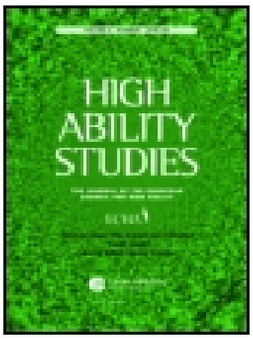

High Ability Studies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/chas20

Multidisciplinary perspectives and field strengthening questions for gifted education research

Jonathan Wai & Keri M. Guilbault

To cite this article: Jonathan Wai & Keri M. Guilbault (2022): Multidisciplinary perspectives and field strengthening questions for gifted education research, High Ability Studies, DOI: 10.1080/13598139.2022.2064269

To link to this article: https://doi.org/10.1080/13598139.2022.2064269

Published online: 12 Apr 2022.

HIGH ABILITY STUDIES
https://doi.org/10.1080/13598139.2022.2064269

Routledge
Taylor & Francis Group

ORIGINAL ARTICLE

Multidisciplinary perspectives and field strengthening questions for gifted education research

Jonathan Wai [a] and Keri M. Guilbault [b]

[a]Department of Education Reform and Department of Psychology, University of Arkansas, Fayetteville, AR, USA; [b]Department of Counseling and Educational Studies, Johns Hopkins University, Baltimore, MD, USA

ABSTRACT

Considers multidisciplinary perspectives as a lens through which to view gifted education research. In the spirit of scholars who have also sought to ask field strengthening questions to help improve scientific advance, we address four questions and encourage other scholars from all disciplines to ask their own questions: 1. What if the field is much larger than we think it is? 2. What if the field is less intellectually diverse than we think it is? 3. What if the evidence supporting the efficacy of gifted programming is not as strong as we think it is? and 4. What if gifted learners may actually be okay even if they are not fully challenged? After reviewing evidence supporting (and failing to support) the core idea behind each of these questions (with a U. S. focus and for academically-gifted students in more academic domains) we conclude with ideas about continuing to ask field strengthening questions to improve research. We should explore questions and ideas and established findings from disciplines outside gifted and try to make gifted a more multidisciplinary field by being open to learning from other ways of approaching knowledge through a plurality of methods and disciplinary perspectives.

KEYWORDS

Multidisciplinary approach; conceptual foundations; population representative samples; communication

Experts, in looking at something new, always bring their expertise with them, as well as their particular way of looking at things. Whatever does not fit into their frame of reference is dismissed, not seen, or forced to fit into their beliefs. Thus, really new ideas seldom arise from the experts in the field. – Hamming (2020, p. 336, *The art of doing science and engineering: Learning to learn*)

In 1996, Coleman convened a special issue in *Journal for the Education of the Gifted* emphasizing *critical appraisals* of gifted education, with the purpose to have "readers to be able to step outside their routine thoughts and behaviors in order to take a constructive look at their practices, their

CONTACT Jonathan Wai waijon@hotmail.com Department of Education Reform and Department of Psychology, University of Arkansas, Fayetteville, AR, USA

profession, and their programs" (p. 127). Gallagher (2000, p. 5) argued that "One of the ways to engage ourselves is to consider a few *unthinkable thoughts*," or questions that those within the field have not considered or stopped to ask. Subotnik, Olszewski-Kubilius, and Worrell (2011) emphasized *rethinking giftedness and gifted education* and Ambrose, Van Tassel-Baska, Coleman, and Cross (2010) discussed whether gifted education was *unified, insular, firmly policed, or fractured, porous, contested*. Though these authors did not agree on what should be changed about gifted education, they did share the effort to inject what might be called heterodoxy into gifted education. Duarte et al. (2015) stressed the importance of political diversity to improve psychological science. Heterodoxy, at least to us, is really about an unencumbered diversity of perspectives in thinking about scientific questions, especially multidisciplinary perspectives outside the traditional questions typically asked in any given subfield, or any given cultural climate or context.

It is also related to the idea of *antidisciplinary* work (Ito, 2017), or choosing problems that do not fit neatly into any one discipline. As Ito (2014) explained:

> An anti disciplinary project isn't a sum of a bunch of disciplines but something entirely new—the word defies easy definition. But what it means to me is someone or something that doesn't fit within traditional academic discipline—a field of study with its own particular words, frameworks, and methods. Most academics are judged by how many times they have published in prestigious, peer-reviewed journals. Peer review usually consists of the influential members of your field reviewing your work and deciding whether it is important and unique. This architecture often leads to a dynamic where researchers focus more on impressing a small number of experts in their own field than on taking the high risk of an unconventional approach. This dynamic reinforces the cliché of academics—learning more and more about less and less. It causes a hyper-specialization where people in different areas have a very difficult time collaborating—or even communicating—with people in different fields.

Ito (2017) argued that working in the *spaces between traditional disciplines* is useful to innovation, in that many ideas, questions, and investigations don't fit neatly into any specific discipline, the theme of the MIT media lab when he led it. One way of visualizing the spaces between disciplines is to think about the citation structure across various academic research fields. Rosvall and Bergstrom (2008) illustrate one way of visualizing academic fields, their interconnectedness, and the space between them, by showing how strongly disciplines cite others, thus revealing communication architecture. For example, in their map of the social sciences, they show education and educational psychology close to psychology but quite distant and detached from other fields (Rosvall & Bergstrom, 2008, p. 1122, Fig. 4).

This is related to concepts expressed by scholars in medicine (Casadevall, Fang, & Morrison, 2014, p. 1355) in that "Scientists in particular define themselves through group identity and adopt practices that conform to the expectations and dynamics of such groups," and that "specialization carries significant costs." One of these scientific costs is limiting the scope of questions asked, which in turn limits the way the field can move in new directions or be receptive to information from other disciplines. The scope of questions asked can be constrained by many factors, often by the statistical methods and approach that become ingrained (consciously or otherwise) as good practice in an academic domain (e.g., Akerlof, 2020; Singer, 2019), rather than considering method plurality as a way to allow more questions to be asked. More broadly, disciplinary blinders are present in any academic subfield since each discipline is siloed and has its accepted journals and incentives that are all reliant on peer approval to advance (Lyall, 2019; Makel & Wai, 2016). In the words of Packer (2020), "writers are now expected to *identify* with a community and write as its representatives. In a way, this is the opposite of writing to reach other people." In gifted education, and really any academic subfield, there are similar tensions as we seek to navigate peer review and the academic incentive structure.

Roadmap and purpose of this article

The four questions we ask in this article are meant to help the gifted research field seek to strengthen itself, whether this means taking the perspective and evidence from another discipline (e.g., Subotnik, Olszewski-Kubilius, & Worrell, 2019; Wai & Worrell, 2021), considering how to adopt useful methods from other domains, or seeking to ensure that ideas and points on which we often advocate for gifted learners have solid evidence to support them. Our hope is that more scholars from many different fields, including younger scholars without established ideas to defend (Dunnette, 1966), will be inspired to come up with their own field challenging questions and be willing to ask them. Of course, this does not mean that questions should be asked without an appreciation or understanding of the cultural context (Lewis & Wai, 2021), but asking difficult questions should be something we continue to seek to do (e.g., Borland, 1996). This can help us continue to push edge science (Bhattacharya & Packalen, 2020), where the boundaries of gifted education research are moved forward through a combination of exploring truly new ideas and upending old assumptions, while simultaneously ensuring that these new ideas are in fact truly new (e.g., Kelley, 1927; Schmidt, 2017).

