

Determining the Effectiveness of Service Options in Gifted Education

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Abstract: - This study synthesizes the findings from relevant research and meta-analytical articles spanning 1990 to 2018, in gifted education with an intentional focus on the effectiveness of enrichment, acceleration, and grouping service options. This study focused on academic and social and emotional outcomes for gifted students through review of existing research. The purpose of this study is to provide insight into effective service options through careful review of the existing research in gifted education on enrichment, grouping, and acceleration. Findings revealed considerable evidence in support of acceleration as a strong component to gifted programs, and further support is discussed surrounding the individualization of gifted education programs along with consistency and continuity in implementation. All forms and types of academic acceleration have demonstrated positive academic growth for gifted students, and academic acceleration yielded most consistently highly positive effects. Future paths for research are proposed in response to the findings and gaps in the literature to guide and improve service options for gifted learners.

Key-Words: - academic acceleration, achievement, clustering, enrichment, enhancement, gifted, gifted educational programs, grouping, higher learning, psychological, social-emotional

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1 Introduction

Individuals who will eminently improve society are the desired goal of gifted education [104]. Yet, gifted individuals need to be nurtured to develop their natural abilities into talents and transform talent to eminent levels [104]. The developmental process of giftedness and talents calls for attention to environmental catalysts, or the factors which may propel individuals to meet their potentials or not [21]. Gifted services in schools represent ‘provisions’ as catalysts that systematically intervene either positively or negatively toward talent development [21]. To boost developmental trajectories toward adulthood self-actualization or eminence, giftedness should be treated as a process requiring proper training and interventions [104]. While some areas have improved, particularly for high school students, implementation of effective service options, such as acceleration or flexible grouping, is not widespread throughout U.S. schools [2].

What happens when gifted students are not provided appropriate educational opportunities? Past research has shown that 18% to 25% of high school dropouts are gifted students [79], [96]. Educational experiences are critical environmental catalysts in the development of gifted abilities and talents. The field of gifted education offers numerous methods for tailoring education to gifted learners’ needs, but confounding variables such as conflicting research

findings, varying instrumentation, and inconsistencies in definitions make it difficult to form causal inferences and can make discriminating between effective service options a daunting task. Developing gifted learners’ eminence is mutually beneficial for gifted individuals and the prosperity of society [104].

By promoting the development of gifted learners’ abilities and talents, society may reap the benefits of new inventions, solutions to global problems, and decreased economic strain. Adverse effects of not providing gifted individuals with appropriate educational experiences include lower educational attainment, pecuniary losses, and fewer innovations [108]. Gifted individuals have the potential to provide novel ideas and creative solutions. When gifted individuals reach eminence, they can contribute to society economically, creatively, and through civic leadership.

2 Problem Formulation

Gifted educational research is complicated by methodological limitations (e.g., inconsistencies in defining constructs, few scientific experimental studies, and variability in identification methods), making it difficult to generalize or make causal inferences with regard to effective practices [72]. It is difficult for educators to measure the effects of enrichment strategies on gifted students’ academic

and social-emotional outcomes on a consistent basis. While schools have turned to legislative policy and enforcement to advocate for funding and state support to implement their gifted education programs [9], the legislative policies and rules are patchy and scantily representative of the gifted population's needs [110]. Still, the benefits of providing these services for gifted learners are globally and ethically, if not federally regulated, necessary for individual and societal prosperity. The present study aims to summarize the research findings on the effects of enrichment, acceleration, and grouping options on the academic and social-emotional outcomes for gifted students.

2.1.1 Research Question 1 (RQ1):

What are the effects of enrichment strategies on gifted students' academic and social-emotional outcomes?

2.1.2 Research Question 2 (RQ2): What are the effects of grouping strategies on gifted students' academic and social-emotional outcomes?

2.1.3 Research Question 3 (RQ3): What are the effects of acceleration strategies on gifted students' academic and social-emotional outcomes?

3 Problem Solution

Mirroring the analytical framework of Rogers (1991) meta-analysis of 13 research syntheses of grouping practices, the present study reviews the literature with a "best evidence" approach, coined by Slavin [97], by considering the reported statistical effect sizes for gifted service options along with the methodological and conceptual details of more traditional narrative reviews [85]. Selected articles on gifted service options were reviewed and scanned for data on effect sizes and populations sampled.

Study Search

The current study focused on research published from 1990 to 2022. The year 1990 was selected as a cutoff year due to the presence of several existing meta-analyses in 1991. These early meta-analyses incorporated research beginning in 1861 and up to 1991. Additionally, multiple meta-analyses have been published since 1991, and have created an overlap of singular studies or intervention studies being analyzed. The initial literature selection search within Academic Search Premiere and PsycARTICLES involved the following keywords: gifted education OR gifted services OR enrichment or acceleration or grouping AND gifted, resulting in 1,846 search results. Limiters included: Scholarly

(Peer Reviewed) Journals, Published Date 1990-2018, K-12 population, Journal Article, English, Exclude book reviews, and exclude non-article content.

Additional articles were selected through professional affiliation websites including National Association for Gifted Children (NAGC) and the Department of Education (DOE). Once specific frameworks, models, and strategies were identified as contemporarily relevant to this study, subsequent searches were conducted within specific service option domains. Specifically, an advanced search within Academic Search Complete, PsychINFO, and WorldCat.org was conducted using keywords, subject phrases, and author's names or titles (when available). The search for research on gifted AND grouping originally yielded 10,052 results. Subsequently limiting the search by language (English), peer-reviewed, journal article, and custom year range (1990-2019), the results totaled 677 articles. Adjusting the subject term to gifted grouping yielded 492 results. The results were further limited by relevance, recency of publication, and authors. Similar search processes were repeated for enrichment and acceleration research articles. Finally, the references sections of selected articles were scanned to eliminate the exclusion of relevant research. Pertinent or seminal articles dating earlier than 1990 are included in discussions given their relevance to the topics.

Inclusion criteria

Inclusion criteria for primary literature in the present study included factors of validity, both internal and external, statistical effect size and analysis data reported, and year of publication within the window of 1990-2018. Several earlier meta-analyses or studies were retained due to their importance in comparisons, discussions, or seminal value. Additional criteria for studies included relevance to the topics of interest (i.e., gifted services in education), English or translated to English, and measured outcomes including academic achievement or social-emotional outcomes for gifted learners.

Exclusion criteria

Articles that fell within the dates of 1990 to 2018, and met all inclusion criteria but did not report effect sizes for at least one of the indicators of interest were excluded from the review and data tables. This included qualitative analyses that did not report a statistical effect size for at least one of the indicators of interest. Meta-analyses leading to redundant reporting of studies with other meta-analyses were also excluded. Results were compared and redundant findings were not included as multiple findings.

