Professional Development in Gifted Education: A Systematic Literature Review

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Abstract: This systematic literature review explored the importance of professional development (PD) for educators working with gifted students. Findings highlighted the need for PD to improve teacher knowledge, skills, efficacy, and student outcomes, especially considering the heterogeneously grouped classrooms, unique student needs, and lack of pre-service gifted education training for most teachers. The review identified key themes including PD evaluation, teacher perceptions, and pedagogical practices. The findings suggested that effective PD programs should (a) enhance knowledge and classroom practice, (b) be evidence-based, (c) consider both teacher and student outcomes, (d) be of sustained duration, and (e) include collaborative activities with ongoing mentoring support. Equally important was school leadership support such as the development of policies and allocation of resources (e.g., time). Recommendations include PD focused on the use of project/problem-based learning, quality differentiation, and consideration of the context in which the PD is delivered. Overall, this literature review underscores the importance of ongoing PD for educators working with gifted students and the need for additional empirical research focused on changing teacher practices and impact on student outcomes.

Keywords: gifted education, professional development, professional learning, teacher attitudes, differentiation, teacher efficacy

Introduction

Professional development (PD) or professional learning (PL)[1] leads to educators' extension of knowledge and skills, achievement of personal career goals, gaining of professional accreditation, and fulfillment of additional professional responsibilities (e.g. Bragg et al., 2021; Krill, 2020) with the underlying expectation that PD leads to improved student outcomes (e.g. Darling-Hammond et al., 2017). As such, millions of PD hours are undertaken annually by educators and school leaders (Peters & Jolly, 2018).

Calls for teachers to participate in gifted education PD to address gifted students' needs appear throughout gifted education standards, literature (e.g., Gubbins & Hayden, 2020), grant funding requirements, and educational policy. For example, Standard 6 in the (U.S.) National Association for Gifted Children (NAGC)/Council for Exceptional Children (CEC) *Teacher Preparation Standards in Gifted Education* (2013), the (U.S.) *PreK-12 Gifted Programming Standards* (2019) and the New South Wales (Australia) High Potential and Gifted Education Policy (2019) explicitly addresses PL as an essential component for continued professional growth for educators working with gifted and talented students. The NAGC also published a three volume book series devoted to PL and teacher preparation in gifted education, which offered methods and strategies across special populations and content areas (see Novak & Webster, 2018). The U.S. Department of Education Jacob K. Javits Gifted and Talented Students Education grant program also often includes projects with PL elements.

Policy and legislation also support teachers and administrators to pursue additional PD. For example, the 2015 U.S. Every Students Succeeds Act Title II PD funds are spent for the benefit of all students, including gifted students. In Australia, whilst there are a diverse range and level of implementation of policies and practices implemented at state level, the New South Wales High Potential and Gifted Education 2021 policy statement 1.6 uniquely states that school leaders and teachers must engage with PL "to enhance planning and implementation of quality learning opportunities for high potential and gifted students" (p. 3). Therefore, there is a shared understanding that PL is important and needed for educators working with gifted students; what is unknown, however, is the corpus of research addressing PL in gifted education.

The Need for Gifted Education PL

All students have the fundamental right to access teachers with developed knowledge and skills to adequately support their learning needs. These needs include gifted students, students with learning disabilities, English language learners (ELL), or a combination of these needs (OECD, 2012). Additionally, the United Nations Goal 4 of the 'Sustainable Development Goals', as adopted by the Australian Government, aims to ensure that inclusive and equitable, quality lifelong education is available for all students (Department of

[1] The literature references professional development (PD) and professional learning (PL) which are often used interchangeably (Viac & Fraser, 2020). PD and PL are used in this paper to reflect the terminology from the original document or study (see Richter et al., 2011 for greater discussion regarding PL). Current literature reflects PL as the more commonly used term.

Education, 2020). Gifted students spend most of the school day, if not the entire day, in heterogeneously grouped classrooms representing a wide range of student abilities or readiness levels (Rinn et al., 2022). Differentiated instruction has become the default instructional approach to addressing learning needs of all students, including gifted learners (Yuen et al., 2018). The concept of differentiated instruction to address the learning and affective needs of gifted and talented students is not a new one. Ward (1952, 1961a, 1961b, 1983) conceptualized "differential education" as a holistic approach to develop the advanced abilities of students. Ward's written description of differentiation is a dense and complex tome when compared to the version practiced in schools. Tomlinson (1995, 1999), a primary figure in differentiated instruction, translated the tenets of Ward's work with the needs of all learners in mind and her approach is now frequently used in schools and school systems worldwide, including Australia (NSW Dept of Education, 2024; Schools VIC, 2023). She describes differentiation as adapting instruction to meet a student's needs, which are determined by student's readiness level, so that adjustments can be made to the content, product, process, and/or environment (Tomlinson, 2017).

A paucity of initial teacher education (ITE) programs include content focused on the needs of gifted learners (e.g., Fraser-Seeto, 2014; Peters & Jolly, 2018; Rowan & Townend, 2016; Vreys et al., 2018; Woo et al., 2022), suggesting that teachers leave these programs ill-equipped to meet gifted students' needs. This gap in knowledge and skills necessitates the need for PL related to gifted and talented students. PL is also required to dispel the well-documented and entrenched myths regarding gifted students' abilities and attitudes (e.g., *gifted students don't need help and will do fine on their own*; *gifted students can't have a disability or receive poor grades*); myths that affect teachers' interaction with gifted students (NAGC, n.d.; Wallace et al., 2018).

For educators seeking to be gifted specialists or coordinators of gifted education programs, additional training or university coursework may be required to meet state or national accreditation requirements dependent on country, sector, jurisdiction, or individual school. For example, the NAGC's *2020–2021 State of the States in Gifted Education* report illustrated the variability in requirements across the U.S., ranging from no extra training to a master's degree in gifted education (Rinn et al., 2022).