Here are the four questions we ask in this paper:

(1) What if the field is much larger than we think it is?
(2) What if the field is less intellectually diverse than we think it is?

(3) What if the evidence supporting the efficacy of gifted programming is not as strong as we think it is?
(4) What if gifted learners may actually be okay even if they are not fully challenged?

After reviewing the evidence supporting (and failing to support) the core idea behind each of these questions (largely with a focus on the U.S. and for gifted students in more academic domains), we conclude with ideas on how to continue the tradition of taking multidisciplinary perspectives and asking field strengthening questions to ultimately improve gifted education research.

What if the field is much larger than we think it is?

Are gifted education scholars the only people who conduct research on gifted students? The answer to this is obviously no, and many gifted education scholars would openly acknowledge this. We are going to argue here that the extent to which other scholars outside the field of gifted education conduct gifted education research – in the sense of studying students who are intellectually advanced – is *vastly larger and systematically uncharted* than many gifted and other scholars realize. Charting this larger space could in fact greatly inform the field of gifted education itself while simultaneously helping researchers from numerous fields understand that many of their findings are in fact findings conducted on gifted samples and thus, they are engaged in gifted education research.[1] We acknowledge that some scholars in gifted education have already connected their work into other ability areas and domains, such as research into specific talent areas like sports, performing arts, and games like chess and Scrabble (Subotnik et al., 2019), and more broadly, the field of expertise research (see *Journal of Expertise*: https://www.journalofexpertise.org/) crosses multiple boundaries and should be better integrated with the field of gifted education (e.g., Hambrick, Macnamara, Campitelli, Ullen, & Mosing, 2016). However, we encourage more gifted education scholars to work in collaboration with other disciplines that share similar interests. The American Educational Research Association (AERA) Michael Pyryt Collaboration Award is given every other year to encourage such collaborations, and perhaps more ways of incentivizing collaborations could be useful.

For example, many prominent social science findings have originated using undergraduate convenience samples. Henrich and colleagues (2010) argued that by using samples from WEIRD (Western, Educated, Industrialized, Rich, and Democratic) societies, finding universal laws of human behavior is very difficult to do. IJzerman and colleagues (2021) recently extended this argument to emphasize the importance of the world for the improvement of psychological science. An additional aspect

to consider is that undergraduate pools at highly selective universities – students who possess and are partly selected for very high *developed* cognitive and other aptitudes – are often the samples used to conduct research on new, and sometimes groundbreaking ideas and findings.

SAT (Frey & Detterman, 2004) and American College Test (ACT) scores (Koenig, Frey, & Detterman, 2008) have been shown to measure mathematical and verbal specific aptitudes as well as general reasoning. This suggests that colleges and universities with average SAT or ACT scores that fall within the top 1% or even 5% are essentially conducting research on a segment of gifted or high aptitude students. Of course, this is a segment of the gifted population that has math and verbal reasoning strengths, high conscientiousness, motivation to achieve, and likely other aspects such as parental support and resources.

Wai (2013) illustrated that schools with average SAT (M + V) scores of 1400 or higher have student bodies, on average, that are roughly in the top 1% of aptitude scores. Wai, Brown, and Chabris (2018) Supplementary A provides a list of U.S. schools from *U.S. News & World Report* in 2014 (America's Best Colleges, 2015) ordered by average SAT or ACT scores where ACT scores were translated to equivalent SAT scores for comparison purposes. Table 1 of Wai and Rindermann (2017) shows the set of 34 schools with average SAT scores 1400 or greater (top 1%), extending to the 98 schools with average SAT scores 1300 or greater to capture a broader gifted population. SAT scores of 1200 or greater would include schools like Purdue University-West Lafayette, University of Tennessee, Baylor University, and others, expanding the list of schools to 208 total. If we include research with selective student populations attending the United States Service Academies, Honors Colleges within state university systems, and even graduate programs such as medical, engineering, and other highly skilled professions that require GMAT, GRE, and other standardized test scores in the top 1–5% for admission, this number grows substantially. The point here is not to define a set of schools that strictly define the gifted

Table 1. PhD institution frequency of editorial board members of Gifted Child Quarterly.

PhD Institution	Frequency
University of Connecticut	14
University of Virginia	10
Purdue University	7
University of Georgia	3
University of Iowa	3
Baylor University	3
Indiana University, Bloomington	3
University of Louisville	2
University of California, Berkeley	2
Stanford University	2
University of Texas, Austin	2

population, but rather to illustrate that there are a large number of schools that use gifted student populations in research across numerous areas of social science.

Future work focused on conducting a systematic review of this literature across numerous fields could broaden what we know about gifted populations, and perhaps even provide insight about how to help gifted students not just in the adult years (e.g., Rinn & Bishop, 2015) but also in K-12. Findings on gifted populations are much broader than what is published in traditional gifted education journals. Prominent researchers in other social science fields have actually been conducting gifted student research for decades because they have relied on populations from highly selective institutions or programs. The students at these selective schools largely have aptitude and achievement scores in the top percentiles suggesting that many findings across social science on these populations, including findings from the field of cognitive abilities research broadly (e.g., Wai & Worrell, 2021) in addition to the broader literature on individual differences (e.g., Revelle, Wilt, & Condon, 2011), may provide important insights into knowledge about gifted individuals and gifted education.

What if the field is less intellectually diverse than we think it is?

Intellectual diversity can come from people with different socioeconomic backgrounds, ethnicities, cultures, and many other aspects (e.g., Duarte et al., 2015). However, when diversity of all kinds is limited, ideas and innovation is often limited. Because doctoral training is highly influential in one's initial if not eventual research program trajectory, the set of advisors one is trained by has a disproportionate influence on one's ideas and career trajectory, given that typically one must position one's ideas within the galaxy of one's mentors and their colleagues (Angus, Atalay, Newton, & Ubilava, 2020; De Los Reyes, 2020). Harvard president Charles Eliot (1908, p. 90) articulated this conflict of interest over a century ago by noting that:

> It is natural, but not wise, for a college or university to recruit its faculties chiefly from its own graduates – natural, because these graduates are well known to the selecting authorities, since they have been under observation for years; unwise, because [it] has grave dangers for a university.

Other scholars have noted that there is a broader issue when personal relationships are highly intertwined, of which hiring one's own graduates is but one form (Gorelova & Yudkevich, 2015; Rocca, 2007; Godechot & Louvet, 2008). For example, we tend to hire and want to talk with those individuals who share our cultural and intellectual values and are similar to us (e.g., Rivera, 2012).