These included multiple meta-analyses in similar research ranges.

Selected studies

The selected studies varied in their designs as well as their reporting and organization of effects. Several studies were meta-analyses that grouped effects by gifted service form [102], [103]; others organized effects by type [89], [91], while others varied in how they made comparisons for effect sizes (e.g., [98], [44]). The selected articles included a variety of research syntheses and conceptual reviews (e.g., [89], [111]) longitudinal studies on enrichment or acceleration programs for the underserved (e.g., [38], [30], [118]), and quasi-experimental with a focus on the effects of summer programs on academic achievement (e.g., [48]) or early entrance to kindergarten [22]. The selected articles included case studies on the impacts of acceleration [60], and others approached the effects of homogeneous grouping on gifted students' social or psychological outcomes [120]. Others employed programmatic and ability grouping interventions such as mathematics units [76], or science [112], developed with gifted curricular frameworks.

4 History of the Problem

From approximately 1960 through the late 1970s, US policy pushed for differentiated educational opportunities to further advance our students and society [49]. But concerns with social inequalities amidst changes in our country like The Civil Rights Act (1964) and fears of sentencing struggling or minority students to poor educational experiences brought about an influx of research on the detrimental effects of these practices [64], [65]. Amidst an economic recession, and growing concerns about competing countries, such as Japan and South Korea, outperforming the United States, *A Nation at Risk: The Imperative for Educational Reform* nearly extinguished the hopes of gifted educational proponents [23]. The country embraced an educational reform promoting heterogeneous classrooms, national education standards, and prescribed excellence in education for all students. This view was further instilled by research publications. For example, findings from Oakes study of twenty-five middle and high schools suggested that homogeneous grouping strategies, such as tracking or ability grouping, in schools do not lead to any consistent academic achievement or social-emotional gains for any students and should be abolished [64]. Careful review of studies like Oakes [64] [65], or Rosenbaum (1976) reveal that findings on the effects of service options, such as grouping, are mediated by the instruction and curriculum

content offered within sampled groups (Gamoran, 1986). Despite findings from research like the (1972) Marland Report, which exposed the nation's lack of attention on gifted education, the federal government limped along in providing support for gifted education [54].

Proponents of service options continued to emerge as studies involving enrichment (Renzulli and Reis's, (1985) schoolwide enrichment model [80], or Treffinger's (1986) self-directed learning model) [107] provided evidence of gains in academic achievement outcomes. Still, the sense that schools were failing to produce internationally competitive students persisted. The U.S. Scholastic Aptitude Test (SAT) scores were well-below historic highs, and Japan, along with nine other countries outscored U.S. students, including the top 1%, on SAT mathematics [81]. The U.S. government issued the Javits Gifted and Talented Education Act (1988) furthering research efforts through grants to promote services for gifted and talented students [94]. Gifted education experts continually advocated with research findings for gifted programming in schools [85]. Still, support for service options, like grouping, was not widespread [81].

The 1992, United States' Department of Education report perpetuated negative beliefs about gifted education describing grouping practices negatively, noting that all children are gifted, and encouraging the end of grouping practices. However, research continued to surface regarding the needs for gifted education services. Acceleration options like curriculum compacting became highlighted with findings indicating gifted students were spending too much time in US classrooms being presented material they already understood [77]. A national report surveying classroom teachers and heterogeneous classroom practices revealed students were rarely or inconsistently receiving differentiated curriculum [2]. The concerns circling our nation's underachieving students gave way to more research guiding grouping and instructional strategies [40], [75]. Colangelo et al.'s, (2004) report provided empirical research to support implementation of gifted service options in schools and refuted myths surrounding these practices [12]. Along with academic achievement goals, and amidst concerns for the social-emotional outcomes of students, some researchers focused on social and emotional development among gifted students [35], [10], [62]. To further practitioner implementation of gifted services and provide recommendations for student outcomes, NAGC issued revised standards for teacher preparation programs and knowledge and skill standards for gifted students. The revisions

arrived on the educational scene concurrently with a follow-up longitudinal study of 5,000 individuals with high abilities or talents in the STEM domain emphasizing the criticality of identifying and providing educational opportunities for individuals to develop their talents, realigning priorities for the future of U.S. prosperity [51]. The longitudinal data was compellingly in favor of acceleration practices. Lubinski et al. cited the rapid academic assimilation capabilities for the gifted participants of the study, and documented their propensity to obtain advanced degrees, contribute to society professionally, and generate scholarly works at rates higher than non-accelerated peers [51]. Yet, debate on these practices remained an obstacle for implementation in schools and state policies.

More recently, research-based evidence in favor of acceleration has reawakened support for implementation of gifted services and policies to regulate and promote them in schools [3]. Even so, implementation of highly-effective gifted education services, such as acceleration, across American schools is sparse (Rinn et al., 2022). The NAGC found only seventeen of the forty-six responding U. S. states indicated their state had a law in place regarding early entrance to kindergarten and [82]. While gifted education has made leaps forward, with states like South Carolina leading the way to implementing gifted education mandates for schools [111], and thirty-five of fifty-one responding states reporting their states address dual credit programs, there is a long road ahead to meet the needs of all gifted learners [82].

5 Gifted Services Options

Research indicates that services for gifted students should stem from systemic program goals characterized as “long-term, broad, general statements of expected outcomes,” [8]. Findings suggest that gifted coordinators place emphasis on process goals (e.g., development of curriculum, teacher training) rather than learning outcome goals to guide program development [8]. Amongst the multitude of options available to gifted learners, it can be difficult to decipher which service option is most effective.

The purpose of this study is to provide insight into effective service options through careful review of the existing research in gifted education on enrichment, grouping, and acceleration. First, it is wise to consider expert recommendations from the field. In her synthesis of research, Rogers identified five, research-based best practices for gifted and talented education [89]. The five best practices are a) daily challenge in talent or interest area(s), b)

providing opportunities for independent learning (Rogers emphasizes teaching gifted students these skills [89]), c) providing acceleration options, d) providing gifted students socialization and learning opportunities with their like-ability peers, and e) differentiating curriculum and instructional practices with variable pacing, appropriate amounts of review and practice, and whole-to-part presentation. In broader terms, these research-based practices can be demonstrated through the use of enrichment, grouping, and acceleration.

