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Journal for the Education of the Gifted 2012 35: 103 originally published online 23 March 2012

DOI: 10.1177/0162353212440610

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Journal for the Education of the Gifted
35(2) 103–128

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DOI: 10.1177/0162353212440610

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Abstract

A search of the literature from the past 30 years reveals that there is a dearth of research surrounding effective interventions for intellectually gifted children in the early childhood years. The findings of 11 empirical studies of educational provisions for young gifted children were located and the methodological rigor of the studies examined. Aspects problematic to research with young gifted children are discussed, including issues relating to sample sizes, definitions of giftedness, difficulties in conducting experimental studies, finding appropriate standardized measures for use with gifted children, and measurement of program outcomes. Suggestions are made for strengthening future research in the field of early childhood gifted education.

Keywords

gifted education, early childhood, evidence-based practice, educational interventions

Young gifted children have been described as one of the most underserved groups in education (Barbour & Shaklee, 1998; Chamberlin, Buchanan, & Vercimak, 2007; Jolly & Kettler, 2008; Karnes & Johnson, 1987a; Karnes, Shwedel, & Linnemeyer,

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1982; Koshy & Robinson, 2006; N. M. Robinson, 2000, 2008). While there appears to be consensus that these children can be identified in the early years (N. M. Robinson, 2008; N. M. Robinson, Abbott, Berninger, Busse, & Mukhopadhyay, 1997; Smutny, 1999) and that they need to have access to a curriculum that meets their unique learning characteristics (Maker, 1986; Maker & Schiever, 2005; N. M. Robinson, Reis, Neihart, & Moon, 2002), there has been very little research to date that addresses the types of educational interventions that are most successful with young gifted children (Jolly & Kettler, 2008; N. M. Robinson, 2000, 2008). The research that has been conducted with this group has focused mainly on their identification rather than on the teaching techniques that are most effective to develop and nurture their talents (Meador, 1994; N. M. Robinson, 2000).

The purpose of this article is to examine the research on effective educational provisions for gifted children in the early childhood years. An analysis of the methodological rigor of the research conducted with these children seeks to determine which educational interventions have a solid evidence base for their effectiveness with young gifted children. In their book *Best practices in gifted education: An evidence-based guide*, A. Robinson, Shore, and Enerson (2007) highlighted the urgent need for educators and parents to have access to, and knowledge of, the practices in gifted education that have a firm research base. Yet, despite calling for early identification of giftedness, they described few educational practices related specifically to gifted children in the early years.

Previous reviews of research on gifted education have reported a dearth of empirical studies (Johnsen & Ryser, 1996; Jolly & Kettler, 2008; White, Fletcher-Campbell, & Ridley, 2003; Ziegler & Raul, 2000), particularly in the early childhood years. In a review of gifted education research articles published between 1994 and 2003, Jolly and Kettler (2008) found that only 5.5% were experimental or quasiexperimental studies, with the majority of studies (83.6%) presenting descriptions of educational approaches with no supporting efficacy data. In that review, only 1.75% of the studies addressed children in the preschool years. Similarly, Johnsen and Ryser (1996) found only 39 references in the period 1989 to 1996 that examined the effectiveness of educational practices with gifted students in general education settings. Of these, only 39% reported using experimental or quasiexperimental methodology.

Jolly and Kettler (2008) concluded that for practice in gifted education to improve, a shift was needed in the research base from merely describing giftedness to evaluating and verifying the most effective practices. White et al. (2003) stated that the lack of evidence-based practice and policy in gifted education and the scarcity of empirical studies meant the majority of literature reflected practitioner experience only. They acknowledged that while practitioner experience was useful, the absence of empirical research meant there was a danger that the field would be dominated by the ideas of an influential few, become self-perpetuating, and not consider other possible educational options.

Current practice in early childhood gifted education suggests that educational interventions that should be successful with young gifted children include enrichment, the

process of broadening the curriculum options offered to these children; acceleration, including the presentation of intellectually demanding material at an earlier age and/or early entry to formal school; and ability grouping, that is, placing children of similar intellectual ability together for both instructional and socio-affective purposes. The current state of early childhood education would suggest that there are many opportunities for those working in the fields of gifted education and early childhood to collaborate constructively to deliver these types of interventions to young gifted children (Walsh, Hodge, Bowes, & Kemp, 2010).

In this article, an overview of studies of interventions undertaken with gifted children in early childhood is presented, and the strengths and limitations of their research designs are identified. Such a critique is needed because increasing calls for evidence-based educational practice mean those working with young gifted children should be able to justify their programs with reference to research that demonstrates program effectiveness. Educators and policy makers also need to be able to make informed judgments about the rigor and credibility of research pertaining to young gifted children. Often research can be found to support diametrically opposed points of view on a particular intervention, for example, research relating to the ability grouping of children, and only careful examination of research methodology can determine possible flaws in the research. To date, there have been no reviews focusing exclusively on educational interventions for gifted children in the early childhood years.

Method

Search Procedures

Database searches of ERIC (Educational Resources Information Center) and PsycInfo (the American Psychological Association database) were carried out using the descriptors *gifted*, *talented*, *high ability*; *early childhood*, *preschool*, *kindergarten*, *prior-to-school*; and *training*, *instruction*, *teaching*, and *intervention*. In addition, manual searches of the principal international journals in gifted education—*Gifted Child Quarterly (GCQ)*, *Journal for the Education of the Gifted (JEG)*, and *Roeper Review (RR)*—were undertaken.

Selection Criteria

For inclusion in this review, a publication had to meet certain criteria. First, it had to be a primary research paper published in a peer-reviewed journal over the past 30 years. The use of peer-reviewed articles increased the likelihood of quality research being selected. It was decided to include publications as far back as 30 years as there were few recent articles.

Second, the reported research had to have a focus on children in the early years prior to school and those in the first year of formal schooling. Studies for which the upper age range exceeded 6 years were not included, with the exception of

longitudinal research following up on early childhood interventions. This was to ensure that issues pertinent to conducting research with young gifted children were addressed.

Third, the study had to include efficacy or effectiveness data on the educational intervention used with gifted children. Papers that described interesting and potentially effective interventions but provided no effectiveness data (e.g., Coates, Thompson, & Shimmin, 2008; Diezmann & English, 2001; Diezmann & Watters, 1997; Hensel, 1991; Hertzog, Klein, & Katz, 1999; Morgan, 2007; Rosenbusch & Draper, 1985) were excluded.