To examine the extent to which the gifted education field is intellectually diverse, one could look at a list of authors frequently published in the major gifted education journals, those who hold leadership positions in the gifted education organizations, and individuals serving on editorial advisory boards in the field. The first author looked up all of the individuals on the editorial board of *GCQ* in September of 2020, and where each of these people had earned their doctorate, which is an important period of intellectual socialization. What can be seen in Table 1 are all those institutions with at least two graduates on the *GCQ* editorial board at the time of data collection. The three universities who have the largest number of graduates are the University of Connecticut, the University of Virginia, and Purdue University. Perhaps this is understandable given that there are only so many doctoral granting institutions with programs focused on gifted education. At the same time, this also means that certain networks of individuals can come to dominate any given field, and there should at least be some awareness around seeking to diversify the field as much as possible by hiring individuals who study gifted education but from different subfields, universities, geographic locations, and other dimensions (Ambrose et al., 2010). At the present time there may not be easy ways to rapidly change the tight social networks and overlapping collaborations and ideas within the gifted field, and ultimately these tight clusters may even lead to better collaboration and focus due to the building of these longstanding relationships. However, intellectual diversity is a struggle for all academic subfields, and the gifted education subfield should seek to find ways to ensure diversity of all kinds are encouraged and accepted, whether through deliberate hiring practices or seeking editorial board members and association leaders from diverse backgrounds. In particular, all the institutions on the list in Table 1 are from the U.S. but most gifted students are not in the U.S. nor are U.S. gifted education concerns necessarily the most important by any means.

What if the evidence supporting the efficacy of gifted programming is not as strong as we think it is?

Callahan (1996, p. 159) argued that "Failing to document the impact of [gifted education] services has long been a major shortcoming of our field … we have avoided the collection of systematic data that would provide the uncontested arguments regarding success of our programs." More recently, Plucker and Callahan (2014, p. 393) state: "the lack of causal research leaves the field with considerable ambiguity about effective practices" (also see Matthews, Peters, & Housand, 2012; Plucker & Callahan, 2020). In the last few decades, there has been much more systematic research around the different types of educational interventions

typically used to address the learning needs of the gifted (Wai, Lubinski, Benbow, & Steiger, 2010), including acceleration (e.g., Assouline, Colangelo, VanTassel-Baska, & Lupkowski-Shoplik, 2015; McClarty, 2014; Park, Lubinski, & Benbow, 2013; Rogers, 2015), grouping (e.g., Kulik & Kulik, 1992; Steenbergen-Hu, Makel, & Olszewski-Kublius, 2016), and enrichment (e.g., Kim, 2016; Rogers, 2007; Vaughn, Feldhusen, & Asher, 1991; for a review of educational interventions on behalf of the gifted, see Wai & Benbow, 2021).

Despite these advances within the gifted education field itself, a revolution has already occurred outside the field of education in regard to the statistical research design and associated tools now used to evaluate programs and interventions (Schlotter, Schwerdt, & Woessman, 2011). These tools have largely come from the fields of economics, educational program evaluation, and education policy whose researchers are very much focused on forward causal inference (Bailey, Duncan, Cunha, Foorman, & Yeager, 2020; Singer, 2019; Wai & Bailey, 2021), or using careful, often econometric methods, to determine whether an education program *causes* academic growth or later educational outcomes rather than *selection bias* (e.g., Abdulkadiroglu, Angrist, & Pathak, 2014; Dale & Kreuger, 2011; Dobbie & Fryer, 2014) such as initial student aptitudes to begin with. Most of the research in the field of gifted education is quasi-experimental at best, thus there remain continued challenges within gifted program evaluation research to determine causes of later outcomes (e.g., Bui, Craig, & Imberman, 2012; Card & Giuliano, 2014; Peters & Matthews, 2016), as much of the research within gifted education remains largely *associational* (Gelman, 2009) even though we often talk about effects or impacts as if gifted programs have caused various outcomes.

Some researchers who initiated the focus on forward causal inference in educational evaluation research (i.e., Singer, 2019) have stressed that the educational evaluation and policy research community today has shifted toward using methods focused on causal inference almost exclusively, which has narrowed, rather than broadened the questions asked and method perspectives from which one comes from and considers good evidence. The differences in the methods used by economists and gifted education scholars may help explain why economists have entered the field of gifted education with their tools but have largely ignored our large base of research findings (Wai & Bailey, 2021; Wai & Benbow, 2021). Basically, like any academic discipline, economists favor their own tools, and economics is largely a tool discipline (Akerlof, 2020).

Though it would benefit the gifted education field to design more studies with causal inference in mind, with randomized controlled trials (RCTs) being the most rigorous way to determine causes in the context of program

evaluation research, it should be noted that many rigorous large-scale educational RCTs are not very informative (Lortie-Forgues & Inglis, 2019; Sims, Anders, Inglis, & Lortie-Forgues, 2020) and not always ethically possible in education practice. Plucker and Callahan (2020, p. 17) assert that "if we lack gold-standard research, that doesn't mean we lack evidence. In fact, there is a great deal of intervention research regarding the effectiveness of programs for advanced learners." Additionally, if a child is ready to move ahead through educational acceleration because they have already mastered the curriculum up to a certain point, one does not really need an RCT to know this is probably logical for the child to advance at their own individualized pace. For example, a 3rd grade student who tests at the reading level of a 7th grader is ready to read and should be provided books at the 7th grade level. This content acceleration can be considered a form of gifted education. And ultimately, what matters most may be that each student gets the appropriate *educational dosage* (Wai et al., 2010) – or the right mix of stimulating educational opportunities that are around and available to them – rather than any single specific intervention. It's important that in the gifted education field we seek to truly document the positive impact (or lack of impact, or even negative impact) of services as Callahan (1996) suggested using methods that already are widely used in program evaluation research and are considered best practices today. The assumption that any kind of gifted education services is better than none is not necessarily reasonable for all cases, may differ depending upon the specific context, and often requires rigorous program evaluation evidence. Perhaps most importantly, we can't as a field just assume we know what works for all populations of gifted learners or that our gifted programs are as useful as we think. A recent example may help illustrate this point. Redding and Grissom (2021) published a paper in *Educational Evaluation & Policy Analysis* using an economics of education method approach and found little to no impact of gifted programming. Although this was just one study, it was on a large population representative sample, appeared in a policy influential journal, and also was given education specific media attention from *The Hechinger Report* (Barshay, 2021) with a headline stating "Gifted programs provide little to no academic boost, new study says" and further discussion completely ignoring the evidence from the gifted education field illustrating that talented students need programming to challenge them, just like all students. Perhaps more importantly, the study used test score growth as the outcome measure, which was certainly limited in fully capturing the efficacy of programming considering some program models may have involved enrichment or non-core content curriculum. The dataset used provided a way to examine average effects across the U.S. but did not provide information about specific program services. In fact, a policy report published on the state of Arkansas using similarly rigorous methods with test

scores as outcomes showed that gifted programming is associated with quite high test score growth in the state (Tran, Wai, & McKenzie, 2021). Thus, even though most findings are context or locale specific and depend greatly on the population studied, the specific intervention, and the types of outcomes studied, much more research from the gifted education field is needed using similarly rigorous methods and using similar outcomes such as test scores, which are common in education policy research and evaluation given their widespread availability in secondary datasets. This may help the field address the increasingly common lines of criticism among those who seek to eliminate programs or gifted identification altogether (Place NYC G&T Working Group, 2021; Plucker & Callahan, 2020; Student Diversity Advisory Group, 2019).