Review of Research on Enrichment

Debates of enrichment versus acceleration have been alive for at least a century in gifted education. Original emphasis was placed on acceleration as a means of meeting the needs of gifted learners, however, concerns over the socioemotional outcomes of the gifted made way for enrichment programs to address affective development [44]. One perspective on enrichment is to ensure that it involves activities that all children should be doing, would enjoy doing, and are capable of doing [69]. However, other experts in gifted education have expanded the concept of enrichment to be more appropriate for the needs of gifted learners [85], [87]. According to Rogers, enrichment should promote concept development and curriculum enrichment through the production of projects or independent studies [87]. Enrichment has can involve modifying or providing alternate programs, materials, experiences, and projects, to increase the depth or to expand learning experiences within a subject area or topic. It has been described as highly effective in making academic achievement gains [41]. Some forms of enrichment augment curricula to promote creativity, motivation, and independence. Three main types of enrichment have been categorized as a) exposure, where students learn about new areas they might find interesting; b) content, where curriculum is enhanced to promote the achievement of gifted learners as well as providing in-depth learning into content; and c) extension, which increases the breadth of the core curriculum and enriches the learning contents [87]. Frequently, enrichment strategies are housed within a gifted curriculum plan or program framework such as the Schoolwide Enrichment Model (SEM) [80], [81].

Enrichment program frameworks

It has been recommended for gifted enrichment programs to follow an internal framework that guides them in documenting progress toward all goals and data to reflectively assess needs/changes to services provided and other areas (e.g., identification policy, operational definitions of the program, & professional development) [9]. Program frameworks assist in identifying what goals

facilitators of enrichment programs or curricula seek to achieve, how they will achieve goals, and evaluation procedures. More importantly, enrichment needs to occur in areas of interest for the gifted individual [87]. Enrichment programs can facilitate development of talents or interests through three levels of enrichment as learners are exposed to new learning and skills not taught in the regular school curriculum. However, Callahan et al.'s (2017) results revealed that only one-third of respondent gifted coordinators in the studied schools acknowledged the use of a guiding framework for gifted pedagogy [8]. Of those frameworks reported, the most frequently mentioned were: Renzulli's (1977) Enrichment Triad Model [78], Tomlinson's (2001) Differentiation Model [106], and Kaplan's (2005) Depth and Complexity Model [37], [8].

Gifted coordinators have shown a variety in responses when asked about gifted programs and possibly lack clarity of the construct of 'gifted programs,' [95]. Perhaps the lack of schools identifying their gifted frameworks is influenced by the field of gifted education's ill-structured delineation of options. Although gifted programs imply delivery structures and curriculum, they are not universally understood by practitioners or administrators. For example, it may be less clear to discuss Renzulli's Enrichment Triad Model with a gifted coordinator or teacher than it would be to simply discuss plans for grouping, enrichment, or acceleration pedagogy. This could stem from few teacher preparation programs requiring gifted education training [16]. Although the importance of understanding and adopting a theoretically-based program framework is acknowledged, an in-depth analysis and comparison of each enrichment framework exceeds the boundaries of the current study. Instead, we aim to identify the effects of particular strategies on the academic achievement and social-emotional development of gifted learners and will briefly outline several enrichment frameworks, instructional models, and curricular materials within the context of enrichment levels. Discussion of enrichment effects will likely reveal mention of enrichment frameworks/options, yet the isolated concept of enrichment frameworks as a category are not being evaluated directly and the effects of these frameworks will be seen in review of other types of interventions for enrichment.

6 Current Approaches

Researchers have examined various forms of enrichment through curriculum frameworks, curricular materials, and variations of delivery methods [9], [95]. While experts in gifted education may cringe at an integrated comparison of

theoretically based enrichment frameworks along with enrichment/curricular materials and models, the present study intends to mirror previous approaches observed in peer-reviewed meta-analyses, yet on a smaller scale. Therefore, the current surface-level exploration of enrichment effects includes a mixture of studies on enrichment frameworks, instructional models, and curricular materials collectively and categorizes studies based on three levels of enrichment as described by Karen Rogers: 1) exposure, 2) extension, and 3) concept development (2002). Details regarding the identified enrichment type of each study can be reviewed in Table A1.

Exposure. Enrichment that provides exposure to other areas of knowledge not typically presented in regular school curricula are crucial components for developing gifted learners' complex cognitive processes and should occur prior to other types of enrichment such as extension or concept-based programs [87]. Renzulli's Enrichment Triad Model and an updated version, the Schoolwide Enrichment Model (SEM) [78], [80], [81], is a popular pedagogical approach to enrichment [109]. The SEM is primarily used for enrichment among gifted and non-gifted programs due to its emphasis on students' interests and learning/product styles and its generalizable goals as follows: a) develop talents in all children, b) provide a broad range of differentiated learning experiences for all children, and c) provide follow-up advanced learning opportunities fit for the abilities and interests of all children [79], [81]. The SEM encourages students to engage in traditional content in real-world contexts, solving real-world problems, and in-depth investigations within areas of students' interests and abilities to increase complex cognitive skills [81]. Regardless of the framework or decision not to have a framework, gifted students need guidance in the development of skills, such as divergent thinking, and they can benefit from specific training in these areas [78].

Extension. Some gifted enrichment models, like SEM-R, can be used to promote enrichment at exposure levels or extension levels. Enrichment extensions aim to extend the regular school curriculum beyond and across multiple domains of learning. This could be described as a multi-disciplinary approach of enrichment. Like the SEM-R, the ALM aims to increase divergent and convergent thinking along with other problem solving skills, social skills, while building on students' interests, but is used more for broad-based topics [4]. For gifted learners, extensions should occur within their areas of interest or talent [87]. As mentioned in the exposure enrichment section above, the models for inquiry-based learning and

independent projects (i.e., SEM, ALM, Depth and Complexity Model) are well-fitted for extension enrichment as well as exposure. Additionally, mentorships are an established enrichment method for extending the curriculum in an area of interest for gifted education [85]. Research findings also indicate that mentorships, as seen with Project Promise, can have positive academic and psychological effects on gifted students [38], [85], [87], [89]. Mentorships may extend curriculum or provide motivation and support for conceptual development. Olszewski-Kubilius and Thomson, advised support networks with mentors, as Kaul et al. demonstrated, provide opportunities for gifted students to increase their abilities to work with diverse populations [38], [68].

Concept Development. Enrichment based on concept development is the third level of enrichment for gifted learners. In concept enrichment, gifted students are forming deep learning experiences and in-depth mastery of skills or concepts that are merely introduced in regular school curriculum. These enrichment structures provide frameworks and opportunities for gifted learners to become experts in their areas of interest. As with extension enrichment, mentors can be a valuable form of enrichment for gifted learners to develop concepts in-depth. Either with a mentor, or a classroom teacher, gifted students can gain concept enrichment through discussions with professionals and experts. Concept development could be part of an independent study or project framed in any of the aforementioned inquiry-based tools for enrichment (e.g., William and Mary ICM units, SEM-R, etc.), or it could be a natural step as learning progresses to deeper levels and interests for gifted students. Alternately, Rogers suggests using educational experiences from curriculum in the arts to build conceptual development for gifted learners with talents in these areas [87].