In all, 11 studies were located that met the specified criteria (see Table 1 for publication details and details relating to the participants, interventions, intervention outcomes, and major findings). These studies are marked with an asterisk in the reference list.

Overview of the Studies

The selected studies reported a wide variety of interventions (see Table 1). Some studies provided instruction in a specific subject area such as mathematics (N. M. Robinson et al., 1997), synectics (Meador, 1994), and analogies (Castillo, 1998). Others employed programmatic and ability grouping interventions such as a full-time or part-time, self-contained preschool program (Karnes & Johnson, 1987a, 1987b; Karnes, Shwedel, & Lewis, 1983a, 1983b; VanTassel-Baska, Schuler, & Lipschutz, 1982) or early entry to elementary school (Gagné & Gagnier, 2004; Obrzut, Nelson, & Obrzut, 1984).

A total of 10 studies were conducted in the United States and 1 in Canada. The studies ranged in length from 20-min interventions (Castillo, 1998) to full-time self-contained classes for gifted preschoolers over a period of 2 years (Karnes & Johnson, 1987a) to longitudinal studies of early entry to school over 4 years (Obrzut et al., 1984).

All studies included children in the early childhood age range (see Table 1). In all, six of the studies involved children in prior-to-school settings. A wide variety of measures was employed to assess giftedness (see selection criteria in Table 2). These included IQ testing, other forms of norm-referenced ability and achievement testing, and parent and teacher nomination. Studies varied greatly in the instruments used and the score/level at which a child was considered to be gifted. Castillo (1998) did not report selection criteria and indicated that a sample already designated as gifted by the school had been used.

Sample sizes ranged from 14 children (VanTassel-Baska et al., 1982) to 1,821 children (Gagné & Gagnier, 2004) as presented in Table 2. Only two studies (Castillo, 1998; N. M. Robinson et al., 1997) reported using some form of random sampling.

A myriad of instruments was used to measure dependent variables (see Table 1). These included traditional IQ tests, such as the Stanford-Binet IV (Thorndike, Hagen, & Sattler, 1986); tests of creativity and divergent thinking, such as the Torrance Test

Table 1. Selected Features of Studies Included in the Review

Author/s and journal	Age of children	Focus of intervention	Dependent variables	Measures	Major findings
Castillo (1998) <i>Roeper Review</i>	5-6 years	Analogies	Analogy explanation, response justification, and metaphor interpretation	Author-devised tests of analogy explanation, response justification, and metaphor interpretation	Analogy training intervention significantly improved children's understanding of metaphors
Gagné and Gagnier (2004) <i>Roeper Review</i>	Kindergarten and Grade 2	Early entry to school	Socio-affective adjustment and academic achievement	Teacher ranking using an author-devised instrument based on problem behaviors identified by Quay (1979)	No substantial differences between early entrants and regularly admitted students on measures of conduct, social integration, academic maturity, and academic achievement. Semiquantitative analysis revealed that teachers judged a significant proportion of the early entrants to have adjustment difficulties
Hanninen (1984) <i>Journal for the Education of the Gifted</i>	3-5 years	Concept assessment and curriculum plan	Creativity	PIAT, Torrance Test of Creativity (TTC)	Significant results in PIAT category of General Information but not Mathematics and Reading Recognition. Higher creativity, fluency, and originality scores for preschool participants

(continued)

Table 1. (continued)

Author/s and journal	Age of children	Focus of intervention	Dependent variables	Measures	Major findings
Karnes and Johnson (1987b) <i>Gifted Child Quarterly</i>	Not stated, but children were in the year prior to school	BOHST	Creativity	Thinking Creatively in Action and Movement (Torrance, 1981), four subtests from the K-ABC (Kaufman & Kaufman, 1982; Magic Circle, Face Recognition, Gestalt Closure, and Expressive Vocabulary) and the Self-Concept and Motivation Inventory (Milichus, Farrah, & Reitz, 1967)	Better performance for children in the intervention than for comparison groups. Biggest gains made by children who were part of the intervention group but were not identified as potentially gifted. Intervention group teachers described their classes more positively than comparison group teachers
Karnes and Johnson (1987a) <i>Journal for the Education of the Gifted</i>	3-5 years	Full-time self-contained preschool using Guilford's SOI and the British Infant School open framework	Reading and mathematics	Achievement and Education Abilities Series (Science Research Associates Inc, 1985), Teacher and parent report	Measurable gains for the children involved in each program
Karnes, Shwedel, and Lewis (1983a) <i>Journal for the Education of the Gifted</i>	Preschool age (followed up at K-Grade 4)	RAPYHT	Reading and mathematics	Standardized national achievement tests, teacher survey	On all measures, the RAPYHT children were rated as superior to their regular classmates, except for willingness to try new activities

(continued)

Table 1. (continued)

Author/s and journal	Age of children	Focus of intervention	Dependent variables	Measures	Major findings
Karnes, Shwedel, and Lewis (1983b) <i>Exceptional Children</i>	M = 4.4 years (gifted) M = 4.3 years (nongifted)	RAPYHT	Talent area functioning, self-concept, creativity, and task persistence	Two subtests from Animal Crackers (Adkins & Ballif, 1973), Thinking Creatively in Action and Movement (Torrance, 1981), and the Talent Assessment Checklist (Karnes, Brown, Shwedel, & Svoboda, 1980)	Treatment group of gifted children performed higher than would be expected without the intervention
Meador (1994) <i>Journal for the Education of the Gifted</i>	M = 5.7 years	Synectics	Creativity, self-concept, and verbal skills	TTCT, MZSCS, and PPVT	No significant differences for experimental and control groups on PPVT or MZSCS. Experimental groups scored statistically significantly better than control groups on TTCT, indicating that training in synectics had improved creative thinking. No differences found between gifted and nongifted children, indicating that training had a similar effect on both groups

(continued)

Table 1. (continued)