Definitions, Models, and Outcomes of PD

Multiple definitions of PD are offered in the research literature. For gifted education, NAGC defines PL as "intentional sustained development of professional expertise . . . based on… systematic needs assessment and professional reflection" (NAGC, 2019, p. 16). Several frameworks have been proposed that provide a scaffold for high quality and effective PD. Desimone's (2009) widely acknowledged PD conceptual framework outlines five characteristics: (a) content focus, (b) active learning, (c) coherence, (d) sustained duration of 20 hours or more of contact time, and (e) collective participation (see also Desimone & Stuckey, 2014). Additionally, Darling-Hammond et al. (2017) suggested seven characteristics of high-quality PD: (a) focused on specific content, (b) used active learning based in adult learning theory, (c) were collaborative and context specific, (d) based on models of best-practice, (e) offered support from facilitators or coaches, (f) provided opportunities for reflection, and (g) sustained over a period of time. In a review of 28 studies of PD programs, Kennedy (2016) suggested that effective PD should be intellectually engaging, meaningful to the teacher, and offer "real learning vs 'noise'" (p. 975), which reflected elements of Desimone (2009) and Darling-Hammond et al.'s (2017) recommendations.

Notably, Kennedy's review (2016) found that more nuanced or tailored applications of high-quality PD characteristics evidenced better outcomes. For example, a sole focus on content knowledge was shown to be less effective on student learning. PD interactions or activities were more effective if they were inquiry-based. Program intensity or the length of the PD was found to be less effective when the PD was prescriptive, whereas strategy-based PD was more effective. Finally, coaches who interactively planned and modelled with teachers was more valued by participants. Coaches who delivered PD and only evaluated teaching was considered less effective.

While common characteristics can be identified, outcomes of PD are inconsistent (Darling-Hammond et al., 2017; Peters & Jolly, 2018). Pre-packaged PD produced by institutions or publishing companies were often used in large studies, but failed to be effective in increasing student achievement, whereas PD originating from schools or similar contexts was more effective (Kennedy, 2019). Evidence supporting any lasting changes to teacher practice and the impact of PD on student outcomes is weak, particularly when analyzed over time and at scale (Kennedy, 2016, 2019). These outcomes may be due to the PD format, the measure of student achievement used by researchers, the quality of delivery by the person conducting the PD, fidelity of implementation, and research design (e.g., a lack of control or comparison groups) (Bragg et al., 2021; Gore et al., 2020; Kennedy, 2019; Plucker & Callahan, 2014). Additional factors to consider are the diverse reasons and motivations for educators undertaking PD, varying settings in formality, foci, and format (e.g., spanning from one-time PD sessions to learning communities that transpire across a year). PL providers include university researchers, school personnel, and private consultants with a range of knowledge, experience, expertise, and effectiveness (Desimone, 2009; Meissel et al., 2016).

Despite these contradictory findings, PD remains the most practical and viable way to improve educators' knowledge and skills, change their attitudes and behaviors, and impact student achievement (Gore et al., 2020; Sims & Fletcher-Wood, 2021). In addition, gifted education remains committed to PL for those educators who work with gifted students (Cotabish & Robinson, 2012; NAGC, 2013; Peters & Jolly, 2018; Rowan & Townend, 2016; Watters, 2013).

Purpose of the Current Study

Professional learning remains critical in the development of educators (Kennedy, 2016; Tualaulelei & Halse, 2021) and numerous reviews have been conducted on the various countenances, qualities, and foci of PL (Kennedy, 2016; Greenhow et al., 2020; Ohrt et al., 2020). The role of PL is reinforced by the gifted education community as a necessary mechanism to meet the academic and affective needs of gifted students (Azano et al., 2020; Mun et al., 2021; Novak & Webster, 2018), but little attention has been given to a systematic review of the gifted education PL literature. This puts the field at a significant deficit in understanding PL conducted in gifted education. Using systematic literature review (Page et al., 2021), this study synthesized and analyzed the research on professional learning/development conducted in gifted education to: (a) understand the characteristics and quality of studies on professional development in gifted education; (b) identify gaps in the literature; and (c) suggest future areas of study.

Method

Search Strategy and Selection Process

A systematic review of research was conducted using Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA; Moher et al., 2009; Page et al., 2021) to provide guidance around best practice as a process for analysis. First, a search of key online databases was conducted to identify peer-reviewed articles (dissertations, master's thesis, and other non-peer-reviewed literature were eliminated). Databases included ProQuest Education and Social Science, PsychInfo, Web of Science, Arts, and Humanities, Conference Proceedings, and Citation Index Databases. Searches were conducted between March 2000 to March 2022, using the search terms gifted; talented; high ability; advanced learners; creativity; differentiation; teacher training; professional learning; professional development; in-service; and/or curriculum. Delimiters included empirical articles published in peer-reviewed English language journals, within the publication years 2000–2022. During the search period, gifted education journals were also individually searched. These included *Gifted Child Quarterly*, *Roeper Review*, *Australasian Journal of Gifted Education*, *Gifted Education International*, *Journal for the Education of the Gifted*, *Gifted and Talented International*, and *High Ability Studies*, and used the search terms differentiation, teacher training, creativity, professional learning, professional development, in-service, and/or curriculum (see Table 1 for search strategy). A total of 42 articles were assessed for eligibility (see Figure 1).