Additionally, instead of focusing on RCTs or forward causal inference as important to educational policy or system improvement, scholars – largely from education policy – have advocated for what are known as research practice partnerships (RPPs) where researchers and practitioners in schools work together to ask questions and answer them using data that can directly inform questions of practice (Conaway, 2020; Tseng, 2012). Bryk, (2015) in his 2014 AERA distinguished lecture introduced a somewhat similar idea with networked improvement communities (NICs) which "combine analytic thinking and systematic methods to develop and test changes that can achieve better outcomes more reliably . . . The point is not just to know what can make things better or worse; it is to develop the know how necessary to actually make things better" (p. 467).These may be more ecologically valid approaches to actually improving things for kids in schools, education, or otherwise.

What if gifted learners may actually be okay even if they are not fully challenged?

A core assumption shared by many in gifted education is that gifted students are not being sufficiently challenged to fully develop their talent (e.g., Assouline et al., 2015; Subotnik et al., 2011). In full disclosure, we absolutely agree based on what we consider solid evidence that gifted students, especially those from marginalized and underrepresented minority backgrounds, are not being sufficiently challenged (Wai & Worrell, 2016, 2021), and that talent development of *all* students, including gifted students, can be improved greatly. This core assumption about gifted learners from the gifted community is *not* shared by the majority of the broader education community, and this tension resurfaces from time to time in various debates in education. For example, in an *Education Next* article (a publication that many U.S. education policymakers and researchers read and are influenced by) titled "Serving the math whiz kids" (Baron, 2019), Harvard University

education professor Jon Star commented: "We're obligated to do a good job for both" [referring to both students performing below standard and to whiz kids] but also that "high-achieving kids are going to succeed even if they're not challenged enough." In response, Plucker comments in the same article: "the data don't bear out the notion that bright kids will take care of themselves . . . the goal should be that every student continues to grow." Plucker's view (which is also our own) has been shared by the gifted field well before even Stanley's (2000) famous line that our goal in education should be "helping students learn only what they don't already know."

And yet, outside of the gifted education community, this perspective of helping *all* kids, *including* gifted learners, improve is not often a shared goal. We would hypothesize this is largely in part because helping gifted students is likely to increase rather than narrow inequality in educational and life outcomes – the idea of the Matthew Effect in education – when you increase the mean of a distribution you often also increase the variance in the outcome distribution (Borland, 1996; Ceci & Papierno, 2005). We believe – based on our synthesis of the evidence (e.g., Wai & Worrell, 2016, 2021) – that we should help all gifted students, especially those from historically marginalized and low-income backgrounds, because this can help narrow excellence gaps (Plucker & Peters, 2016; Wai & Lakin, 2020) and improve the opportunity to learn for so many students who are not getting that full experience. At the same time, however, it's worthwhile to explore the evidence that might actually *support* the idea that bright kids may still succeed in some ways even if not challenged enough, because understanding where an argument is not well supported often requires understanding what evidence actually supports it to begin with.

If one is willing to consider that developed specific and general cognitive aptitudes (e.g., Carroll, 1993; Lohman, 1993, 2005; Snow, 1996) are an important component of a measurable definition of giftedness (e.g., Lubinski, 2004; Thompson & Oehlert, 2010), then there is a large body of research that that can provide some insights into whether gifted students do end up reasonably okay, at least relative to their less talented peers. Damian and colleagues (2014) examined a nationally representative sample of U.S. students to determine whether cognitive aptitudes or personality traits could compensate for background disadvantage. They also investigated whether personality traits might be able to compensate for lower levels of aptitude. Though both aptitudes and personality traits were important in predicting educational and occupational outcomes, it was cognitive aptitude level (and not so much personality) that was fundamental to helping students from disadvantaged and low-income backgrounds catch up with their more advantaged and higher-income peers. Personality, at least as measured in the study, also could not compensate for lower levels of aptitude. This doesn't necessarily mean that talented but poor kids will be

just fine on their own, because in many cases students won't even have the opportunity to develop their giftedness (Hair, Hanson, Wolfe, & Pollak, 2015), but it does mean that their higher developed aptitudes can help them catch up in school if they are provided adequate academic challenge.

Gifted or high aptitude kids also tend to end up as healthy adults in midlife relative to their less gifted peers. Specifically, higher developed cognitive aptitudes in youth were linked with better physical health at age 50 and a lower risk for many chronic health conditions (Wraw, Deary, Gale, & Der, 2015). Gifted learners, on average, also end up being psychologically well-adjusted (e.g., Bernstein, Lubinski, & Benbow, 2020; Brown, Wai, & Chabris, 2021; Kroesbergen, van Hooijdonk, Van Viersen, Middel-Lalleman, & Reijnders, 2015; Lubinski, Benbow, & Kell, 2014). And perhaps most importantly, more high aptitude students who have *had their talents well developed* tend to have higher educational and occupational success (e.g., the Study of Mathematically Precocious Youth, [SMPY]; Lubinski & Benbow, 2020; Makel, Kell, Lubinski, Putallaz, & Benbow, 2016). Even within four independent cohorts of a random sample of students in the top 1% of cognitive aptitude (Project Talent) and a nonrandom sample of the top 1% (SMPY), the proportion of those earning bachelor's, master's, and doctorate degrees when followed up two decades later was nearly identical (Wai, 2014). Though many in the SMPY sample were deliberately selected for extraordinary talent, specifically on math and verbal reasoning measures, the top 1% of the Project Talent sample were not, thus it appears that even if the SMPY sample had greater educational and cognitive supports, as some have hypothesized (e.g., Ericsson, 2014), it did not change higher education outcomes relative to the random sample base rate.

Again, it is crucial to reiterate that this does not mean that gifted students don't face problems or challenges (Moon, 2009). They do, just like all other students. And sometimes, being more able can lead to unique challenges. But, overall, having higher developed aptitudes is typically not a negative (e.g., Brown et al., 2021). Therefore, though we in the gifted community know that talented students could benefit from educational or other intellectually stimulating opportunities (e.g., Assouline et al., 2015; Plucker & Peters, 2016; Stanley, 2000; Subotnik et al., 2011; Wai et al., 2010), the broader U.S. educational community still remains focused on relative standing or rank order on the ladder of opportunity and success (Borland, 1996; Ceci & Papierno, 2005; for broader concerns about inequality and possible solutions, see; Blanchard & Rodrik, 2021). Outcome inequalities between the gifted and other students suggests that relative to students with lower developed aptitudes, students with higher developed aptitudes most certainly have a head start in life, which is why the term gifted was likely used to begin with, at least in part. This is also why the development of character and care for the common good, among many other aspects, can be

important to teach gifted students (Wai & Lovett, 2021). To be clear, we believe that the evidence base definitely supports the importance of developing the talents of students, especially from disadvantaged and historically marginalized backgrounds who continue to face numerous structural inequities (Wai & Worrell, 2021). In many cases, children who are born into circumstances without sufficient opportunities may not even develop to be gifted (e.g., Hair et al., 2015).