Affective, talent search, other types. Enrichment to encourage social-emotional skills development, talent development, college preparation, or career counseling for gifted students can take many forms. Several of these enrichment programs overlap with acceleration, particularly mentorships and talent search programs. To address areas of affective skills, there are many options that combine academics with affective development, and Junior Great Books combine enrichment of complex cognitive skill development, and inspire literacy through shared inquiry, while incorporating character development concepts [29]. Talent search enrichment programs specifically addressing the identification and development of talents are another option. These include programs like the Duke University's Talent Identification Program (TIP) that identifies talented

learners and offers year round enrichment opportunities. Other year-round programs like TIP include but are definitely not limited to the following: Project SPARK, Project EXCITE, Project LIVE, Project PROMISE, and Project ASPIRE. These enrichment programs combine elements of grouping and acceleration in their deliveries and have had very positive results on academic and social outcomes. To get into the details of all enrichment programs and compare them by design is beyond the focus of the current study. Therefore, with these enrichment varieties in place, discussion will continue regarding the effects of enrichment.

(RQ1): What are the effects of enrichment strategies on gifted students' academic and social-emotional outcomes?

The Effects of Enrichment

With the understanding that enrichment can be categorized in three levels of increasing depth and breadth for gifted learners, and that several of the discussed frameworks and models can provide support in multiple levels of enrichment, deciding on the best fit for a gifted individual is a tailored decision. In terms of generality, to consider what types of enrichment could be most academically or affectively impactful, one must first come to terms with the variability in measured constructs for these domains. By scanning the existing enrichment research, it is apparent that many analyses rate academic effects according to achievement in specific domains (e.g., reading fluency, reading comprehension, scientific method, research techniques), while affective components have been calculated for a variety of domains including: career aspirations, higher degree plans, self-concepts, creative products, and self-esteem (see Table A1, for detailed effect sizes by domain).

Secondly, one must consider effects as reported in meta-analyses versus single studies. Thirdly, there is the matter of enrichment level to confuse comparisons of effects across the body of research. To clarify this possible confusion, the current study labels the research in the Table A1, by design (e.g., meta-analysis, intervention), enrichment level (i.e., exposure, extension, or concept development), and with further categorization by framework (e.g., SEM, ICM), delivery/intensity (summer, school year, pull-out program) descriptors (see Table A1). Due to the complexity of studies combining an enrichment intervention with a form of grouping or acceleration, it is difficult to sort the effects purely for enrichment. For example, Kulik and Kulik, focused on the effects of grouping, but included studies on "enriched classes for the gifted and talented," [44]. These classes could be considered for their enrichment

effects on academic achievement or for the effects of grouping on academic achievement. Given this complexity, the present study examined effects of enrichment from research focused on enrichment.

Meta-analyses of enrichment effects

Academic

Kim's (2016) meta-analysis of empirical studies on enrichment programs from 1985-2014, reported a large positive effect ($g=.96$), overall for enrichment programs on gifted students' academic achievement [41]. However, Vaughn et al.'s (1991), meta-analysis (with studies from 1959-1989), on gifted pull-out programs reported an effect size of .65, which is still large and positive, but somewhat smaller than Kim's findings [41], [115]. For mentorships and talent search programs, Rogers reported small positive academic effects of .22, and .34, respectively [91]. The meta-analyses reported large positive academic effects for enrichment in the forms of summer programs, summer day programs, Saturday programs, and school-day or pull-out, and small positive effects from mentorships and talent search.

Social-Emotional

The meta-analyses varied the most when considering social-emotional effects of enrichment, however each study reports on different types of enrichment with variations in intensity. Kim (2016), reported moderate positive effects of .55, for enrichment on a combined construct of social-emotional development across studies, yet Vaughn et al. reported small insignificant effects ($d=.11$, $p>.05$) for enrichment on self-concept [41], [115]. The largest social-emotional effects were seen from talent search programs ($d=+1.35$) on social adjustment, followed by mentorships with a large positive effect size of .71 [91]. The intensity of the program, as well as the co-occurrence of acceleration strategies, likely accounts for the variance in these effects. In summary, meta-analytic findings of enrichment show moderate to large positive effects ranging from .55 to 1.35 on social-emotional outcomes.

Primary studies of enrichment effects

Academic effects

Primary studies that measured the academic effects from enrichment were variant in their approaches to delivery and intensity of programs, as well as differing in the subject measured, yet all academic outcomes were positive and significant. However, comparing them by different aspects may result in an explanation for the various findings of small to large positive effects. For example, three studies measured the effects of enrichment on reading/language arts-related outcomes using standardized norm-referenced assessments (i.e., Iowa

Tests of Basic Skills) or a researcher-created standardized reference assessment [7], [46], & Reis et al., 2011). Of these studies, two reported large positive effects of .67 [7], & [46], Reis et al., found small positive effects of .33, and .10 for reading fluency; and .27 for comprehension [76]. Differences in these effects may have been due to the intensity of the programs, with Lee et al.'s study being a year-round program with more exposure to the enrichment, while others were occurring during school [46]. Alternately, the effects of enrichment on elementary students in reading scores were small (Reis et al., 2011), while the effects of enrichment in reading for older students was large [7], [46].

To simplify, most of the primary studies used standardized assessments as the measure of the academic outcomes. The truly differentiating factor among them was the type and intensity of their enrichment strategies. Therefore, it could be summarized that enrichment programs involving talent search, year-round, or research-based frameworks/programs with summer classes or camps boasted large positive effects for academic achievement as follows: .92, .93, .67 [41], [46], [48].

Enrichment studies using research-based, differentiated curriculum developed for gifted students and taking place across the academic year had moderate to large academic effects [17], [59], [112]. Academically, enrichment has been associated with positive effects ranging from small to large, and varying based on the instructional design, delivery, and intensity of the program. Syntheses of the larger body of research on enrichment have calculated small positive effects of .20, for enrichment on academic achievement, in isolation of the effects from grouping or acceleration, which are often in tandem with enrichment [3], [91].

Social-emotional effects

The social-emotional effects of enrichment as a subject-based-unit, delivered through pull-out programs or special classes in school were small and positive .34, [66], and qualitatively positive [31], [112]. However, meta-analyses of enrichment programs involving year-round models paired with acceleration strategies and homogenous grouping reported .71 for mentorships, and 1.35 for talent search programs demonstrating large positive effects on social-emotional factors respectively [89]. Enrichment without combined services, such as whole-class heterogeneously arranged, is historically not as effective.