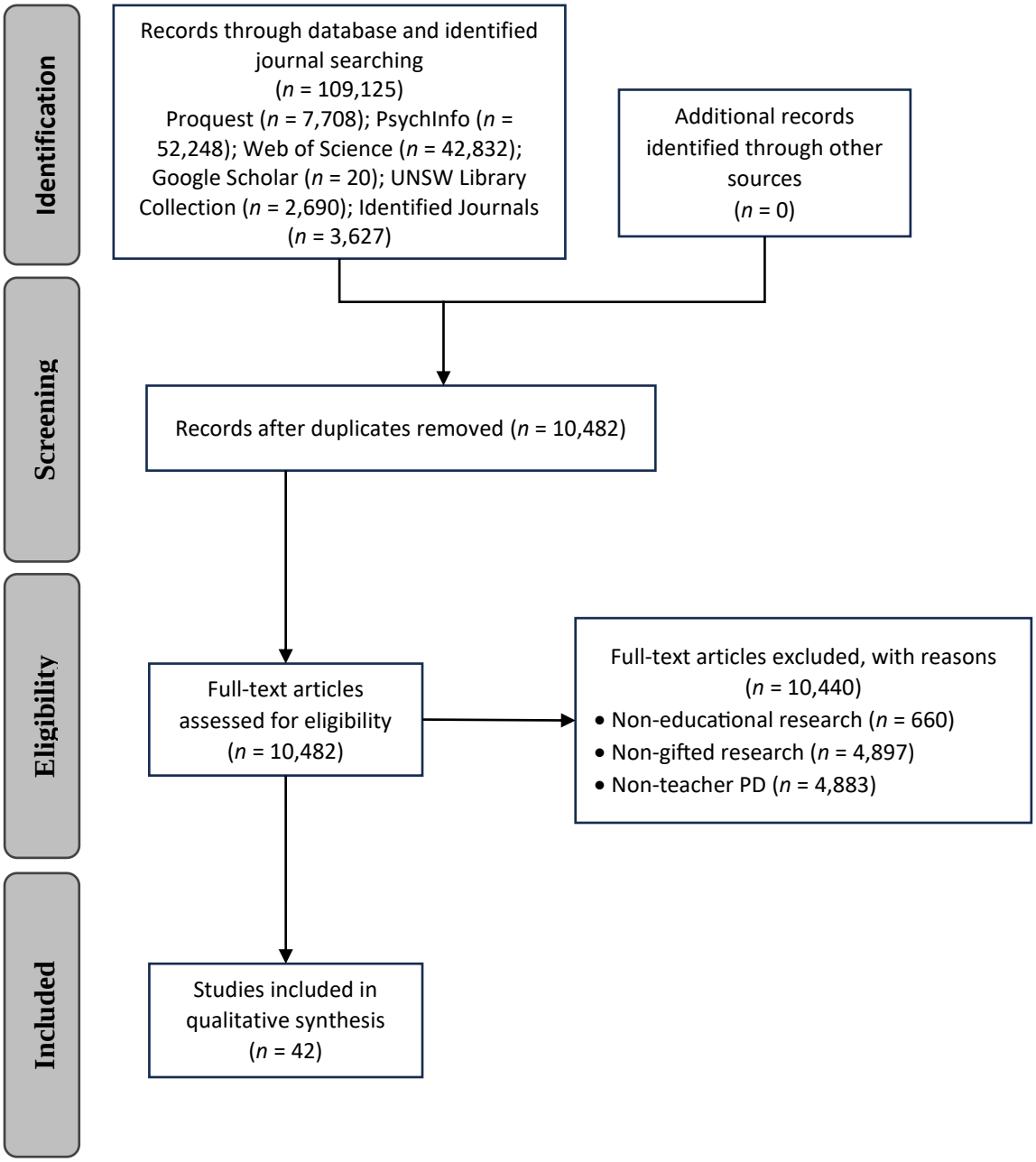

Figure 1 Selection Process for Articles

Database/Journal	Syntax	Number of Articles
Proquest Education and Social Science Databases	noft(gifted) OR noft(talented) OR noft(high-ability) OR noft(potential) OR noft(advanced learners) OR noft(creativity) AND noft(differentiation) OR noft(teacher training) OR noft(professional learning) OR noft(professional development) OR noft(in-service) OR noft(curriculum)	7,708
PsychInfo	noft(gifted) OR noft(talented) OR noft(high ability) OR noft(potential) OR noft(advanced learners) OR noft(creativity) AND noft(differentiation) OR noft(teacher training) OR noft(professional learning) OR noft(professional development)	52,248
Web of Science Social Sciences, Arts & Humanities, Conference Proceedings Citation Index databases	TS= (gifted* OR talented* OR high-ability* OR potential* OR advanced learners* OR creativity* AND differentiation* OR teacher training* OR professional learning* OR professional development* OR in-service* OR curriculum*)	42,832
Google scholar	(gifted) OR (talented) OR (high-ability) OR (potential) OR (advanced learners) OR (creativity) AND (differentiation) OR (teacher training) OR (professional learning) OR (professional development) OR (in-service) OR (curriculum)	20
UNSW Library Collection	effectiveness of professional development AND gifted	2690
Australasian Journal of Gifted Education	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	37
Gifted & Talented International	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	204
Gifted Child Quarterly	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	322
Gifted Child Today	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	1028
Gifted Education International	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	604
High Ability Studies	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	27
Journal for the Education of the Gifted	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	340
Journal of Advanced Academics	differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum	419
Roeper Review	(differentiation OR teacher training OR professional learning OR professional development OR in-service OR curriculum)	646

Table 1: ***Search Strategy Syntax***

Data Analysis

Key characteristics were collected from each article including authors, year of publication, name of journal, study participants, and methodological approach. Quality of research was determined using an adapted version of the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018). The MMAT was developed to determine the quality of empirical studies for quantitative, qualitative, and mixed methods studies (Hong et al., 2018). Rigor was classified into 4 categories; 4 = very poor (met 20% of MMAT quality criteria); 3 = below average (met 40% of MMAT quality criteria); 2 = average (met 60% of MMAT quality criteria); 1 = excellent (met 80% or above of MMAT quality criteria). The MMAT recommends that two reviewers be used to appraise each study as subjective judgement is required. As such, the first two authors independently read and scored each of the 42 manuscripts (Hong et al., 2018). Where reviewers differed in their scores, they discussed their scoring decisions until agreement was reached with an interrater reliability of .93.

A thematic analysis of the literature was then undertaken (Braun & Clarke, 2006). The first two authors independently read each article noting initial ideas and developed them into codes, which were then reviewed by the research team. The codes were then developed into potential themes and sub-themes. Potential themes and sub-themes were reviewed in relation to the initial codes and continued to be refined. In this step, the data were reviewed in relation to appropriateness to the theme and sub-themes. Where more than one potential theme in the article was noted, the dominant theme was used for analysis. The identified articles fell into three broad thematic areas that included (a) PD evaluation, (b) teacher perceptions, and (c) pedagogical practices. Findings of this systematic review are presented followed by a discussion of the themes and sub-themes.