Author/s and journal	Age of children	Focus of intervention	Dependent variables	Measures	Major findings
Obrzut, Nelson, and Obrzut (1984) <i>Psychology in the Schools</i>	4.8-5.11 years at entry to school	Early entry to school	Academic achievement (reading, spelling, mathematics) and school adjustment	WRAT, school records, health records, Parent-Teacher Academic Sentiment Questionnaire, and interviews	Children admitted early to school performed significantly better on measures of reading, spelling, and mathematics. No significant differences between the groups on measures of social maturity. In all, 28% of the early entrants had been retained in the first 4 years of school, as compared with only 2% of regular entry children
N. M. Robinson, Abbott, Berninger, Busse, and Mukhopadhyay (1997) <i>Gifted Child Quarterly</i>	M = 5.5-8.0 years (over 2 years of the study)	Mathematics enrichment	Visual-spatial reasoning and mathematical ability	Stanford-Binet IV (Number Series, Quantitative, Vocabulary, Comprehension, Memory for Sentences, Pattern Analysis and Matrices subtests), Key Math Test-Revised (Geometry, Numeration, Problem Solving Subtests), Woodcock-Johnson Achievement Test-Revised (Calculation Subtest), Word Problems Test, Number Knowledge Test, Counting Span Test, Visual Spatial Span Test	Higher mean score for the intervention group in the quantitative domain, as well as significantly higher correlation between verbal and quantitative factors at the end of the intervention

(continued)

Table 1. (continued)

Author/s and journal	Age of children	Focus of intervention	Dependent variables	Measures	Major findings
Van Tassel-Baska, Schuler, and Lipschutz (1982) <i>Journal for the Education of the Gifted</i>	4.1-4.10 years	Individualized academic program	Mathematics and reading, receptive vocabulary	WRAT, PPVT, Raven's CPM, Parent Interviews	Increases in WRAT subtest scores by 1 year or more (35% in reading, 85% in math). Increase in PPVT score by 10 percentile points or more (64%). Scores at 80th percentile or above on Raven's CPM (64%). Parents' narrative evaluation indicated development of positive student attitudes (100%)

Note: PIAT = Peabody Individual Achievement Test; BOHST = Bringing Out Head Start Talents; K-ABC = Kaufman Assessment Battery for Children; SOI = Structure of the Intellect; RAPHIT = Retrieval and Acceleration of Promising Young Handicapped and Talented; MZSCS = Martinek-Zaichkowsky Self-Concept Scale; PPVT = Peabody Picture Vocabulary Test; WRAT = Wide Range Achievement Test; CPM = Colored Progressive Matrices.

Table 2. Research Design of Studies Included in the Review

Study	Sample size	Research design	Control/ comparison group	Definition of giftedness	Selection of children
Castillo (1998)	N = 63	True experimental	Yes—nongifted children	Not reported	Enrolled in a school for gifted children—Specific criteria not reported
Gagné and Gagnier (2004)	n = 98 (early entrants), n = 1,723 (regularly admitted students)	Nonexperimental	Yes—Regularly admitted students	Not reported	Mental age of 5 years 9 months for early entrants. Equivalent to IQ 117 for children with an October birthday
Hanninen (1984)	N = 66	Mixed methods	No—But a sample of 3 children not in the preschool program were matched on basis of Slosson IQ	“A preschool child who functions significantly above age level in any number of areas such as language development, cognitive ability, social skills, physical adaptability, creativity and leadership may be considered as gifted and talented” (p. 193)	Multicriteria: 1.5 standard deviations above the mean on PPVT, CMMS, and/or Goodenough-Harris Draw-A-Person Test, Parent Interview
Karnes and Johnson (1987b)	N = 446	Mixed methods	Yes	Not reported	Multicriteria: Teacher checklist, parent checklist, and talent identification summary
Karnes and Johnson (1987a)	N = 31	Mixed methods	Children compared with similar ability peers based on expected outcomes on educational ability quotient	1.5 standard deviations from norm	Multicriteria: Parent questionnaire and assessment of intellectual, fine motor, and creative functioning
Karnes et al. (1983a)	N = 30	Mixed methods	No, but children were compared with classmates and national norms	Marland (1972)	Talent Screening Checklist, Activities for Talent Identification, follow-up with psychologist if required

(continued)

Table 2. (continued)

Study	Sample size	Research design	Control/ comparison group	Definition of giftedness	Selection of children
Karnes et al. (1983b)	n = 28 (experimental), n = 8 (control)	Mixed methods	Yes	Marland (1972)	Teacher ratings on Talent Identification Checklist
Meador (1994)	n = 23 (experimental), n = 41 (control)	Quasiexperimental	Yes—Both gifted and nongifted experimental and control groups	Not reported	Two-stage screening process conducted by school district. Student interview, parent questionnaire, KBIT, and Einstein Readiness Test administered
Obrzut et al. (1984)	N = 68	Nonexperimental—ex post facto	Yes—Children who did not qualify for early entry and children who qualified but did not enter school early (latter group omitted due to small numbers)	Not reported	IQ \geq 132 and above average performance on other developmental variables (perceptual, psychomotor, achievement, and affective). Social-emotional maturity assessed informally through interview by school psychologist
N. M. Robinson et al. (1997)	N = 276	True experimental	Yes—But not nongifted children	Not reported	98th percentile or above on arithmetic subtest of WPPSI-R, WISC-III, or K-ABC
VanTassel-Baska et al. (1982)	N = 14	Mixed methods	No	Not reported	Children functioning 2-year levels above the norm on either reading or math subtests of WRAT

Note: CMMS = Columbia Mental Maturity Scale; PPVT = Peabody Picture Vocabulary Test; KBIT = Kaufman Brief Intelligence Test; WISC-III = Wechsler Intelligence Scale for Children—Third Edition; K-ABC = Kaufman Assessment Battery for Children; WRAT = Wide Range Achievement Test.

of Creative Thinking (Torrance, 1998); norm-referenced tests of academic achievement; and researcher-devised instruments.

Each study was classified according to its research design using the categories suggested by McMillan and Schumacher (2006). Of the 11 studies included, 3 used an experimental research design (true experimental or quasiexperimental), 6 used a mixed-methods approach, and 2 used nonexperimental approaches (see Table 2).

Six studies reported using a control or comparison group in their design (see Table 2). In the case of N. M. Robinson et al. (1997), a control group that consisted of similarly gifted children was used; in other cases, the performance of gifted children was compared with that of nongifted children (Castillo, 1998; Gagné & Gagnier, 2004; Obrzut et al., 1984), and in two cases, both gifted and nongifted control groups were used (Karnes & Johnson, 1987b; Meador, 1994).