Summary of all effects for enrichment

Blending the types of enrichment offered increases the complexity of a synthesized determination for overall effect size on academic

achievement or social-emotional outcomes. For example, Kim excluded enrichment studies involving programs designed for use with all types of learners, therefore studies on SEM were excluded from her meta-analysis [41]. To better understand the effects of enrichment, researchers need to consider the levels and types of enrichment, contexts, and ability levels of learners being compared. In reality, enrichment methods are frequently combined with other strategies for gifted education such as grouping or acceleration. This complexity, along with the inconsistencies within the body of literature on enrichment measuring different social-emotional or achievement constructs, involving varying programs or frameworks, varying delivery methods, and varied samples/comparison groups make it complex to synthesize an overall rating.

The findings for the present study, as viewable in Table A1, along with the review of research can be interpreted in summary that enrichment has no negative effects on social-emotional outcomes. In cases where enrichment is part of an acceleration program, and especially with increased intensity (e.g., summer programs, summer residential programs), the effects are magnified in positive ways. For example, when enrichment is the curriculum aspect of an acceleration program (i.e., mentorships or talent search), the effects on social-emotional development are large and positive. Furthermore, enrichment has small to moderate positive effects on academic achievement for gifted students. As with social-emotional outcomes, when enrichment is part of an acceleration plan or combination of acceleration and homogeneous grouping, the effects are positively impacted. Enrichment, in isolation of grouping or acceleration or gifted curriculum, has little to no effects on academic or social-emotional outcomes for gifted students.

Review of Research on Grouping in Gifted Education

The field of gifted education is flooded with research on the topic of grouping with approximately 13 meta-analyses published from 1982-2009 [26], and more since that date. Grouping strategies can be divided into two overarching types: a) small group, or b) whole-class/full-time [116]. Ability grouping remains controversial among educators, parents, and students [26], [84], [89], [103]. Proponents of ability grouping argue that it allows all students to receive appropriately challenging instruction and provides opportunities for medium and lower performing students to emerge as higher achievers within their groups [87], while others argue that grouping leads to negative social-emotional effects for all levels of student abilities and decreased academic achievement for lower ability students [63]. This

disbanded set of beliefs may stem from misinterpretations of grouping concepts or research, the domain-specific effects of grouping, variations in sample demographics, limited research on socio-emotional impacts, ease or complexity of implementation, and availabilities of schools to successfully implement grouping patterns [84] [87].

Still, recent studies show that schools are increasingly turning to the use of ability grouping to meet the variant ability levels and demands within modern classrooms [50]. Ability grouping practices among 4th grade reading teachers jumped from 28% in 1998, to 71% in 2009 [50]. Similarly, teachers of mathematics have increased the use of ability grouping with reported increases of math ability grouping from 40% to 61% between 1996 and 2011 [50]. Although teachers employ the practices of ability grouping to meet diverse groups of learners' needs, conflicting findings among research studies cause doubt in the efficacy of ability grouping (Rogers, 1993).

7 Confounding Issues

With all of the research on ability grouping, it may be difficult to understand why experts disagree about its positive effects. One confounding issue within the research on ability grouping stems from the fact that grouping effects are impacted by many factors associated with intentional teaching (e.g., classroom management, planned use of differentiated activities, teacher support, differentiated assessment techniques, and type of grouping), which can make it difficult to delineate causal findings. Despite findings on the importance of gifted education, teacher training in identifying gifted students has been declining for some school systems [120]. A second confounding issue within the research on ability grouping are the variations in types of grouping strategies and how these are reported in the literature. Across studies, comparisons with control groups vary, and nomenclature used for types of grouping also varies. For example, some research refers to between-class grouping as cross-grade grouping, and this concept can be easily confused with multi-age classrooms in acceleration literature. From a practitioner's perspective, interpretations of the vast amount of research available are likely confounded by these discrepancies. Critics of ability grouping may consider it elitist, and a method that puts at-risk students in worse situations academically and socially [87]. Some anti-grouping advocates may confuse ability grouping with tracking. As explained earlier, there are variations of ability grouping which are not synonymous with tracking. The success of ability groups is dependent upon their careful

construction, flexibility in membership, purposeful teaching, and use of appropriately differentiated curriculum [69]. With these provisions in place, research has suggested ability grouping arrangements can benefit students at all levels both academically and social-emotionally [87].

The present study

To clarify effect sizes for each grouping type, the present study provides Table B1 with studies labeled by approach to grouping and the specific strategies employed for the grouping research. The small group strategies discussed in the present study include: pull-out programs, cluster grouping, regrouping for subjects, within-class ability/achievement, like-ability cooperative, cross-grade by achievement level, peer tutoring, and mixed-ability cooperative grouping plans. The whole-class grouping strategies discussed include: homogeneous ability level classes, specialized schools, and school-within-a-school grouping plans. The following section reviews findings from relevant research with effect sizes for whole-class grouping arrangements followed by small group arrangements.

Research Question 2 (RQ2): What are the effects of grouping strategies on gifted students' academic outcomes and social-emotional outcomes?

Effects for Whole-class Full-Time Grouping

Research suggests gifted students in whole-class grouping/special schools results in higher academic achievement gains than regrouped, pull-out, or within class grouping options [14] and has positive social benefits for gifted students [87], [89]. According to meta-analytical findings, gifted students' academic achievement is positively and moderately impacted by full-time grouping with effect sizes of .41, and .49 [44], [89]. The Kuliks' (1992) meta-analysis was included in a second-order meta-analysis where the overall academic achievement effect size for full-time grouping among the six meta-analyses was positive and small at .37, [103]. Rogers' meta-analysis noted a small positive effect size of .24, for social adjustment and a small negative effect size of -.16, for whole-class/full-time ability grouping on self-esteem [89].

Research has suggested that gifted students prefer homogeneous grouping arrangements, like full-time ability grouping, when considering academic benefits, however, gifted students prefer heterogeneous arrangements (e.g., mixed-ability) to fulfill their social-emotional needs [62]. However, this could be impacted by the increased challenge gifted students face when confronted by appropriately challenging and differentiated curriculum [89]. A primary, mixed-methods study of twenty-five secondary students in a special gifted

classroom within a mixed-ability school setting reported that gifted students experienced increases in measures of romantic appeal and close friendships, however their levels of social acceptance were unchanged and remained below normative levels [120]. Additionally, the students' qualitative responses indicated that they enjoyed the gifted classroom atmosphere, but remained aware of being labeled as different than nongifted peers [120]. According to these findings, whole-class ability grouping has moderate effects on academic achievement, and small positive (or no negative) effects on social outcomes.

