaching to its many intellectual and decision-making aspects nor did it account for how teachers' knowledge and beliefs mediated their behavior in classrooms," the field moved away from transmitting commonly agreed practices, and toward inviting teachers to examine themselves:

> "The research on teacher education moved away from identifying the most effective instructional procedures for training prospective teachers to perform specific behaviors and toward understanding teachers' knowledge development; sources and use of knowledge, beliefs, and attitudes; the teacher education pedagogies that prompted knowledge development; and how people learn to teach over time….To an extent, constructing teacher education as a learning problem involved explicitly rejecting the technical view of teaching and the training view of teacher education that were prevalent in the training study era."

So who is most apt to reject this model? Not the most selective institutions. Using Barron's selectivity rankings, we see almost no difference between the most selective programs[49] and the least selective[50]

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[47] Cook, Thomas D. (2001). Sciencephobia. *Education Next* 1.3.

[48] Cochran-Smith, M., & Fries, K. (2005.) "Researching teacher education in changing times: Politics and paradigms." *Studying teacher education: The report of the AERA Panel on research and teacher education.* Washington, DC: American Educational Research Association.

[49] Those categorized as Highly Competitive, Very Competitive, or Most Competitive, N=168 undergraduate elementary programs in our sample.

[50] Those categorized as Less Competitive or Noncompetitive, N=136 undergraduate elementary programs in our sample.

in their approach to teaching scientifically based reading instruction. In the most selective institutions, 44 percent entirely miss the mark,[51] while 38 percent address essential topics;[52] in the least selective, 46 percent do a dismal job, while 38 percent address the essentials.

Barriers to Change

After decades of de-emphasizing research, the field of education faces a number of chicken-and-egg problems.

Teacher prep faculty cannot teach what they do not know

Several studies collectively surveyed several hundred teacher educators responsible for teaching reading courses to elementary teacher candidates at dozens of different institutions, asking them questions to measure their knowledge of phonology, phonics, and morphology. Both studies found that these teacher educators were noticeably weak in their knowledge of language constructs. The exceptions were teacher educators who were participating in a multiyear professional development program on research-based reading instruction. Also, most educators surveyed excelled in counting the syllables in words. Concerning but not surprising, teacher candidates whose instructors had weaker knowledge of these reading constructs also tended to have weaker knowledge themselves.[53] Put plainly, the authors state that, "this study showed that teacher educators do not possess a good understanding of basic language constructs."[54] And without that understanding, faculty cannot teach this critical area to their candidates.

The extent to which teacher prep faculty regularly read rigorous research and use that research to inform their practice is unclear. A study of how teacher educators engage in professional learning reviewed over a hundred research articles and found only three (2 percent) that described teacher educators "Reading/writing research articles and attending conferences." Other modes of professional learning included attending professional development, collaborating with others, engaging in a reflective activity, or conducting one's own research such as doing a "self-study" or conducting academic research.[55] The absence of research-based materials like the IES practice guides in teacher preposition lends further credence to the hypothesis that teacher educators do not make use of research in their practice.

We don't know enough about how to train teachers

This surprisingly common refrain argues that research on preparing teachers simply does not exist. While there is clear evidence about what teachers should *do* in areas like teaching reading, using

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[51] Based on programs earning a D, F, or Fail on the *Teacher Prep Review's* Early Reading Standard.

[52] Based on programs earning an A or Pass on the *Teacher Prep Review's* Early Reading Standard.

[53] Binks-Cantrell, E., Washburn, E. K., Joshi, R. M., & Hougen, M. (2012). Peter effect in the preparation of reading teachers. *Scientific Studies of Reading*, *16*(6), 526-536.; Malatesha Joshi, R., Binks, E., Hougen, M., Dahlgren, M. E., Ocker-Dean, E., & Smith, D. L. (2009). Why elementary teachers might be inadequately prepared to teach reading. *Journal of Learning Disabilities*, *42*(5), 392-402.

[54] Binks-Cantrell, E., Washburn, E. K., Joshi, R. M., &Hougen, M. (2012).

[55] Ping, C., Schellings, G., & Beijaard, D. (2018). Teacher educators' professional learning: A literature review. *Teaching and Teacher Education*, *75*, 93-104.

instructional techniques that support learning and retention, and managing a classroom, the lack of rigorous research within teacher education means that there is less information about how to impart this knowledge to teacher candidates.[56] How many lessons do teacher candidates need to spend on phonemic awareness? What kinds of activities solidify this information? Is it better to offer courses online or in person?

While these are important questions, the limited research shouldn't stand in the way of doing *something*. Programs can still implement preparation based on existing research, even if they are uncertain about the most effective way to do so. Certainly teaching candidates about phonemic awareness is better than not addressing this topic, even without knowing the most effective way of teaching this component. Yet fewer than half of programs (43 percent) address this component.

A mix of research, consultation with experts, and common sense can set some clear guidelines for how teacher preparation programs can operate.