Results

The criteria for evaluating the quality of the studies were based on the work of Troia (1999), as well as the *Standards for Reporting on Empirical Social Science Research in AERA Publications* (American Educational Research Association, 2006). The set of criteria used for evaluation is presented in Table 3. Two broad categories of internal and external validity were established. Within the category of internal validity, issues of general design characteristics, measurement and analysis, and interpretation were examined. The category of external validity was divided into research hypotheses, and participant selection and description.

In Tables 4 and 5, each study in this review is evaluated against the quality criteria. Cases in which a criterion was deemed to not be applicable to a particular research design were recorded as *n/a*. Cases in which insufficient information existed in the publication to determine if a criterion had been met were evaluated negatively. The purpose of this review is not to criticize individual studies but to stimulate discussion about the quantity and quality of early childhood research being conducted within the field of gifted education.

Internal Validity

General design characteristics. Randomized experimental designs are considered the “gold standard” in educational research and offer procedures by which intersubject differences can be eliminated (McMillan & Schumacher, 2006). Two studies reported using some form of random sampling (Castillo, 1998; N. M. Robinson et al., 1997).

It is generally accepted that rigorous research designs will include a control group (McMillan & Schumacher, 2006). Ideally, interventions should be trialed with both gifted and nongifted control groups for two reasons. The first reason is to eliminate the possibility that an intervention is merely a good teaching technique that is suitable for use with all children. Karnes and Johnson (1987b) noted that their intervention with potentially gifted Head Start children also resulted in gains in higher order thinking

Table 3. Criteria for Evaluating Quality of Studies

Criterion	Definition
Internal validity criteria	
General design characteristics	
Random assignment	Participants were randomly assigned to interventions.
Control group present	A control group was used.
Intervention conditions explicitly described	Intervention conditions were described in sufficient detail to allow replication.
Length of intervention stated	The length of time the intervention took was stated.
Measurement	
Operationalized measures	Dependent variables were described in enough detail so that the task demands and underlying variables of interest were clearly evident.
Suitability of dependent variables	Dependent variables were relevant to the research hypothesis.
Reliability of measures reported	Appropriate measures of reliability for the dependent variables were present.
Treatment fidelity	A procedure was in place to ensure that the intervention was being implemented faithfully.
Analysis and interpretation	
Sufficiently large <i>N</i>	The number of participants was appropriate to the research design chosen.
Analysis techniques described	Analytical techniques were described in sufficient detail to permit an understanding of how the data were analyzed.
Satisfactory statistical analysis	Statistical tests appropriate to the research hypotheses were carried out and appropriately reported.
Effect size reported	Effect sizes were reported.
Evidence of triangulation of data	Data were triangulated.
External validity criteria	
Research hypotheses	
Problem formation	A clear and defensible research hypothesis was provided.
Contribution to knowledge	A clear statement as to the rationale for the research was provided.
Review of relevant scholarship	A review of the relevant scholarship was provided.
Design description	A clear description of the study design and methods of data collection were included.

(continued)

Table 3. (continued)

Criterion	Definition
Participant selection and description	
Participant selection	The manner in which the participants were selected for the study was described.
Age	The mean chronological age of the participants in each group was provided.
Sex	The number of male and female participants in each group was provided.
SES	The socioeconomic status of the participants' families was reported.
Definition of giftedness	The definition of giftedness applied to the participants was reported.
IQ	IQ or some other standardized measure of ability was reported.
Multiple criteria selection	A multiple-criteria approach using subjective and objective data was used in selecting participants.

Note: SES = socioeconomic status.

skills for the children not identified as gifted. In fact, these children experienced larger gains than those of the gifted children in the intervention group, calling into question whether the treatment is really appropriate only for use with gifted children. The second reason is that if strategies and curriculum appropriate for all children are reserved for the gifted, educators leave themselves open to justifiable accusations of elitism (Borland, 1989; Carter, 1992; Passow, 1982).

The replicability of an intervention depends on it being described in sufficient detail. In eight of the studies reported, there was adequate description for replication.

Measurement. In all studies, the outcome measures were operationalized, that is, the dependent variables were described in sufficient detail so that the task demands and underlying variable of interest were clearly evident. Only three studies (Karnes et al., 1983a, 1983b; N. M. Robinson et al., 1997) reported the reliability of the dependent variables.

Treatment fidelity ensures that all participants receive the same intervention. Without it, there is no certainty that the effect on the dependent variables is made by the intervention and not some extraneous factor such as a difference in the teacher delivering the intervention. Only two studies appeared to have any measures of treatment fidelity (Castillo, 1998; Meador, 1994), and in both instances the intervention was administered by the same person. In no study was the issue of treatment fidelity overtly addressed, although one larger study reported using manuals and staff training (N. M. Robinson et al., 1997).

Table 4. Studies Cross-Referenced With Internal Validity Criteria

Study	Intervention			Length of intervention stated	Operationalized measures	Suitability of dependent variables	Reliability of measures reported
	Random assignment	Control group present	Intervention conditions explicitly described				
Castillo (1998)	Y	Y	Y	Y	Y	Y	N
Gagné and Gagnier (2004)	N	N	N	Y	Y	Y	N
Hanninen (1984)	N	N	Y	Y	Y	Y	N
Karnes and Johnson (1987b)	N	Y	Y	Y	Y	Y	N
Karnes and Johnson (1987a)	N	N	N	Y	Y	Y	Y
Karnes et al. (1983a)	N	N	N	Y	Y	Y	N
Karnes et al. (1983b)	N	Y	Y	Y	Y	Y	Y
Meador (1994)	Y	Y	Y	Y	Y	Y	N
Obrzut et al. (1984)	N	Y	Y	Y	Y	Y	N
N. M. Robinson et al. (1997)	Y	Y	Y	Y	Y	Y	Y
Van Tassel-Baska et al. (1982)	N	N	Y	Y	Y	Y	N