Results

Descriptive Findings

Research authored (first author used) in the United States (n =15, 35%) and Australia (n = 12, 30%) indicated authors from the U.S. and Australia considerably outweighed the studies conducted in other contexts. Fifteen studies (35%) were conducted in European countries, Israel, or Hong Kong. PL study participants included K–12 teachers (*n* = 15; 39%), primary school teachers only (*n* = 10; 24%), secondary school teachers (*n* = 5; 12%), and mixed groups of participants including school leaders, gifted specialists, and other school personnel (*n* = 27; 64%). Methodological approaches encompassed 17 quantitative studies (40%), 16 qualitative studies (38%), and nine mixed methods studies (22%). MMAT scores represented a range of article quality classifications including 38%–excellent, 24%–average, 26%–below average, and 14%–very poor (see Table 2). Between 2000 and 2016, there were approximately 1.4 articles published each year with a noticeable increase in 2017, and a high of 6 articles in 2020.

No	Author(s)	Year of Publication	Journal	Country of Study	MMAT Score	Study Participants	Methodology	Theme
1.	Beck & Beasley	2021	*Education & Information Technologies*	US	3	K-12 teachers *N* = 92	Qualitative	3
2.	Benny & Blonder	2016	*Education Research International*	IL	3	Middle and high school chemistry teachers *N* = 14	Qualitative	1
3.	Brigandi et al.	2019	*Journal for the Education of the Gifted*	US	1	Elementary classroom teacher *N* = 1	Qualitative	1
4.	Cannaday & Courdruff	2017	*Gifted & Talented International*	US	2	K–12 teachers *N* = 93	Mixed	2
5.	Cotabish & Robinson	2012	*Gifted Child Quarterly*	US	1	Gifted program administrators *N* = 200 experiment group (*n* = 100) control group (*n* = 100)	Quantitative	3
6.	Dixon et al.	2014	*Journal for the Education of the Gifted*	US	1	Primary and secondary teachers *N* = 41 primary teachers (*n* = 18) middle school teachers (*n* = 13) high school teachers (*n* = 10)	Quantitative	2
7.	Edinger	2017	*Gifted Child Quarterly*	US	1	Elementary and secondary teachers *N* = 231	Quantitative	1
8.	Edinger	2020	*Gifted Child Quarterly*	US	1	Primary and high school teachers *N* = 184	Quantitative	1
9.	Forster	2006	*Australasian Journal of Gifted Education*	AU	3	Primary and secondary teachers No *N* provided	Qualitative	1

No	Author(s)	Year of Publication	Journal	Country of Study	MMAT Score	Study Participants	Methodology	Theme
10.	Forster	2010	*Australasian Journal of Gifted Education*	AU	3	Secondary teachers No *N* provided	Qualitative	1
11.	Fraser-Seeto et al.	2015	*Australasian Journal of Gifted Education*	AU	3	Primary teachers *N* = 96	Quantitative	1
12.	Geake & Gross	2008	*Gifted Child Quarterly*	UK	1	Primary, middle, and high school teachers *N* = 377	Quantitative	2
13.	Godor	2021	*The Teacher Educator*	NL	3	High school teachers *N* = 32	Quantitative	1
14.	Goodnough	2001	*Gifted & Talented International*	CA	1	Primary, middle, high school teacher pre-service, and in-service teachers *N* = 28	Qualitative	2
15.	Jen & Hoogeveen	2022	*Evaluation & Program Planning*	NL	4	International scholars (*n* = 22) Education professionals (*n* = 30) *N* = 52	Mixed	2
16.	Kokkinos & Gakis	2021	*Journal of Further & Higher Education*	GR	2	Pre-service teachers *N* = 144 *N* = 15	Mixed	3
17.	Kronborg & Plunkett	2013	*Australasian Journal of Gifted Education*	AU	4	Secondary teachers (*n* = 13) Principal (*n* = 1) and Deputy principal (*n* = 2)	Mixed	2
18.	Lassig	2015	*Australasian Journal of Gifted Education*	AU	2	Primary teachers *N* = 126	Quantitative	2
19.	Leavitt & Geake	2009	*Gifted & Talented International*	LT	3	Primary teachers *N* = 93	Qualitative	2

No	Author(s)	Year of Publication	Journal	Country of Study	MMAT Score	Study Participants	Methodology	Theme
20.	Lee & Ritchotte	2019	*Journal for the Education of the Gifted*	US	1	PK-12 Teachers *N* = 11 teachers (n = *7*) administrators (n = *4*)	Qualitative	1
21.	Levenson & Gal	2013	*International Journal of Science & Mathematics Education*	IL	2	*N* = 16 Primary teachers *n* = 8 Secondary teachers *n* = 8	Mixed	2
22.	Lewis & Milton	2005	*Australasian Journal of Gifted Education*	AU	3	Primary teachers *N* = 12	Quantitative	2
23.	McCoach & Siegle	2007	*Gifted Child Quarterly*	US	1	PK–12 teachers *N* = 262	Quantitative	2
24.	Mellroth et al.	2021	*Mathematics Teacher Education & Development*	SE	3	High school teachers *N* = 8	Qualitative	3
25.	Miller	2009	*Journal for the Education of the Gifted*	US	2	Primary teachers *N* = 60	Quantitative	2
26.	Morrissey & Grant	2017	*Australasian Journal of Gifted Education*	AU	4	Early childhood and primary teachers *N* = 66	Mixed	1
27.	Mun et al.	2021	*Gifted Child Quarterly*	US	2	Elementary, middle, and high school teachers, and gifted facilitators *N* = 61	Qualitative	3
28.	Peters & Jolly	2018	*Australian Education Researcher*	AU	1	K–12 teachers *N* = 279	Quantitative	3
29.	Phillipson	2004	*Australasian Journal of Gifted Education*	HK	4	PK–12 teachers *N* = 31	Quantitative	1