Continuing to ask field strengthening questions, especially from a multidisciplinary lens

The questions explored here were meant as somewhat of a provocation, but with positive intent, to hopefully help the field strengthen itself. A core goal was to help all of us, (re)think a bit more about the field of gifted education research as an outsider and in more heterodox ways, as someone who doesn't necessarily share the same set of disciplinary blinders but who is interested in understanding what the research – from numerous fields – tells us about the gifted. There are many other possible questions that consider how fields outside of education might be useful to view education through a different lens, and so the purpose here was to provide some examples of assumptions of the field that might be worth revisiting. Other field strengthening questions might surround whether we as a field are actually impacting education policy as much as we think, or how much of our literature is based on non-population representative samples which can limit the strength and generalizability of our findings. In the former case, the central education policy debates in the U.S. really do not involve gifted education, and this has been true throughout much of the history of education reform (e.g., Education Next, 2020; Tyack & Cuban, 1995). For the latter case, an example of how population representative samples are important for understanding the gifted was illustrated through the question: "What if gifted learners may actually be okay even if they are not fully challenged?"

So, what can we as a field focused on gifted education do to ask more antidisciplinary or heterodox questions to advance both the frontiers of knowledge and help gifted children? As the first question illustrates, the field of gifted education research can be fruitfully advanced if we think about established literatures *outside* of the field that have simply not yet been integrated. As the second question illustrates, examining the extent to which there is a large overlap among scholars who are influential in gifted education research can help us think about ways to improve our intellectual diversity from *outside* traditional networks that have become established in the field. As the third question illustrates, we can seek to integrate into our field the methodological tools *outside* of it and revisit what good evidence means to different parties such as education policy

researchers or policymakers. And as the fourth question illustrates, focusing solely on nonrandom samples of gifted students rather than population representative samples *outside* our field doesn't provide the broader picture. Thus, we should seek to ask and answer questions and explore ideas and established findings from *other* disciplines, and we should fruitfully try to make gifted education a more interdisciplinary or multidisciplinary field by learning from other disciplines. To be fair, this is a struggle for *all* academic disciplines, especially because the incentive structure of academia prioritizes those who are narrow rather than broad in their approach to discovering new knowledge (Lyall, 2019). An antidisciplinary approach (Ito, 2014, 2017) might explicitly seek to find the spaces that are *outside* traditional disciplines, and deliberately ask questions, develop new approaches and tools, and work in those spaces to advance knowledge. At one time, the MIT media lab sought faculty

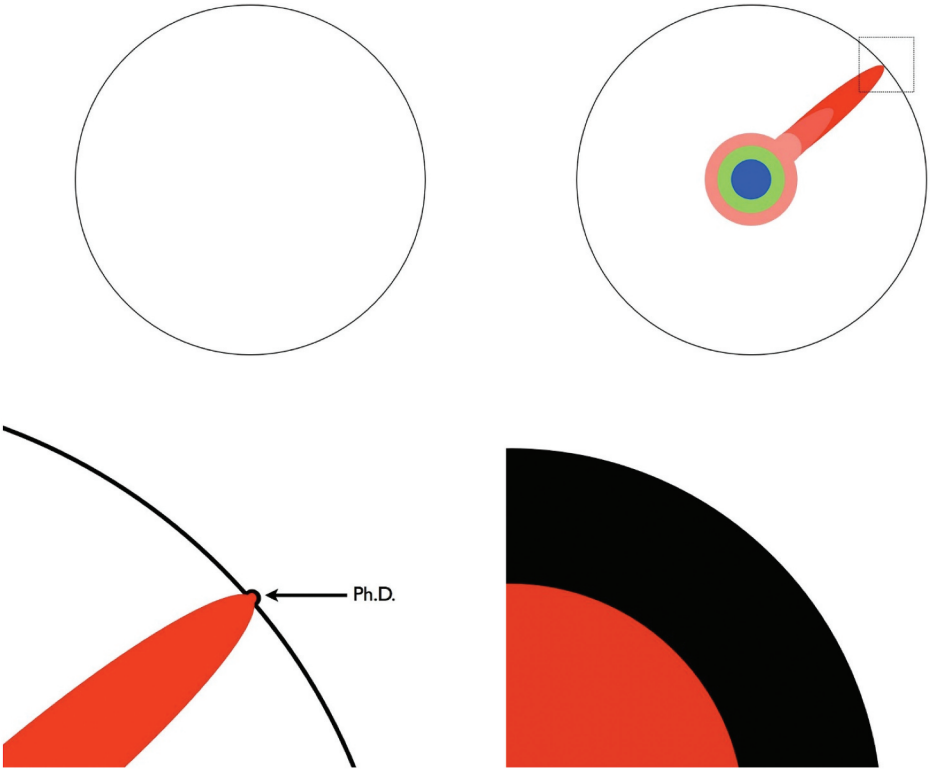

Figure 1. Adapted from Matt Might's (2010) "The illustrated guide to the PhD." Upper left panel represents a circle that contains all human knowledge. Upper right panel shows the learning and research path needed to make it to the boundary of knowledge in a specific discipline. Lower left panel shows the dent in knowledge that can be considered a Ph.D. (or really any individual research paper). Lower right panel shows a zoomed in version of how someone who has done a specific piece of research (or any academic subfield) sees the world now that they are an expert.

candidates under the banner of "Professor of Other," who "had to be proficient in at least two orthogonal fields, and that what they wanted to do couldn't fit in any existing discipline" (Ito, 2017, p. 23).

This idea of truly seeking multidisciplinary perspectives is conveyed quite clearly by Might (2010) in "The illustrated guide to a Ph.D." In this picture book approach, he asks us to first imagine a circle that contains all of human knowledge.

He explains that a Ph.D. – what we would conceptualize as one peer reviewed research paper – is just a tiny dent in advancing knowledge at the boundary of the circle in one domain (assuming the finding is replicable and stands the test of time). Most insightful and applicable to thinking about multidisciplinary perspectives broadly is the lower right panel in Figure 1, which shows that any given expert (or really any given academic field) largely sees the world from their perspective, which is a set of tiny dents in a particular place on the circle of knowledge. This might be considered *intellectual point of first contact*, or the idea that because we are experts in gifted education, we will use our disciplinary lens and our history to see most everything else.

A critic of this article might disagree with everything that has been written here, and we think that's fine. We would simply encourage that critic to marshal the largest body of evidence and logical argumentation to the table when explaining why and where they disagree. In the spirit of Gallagher (2000), Coleman (1996), Callahan (1996), Ambrose et al. (2010), Borland (1996) and many other scholars who have helped us rethink so much of gifted education (Subotnik et al., 2011), let us encourage the thinkers who keep trying to tell us what we don't necessarily want to hear (Packer, 2020). As Hamming (2020) explains: "Ask yourself regularly, "Why do I believe whatever I do?" (p. 340). Especially in the areas where you are so sure you know, the area of the paradigms of your field.

Note

1. The developed cognitive aptitudes a student brings to a specific situation at a given time are important to *learning* in school, but these aptitudes are also important *products* of schooling (Lohman, 1993, 2005; Ritchie & Tucker-Drob, 2018; Snow, 1996). In this paper we start from the well-established structure of cognitive abilities (Carroll, 1993) and specifically the Radex configuration (Lubinski, 2004) which draws from general reasoning along with the specific aptitudes of mathematical, verbal, and spatial. Schmidt (2017, p. 32) noted the importance of "omitted relevant research in the credibility of research" and argued that the "failure to acknowledge well-established findings on specific abilities" in addition to general reasoning was one of the largest omitted aspects across all of the social sciences. This is also an omitted aspect in gifted education research. We view high cognitive aptitudes or achievements

as one indicator of giftedness (e.g., following Subotnik et al., 2011), with full recognition that there are many other much broader conceptualizations of what being gifted means. From a measurement perspective, it makes sense that the developed aptitudes from the Radex configuration should at least be considered an important aspect of a measurable definition of giftedness. Cognitive aptitudes then, as measured by standardized tests, provides an important bridge that connects gifted education research to numerous other disciplines across the social sciences.