Study	Treatment fidelity	Sufficiently large N	Analysis techniques described	Satisfactory statistical analysis	Effect size reported	Evidence of triangulation of data
Gagné and Gagnier (2004)	N	Y	Y	Y	N	Y
Hanninen (1984)	n/a	Y	Y	Y	N	N
Karnes and Johnson (1987b)	N	Y	Y	Y	N	Y
Karnes and Johnson (1987a)	N	N	Y	Y	N	Y
Karnes et al. (1983a)	n/a	N	Y	Y	N	Y
Karnes et al. (1983b)	n/a	N	Y	Y	N	Y
Meador (1994)	Y	Y	Y	Y	N	Y
Obrzut et al. (1984)	N	Y	Y	Y	N	Y
N. M. Robinson et al. (1997)	N	Y	Y	Y	N	Y
Van Tassel-Baska et al. (1982)	N	N	Y	Y	N	Y

Table 5. Studies Cross-Referenced With External Validity Criteria

Study	Problem formation	Contribution to knowledge	Review of relevant scholarship	Design description	Participant selection			Definitions of giftedness			Multiple criteria selection
					Age	Sex	SES	SES	SES	IQ	
Castillo (1998)	Y	Y	Y	Y	N	Y	Y	N	N	N	N
Gagné and Gagnier (2004)	Y	Y	Y	Y	Y	Y	N	N	N	N	Y
Hanninen (1984)	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y
Karnes and Johnson (1987b)	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y
Karnes and Johnson (1987a)	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y
Karnes et al. (1983a)	Y	Y	N	Y	Y	N	N	N	Y	Y	Y
Karnes et al. (1983b)	Y	N	N	Y	Y	Y	N	N	N	N	Y
Meador (1994)	Y	Y	Y	Y	Y	N	N	N	N	Y	Y
Obrzut et al. (1984)	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y
N. M. Robinson et al. (1997)	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
Van Tassel-Baska et al. (1982)	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y

Note: SES = socioeconomic status.

Analysis and interpretation. In most studies, the number of participants was small. No studies reported effect size, despite broad acceptance that practical significance of results is based on its calculation (McMillan & Schumacher, 2006). All studies showed evidence of triangulation of data through using multiple data sources.

External Validity

Research hypotheses. All studies included a clear and defensible research hypothesis, and all, with the exception of one (Karnes et al., 1983b), stated the contribution that their research made to the knowledge of the field. Two studies did not include a review of scholarship relevant to the field (Karnes et al., 1983a, 1983b). This omission could be attributed to the fact that these articles were reporting on different aspects of the same study, and a review of the literature had been included in an early article. All studies had clear descriptions of the design used and the ways in which data were collected.

Participant selection and description. One study (Castillo, 1998) did not include sufficient information on the way in which participants in the study had been selected. In this particular case, it was reported that the children were deemed to be intellectually gifted because they had been placed in a program for gifted children, but no detail was given on how the children had been selected for that program.

Many studies did not include information as basic as the mean age for the cohort being studied or the gender distribution. Only 4 of the studies stated the definition of giftedness that underpinned the intervention and selection of students. In all, 7 studies reported the IQ of the children involved in the study. Multiple criteria selection was used by 9 of the 11 studies.

Discussion

The small number of studies, varying methodologies, and quality of those reviewed suggest that early childhood researchers in the field of gifted education still have much work to do before it can be claimed that true evidence-based practice exists. Admittedly, there are many difficulties in conducting empirical research in gifted education, and this may account for the paucity of research and the variability in quality. These difficulties relate to issues with sample sizes, problems with sampling, definitions of giftedness, finding and selecting appropriate dependent variables to use with gifted children, and the measurement of these outcome variables in programs for young gifted children.

Samples

The size of the target population (i.e., gifted students in early childhood years) is, by definition, small (Ziegler & Raul, 2000), with definitions ranging from the top 10% of the population (Gagné, 2003) to more conservative estimates of the top 2%

(Terman, 1925). This means that finding samples of sizes that will provide sufficient external validity is difficult, especially when adding a specific age range into the mix. In addition, finding suitable children is more difficult in the prior-to-school years because of the variety of care arrangements that exist; for example, children may be cared for by their parents on one day, a grandparent on another, and attend preschool or day care for the other 3 days a week (N. M. Robinson, 2008). This problem is further exacerbated when conducting research with very young children because both parents and educators have an understandable impetus to protect their children. Most of the studies related to prior-to-school settings had very small samples, that is, less than 30. The one exception to this rule was the study by Karnes and Johnson (1987b) where an already-established program (Retrieval and Acceleration of Promising Young Handicapped and Talented [RAPYHT]) was able to be expanded and replicated using participants from the Head Start Program. The question that needs to be asked is why other preschool programs that have appeared to be successful with young gifted children have not been replicated and studied with larger sample sizes.

Control and Comparison Groups

Although it is acknowledged that a control and/or comparison group is fundamental to a good experimental design, few of the studies included in this review reported the use of a control group. Some of the reviewed studies made attempts to control variables using other methods. Unable to find a suitable comparison group, Karnes and Johnson (1987a) compared children's grade level achievement tests with the scores that would have been expected based on their educational ability quotient. They found that only 3% of the students were performing below expectation, although whether this can be attributed to the intervention is difficult to determine without a valid control group.

Karnes et al. (1983b) used a regression-discontinuity analysis, where the effectiveness of an intervention is assessed using the "correlation between ratings on the entry criteria and post-test scores to obtain estimates of performance for each group" (p. 106). They used a comparison group of children who were enrolled in the same classroom but did not qualify for RAPYHT to determine whether gains made in the program were educationally significant or merely due to maturation, the regular educational program, or the testing process. They found that, even with small sample sizes, the children in the intervention performed better on tests of their talent area, creative functioning, and school-related achievement motivation than those who did not take part.

Random Sampling

There are ethical issues regarding random assignment of students to treatment and control groups in research with gifted children. Is it educationally responsible, for example, to withhold a potentially beneficial intervention from an individual child to

ascertain whether the program is effective (Borland, 1989; Carter, 1992; Kitano & Perez, 1998)? It has been suggested that research designs allowing for the intervention to be subsequently administered to the control or nonintervention groups provide a way to circumvent this dilemma. This is not always possible, however, and greatly increases the length and cost of a study. None of the studies reviewed here were able to offer their intervention to the control group, where one existed, after the experimental phase.

Definitions of Giftedness

A surprising aspect of the review was the number of studies that did not define the intended meaning of “giftedness.” Only two studies referred to a formally recognized definition of giftedness, perhaps reflecting the difficulty practitioners may have in operationalizing formal definitions in the early childhood context. The preponderance of definitions of giftedness and a heated debate around these has made comparing studies of interventions for gifted children difficult (Carter, 1991; Ziegler & Raul, 2000). For example, if the model used by one study defines giftedness as high achievement whereas another uses ability scores, then the data collected may be different, making comparison of the studies problematic.