No	Author(s)	Year of Publication	Journal	Country of Study	MMAT Score	Study Participants	Methodology	Theme
30.	Sahin	2021	*International Journal of Progressive Education*	Global	4	Meta-analysis of 31 articles	Qualitative	2
31.	Sharp et al.	2020	*International Journal of Inclusive Education*	AU	1	Secondary teachers *N* = 22	Qualitative	3
32.	Siegle & Powell	2004	*Gifted Child Quarterly*	US	1	*N* = 92 Teachers (*n* = 59) Gifted Specialists (*n* = 34)	Quantitative	2
33.	Spoon et al.	2020	*Journal for the Education of the Gifted*	US	1	PK-12 teachers *N* =15	Qualitative	1
34.	Swanson et al.	2020	*Roeper Review*	US	1	Primary teachers *N* = 56	Quantitative	2
35.	Valiandes & Neophytou	2018	*Teacher Development*	GR	2	Primary teachers *N* = 14	Qualitative	3
36.	VanTassel-Baska et al.	2008	*Gifted Child Quarterly*	US	2	Primary teachers *N* = 71	Quantitative	3
37.	Vialle et al.	2003	*Australasian Journal of Gifted Education*	AU	3	Secondary teachers *N* = 9	Qualitative	1
38.	Vidergor & Eilam	2011	*Gifted & Talented International*	IL	3	K-12 Teachers *N* = 147	Mixed	1
39.	Vreys et al.	2017	*High Ability Studies*	BE	1	Early childhood and primary teachers *N* = 91	Quantitative	1
40.	Watters	2013	*Australasian Journal of Gifted Education*	AU	2	PK–12 teachers *N* = 56	Mixed	3
41.	Wood	2009	*Australasian Journal of Gifted Education*	AU	4	K–12 teachers PL coordinators *N* = 18 schools	Qualitative	1

No	Author(s)	Year of Publication	Journal	Country of Study	MMAT Score	Study Participants	Methodology	Theme
42.	Yuen et al.	2018	*Gifted Education International*	HK	2	Primary teachers curriculum leaders, and panel chairpersons, $N = 190$	Mixed	1

Table 2: ***Characteristics of Identified Articles***

	Frequency
Research	
Authored	
United States	35 (*n* = 15)
Australia	30 (*n* = 12)
Rest of the World	35 (*n* = 15)
Participants	
Primary Teachers	24 (*n* =10)
Secondary	12 (*n* = 5)
Mix Group	64 (*n* = 27)
Methodology	
Quantitative	40 (*n* =17)
Qualitative	38 (*n* = 16)
Mixed Methods	22 (*n* = 9)

Table 3: Descriptive Findings

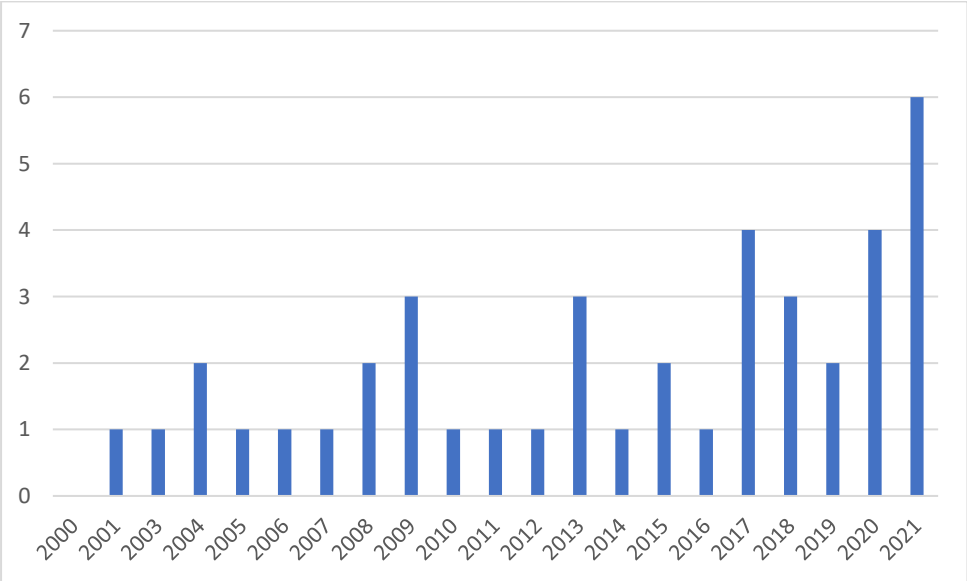

Table 4: **Study Frequency Over Time**

Qualitative Findings

Three themes were identified in the qualitative analysis. These included (a) PD evaluation, (b) teacher perceptions, and (c) pedagogical practices. Each overarching theme was comprised of several subthemes, representing the contrasting research foci.

Theme 1: PD Evaluation

The evaluation of PD programs featured largely in the identified articles and focused on three areas: (a) differentiated instruction, (b) teacher beliefs and knowledge, and (c) subject or problem/project-based learning.

Differentiated Instruction

Differentiated instruction was a key approach to organizing instruction to provide learning adjustments for gifted students across contexts. Professional development design and delivery varied across the studies. For instance, Yuen et al. (2018) provided PD on differentiation in the form of a three-hour lecture followed by five six-hour workshops to primary teachers, whereas Forster's (2006) study used action research as a form of PD with primary and secondary teachers working as a team to apply and reflect on the PD introduced by the embedded researcher who worked in the schools. Brigandi's et al. (2019) PD consisted of two-hour whole-group sessions over six months to 15 elementary and middle school teachers. In relation to PD design, on-site support was reported as a feature of good PD (Brigandi et al., 2019; Forster, 2006), including the student openness and equitable support for differentiation practices in the school context (e.g., Godor, 2021). Although the PD in the studies focused on differentiation, the outcomes differed based on the study's research focus, and types of data collected, which were mostly qualitative even when multiple data sources were used (e.g., Forster, 2010).