Disclosure statement

The research reported here was in part supported by the Institute of Education Sciences, U.S. Department of Education, through grant R305A210428 to Jonathan Wai at the University of Arkansas. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education, London, UK.

ORCID

Jonathan Wai http://orcid.org/0000-0002-7686-1312
Keri M. Guilbault http://orcid.org/0000-0002-9563-633X

References

Abdulkadiroglu, A., Angrist, J., & Pathak, P. (2014). The elite illusion: Achievement effects at Boston and New York exam schools. *Econometrica*, *82*(1), 137–196.

Akerlof, G. A. (2020). Sins of omission and the practice of economics. *Journal of Economic Literature*, *58*(2), 405–418.

Ambrose, D., Van Tassel-Baska, J., Coleman, L. J., & Cross, T. L. (2010). Unified, insular, firmly policed, or fractured, porous, contested, gifted education? *Journal for the Education of the Gifted*, *33*(4), 453–478.

America's Best Colleges. (2015).Retrieved August 4, 2022, from Available online: http://colleges.usnews.rankingsandreviews.com/best-colleges

Angus, S. D., Atalay, K., Newton, J., & Ubilava, D. (2020). Geographic diversity in economic publishing. *SSRN*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3697906

Assouline, S. G., Colangelo, N., VanTassel-Baska, J., & Lupkowski-Shoplik, A. (2015). *A nation empowered: Evidence trumps excuses holding back America's brightest students*. Iowa City, IA: Belin Blank Center for Gifted Education and Talent Development. University of Iowa.

Bailey, D. H., Duncan, G. J., Cunha, F., Foorman, B. R., & Yeager, D. S. (2020). Persistence and fade out of educational intervention effects: Mechanisms and potential solutions. *Psychological Science in the Public Interest*. Retrieved August 4, 2022, from: https://www.researchgate.net/publication/339956602_Persistence_and_Fadeout_of_Educational_Intervention_Effects_Mechanisms_and_Potential_Solutions

Baron, K. (2019). Serving the math whiz kids. *Education Next*, *19*: 4 https://www.educationnext.org/serving-math-whiz-kids-private-enrichment-programs-step-up-meet-need/

Barshay, J. (2021). Gifted programs provide little to no academic boost, new study says. *The Hechinger Report*. Retrieved August 4, 2022, from https://hechingerreport.org/proof-points-gifted-programs-provide-little-to-no-academic-boost-new-study-says/

Bernstein, B. O., Lubinski, D., & Benbow, C. P. (2020). Academic acceleration in gifted youth and fruitless concerns regarding psychological well-being: A 35-year longitudinal study. *Journal of Educational Psychology*. doi:10.1037/edu0000500

Bhattacharya, J., & Packalen, M. (2020). Stagnation and scientific incentives. *NBER Working Paper 26752*. Retrieved August 4, 2022, from http://www.nber.org/papers/w26752

Blanchard, O., & Rodrik, D. (Eds.). (2021). *Combating inequality*. Cambridge, MA: The MIT Press.

Borland, J. H. (1996). Gifted education and the threat of irrelevance. *Journal for the Education of the Gifted*, *19*(2), 129–147.

Brown, M. I., Wai, J., & Chabris, C. F. (2021). Can you ever be too smart for your own good? Comparing linear and nonlinear effects of cognitive ability on life outcomes. *Perspectives on Psychological Science*, *16*(6), 1337–1359.

Bryk, A. S. ((2015). 2014). AERA distinguished lecture: Accelerating how we learn to improve. *Educational Researcher*, *44*(9), 467–477.

Bui, S. A., Craig, S., & Imberman, S. A. (2012). Is gifted education a bright idea? Assessing the impact of gifted and talented programs on students. *American Economic Journal: Economic Policy*, *6*(3), 30–62.

Callahan, C. M. (1996). A critical self-study of gifted education: Healthy practice, necessary evil, or sedition? *Journal for the Education of the Gifted*, *19*(2), 148–163.

Card, D., & Giuliano, L. (2014). Does gifted education work? For which students? *NBER Working Paper No. 20453*. Retrieved August 4, 2022, from https://www.nber.org/papers/w20453

Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies*. Cambridge, UK: Cambridge University Press.

Casadevall, A., Fang, F. C., & Morrison, R. P. (2014). Specialized science. *Infection and Immunity*, *82*, 1355–1360.

Ceci, S. J., & Papierno, P. B. (2005). The rhetoric and reality of gap closing: When the "have-nots" gain but the "haves" gain even more. *American Psychologist*, *60*(2), 149–160.

Coleman, L. J., & Coleman, L. J. (1996). Notes from the editor's desk: Critical appraisals of gifted education. *Journal for the Education of the Gifted*, *19*, 127–128.

Conaway, C. (2020). Maximizing research use in the world we actually live in: Relationships, organizations, and interpretation. *Education Finance and Policy*, *15*(1), 1–10.

Dale, S., & Krueger, A. B. (2011). Estimating the return to college selectivity over the career using administrative earnings data. *NBER Working Paper No. 17159*. Retrieved August 4, 2022, from https://www.nber.org/papers/w17159

Damian, R. I., Su, R., Shanahan, M., Trautwein, U., & Roberts, B. W. (2014). Can personality traits and intelligence compensate for background disadvantage? Predicting status attainment in adulthood. *Journal of Personality and Social Psychology*, *109*(3), 473–489.

De Los Reyes, A. (2020). *The early career researcher's toolbox: Insights into mentors, peer review, and landing a faculty job*. College Park, MD: The Center for Reinforcing Early Academic Training and Enhancement (CREATE).

Dobbie, W., & Fryer, R. G., Jr. (2014). The impact of attending a school with high-achieving peers: Evidence from the New York City Exam Schools. *American Economic Journal. Applied Economics*, *6*(3), 58–75.

Duarte, J. L., Crawford, J. T., Stern, C., Haidt, J., Jussim, L., & Tetlock, P. E. (2015). Political diversity will improve social psychological science. *Behavioral and Brain Sciences*, *38*, e130.

Dunnette, M. D. (1966). Fads, fashions, and folderol in psychology. *American Psychologist*, *21*(4), 343–352.

Education Next (2020). Results from the 2020 Education Next poll. Retrieved August 4, 2022, from https://www.educationnext.org/2020-ednext-poll-interactive/

Eliot, C. W. (1908). *University administration*. Boston, MA: Houghton Mifflin.

Ericsson, K. A. (2014). Why expert performance is special and cannot be extrapolated from studies of performance in the general population: A response to criticisms. *Intelligence*, *45*, 81–103.