Multiple Criteria Identification

One area in which the studies appeared stronger was an acknowledgment that multidimensional identification procedures were essential (A. Robinson et al., 2007), with most studies employing a range of measures to select gifted participants. Interestingly, VanTassel-Baska et al. (1982) reported using a multicriteria approach to screen candidates but found that parent information was not a good discriminator of ability, with all parents in their study reporting that their child was functioning at a high level. VanTassel-Baska et al. concluded that test scores were a better measure of potential success in their highly academic program than data obtained from parents. This is perhaps unsurprising given the outcomes for the study were measured by the use of test scores.

Dependent Variable Measures

A wide range of dependent variable measures were used across the studies. Kitano and Perez (1998) suggested that research with children in the early childhood years is particularly challenging because of the difficulties researchers encounter in finding suitable instruments for measuring intellectual gains in young children following educational interventions. In some instances, a tool may not have a normative sample of young children, thereby rendering a comparison with the normal population problematic. In addition, the advanced ability of the young gifted child may mean a ceiling effect is encountered when using instruments that are age appropriate (Borland, 1989;

Carter, 1991). For example, has a child who enters a program with scores at the 99th percentile and leaves the program in the same percentile range really made no gains during the year, or does the postintervention score reflect the limitations of the measure at its upper limit? Furthermore, there are no established criteria as to what the size of gain should be to determine whether a program or intervention has been successful. Measures of effect size, in addition to statistical significance, can assist in alleviating this problem. However, none of the interventions reported here included any effect size measures.

VanTassel-Baska et al. (1982) reported setting measurable objectives for their program, including such outcomes as “Program students will increase their vocabulary concept mastery by 10 percentile points as measured by the PPVT pre and post” (p. 47). They reported the mean score gains for the cohort but not individual scores or gains, despite mentioning that some individual results were outstanding. With such a small and exceptional sample, a single-subject design might prove a further option for experimental research in this area.

Some researchers (Mathews & Burns, 1992; Morgan, 2007) suggested that using quantitative measures of program effectiveness is simply too difficult and that qualitative measures such as parent, teacher, and student surveys and interviews provide rich data for program evaluation. Hertzog et al. (1999) noted that it is often “difficult to ‘see’ learning as it is happening, or to document the processes of thinking” (p. 44). They concluded that even without traditional pre- and posttest measures, teachers could report on student growth by documenting the experiences of children before, during, and after the intervention.

While the perceptions of participants and their parents are an important factor in a program’s success and effectiveness, curriculum decisions should not be based solely on perceived benefits without attempting to measure real gains in knowledge and skills. To be able to do this, a clear idea of what is being measured needs to be established. Conducting research that measures the effectiveness of interventions requires these interventions to have clearly articulated goals and outcomes. With gifted children, goals and outcomes can be difficult to define. Educators are working to extend and challenge children who are likely to have, in their areas of strength, already mastered and moved beyond the curriculum outcomes suitable for same-aged peers. Kitano and Perez (1998) suggested that the goals that are appropriate for young gifted children are often long term, individual, and hard to define operationally, such as prevention of later underachievement or development of intellectual risk taking. The measurement of gains or success in these areas and over such a period presents a challenge for researchers.

Karnes and Johnson (1987a) suggested that rather than cognitive goals, suitable objectives for gifted preschoolers include

- (a) a healthy self-concept and good self-esteem;
- (b) appropriate interpersonal skills;

- (c) a high level of curiosity and motivation to learn;
- (d) ability to persist at task;
- (e) willingness to take risks;
- (f) ability to engage in creative and productive thinking;
- (g) acquisition of higher level thinking process; and
- (h) ability to work independently and in groups. (p. 198)

Implications for Future Research

Effective delivery of interventions for young gifted children requires educators who understand the theory behind the particular intervention. The current gap between research in the field of gifted education and the day-to-day practice of educators was highlighted in a survey of practitioners conducted by Wadlington and Burns (1993). They found that although educators acknowledged that exposure to materials and concepts that would usually be deemed inappropriate for young children may be valid for the gifted, most were neither using such advanced materials nor teaching concepts that research had indicated were within the grasp of young mathematically advanced students, such as time and measurement. The ease with which interventions can be adopted in the regular early childhood setting should be a fundamental concern to researchers developing and trialing new interventions for young gifted children.

Karnes and Johnson's (1987a) evaluation of the three programs for young gifted children at the University of Illinois and an earlier review of conceptual models for young gifted children (Karnes et al., 1982) found that, despite differences in approach, each program showed measurable gains for the children involved. Karnes and Johnson (1987a) concluded that the differences in approach clearly supported the notion that there was no single best way to cater to the needs of gifted children. They did, however, suggest a number of common factors such as the importance of appropriate multicriteria identification of the children, parental involvement, ongoing assessment, linking of programming to assessment, programming that builds on strengths and promotes higher level thinking, and an emphasis on divergent thinking.

Surprisingly, only two studies relating to early entry to elementary school were located (Gagné & Gagnier, 2004; Obrzut et al., 1984), despite a number of well-known and oft-cited reviews and meta-analyses supporting its use with young gifted children (Kulik & Kulik, 1984; Proctor, Black, & Feldhusen, 1986; Rogers, 1992). It would appear that much of what we know about the effectiveness of early entry is based on studies conducted in the 1950s and 1960s. Given significant changes in early years educational strategies and pedagogy, coupled with Rogers' (1992) finding that the effect sizes for acceleration on the whole appeared to be declining in the period 1966-1988, this could well be an area ripe for further investigation.

It is also interesting to note that, with only one exception (Obrzut et al., 1984), the studies reported in this article appeared in gifted education journals rather than mainstream early childhood education or special education journals. Perhaps those working in the field of early childhood gifted education need to draw more fully on the experiences and research methods of colleagues working with young children in early childhood settings and young children with other special needs. If not, as White et al. (2003) suggested, we risk “the danger that practice remains limited by the particular ideas of those who are influential in the field and is self-perpetuating, and that other options are not considered” (p. vii). There were, for example, no single-subject designs reported in the research included in this review despite the design’s popularity with special populations and in disability research. A further search of gifted education publications revealed only one published single-subject design (Simonsen, Little, & Fairbanks, 2010). Swassing and Amidon (1991), Foster (1986), and most recently Simonsen and Little (2011) suggested that this design has particular appeal for research in gifted education.