Additional concerns with full-time grouping include the static nature of the groups as a downside [18], along with the possible impact of the big-fish-little-pond-effect (BFLPE), negatively affecting gifted students in these arrangements [61]. Furthermore, with few availability options of specialized schools for gifted students, and decreasing school budgets making within school whole-class grouping difficult, this grouping option is not as widespread and research on its effects for gifted students are less available than other grouping arrangements.

Effects for Small Group Strategies

In the wake of budget cuts, a push for heterogeneous classrooms, and wanting to meet the instructional needs of students, schools may favor the use of small group arrangements [25], [50]. In the present study, small group strategies discussed include clustering, within-class grouping, between-class grouping, and cross-grade grouping. The ensuing discussion of effects for small group arrangements begins with cluster grouping, a popular method for small group arrangements which can extend gifted services to more students, and be easier to implement and maintain for teachers [15], [87].

Cluster grouping. Cluster grouping alleviates the vast breadth of achievement levels within a classroom making differentiated instruction and curriculum more attainable and consistently implemented by teachers [24], Rogers reported cluster grouping to have a moderate-to-large effect size of .62 on academic achievement, for gifted students compared to their non-cluster grouped gifted peers [85], [89]. Primary studies have also reported significant effects on achievement for cluster grouping. Gentry and Owen reported that cluster groups accounted for 66% of the total variance between groups in their study with fifth grade gifted students [24]. Furthermore, longitudinal findings suggest that cluster groups are associated with higher rates of gifted identification among 3rd through 5th graders [24]. However, their findings are limited by

the simultaneous practice of homogeneous regrouping for reading and mathematics instruction, making it difficult to attribute the effects specifically to cluster grouping [24]. Primary research has observed small positive effects for gifted learners in geometry with cluster groups, and positive academic benefits were noted for all levels of participants [71]. Furthermore, these benefits have been reported across ability levels, [26], [44], [71], [57], [85].

Positive effects could stem from the way cluster grouping promotes interactions between students of similar intellectual and age groups, as well as provides an opening for lower achieving students to emerge as higher achievers [24], [26]. Cluster grouping has also been associated with small, positive social and self-esteem effects [44], [24].

Perhaps an explanation for the range of academic gains among cluster grouped gifted learners is due to the structures of the groups. It is important to note that cluster grouping outcomes are sensitive to how groups are formed. Specifically, schools may group gifted students in clusters based on intellectual ability, talents, or a mixture of ability and talents. When grouping by ability levels (cognitive reasoning, abstract thinking, or problem solving skills) gifted students in cluster groups may perform less similarly to one another and may not be the most advanced in grade level material. When grouping by talents (as indicated on tests of achievement in specific domains) gifted students in clustered groups will likely be high performing within their talent areas and ready for the most advanced or above grade level material in talent areas. The positive effects of cluster grouping may be deflated by a mixture of gifted students with either ability or talents being placed in the same groups [87]. In these situations, students with intellectual abilities may not be ready for the same pace of curriculum as the students with talents in specific domains. Similarly, talented students may become frustrated at the slow pace of curriculum. In this way, mixtures of intellectually gifted and talented students within clusters can lead to negative impacts on social-emotional outcomes.

Ideally, cluster grouping is flexible, and is coupled with differentiated instruction and varied pace. Clustered gifted students have been able to make substantial growth academically and socially [89]. As mentioned previously, cluster grouping trims down the vast levels of ability within each classroom, making differentiation more feasible for teachers to implement. In this way, it differs from within-class grouping, however, within-class grouping may be a more realistically flexible option for teachers to implement.

Within-class grouping. Within-class grouping has been a common practice, especially for reading instruction, in schools for many years [43], [87]. Within-class grouping may have positive effects on academic and social-emotional outcomes for students of all levels, however it has not been linked with higher effects than alternate forms of grouping. For example, when compared with specific forms of grouping (i.e., pull-out, separate school classes, & regrouping), within-class grouping showed less gains for academic achievement in gifted students [14]. However, it may be a better alternative than whole-class/full-time arrangements, given its flexibility. Within-class grouping has been found more effective at increasing achievement levels than whole-class grouping [44], [85], [98]. While Kulik's (1992) meta-analysis reported small positive effects of .25 on academic achievement, Slavin's study indicated within-class ability grouping had moderate effect sizes of .41 [44] [97]. Additional second-order, meta-analyses of research suggest within-class ability grouping has led to clear increases in achievement for students of all levels, as seen in Loveless' (1998) comparison of Kulik and Slavin's meta-analyses [49] [97]. More recently, a meta-analysis suggested within-class grouping had an effect size of .22 on students' reading achievement in second through tenth grade students [74]. When compared to average yearly growth in reading, these findings could be translated into an additional half year of growth in reading achievement [74].

Results for within-class ability grouping are also subject to differences in either homogeneous or heterogeneous group structures. Research findings have provided varying results to show whether or not the classroom structure of within-class ability groups (heterogeneous vs homogeneous) has a significant effect for learners achievement [39], Leonard, 2010). Possible reasons for these different findings could stem from the school populations studied or the subject areas assessed for achievement in the studies being different. This lack of inconsistency among research findings also extends into social-emotional factors.

Within-class ability grouping. Within-class ability grouping has faced inconsistent findings for social-emotional effects [14], [24], [63]. Research findings supporting within-class grouping reported increased outcomes in students' attitudes toward subject matter [98], [99], and higher motivation levels [1], while other studies have reported insignificant and negative effects on self-concept and self-esteem for within-class ability grouping [44], [62]. Research has varied on the results for within-class ability grouping, possibly stemming from inconsistencies across

sample groups, varied instructional methods, varying levels of differentiated instruction within these groups, and differing control group comparisons. In sum, within-class ability grouping results in moderately positive academic effects for gifted students.

Between-class/cross-grade /Joplin Plan. As defined earlier, studies on regrouping students for subjects vary on their terminology. For consistency, the present study refers to this area according to how it was reported in each analysis. Past meta-analytic research has shown between-class grouping to have small to non-existent effects on academic achievement for combined abilities of students [42], [44], [99], [100], while other analyses have reported small-to-moderate effects for gifted learners [14], [85]. Unfortunately, not all studies have focused on gifted learner outcomes specifically, but among the research that has, between-class grouping has shown significant academic gains for gifted students in specifically regrouped subject areas [87].