Gifted Education Knowledge

The second sub-theme of PD evaluation focused on teachers' beliefs and knowledge regarding gifted students' needs. This feature appeared to be important to all research contexts and teachers primary and secondary school. PD was tailored to the disparate contexts, topics, and participants as determined by the researcher. Overall, the studies reported an increased in participants' knowledge of gifted students' needs after PD. For instance, Belgian teachers who underwent a 12-month PD program reported increased knowledge of gifted education and enhanced abilities in providing appropriate strategies to gifted students (Vreys et al., 2018). Similar positive outcomes were also reported by Morrissey and Grant's (2017) study of Australian early childhood educators who completed three sessions of PD situated within a socio-cultural perspective. PD also led to the increased identification of gifted students (Lee & Ritchotte, 2019) and a change in teaching practices to better meet gifted students' needs (Benny & Blonder, 2016).

Several of the studies also noted how the design of the PD impacted gains in knowledge and skills. For instance, Vidergor and Eilam (2011) discussed how the incorporation of classroom observations and practicums into the PD was key to improving participants' knowledge and abilities (see also Edinger (2017, 2020) for an online design example). A PD design using collectivist culture which takes into consideration the

participants' learning needs and prior knowledge were also important factors in PD design (Phillipson, 2004; Vidergot & Eilam, 2011). Lastly, some studies highlighted how the awareness and accessibility of resources can influence the engagement and effectiveness of PD. For example, Fraser-Seeto et al. (2015) found that despite "teachers' stated willingness to undertake" PD in gifted education, the lack of awareness of PD opportunities was a clear barrier to its utilization (p. 10).

Project/Problem-Based Learning

The final sub-theme focused of PD evaluation was the use of project/problem-based learning (PBL) as the learning model used for PD delivery. The use of PBL as a learning model provided opportunities for deeper understanding of the content knowledge and skills for participants (Mellroth et al., 2021; Vialle, 2003; Wood, 2009). Vialle (2003) designed PD around PBL strategies in her work with nine teachers from Australian selective schools. These teachers then designed interdisciplinary web-based curricula, using features of PBL, for their students. Teachers reported an increased level of knowledge about gifted education and an overall sense of accomplishment and empowerment in their ability to create curricula for their students. Similarly, Wood (2009) also used PBL as the vehicle to help schools develop enrichment programs aligned to needs of each school and their gifted students. The teachers in Wood's (2009) study also reported positive learning outcomes as PBL "proved useful in engaging teachers with their learning, but it was less clear if any deep learning about gifted education occurred" (p. 54). Spoon et al. (2020) used the Design Thinking Model (DTM), a non-linear process for problem solving, which is not often used in gifted education PL. During the PL researchers modeled the different stages of DTM for the teachers, then teachers took the DTM back to their own classroom to address student issues and model the process for their own students. In their evaluation of the PL, teachers felt this approach aided them in creating rigorous and meaningful learning opportunities for their students (Spoon et al., 2020).

Theme 2: Teacher Perceptions

Changing teacher perceptions represented about one-third of the identified literature focused on three areas: (a) teacher practice and self-efficacy, (b) teacher attitudes about gifted students' needs, and (c) teacher perceptions of the utility of gifted education PD.

Teacher Practice and Self-Efficacy

These studies mostly discussed PD as a vehicle to changing teacher beliefs and improving knowledge about gifted education. Positive changes in beliefs and knowledge reported by teachers often led to increased self-efficacy to meet gifted students' needs (e.g., Dixon et al., 2014; Levenson & Gal, 2013). PD addressed teachers' misconceptions about gifted students (e.g., gifted students excel in all subjects) and provided a more expansive vocabulary to discuss giftedness, which "empowered [teachers] to identify gifted children" and to "better meet the needs of gifted students" (Leavitt & Geake, 2009, p. 144).

While PD generally enhanced teacher beliefs and knowledge, Kronborg and Plunkett's (2013) case study of 29 educators in an Australian selective high school, found that years of teaching experience also impacted their beliefs and knowledge. They reported that more experienced educators were more likely to adopt student-centered practices and applied

a greater range of practices, possibly due to enhanced self-efficacy due to an affirmation of their prior knowledge that was acquired through their experiences as teachers (Kronborg & Plunkett, 2013).

The effect of PD of teachers self-reported knowledge and beliefs was mostly positive, but the effect on teachers' classroom practices was less clear as so few studies included observations of practice. For instance, most PD teacher participants in Goodnough's (2001) study reported enhanced beliefs, knowledge, and self-efficacy, but also highlighted that more support was needed (e.g., time) to implement the PD strategies to meet gifted students' needs in their classrooms. Still, Swanson and colleagues (2020) reported improved instructional practices from the study participants as measured by the Classroom Assessment and Scoring System (CLASS) and Classroom Observation Scale-Revised (COS-R) to assess teacher practice.

Teacher Attitudes About Gifted Education and Students

On balance, more studies reported PD as having a positive impact on changing PD participants' attitudes about gifted education and students (e.g., Geake & Gross, 2008; Lassig, 2015). There are, however, a handful of studies that reported limited change in teachers' attitudes after PD participation. For instance, McCoach and Siegle's (2007) and Miller's (2009) studies reported no to limited changes in teachers' attitudes after PD. And in a study of Australian Montessori teachers views of acceleration, participants views regressed following the PD (Lewis & Milton, 2005).

Teacher Perceptions of the Utility of PD

Lastly, while it may be self-evident that positive outcomes from PD would result in participants highlighting the value of gifted education PD, only a few studies explicitly foregrounded this positive feedback. Cannaday and Courdruff's (2017) investigation reported that almost all teacher participants found gifted education PD to be "important for all teachers who work with gifted students" (p. 116). Another example found in Jen and Hoogeveen's (2022) gifted education PD program reported participants were highly satisfied with the usefulness and overall learning of the program. Similarly, these findings are in line with Sahin's (2021) meta-synthesis of teacher training in gifted and talented education, which suggested teachers positively perceived and were eager for gifted education PD, and as teachers proficiency increased so did their abilities in determining and meeting the needs of gifted students.

Theme 3: Pedagogical Practices

The third and final theme focused on educator practice, which offers an understanding of the types of PL used to change practices for teachers working with gifted students in heterogeneously grouped classrooms. These studies examined teachers' knowledge and skills in meeting the intellectual and affective needs of gifted students, and one study focused on school administrators' PL experiences. These studies can be categorized by (a) gifted education practices and (b) differentiated instruction.