Conclusion

It is clear that establishing evidence-based practice in early childhood gifted education is a challenging undertaking. Too much of what is written in the field is based on well-meaning opinions, attempts to extrapolate early childhood practice from research carried out on older children, or poorly designed studies. It would appear that one of the greatest shortcomings of gifted programs for young children is a lack of well-articulated and measurable goals. Past researchers have provided many suggestions as to what may constitute the most effective types of programs for young gifted children. The challenge now is to critically evaluate these suggestions. There is clearly a need for rigorous research that investigates the types of interventions and programs that deliver the best outcomes for young gifted children. Program philosophy, conception of giftedness, target population, and environmental factors will all influence the exact nature of these outcomes.

Funding

This research was supported by a Macquarie University Research Award for Areas and Centres of Excellence scholarship.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or the publication of this article.

References

- Adkins, D., & Ballif, B. (1973). *Animal crackers: A test of motivation to achieve*. Monterey, CA: McGraw-Hill.

- American Educational Research Association. (2006). Standards for reporting on empirical social science research in AERA publications. *Educational Researcher*, 35, 33-40.
- Barbour, N., & Shaklee, B. D. (1998). Gifted education meets Reggio Emilia: Visions for curriculum in gifted education for young children. *Gifted Child Quarterly*, 42, 228-237.
- Borland, J. H. (1989). *Planning and implementing programs for the gifted*. New York, NY: Teachers College Press.
- Carter, K. R. (1991). Evaluation of gifted programs. In N. K. Buchanan & J. F. Feldhusen (Eds.), *Conducting research and evaluation in gifted education* (pp. 245-274). New York, NY: Teachers College Press.
- Carter, K. R. (1992). A model for evaluating programs for the gifted under non-experimental conditions. *Journal for the Education of the Gifted*, 15, 266-283.
- *Castillo, L. C. (1998). The effect of analogy instruction on young children's metaphor comprehension. *Roeper Review*, 21, 27-31.
- Chamberlin, S. A., Buchanan, M., & Vercimak, D. (2007). Serving twice-exceptional preschoolers: Blending gifted education and early childhood special education practices in assessment and program planning. *Journal for the Education of the Gifted*, 30, 372-393.
- Coates, D., Thompson, W., & Shimmin, A. (2008). Using learning journeys to develop a challenging curriculum for gifted children in a nursery (kindergarten) setting. *Gifted and Talented International*, 23, 97-104.
- Diezmann, C. M., & English, L. D. (2001). Developing young children's multidigit number sense. *Roeper Review*, 24, 11-13.
- Diezmann, C. M., & Watters, J. J. (1997). Bright but bored: Optimising the environment for gifted children. *Australian Journal of Early Childhood*, 22(2), 17-21.
- Foster, W. (1986). The application of single subject research methods to the study of exceptional ability and extraordinary achievement. *Gifted Child Quarterly*, 30, 33-37.
- Gagné, F. Y. (2003). Transforming gifts into talents: The DMGT as a developmental theory. In N. Colangelo & G. A. Davis (Eds.), *Handbook of gifted education* (3rd ed., pp. 60-74). Boston, MA: Allyn & Bacon.
- *Gagné, F. Y., & Gagnier, N. (2004). The socio-affective and academic impact of early entrance to school. *Roeper Review*, 26, 128-138.
- *Hanninen, G. E. (1984). Effectiveness of a preschool program for the gifted and talented. *Journal for the Education of the Gifted*, 7, 192-204.
- Hensel, N. H. (1991). Social leadership skills in young children. *Roeper Review*, 14, 4-6.
- Hertzog, N. B., Klein, M. M., & Katz, L. G. (1999). Hypothesizing and theorizing: Challenge in an early childhood curriculum. *Gifted and Talented International*, 14, 38-49.
- Johnsen, S. K., & Ryser, G. R. (1996). An overview of effective practices with gifted students in general-education settings. *Journal for the Education of the Gifted*, 19, 379-404.
- Jolly, J. L., & Kettler, T. (2008). Gifted education research 1994-2003: A disconnect between priorities and practice. *Journal for the Education of the Gifted*, 31, 427-446.
- Karnes, M. B., Brown, J. G., Shwedel, A. M., & Svoboda, M. H. (1980). *RAPYHT project talent assessment checklist*. Urbana: University of Illinois.
- *Karnes, M. B., & Johnson, L. J. (1987a). An imperative: Programming for the young gifted/talented. *Journal for the Education of the Gifted*, 10, 195-214.