Academic freedom

Even when the deans of teacher prep programs want their faculty to instill research-based practices in teacher candidates, they often cannot dictate what their instructors teach. Academic freedom is as an essential underpinning of institutions of higher education, intended to allow academics to pursue their research and the truth without being beholden to any orthodoxy. Modern concepts of academic freedom were developed in the 1930s and 40s in reaction to efforts by totalitarian states to control science and academia. *Inside Higher Ed* explains that academic freedom "establishes a faculty member's right to remain true to his or her pedagogical philosophy," and "gives faculty members substantial latitude in deciding how to teach the courses for which they are responsible," and while it does not "deny faculty members the right to require students to master…the fundamentals of the disciplines that faculty teach," it seems to allow faculty to choose not to teach those fundamentals.[57]

Other fields address this by self-policing, and perhaps by a careful vetting of new hires. In teacher prep, this does not appear to be the case.

V. What will it take to change teacher prep programs' use of research

Willingness on the part of education schools to engage in research-based practices, and evidence that they get better results.

The education field's focus on understanding how candidates learn is perhaps most clearly illustrated through prep programs' penchant for reflection assignments – often inviting candidates to create their own "philosophy" of how to do something. While reflection assignments do not count for a large part of candidates grades (an average of 5 percent of course grades are attributed to reflection assignments), a

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[56]Mitchel, A. L., & King, M. S. (2016). A New Agenda: Research to Build a Better Teacher Preparation Program. *Bellwether Education Partners*. Retrieved from https://bellwethereducation.org/sites/default/files/Bellwether_NewAgenda-GPLP_Final-101316.pdf

[57]Nelson, C. (2010). Defining academic freedom. *Inside higher ed.* Retrieved from https://www.insidehighered.com/views/2010/12/21/defining-academic-freedom

third of teacher prep courses (34 percent) have at least one reflection assignment (compared with 12 percent of courses in other academic areas studied).[58]

For example, one program asks teacher candidates to "Write a personal reading philosophy, addressing such areas as learning theories, the importance of reading, role of the teacher and students in reading instruction, the reading environment and program design." Another assigns candidates to develop a "Values & Beliefs Summary: Each student will write a 2 page statement describing his/her professional values and beliefs regarding student behavior and discipline practices. Values are those things we think are important (respect for others, fairness, cooperation, etc.) and beliefs are our ideas about what work is effective, or what works." Each of these assignments asks candidates what they believe or value about how to teach reading or how to manage a classroom, but neither assignment asks candidates to apply what they have learned in their course or to use research-based strategies – or expects them to eschew approaches that have no basis in research.

Raising the status of teacher education – by implementing rigorous research-based practices

At the risk of offering up another chicken-and-egg scenario, programs may be more willing to adopt research-based practices, finding the right balance of research-based training that gives teacher candidates the foundation upon which to adapt their practices, if they see that with this approach comes greater prestige.

As programs shied away from a model that made teaching seem rote, they moved toward a model that offered few clear guidelines for practice. Instead, programs present teaching as an "art form" that resisted best practices in favor of developing one's own philosophy, and that rejects most modes of evaluation with the argument that evaluation measures are flawed or biased. Creating a profession that is so unmoored from either standards of practice or measurement of outcomes has only deteriorated the reputation of teacher education. If programs can find their way back to a model grounded in research-based practices with a level of rigor that matches the rigors of teaching, they may restore some of the status they have lost.

Some programs have already embarked on this path. NCTQ's *Teacher Prep Review* highlights programs that adhere to research and best practices in many areas. For example, more than 50 programs follow research-based practices in both early reading and classroom management. A handful of programs are strong across every area that NCTQ considers.

Leaders of teacher education, too, have earned prestige for their research-driven teacher preparation programs. At least two stellar deans were such standouts that they were handed the job of running a state's education agency. David Steiner, the former dean of Hunter College's school of education, went on to serve as the New York State commissioner, though he has since returned to academia as the director of the Johns Hopkins Institute for Education Policy. Similarly, Candice McQueen, dean of Lipscomb University's College of Education, went on to serve as Tennessee's commissioner of education for four years, and now is the chief executive officer of the National Institute for Excellence in Teaching. But the high profile of these individuals are more the exception than the rule, which may feed into teacher educators' feelings of inferiority.

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[58]Putman, H., Greenberg, J., & Walsh, K. (2014). *Training our future teachers: Easy A's and what's behind them.* National Council on Teacher Quality. Retrieved April 25, 2019 from https://www.nctq.org/publications/Training-Our-Future-Teachers:-Easy-As-and-Whats-Behind-Them.

All teacher prep programs have the opportunity to follow the lead of these exemplary deans and programs, instilling practices that are grounded in evidence and research, rather than in one's personal philosophy of how to teach. Programs that adopt such practices will also find that they are produce better results, reinforcing the programs' own goals.