Frey, M. C., & Detterman, D. K. (2004). Scholastic assessment or g? The relationship between the Scholastic Assessment Test and general cognitive ability. *Psychological Science*, *15*, 373–378.

Gallagher, J. J. (2000). Unthinkable thoughts: Education of gifted students. *Gifted Child Quarterly*, *44*, 5–12.

Gelman, A. (2009). Describing descriptive studies using descriptive language, or the practical virtues of statistical humility. Retrieved August 4, 2022, from *Statistical modeling, causal inference, and social science*: https://statmodeling.stat.columbia.edu/2009/03/02/describing_desc/

Godechot, O., & Louvet, A. (2010). Academic inbreeding: An evaluation. *Laviedesidees.fr*. Retrieved August 4, 2022, from https://booksandideas.net/Academic-Inbreeding-An-Evaluation.html

Gorelova, O., & Yudkevich, M. (2015). *Academic inbreeding and mobility in higher education*. M. Yudkevich, P. G. Altbach, & L. E. Rumbley Eds., (pp. 17–44). London, UK: Palgrave Macmillan.

Hair, N. L., Hanson, J. L., Wolfe, B. L., & Pollak, S. D. (2015). Association of child poverty, brain development, and academic achievement. *JAMA Pediatrics*, *169*(9), 822–829.

Hambrick, D. Z., Macnamara, B. N., Campitelli, G., Ullen, F., & Mosing, M. A. (2016). Beyond born versus made: A new look at expertise. *Psychology of Learning and Motivation*, *64*, 1–55.

Hamming, R. W. (2020). *The art of doing science and engineering: Learning to learn*. San Francisco, CA: Stripe Press.

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*, 61–83.

IJzerman, H., Dutra, N., Silan, M., Adetula, A., Basnight Brown, D. M., & Forscher, P. (2021). Psychological science needs the entire globe, Part 1. *Association for Psychological Science Observer*. Retrieved August 4, 2022, from https://www.psychologicalscience.org/observer/global-psych-science

Ito, J. (2014). Antidisciplinary. Retrieved August 4, 2022, from https://joi.ito.com/weblog/2014/10/02/antidisciplinar.html

Ito, J. (2017). The antidisciplinary approach. *Research-Technology Management*, *60*(6), 22–28.

Kelley, T. L. (1927). *Interpretation of educational measurements*. Chicago, IL: World Book Company.

Kim, M. (2016). A meta-analysis of the effects of enrichment programs on gifted students. *Gifted Child Quarterly*, *60*(2), 102–116.

Koenig, K. A., Frey, M. C., & Detterman, D. K. (2008). ACT and general cognitive ability. *Intelligence*, *36*(2), 153–160.

Kroesbergen, E. H., van Hooijdonk, M., Van Viersen, S., Middel-Lalleman, M. M. N., & Reijnders, J. J. W. (2015). The psychological well being of early identified gifted children. *Gifted Child Quarterly*, *60*(1), 16–30.

Kulik, J. A., & Kulik, C. C. (1992). Meta-analytic findings on grouping programs. *Gifted Child Quarterly*, *36*, 73077.

Lewis, N. A., Jr., & Wai, J. (2021). Communicating what we know, and what isn't so: Science communication in psychology. *Perspectives on Psychological Science*. doi:10.1177/1745691620964062

Lohman, D. F. (1993). Teaching and testing to develop fluid abilities. *Educational Researcher*, *22*(7), 12–23.

Lohman, D. F. (2005). *Identifying academically talented minority students*. The National Research Center on the Gifted and Talented. Retrieved August 4, 2022, from https://files.eric.ed.gov/fulltext/ED505376.pdf

Lortie-Forgues, H., & Inglis, M. (2019). Rigorous large-scale educational RCTs are often uninformative: Should we be concerned? *Educational Researcher*, *48*(3), 158–166.

Lubinski, D. (2004). Introduction to the special section on cognitive abilities: 100 years after Spearman's (1904) "General intelligence,' objectively determined and measured. *Journal of Personality and Social Psychology*, *86*(1), 96–111.

Lubinski, D., & Benbow, C. P. (2020). Intellectual precocity: What have we learned since Terman? *Gifted Child Quarterly*. 10.1177/0016986220925447

Lubinski, D., Benbow, C. P., & Kell, H. J. (2014). Life paths and accomplishments of mathematically precocious males and females four decades later. *Psychological Science*, *25*(12), 2217–2232.

Lyall, C. (2019). *Being an interdisciplinary academic: How institutions shape university careers*. London, UK: Palgrave Macmillan.

Makel, M. C., Kell, H. J., Lubinski, D., Putallaz, M., & Benbow, C. P. (2016). When lightning strikes twice: Profoundly gifted, profoundly accomplished. *Psychological Science*, *27*(7), 1004–1018.

Makel, M. C., & Wai, J. (2016). Does economic research in education work? For which studies? *Journal of Advanced Academics*, *27*(2), 73–80.

Matthews, M. S., Peters, S., & Housand, A. (2012). Regression discontinuity design in gifted and talented education research. *Gifted Child Quarterly*, *56*(2), 105–112.

McClarty, K. L. (2014). Life in the fast lane: Effects of early grade acceleration on high school and college outcomes. *Gifted Child Quarterly*, *59*(1), 3–13.

Might, M. (2010). *The illustrated guide to the Ph.D*. Retrieved August 4, 2022, from https://matt.might.net/articles/phd-school-in-pictures/

Moon, S. M. (2009). Myth 15: High-ability students don't face problems and challenges. *Gifted Child Quarterly*, *53*(4), 274–276.

Packer, G. (2020). The enemies of writing. *The Atlantic*. Retrieved August 4, 2022, from https://www.theatlantic.com/ideas/archive/2020/01/packer-hitchens/605365/

Park, G., Lubinski, D., & Benbow, C. P. (2013). When less is more: Effects of grade skipping on adult STEM productivity among mathematically precocious adolescents. *Journal of Educational Psychology*, *105*(1), 176–198.

Peters, S. J., & Matthews, M. S. Eds. 2016, Special issue: Gifted education research in the field of economics. *Journal of advanced academics*, Vol. 27: 63–161. https://journals.sagepub.com/toc/joa/27/2

Place NYC G&T Working Group (2021). Expanding gifted & talented: Immediate action towards an idea future. *Place NYC report*. Retrieved August 4, 2022, from https://placenyc.org/wp-content/uploads/2021/11/PLACE-NYC-Expanding-GT-11-2021_FINAL.pdf

Plucker, J. A., & Callahan, C. M. (2014). Research on giftedness and gifted education: Status of the field and considerations for the future. *Exceptional Children*, *80*(4), 390–406.

Plucker, J. A., & Callahan, C. M. (2020). The evidence base for advanced learning programs. *Phi Delta Kappan*, *102*(4), 14–21.

Plucker, J. A., & Peters, S. J. (2016). *Excellence gaps in education: Expanding opportunities for talented students*. Cambridge, MA: Harvard Education Press.

Redding, C., & Grissom, J. A. (2021). Do students in gifted programs perform better? Linking gifted program participation to achievement and nonachievement outcomes. *Educational Evaluation and Policy Analysis*, *43*(3), 520–544.