Joplin plan/cross-grading effects. Some research has specifically studied a version of regrouping known as the Joplin Plan, in which students are regrouped between classrooms for specific subject-based instruction based on their performance levels [83]. The Joplin Plan is most frequently implemented in elementary settings and may span across grade levels and contain up to nine differently leveled groups. Early accounts of the Joplin Plan included 4th, 5th, and 6th graders who switched classrooms to receive differentiated reading instruction [105]. The Joplin Plan continues to be used in schools to meet the needs of students with all types of ability levels. Multiple analyses have shown the Joplin Plan to have small positive effects on reading achievement for elementary and older students demonstrating overall effect sizes of .23, .34, and .30. (respectively Kulik & [42, 43], [98]. Although the Joplin Plan has demonstrated small effects in reading achievement, it has shown greater impacts with mathematics research. Mills et al.'s study involving a mathematics curriculum designed by the researchers resulted in large effects of 1.6 for third graders, and 2.4 for sixth graders (1994). This trend of grouping positively affecting mathematics scores follows across ability grouping studies and flexible small group studies, where mathematics achievement was a focus [43], [98], compared to studies that did not specify subject areas as reported in meta-analyses [92]. However, it is difficult to make absolute determinations from this apparent trend in findings due to the lack of studies indicating subject areas involved. Overall, cross-grade/Joplin Plan

Cross-grade/between-class social-emotional effects. Another positive aspect of cross-grade/between-class grouping is that it provides students opportunities to engage with advanced grade level content regardless of their chronological ages. Cross-grade grouping works similarly to subject-level acceleration in that it affords gifted learners exposure to higher grade level materials, however it does not account for increased pace or important interactions needed with gifted peers. The body of research on cross-grade grouping provides little in the way of social-emotional effects. Kulik and Kulik reported nearly zero effects ($d=.03$ overall) from homogeneous grouping on students' self-esteem across ability levels [44]. Of the few studies that reported self-esteem scores, the effects were small and positive ($d=.19$) for students with low abilities, although high ability students reported a small negative effect of $-.09$ [44]. Self-esteem is a separate construct from academic self-concept, and it is difficult to be certain how participants in primary studies interpreted self-esteem-related probes. Therefore, it is possible that gifted students' responses were more indicative of academic self-concept. Consequently, the lowered affective scores for gifted students could have stemmed from BFLPE impacting their academic self-concepts when grouped with older/like-ability peers who were performing near their same levels [61]. However, gifted students made positive growth in achievement [44], implying that the small, negative effects did not entirely depress their performances.

Summary of the Academic and Social-Emotional Effects for Grouping

Academic

Mathis concluded that ability grouping is harmful for students in lower tracks, causes them to become further behind, and produces no significant positive advantages for students in higher tracks [56]. Similarly, critics of ability grouping have pointed to a lack of resources for students from minority and/or lower economic status backgrounds who reportedly become segregated in the process, and the negative social impacts and decreases in self-concept seen in some studies [36], [100]. Despite arguments that ability grouping is harmful to students with middle or lower abilities' academic achievement outcomes, research indicates small positive effects for these students when differentiated instruction is combined with flexible ability grouping [13], [89], [90], [103]. Furthermore, the effects of flexible ability grouping with differentiated accelerated instruction on gifted students' academic achievement are consistently positive and range from moderate to large [87], [103], [105]

Social-emotional effects

Within the body of research on ability grouping's impact on social-emotional factors there are mixed results. Kulik and Kulik's meta-analysis revealed a small decline in self-concept for gifted in ability grouping [44]. McQuilkin's study indicated an increase in self-concept (1981), however other studies have reported no difference in self-concept for gifted students in ability grouping [115]. Adding to the complexity of results on social-emotional factors for ability grouping, some research has reported mixed results within studies. For example, the arrangement of flexible ability grouping in combination with differentiated curriculum appears to be a differential factor for its impact on self-esteem [86]. Proponents of ability grouping may explain these varied or slightly negative social-emotional outcomes to the natural decline students may face from engaging in more advanced curriculum or from comparing themselves to students with higher ages or equal abilities, eluding the BFLPE [73]. Declines in gifted learners' self-concepts within ability groups may also be a result of their new awareness in discrepancies between their abilities and achievement levels [30].

Overall summary for the effects of ability grouping

To synthesize the overall findings on grouping, it is apparent that for gifted learners, homogeneous ability grouping can result in moderate to large academic gains when coupled with differentiated and accelerated instructional delivery. Furthermore, flexible, homogeneous, ability grouping combined with appropriately differentiated instruction and variable pacing provides gifted students with opportunities for daily challenge, and to associate with peers who may have similar abilities or peers who are performing similarly to their levels. While ability grouping is not advised as a static, one-size-fits-all strategy for gifted students, with flexibility and appropriately differentiated instruction, it results in markedly positive academic benefits.

Acceleration in Gifted Education

Academic acceleration involves the planning processes and implementation of instruction to match students' readiness levels and motivational levels with appropriate pacing, levels of complexity, and interests in curriculum [12]. Acceleration can shorten gifted students' time spent, or decrease the age for, earning a high school diploma and the entrance to post-secondary education or professional careers. The following sections review academic acceleration beginning with a brief overview of its definition and development as a strategy in gifted education, followed by important terminology, and ending with

a summary of the academic and social-emotional effects reported for acceleration forms.

Acceleration has been equated with meeting the needs of gifted students for over a century with formal programs like the Cambridge Double Track Plan in 1891 [43]. Since then, numerous studies have documented the positive effects of acceleration for gifted students while other research has focused on the positive effects for lower achieving students (Mason et al., 1992). Mason et al.'s, study of middle school students in an accelerated mathematics program showed that lower achieving students benefitted from placement in advanced mathematics courses, even more so than the heterogeneously grouped high ability students (1992). This suggests that acceleration may benefit some groups of lower ability learners, but it makes a stronger statement that homogeneous grouping, with challenging curriculum and pace, are keys to acceleration for gifted students.

Continuity and Consistency

A retrospective, longitudinal study in 2015, looked at data from the 1988, National Center for Educational Statistics (NELS) comparing accelerated mathematics eighth grade students with nonaccelerated older grade-level peers [58]. Findings showed that acceleration had small positive effects of .17, on the students' total of completed Advanced Placement (AP) exams in high school. Further analysis showed that the accelerated students who also took AP exams in high school experienced large positive academic effects with higher ACT composite scores ($d=.91$), ACT mathematics ($d=.80$), ACT science ($d=.96$), and ACT English ($d=.80$) scores than their non-accelerated older peers [58]. Large positive effects .77, were also observed through college years, with the accelerated and AP students having higher undergraduate GPAs than their older, nonaccelerated peers. These findings suggest that accelerated gifted students continue to increase in pace and benefit from continual acceleration [58]. After synthesizing research on gifted acceleration, Rogers determined that when consistently, across grade levels, and intentionally provided challenging curriculum in all academic areas (e.g., social studies, mathematics, language arts, etc.), gifted students were shown to have higher academic self-esteem, reduced stress (higher engagement, less boredom), and higher cognitive skills development [116]. Acceleration is effective for gifted students, but it should not be limited to one instance of acceleration in a gifted students' academic career. Continuous educational services, monitoring, consistency across grade levels, and adjustments are an ongoing part of providing

effective, gifted educational services, and acceleration is not an exception to that rule.