Gifted Education Practices

The key goal of PD in these studies was to develop the knowledge and skills of regular education teachers with heterogeneously grouped classrooms. These studies also illustrated how the timeframe for delivering PD can be vastly different; for instance, a sustained period over three years (VanTassel-Baska et al., 2008; Watters, 2013) compared to six-hour hours (Mun et al., 2021). Examples of changed practices include increased use of critical and creative thinking strategies (VanTassel-Baska et al., 2008), more referral of culturally diverse and/or low-income learners to gifted programs and services (Cotabish & Robinson, 2012), and initiating school projects using curriculum differentiation (Watters, 2013).

However, not all PD led to changes in practice. For instance, Peters and Jolly (2018) surveyed educators who had experienced different degrees of experience of gifted education PD and found that the PD did not necessarily lead to better classroom practice, suggesting that their findings may be due to insufficient PD hours for some participants. Studies also noted that while PD can lead to change in pedagogical practices, other factors like school leadership support (Mun et al., 2021), and time for planning and implementation (Watters, 2013) were also needed to support implementation of knowledge and skills gained through PD.

Differentiated Instruction. Several studies used PD to specifically increase teachers' implementation of differentiated instruction for gifted or high ability learners in heterogeneously grouped classrooms. These studies noted a positive shift in knowledge and skills relating to differentiated instruction, leading to the adoption of differentiated approaches to instruction (Beck & Beasley, 2021; Kokkinos & Gakis, 2021; Mellroth et al., 2021; Sharp et al., 2020; Valiandes & Neophytou, 2018). Some studies used sustained dosages of PD, including seven seminars over two school semesters (Valiandes & Neophytou, 2018) and eight professional learning community meetings over eight months (Mellroth et al., 2021). Several studies also concluded that while increased knowledge of differentiation played an important role in teachers adopting differentiated practices in their classrooms, of equal importance was supporting teachers with the implementation of differentiation through sustained coaching and mentoring and having relevant policies, procedures, and resources such as a task analysis guide (see Kokkinos & Gakis, 2021; Sharp et al., 2020).

Discussion

This study synthesized and analyzed the research on professional development conducted in gifted education to: (a) understand the characteristics and quality of studies on professional development in gifted education; (b) identify gaps in the literature; and (c) suggest future areas of study based on the findings from this review.

This systematic literature review revealed a corpus of research that does not reflect the importance and largess of hours devoted to developing educators' knowledge and skills in gifted education. Over a 20-year period, only 42 articles were identified that met the inclusion criteria. Research productivity and quality increased during the last four years under review, which signals a growing interest in this research area and methodological rigor. Most research is conducted in the United States, reflecting a trend found in other literature reviews on gifted education topics (Baccassino & Pinnelli, 2023; Jolly et al., 2024; Jung et al., 2022).

Next, in relation to our descriptive findings, we discuss the impact of PD on (a) teachers' knowledge, attitudes, and self-efficacy, and (b) teaching practices, followed by an outline of key considerations to inform future design of PD for gifted education.

Teacher Knowledge, Attitudes, and Self-Efficacy

Most of the studies reported an increase in participants' knowledge of gifted education, and to a lesser extent meeting gifted students' needs after undergoing PD (e.g., Benny & Blonder, 2016; Lee & Ritchotte, 2019; Morrissey & Grant, 2017; Vreys et al., 2018). Most PD programs were designed to enhance educators' knowledge of gifted education. This enhanced knowledge positively impacted educators' attitudes towards gifted education and students (Bégin & Gagné, 1994; Vreys et al., 2018) and this positive relationship between knowledge and attitudes is reflected in the three identified themes (e.g., Geake & Gross,2008; Lassig, 2015; Siegle & Powell, 2004). Still, several studies reported limited or no change in teacher attitudes (e.g., Lewis & Milton, 2005; Miller, 2009; McCoach & Siegle, 2007). Enhanced knowledge, resulting from PD, was also associated with increased perceived self-efficacy (Morris et al., 2017) and several studies in this review reported educators having increased perceived self-efficacy after participating in PD (e.g., Dixon et. al., 2014; Leavitt & Geake, 2009; Levenson & Gal, 2013).

Teacher Practices

A desired goal of PL is the change of teacher practices to better meet gifted students' needs, which subsequently translates to better student outcomes (Peters & Jolly, 2018). Both positive attitudes and increased perceived self-efficacy are posited to positively influence teacher practices (Missett et al., 2014; Morris et al., 2017). While many of the studies reported positive changes in attitudes and self-efficacy, some did not result in changes to practice following PD. For those studies that reported practice change (e.g., Sharp et al., 2020; Watters, 2013), the authors also found that other enabling factors such as school leadership support, sustained mentorship and support, and relevant policies needed to be in place to drive changes in practice. Therefore, this type of change to better meet gifted students' needs required other support mechanisms in addition to undertaking PL. Still, PL remained a recognized foundational building block in changing practice through improving educators' knowledge and skill (see also Gore et al., 2020; Sims & Fletcher-Wood, 2021).

Considerations for Designing Gifted Education PL Research

The importance of PL design in influencing the quality of PL cannot be overstated. Across the PL literature, oft-cited characteristics of high-quality PL include content focus, collective participation, sustained duration, and coach/mentorship support (e.g., Darling-Hammond et al., 2017; Desimone, 2009; Kennedy, 2016). Gifted education PL with positive outcomes (e.g., enhanced knowledge, change in practice) reviewed in this paper often included these key PD characteristics. For instance, PD provided over a prolonged timeframe led to better practice outcomes in the long-term (VanTassel-Baska et al., 2008; Watters, 2013). By contrast, fewer PD hours can lead to less influence on changing practice (Peters & Jolly, 2018). Therefore, we argue that there is value in designing PL for gifted education around those general characteristics of high-quality PL (Darling-Hammond et al., 2017; Desimone, 2009; Kennedy, 2016). Nevertheless, based on the findings from this review, we highlight three design principles to consider, with the first two often associated with gifted education.