Placing external pressures on teacher prep programs

Accrediting bodies have attempted to raise the bar for teacher preparation, but the field has largely resisted these efforts. CAEP, the only national accreditor of teacher preparation programs, was met with a sharp backlash when it set a higher bar for teacher prep programs' admissions standards, and has since backtracked. Many institutions – about half of the 1,400 institutions with traditional teacher preparation programs – remain unaccredited.[59]

The National Council on Teacher Quality has put forth its own effort to hold programs accountable for using research-based practices in teacher preparation. With 13 pilot studies starting in 2006, and with three full-scale national reviews (in 2013, 2014, and 2016 through 2018), NCTQ has evaluated several thousand teacher preparation programs against a set of research-based standards.
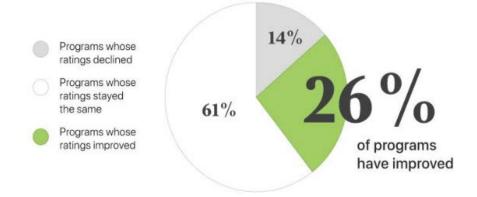
While change is slow, data suggest that prep programs are making progress. Programs are still far from where they need to be, but a much higher proportion of programs are teaching the science of reading in 2016 than they were in 2006. Smaller but measurable improvements have occurred in other areas such as classroom management.

A study used the *TPR's* ratings to see if giving programs additional guidance about their ratings would lead them to improve. The answer was no, but regardless of guidance, programs were more likely to make changes that improved their ratings rather than diminish them.[60]

Figure 10. Changes in programs' ratings from 2013 to 2016

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[59]Greenberg, J., Walsh, K., & McKee, A. (2014). *2014 Teacher prep review: A review of the nation's teacher preparation programs*. National Council on Teacher Quality. Retrieved from
https://www.nctq.org/dmsView/Teacher_Prep_Review_2014_Report.
[60]Graph based on data from Goldhaber, Dan, and Cory Koedel. "Public Accountability and Nudges: The Effect of an Information Intervention on the Responsiveness of Teacher Education Programs to External Ratings." *American Educational Research Journal* (2018): 0002831218820863.

Programs whose ratings declined 14%
Programs whose ratings stayed the same 61%
Programs whose ratings improved 26%

26% of programs have improved

While none of this evidence proves that the *Teacher Prep Review's* ratings are causing programs to make these changes, it does offer cause for hope – perhaps an external, public-facing pressure can prompt teacher prep programs to rethink their practices.

The mere fact that accountability in teacher education was the subject of the opening session at AACTE's 2019 annual meeting - and that NCTQ's *Teacher Prep Review* was discussed on par with accreditation reviews and accountability efforts by the US Department of Education -means that teacher educators are receptive to the kind of public pressure that NCTQ can generate.

VI. Conclusion

Strong resources are available

Teacher prep programs have an opportunity to redirect their efforts. They can set aside the textbooks that peddle false understandings of learning and ignore settled science about reading, and instead choose textbooks that address essential issues. Or they could avail themselves of free guidance that already exists in the form of the Institute of Education Science's What Works Clearinghouse practice guides. For years, IES has turned strong research into usable practice guides for schools and teachers, offering clear signals to teacher prep programs about what they should teach their candidates. These 23 guides address topics ranging from organizing instruction to improve student learning (the basis of the *Learning about Learning* report) to addressing problem behavior to teaching math to different age groups.[61]

There's also a strong body of emerging research in a field firmly in the control of prep program deans and administrators, not subject to the rules of academic freedom: student teaching. New research confirms common sense, that student teachers benefit from being paired with an effective cooperating teacher - but prep programs rarely prioritize the cooperating teacher's effectiveness during the selection

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[61] Currently, programs aren't using these guides. When *Learning about Learning* was released, no programs assigned the relevant IES practice guide, *Organizing Instruction and Study to Improve Student Learning*. Since the report's release, two programs have reported adopting this guide. Similarly, a guide (*Put reading first: Helping your child learn to read: A parent guide* is assigned by University of Texas at El Paso. *Put Reading First: The Research Building Blocks for Teaching Children to Read, Kindergarten Through Grade 3* is assigned by 79 programs.) was developed to supplement the National Reading Panel's study, it is assigned by only 80 programs.

process.[62] The process of placing student teachers with cooperating teachers is different from that of teaching a class, and a clinical coordinator cannot claim the same degree of academic freedom as the instructor of a course.

Programs are currently facing what they see as a crisis of low status and accountability. The responses of teacher education programs and the national association that represents them to NCTQ's *Teacher Prep Review* show that programs are cognizant of outside pressure. The efforts of the Deans for Impact, and the work done by programs highlighted in this paper, show that a small but potentially influential group of teacher education leaders is willing to rethink the principles on which teacher education is based. The combination of these two forces may be the best chance that we have to improve the value of teacher education.

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[62]Lubell, S, &Putman, H. (2016). *Landscapes in Teacher Prep: Undergraduate Elementary Education. Updated.* National Council on Teacher Quality. Retrieved from https://www.nctq.org/publications/Teacher-Prep-Review:-Undergraduate-Elementary-Education