Revelle, W., Wilt, J., & Condon, D. M. (2011). Individual differences and differential psychology: A brief history and prospect. In T. Chamorro-Premuzic, S. von Stumm, & A. Furnham (Eds.), *The Wiley-Blackwell handbook of personality and individual differences* (pp. 3–38). Hoboken, NJ: Wiley Blackwell. 10.1002/9781444343120.ch1

Rinn, A. N., & Bishop, J. (2015). Gifted adults: A systematic review and analysis of the literature. *Gifted Child Quarterly*, *59*(4), 213–235.

Ritchie, S. J., & Tucker-Drob, E. M. (2018). How much does education improve intelligence? A meta-analysis. *Psychological Science*, *29*(8), 1358–1369.

Rivera, L. A. (2012). Hiring as cultural matching: The case of elite professional service firms. *American Sociological Review*, *77*(6), 999–1022.

Rocca, F. X. (2007). In Spain, inbreeding threatens academia. *The Chronicle of Higher Education*, *53*(22), 31. Retrieved August 4, 2022, from https://www.chronicle.com/article/in-spain-inbreeding-threatens-academe/

Rogers, K. B. (2007). Lessons learned about educating the gifted and talented: A synthesis of the research on educational practice. *Gifted Child Quarterly*, *51*(4), 382–396.

Rogers, K. B. (2015). The academic, socialization, and psychological effects of acceleration: Research synthesis. In S. G. Assouline, N. Colangelo, J. VanTassel-Baska, & A. E. Lupkowski-Shoplik (Eds.), *A nation empowered: Evidence trumps the excuses holding back America's brightest students* (Vol. II, pp. 19–42). Iowa City, IA: The Belin-Blank Center for Gifted Education and Talent Education.

Rosvall, M., & Bergstrom, C. T. (2008). Maps of random walks on complex networks reveal community structure. *Proceedings of the National Academy of Sciences*, *105*(4), 1118–1123.

Schlotter, M., Schwerdt, G., & Woessman, L. (2011). Econometric methods for causal evaluation of education policies and practices: A non-technical guide. *Education Economics*, *19*(2), 109–137.

Schmidt, F. L. (2017). Beyond questionable research methods: The role of omitted relevant research in the credibility of research. *Archives of Scientific Psychology*, *5*(1), 32–41.

Sims, S., Anders, J., Inglis, M., & Lortie-Forgues, H. (2020). Quantifying 'promising trials' bias in randomized controlled trials in education. University College London, Centre for Education Policy and Equalising Opportunities (CEPEO), Working Paper No. 20-16.

Singer, J. D. (2019). Reshaping the arc of quantitative educational research: It's time to broaden our paradigm. *Journal of Research on Educational Effectiveness*, *12*(4), 570–593.

Snow, R. E. (1996). Aptitude development and education. *Psychology, Public Policy, and Law*, *2*(3–4), 536–560.

Stanley, J. C. (2000). Helping students learn only what they don't already know. *Psychology, Public Policy, and Law*, *6*(1), 216–222.

Steenbergen-Hu, S., Makel, M. C., & Olszewski-Kublius, P. (2016). What one hundred years of research says about the effects of ability grouping and acceleration on K-12 students' academic achievement: Findings of two second-order meta-analyses. *Review of Educational Research*, *86*(4), 849–899.

Student Diversity Advisory Group. (2019). *Making the grade II: New programs for better schools*. Author.

Subotnik, R. F., Olszewski-Kubilius, P., & Worrell, F. C. (2011). Rethinking giftedness and gifted education: A proposed direction forward based on psychological science. *Psychological Science in the Public Interest*, *12*(1), 3–54.

Subotnik, R. F., Olszewski-Kubilius, P., & Worrell, F. C. (2019). *The psychology of high performance: Developing human potential into domain-specific talent*. Washington, DC: American Psychological Association.

Thompson, L. A., & Oehlert, J. (2010). The etiology of giftedness. *Learning and Individual Differences*, *20*(4), 298–307.

Tran, B., Wai, J., & McKenzie, S. C. (2021). Gifted education in Arkansas: A longitudinal study of gifted status and academic growth. *Office for Education Policy, University of Arkansas, Arkansas Education Report*, *18*(9), 1–46.

Tseng, V. (2012). The uses of research in policy and practice. *Social Policy Report*, *26*(2), 1–23.

Tyack, D., & Cuban, L. (1995). *Tinkering toward utopia: A century of public school reform*. Cambridge, MA: Harvard University Press.

Vaughn, V. L., Feldhusen, J. F., & Asher, J. W. (1991). Meta-analyses and review of research on pull out programs in gifted education. *Gifted Child Quaterly*, *35*(2), 92–98. https://journals.sagepub.com/doi/abs/10.1177/001698629103500208?journalCode=gcqb

Wai, J. (2013). Investigating America's elite: Cognitive ability, education, and sex differences. *Intelligence*, *41*, 203–211.

Wai, J. (2014). Experts are born, then made. Combining prospective and retrospective longitudinal data shows that cognitive ability matters. *Intelligence*, *45*, 74–80.

Wai, J., & Bailey, D. (2021). How intelligence research can inform education and public policy. In A. K. Barbey, S. Karama, & R. J. Haier (Eds.), *The Cambridge Handbook of Intelligence and Cognitive Neuroscience* (pp. 434–447). Cambridge, UK: Cambridge University Press. doi:10.1017/9781108635462.028

Wai, J., & Benbow, C. P. (2021). Educational interventions on behalf of the gifted: Do they have lasting links with development? In J. Van Tassel-Baska (Ed.), *Talent development in gifted education: Theory, research, and practice* (pp. 115–130). England, UK: Routledge.

Wai, J., Brown, M. I., & Chabris, C. F. (2018). Using standardized test scores to include general cognitive ability in education research and policy. *Journal of Intelligence*, *6*(3), 37.

Wai, J., & Lakin, J. M. (2020). Finding the missing Einsteins: Expanding the breath of cognitive and noncognitive measures used in academic services. *Contemporary Educational Psychology*, *63*, 101920. doi:10.1016/j.cedpsych.2020.101920

Wai, J., & Lovett, B. J. (2021). Improving gifted talent development can help solve multiple consequential real-world problems. *Journal of Intelligence*, *9*(2), 31.

Wai, J., Lubinski, D., Benbow, C. P., & Steiger, J. H. (2010). Accomplishment in science, technology, engineering, and mathematics (STEM) and its relation to STEM educational dose: A 25-year longitudinal study. *Journal of Educational Psychology*, *102*(4), 860–871.

Wai, J., & Rindermann, H. (2017). What goes into high educational and occupational achievement? Education, brains, hard work, networks, and other factors. *High Ability Studies*, *28*(1), 127–145. doi:10.1080/13598139.2017.1302874

Wai, J., & Worrell, F. C. (2016). Helping disadvantaged and spatially talented students fulfill their potential: Related and neglected national resources. *Policy Insights from the Behavioral and Brain Sciences*, *3*(1), 122–128.

Wai, J., & Worrell, F. C. (2021). The future of intelligence research and gifted education. *Intelligence*, *87*, 101546.

Wraw, C., Deary, I. J., Gale, C. R., & Der, G. (2015). Intelligence in youth and health at age 50. *Intelligence*, *53*, 23–32.