First, PBL activities should be incorporated into PD. PD using a PBL framework has led to positive outcomes in terms of deeper understanding and higher uptake of knowledge and skills (Mellroth et al., 2021; Spoon et al., 2020; Vialle, 2003; Wood, 2009). A greater understanding of giftedness resulted from the deeper learning opportunities afforded by PBL, and PBL's adaptability across differing contexts for teaching and learning. Additionally, incorporating PBL into PD allowed educators to experience PBL from a learner's perspective and subsequently design PBL opportunities for their gifted students.

Second, differentiation is a key instructional strategy in meeting gifted students' needs (NAGC, 2013; NSW Dept. of Ed., 2024). As such, it is unsurprising that many PD programs focused on upskilling teachers' ability to differentiate. While it is important to have PD content focused on differentiation, equally important are opportunities to include practical activities and receive feedback (e.g., working on subject-specific lessons, and applying a range of differentiation strategies in the 'safe, learning' environment) (VanTassel-Baska et al., 2008; Yuen et al., 2018). In other words, the 'how to' differentiate must consist of both theory and practical components, which echoes PD scholars' call for high-quality PD to include active learning (e.g., Desimone, 2009). To further boost a PD program's efficacy, the differentiation content should be "subsumed under a broader goal", such as getting teachers to enhance student participation and engagement (Kennedy, 2016, p. 971).

Finally, PD design must consider the context in which it is delivered. Contexts include the physical location where the PD occurs, cultural sensitivity and the expertise of the teachers. Vidergor and Eilam (2011) reviewed many contexts and suggested that 'in-school' PD, that aligned with the school culture and included collective/collaborative approaches, offered the most supportive translation into enhanced practice. This reminds us that PD does not exist in a vacuum, and we must consider other socio-material-cultural factors to effect practice change, which reflects our earlier discussion of how PD programs that lead to practice change require other enabling factors (e.g., school leadership support).

Gaps in Gifted Education PD Literature

There are several fissures identified in this review. First, many studies do not measure, or report, improved student outcomes, which is in line with Kennedy's (2016, 2019) observations of PD in education generally. Second, there was very little research focused on the long-term impact of PD on classroom practices and/or student learning. Lastly, most studies did not present experimental evidence, which mirrors the literature on PD in general

education (Kennedy, 2016; Plucker & Callahan, 2014). More sophisticated methodological approaches could provide insight into causality and the effectiveness of PD (Gore et al., 2020; Plucker & Callahan, 2014). Overall, studies used self-report instruments, such as surveys and reflective journals, to measure changes in teacher behaviors (e.g., around the implementation of instructional strategies), and beliefs and attitudes used self-report measures, which are subjected to social desirability bias (Rosenman et al., 2011). Nonetheless, some studies did include additional measures to triangulate data, including additional self-report data (e.g., journaling and discussion boards). Only a handful of studies used observations of teaching, and it was found in some cases, teachers self-reported more favorable ratings of their teaching than the observations suggested (Sharp et al., 2020; VanTassel-Baska et al., 2008).

Future Areas of Research

The sporadic nature of the PL literature in gifted education reflects the broader PL literature (Kennedy, 2016; 2019). The fundamental finding is that more research about professional development/learning should be conducted. Gifted education PL was found to be generally positive and improved teachers' knowledge, attitudes, skills, and self-efficacy. Still, there are key areas to consider when designing future studies of PL programs addressing gifted education.

This corpus of literature included many studies focused on evaluation of PL or teachers' perceptions and beliefs. More studies are needed around pedagogical change and student outcomes. The reliance on self-report surveys or journals only provides a one-dimensional view of teacher change, and the link between high quality PL and improved student outcomes remains unsubstantiated. Very few studies included observations of participants' pedagogical practice. Greater incorporation of pre-/post-test data could also contribute a better assessment of the interventions effect (i.e., professional development). Additionally, the inclusion of a comparison group, when appropriate in PD research designs, is needed to increase internal validity.

In line with an educational ecosystem increasingly moving online (i.e., post-COVID), additional studies should examine how different PD delivery channels (e.g., online, hybrid, or face-to-face) impact teachers' knowledge, skills, pedagogy, and ultimately student outcomes. Coupled with the burgeoning use of artificial intelligence, further research should also be undertaken to explore its utility in designing and delivering PD (Tammets & Ley, 2023).

This review underscores that although there is shared understanding that PD for educators working with gifted students is needed, additional areas of research could include policy development or examining policies or legislation that support PD for educators (Jolly & Robins, 2021). Moreover, while some studies reflect the characteristics of quality PD identified by Desmoine (2009) and Darling-Hammond et al. (2017), greater attention could be focused on these elements in the design and development of PD, coupled with subsequent evaluation or research, particularly as to how the PD translates to change in practice.

Limitations

The present study has several limitations. First, this review focused on studies published in peer-reviewed journal articles in English and excluded dissertations, government documents, books, book chapters, and publications by professional organizations. Second, even though the search strategy was thorough, we could have missed studies that should have

included. Third, a comparison across studies was challenging due to the lack of definitions of giftedness and/or definitions or frameworks for PD included in the identified studies. No study offered a definition of both PD and giftedness, with seven of the 42 studies providing a definition of PD (Brigandi et al., 2019; Forester, 2006; Morrissey & Grant, 2017; Spoon et al., 2020; Valinandes & Neophytou, 2018; Watters, 2013; Wood, 2009), and only five provided a definition of giftedness (Dixon et al., 2014; Forester, 2010; Lee & Ritchotte, 2019; Vidergor & Eilam, 2011). Finally, most of the reviewed studies were conducted in Western contexts or English-speaking countries and the findings from this review may have limited relevance to non-Western contexts.

Conclusion

This corpus of literature evidenced a small but growing research area focused on gifted education professional development or professional learning. As gifted education is not included in most ITE programs, PD plays an important role in developing educators' knowledge and pedagogy regarding gifted education. A more sustained and expansive research effort focused on gifted education PD is required to better understand its effectiveness, and more importantly, its impact on gifted students' outcomes.

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* Indicates identified manuscripts included in literature review.

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