- *Karnes, M. B., & Johnson, L. J. (1987b). Bringing out Head Start talents: Findings from the field. *Gifted Child Quarterly*, 31, 174-179.
- *Karnes, M. B., Shwedel, A. M., & Lewis, G. F. (1983a). Long-term effects of early programming for the gifted/talented handicapped. *Journal for the Education of the Gifted*, 6, 266-278.
- *Karnes, M. B., Shwedel, A. M., & Lewis, G. F. (1983b). Short-term effects of early programming for the young gifted handicapped child. *Exceptional Children*, 50, 103-109.
- Karnes, M. B., Shwedel, A. M., & Linnemeyer, S. A. (1982). The young gifted/talented child: Programs at the University of Illinois. *Elementary School Journal*, 12, 195-213.
- Kaufman, A. S., & Kaufman, N. L. (1982). *Kaufman Assessment Battery for Children*. Circle Pines, MN: American Guidance Services.
- Kitano, M. K., & Perez, R. I. (1998). Developing the potential of young gifted children from low-income and culturally and linguistically diverse backgrounds. In J. F. Smutny (Ed.), *The young gifted child: Potential and promise, an anthology*, (pp. 119-132). Cresskill, NJ: Hampton Press.
- Koshy, V., & Robinson, N. M. (2006). Too long neglected: Gifted young children. *European Early Childhood Education Research Journal*, 14, 113-126.
- Kulik, J. A., & Kulik, C.-L. C. C. (1984). Effects of accelerated instruction on students. *Review of Educational Research*, 54, 409-425.
- Maker, C. J. (1986). Suggested principles for gifted preschool curricula. *Topics in Early Childhood Special Education*, 6, 62-73.
- Maker, C. J., & Schiever, S. W. (2005). *Teaching models in education of the gifted* (3rd ed.). Austin, TX: PRO-ED.
- Marland, S.P. (1972). *Education of the Gifted and Talented. Report to the Congress of the United States by the US Commissioner of Education*. Washington, DC: US Government Printing Office.
- Mathews, F. N., & Burns, J. M. (1992). A parent evaluation of a public preschool gifted program. *Roeper Review*, 15, 69-72.
- McMillan, J. H., & Schumacher, S. (2006). *Research in education: Evidence-based enquiry* (6th ed.). Boston, MA: Pearson and AB.
- *Meador, K. S. (1994). The effects of synectics training on gifted and nongifted kindergarten students. *Journal for the Education of the Gifted*, 18, 55-73.
- Milchus, M. J., Farrah, G. A., & Reitz, W. (1967). *SCAMIN self-concept and motivation inventory*. Dearborn Heights, MI: Person-O-Metrics.
- Morgan, A. (2007). Experiences of a gifted and talented enrichment cluster for pupils aged five to seven. *British Journal of Special Education*, 34, 114-153.
- *Obrzut, A., Nelson, R. B., & Obrzut, J. E. (1984). Early school entrance for intellectually superior children: An analysis. *Psychology in the Schools*, 21, 71-77.
- Passow, H. A. (1982). Differentiated curricula for the gifted/talented. Ventura, CA: Ventura County Superintendent of Schools Office.
- Proctor, T. B., Black, K. N., & Feldhusen, J. F. (1986). Early admission of selected children to elementary school: A review of the research literature. *Journal of Educational Research*, 80, 70-76.

- Quay, H. C. (1979). Classification. In H. C. Quay & J. S. Werry (Eds.), *Psychopathological disorders of childhood* (2nd ed., pp. 1-42). New York, NY: Wiley.
- Robinson, A., Shore, B. M., & Enerson, D. L. (2007). *Best practices in gifted education: An evidence-based guide*. Waco, TX: Prufrock Press.
- Robinson, N. M. (2000). Giftedness in very young children: How seriously should it be taken? In R. C. S. Friedman & B. M. Shore (Ed.), *Talents unfolding: Cognition and development* (pp. 7-26). Washington, DC: American Psychological Association.
- Robinson, N. M. (2008). Early childhood. In J. A. Plucker & C. M. Callahan (Eds.), *Critical issues and practices in gifted education: What the research says* (pp. 179-194). Waco, TX: Prufrock Press.
- *Robinson, N. M., Abbott, R. D., Berninger, V. W., Busse, J., & Mukhopadhyay, S. (1997). Developmental changes in mathematically precocious young children: Longitudinal and gender effects. *Gifted Child Quarterly*, 41, 145-158.
- Robinson, N. M., Reis, S. M., Neihart, M., & Moon, S. M. (2002). Social and emotional issues facing gifted and talented students: What have we learned and what should we do now? In M. Neihart, S. M. Reis, N. M. Robinson, & S. M. Moon (Eds.), *The social and emotional development of gifted children: What do we know?* (pp. 267-288). Washington, DC: The National Association for Gifted Children.
- Rogers, K. B. (1992). A best-evidence synthesis of the research on acceleration for gifted learners. In N. Colangelo, S. G. Assouline, & D. L. Ambroson (Eds.), *Talent development: Proceedings from the 1991 Henry B. and Jocelyn Wallace national symposium on talent development* (pp. 406-409). Unionville, NY: Trillium.
- Rosenbusch, M. H., & Draper, D. C. (1985). Gifted preschoolers: Learning Spanish as a second language. *Roeper Review*, 7, 209-212.
- Science Research Associates Inc. (1985). *Survey of basic skills (Form P)*. Chicago, IL: Author.
- Simonsen, B., & Little, C. A. (2011). Single-subject research in gifted education. *Gifted Child Quarterly*, 55, 158-162.
- Simonsen, B., Little, C. A., & Fairbanks, S. (2010). Effects of task difficulty and teacher attention on the off-task behaviour of high-ability students with behavior issues. *Journal for the Education of the Gifted*, 34, 245-260.
- Smutny, J. F. (1999). A special focus on young gifted children. *Roeper Review*, 21, 172-173.
- Swassing, R. H., & Amidon, S. R. (1991). Single-subject research with gifted and talented students. In N. K. Buchanan & J. F. Feldhusen (Eds.), *Conducting research and evaluation in gifted education: A handbook of methods and applications*. New York, NY: Teachers College Press.
- Terman, L. M. (1925). *Genetic studies of genius: Mental and physical traits of a thousand gifted children* (Vol. 1). Stanford, CA: Stanford University Press.
- Thorndike, R. L., Hagen, E. P., & Sattler, J. M. (1986). *The Stanford-Binet Intelligence Scale: Fourth edition*. Chicago, IL: Riverside.
- Torrance, E. P. (1981). *Thinking creatively in action and movement*. Bensenville, IL: Scholastic Testing Service.
- Torrance, E. P. (1998). *The Torrance tests of creative thinking norms—Technical manual figural (streamlined) forms A & B*. Bensenville, IL: Scholastic Testing Service.

- Troia, G. (1999). Phonological awareness intervention research: A critical review of the experimental methodology. *Reading Research Quarterly, 34*, 28-52.
- *VanTassel-Baska, J., Schuler, A., & Lipschutz, J. (1982). An experimental program for gifted four year olds. *Journal for the Education of the Gifted, 5*, 45-55.
- Wadlington, E., & Burns, J. M. (1993). Math instructional practices within preschool/kindergarten gifted programs. *Journal for the Education of the Gifted, 17*, 41-52.
- Walsh, R. L., Hodge, K. A., Bowes, J. M., & Kemp, C. R. (2010). Same age, different page: Catering for young gifted children in prior-to-school settings. *International Journal of Early Childhood, 42*, 43-58.
- White, K., Fletcher-Campbell, F., & Ridley, K. (2003). *What works for gifted and talented pupils: A review of recent research*. Slough, Berkshire, England: National Foundation for Educational Research.
- Ziegler, A., & Raul, T. (2000). Myth and reality: A review of empirical studies on giftedness. *High Ability Studies, 11*, 113-136.

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