Defining the Practice of Acceleration

Academic acceleration is a simple term referring to the research-based strategies used in gifted education to provide students access to advanced or differentiated content earlier than typical or at a younger age than expected. It involves variable pacing, appropriately matched levels of daily challenge, and opportunities to learn and interact with gifted peers. Acceleration can be divided into two broad categories for simplification. These are referred to as grade-based and content-based (or subject-based) acceleration [3], [91]. While the benefits of acceleration are well-defined through multiple research studies and publications from experts in the field of gifted education, acceleration practices remain sparse across U.S. classrooms [3]. With ample supplies of empirical evidence demonstrating that acceleration works [3], [12], [44], [91], why is implementation resisted in schools? Myths of acceleration propose that it sets gifted students up to fail. Possible reasons that educational administrators, teachers, or parents may avoid acceleration are numerous, yet given the appropriate attention to literature on acceleration, these concerns could be dispelled.

8 Concerns

The detrimental effects of acceleration on the social and emotional well-being of gifted students has been an ongoing concern, largely theoretical, and is addressed by research findings [3], [12], Kulik, 2004; Rogers, 2002, 2015). While accelerating students for inappropriate reasons may have harmful effects (Niehart, 2007), gifted students who are accelerated are no more likely than nonaccelerated gifted peers to display negative social-emotional effects [34], [52], Niehart, 2007). Contrary to the concerns regarding accelerative practices, research has indicated positive effects, and no negative effects, on the social-emotional outcomes of accelerated gifted students [3]. Furthermore, meta-analyses on early entrance to elementary have shown increased socialization and self-esteem outcomes for gifted students compared with non-accelerated gifted peers (Rogers, 2002, 2015). Early acceleration research has repeatedly shown that gifted students continue to benefit academically, and do not suffer, from having been accelerated [12], [58], Stanley, 1973).

Types of acceleration. There are twenty-two types of acceleration (Rogers, 2015), however this study will be reporting on the nineteen that are more directly tied with a schools or educational systems

and have research evidence to support their academic effects.

Research Question 3 (RQ3): What are the effects of acceleration strategies on gifted students' academic outcomes and social-emotional outcomes?

Effects of Acceleration

Social-Emotional and Academic Effects for Content-Based Acceleration

Meta-analyses reporting acceleration effects by type are scant. Rogers' (2008, 2015) results for both types of acceleration across two meta-analyses are consistently positive with few variations between the types [91], [93]. Accordingly, content-based acceleration has small but positive effects on the social-emotional outcomes of gifted students' social adjustment, and similar effects were reported for psychological adjustment. The most current reporting is a moderate and positive effect size of .51, for content-based acceleration on the academic achievement of gifted students (2015). Ultimately, the research findings on content-based acceleration, (see Table C1), show that content-based acceleration positively and moderately effects academic achievement and has small positive effects on the social-emotional development of gifted students.

Social-Emotional and Academic Effects for Grade-Based

Rogers reported small positive effects for grade-based acceleration on social adjustment $d=.23$, (2015), $d=.14$ (1992), and psychological adjustment $d=.34$, (2015). Almost mirroring the results for content-based acceleration effects on academic achievement, Rogers' has reported that grade-based (subject-based in her publications) acceleration has moderate and positive effects .50, (2015). Summarizing Rogers' meta-analyses on grade-based acceleration, (see Table C1), it is clear that grade-based acceleration has moderate and positive academic effects and small positive effects on social-emotional development for gifted students (1992, 2004, 2015). The remainder of summaries on the effects for acceleration are arranged by discussing the forms that have had large effects, moderate effects, and small effects with a mixture of findings from meta-analyses and primary studies. All studies that are discussed and reported statistical effect sizes can be reviewed in supplemental materials, see Table C1 or C2.

Forms of Acceleration with Large Academic Effects

Among the forms of acceleration research considered for the current study, the highest effect sizes were observed for individualized curriculum. Rogers reported individualized curriculum/acceleration to have large positive effects of 2.35, on academic achievement for gifted students

[93]. However, the achievement effects of accelerating through independent study and enrichment may be depressed by the nature of assessments used to measure academic achievement and their lack of matching the learning outcomes [89]. Two forms followed closely behind independent curriculum. Saturday classes on a university campus had an effect size of 1.56, and accelerated/honors high school classes had a large positive effect size of 1.04 on academic achievement [91], [93]. Little et al., demonstrated that single-subject acceleration in mathematics had a large positive effects size of .92, on the academic achievement of gifted kindergarten through second grade students [48]. Similarly, Kim's (2016) synthesis showed that honors' classes on a university campus could have an effect size of .96 on academic achievement [41]. Other forms of acceleration that demonstrated large positive effects included the following (in descending order): computer online courses [58], International Baccalaureate (IB), Grade Skipping, Radical Acceleration (RA), and Advanced Placement (AP) [91], [93]. McClarty's retrospective longitudinal study of early acceleration and the additional effects of AP courses following, showed that gifted students benefitted academically when early acceleration was paired with subsequent acceleration opportunities throughout their education [58].

Forms of Acceleration with moderate Academic Effects

While several studies have also shown positive effects for the forms of acceleration listed in the previous paragraph, if a more recent source provided evidence of the form having a large academic effect, it was categorized as large. With that separation, two forms of acceleration remain that had moderate and positive effects on academic achievement. Concurrent enrollment had an effect size of .41, and summer university courses had an effect size of .43, and .45 [91], [93].

Forms of Acceleration with Small Academic Effects

The remaining forms of acceleration reviewed by the current study were shown to have small and positive effects on the academic achievement of gifted students. These forms were identified through meta-analyses, and it should be noted that intervention studies in isolation may show higher effect sizes for certain forms of acceleration. However, the unique power of meta-analytic findings lies in their ability to span years of intervention studies and recognize trends and overall effects across contexts. The following forms of acceleration had positive small effects: talent search programs .34, early entrance to kindergarten or first grade .30,

Accelerated Residential (AR)/high school on university campus .29, early entrance to university .23, mentorships .22, and compacted curriculum .20 [91], [93].

Forms and Effects for Social-Emotional Outcomes

As previously mentioned, Rogers' syntheses separated effects by type and found small positive social-emotional effects for content-based and grade-based acceleration [93]. In contrast, when examining the social-emotional effects of specific forms of acceleration, the findings are quite different. The following effects are reported from a mixture of meta-analyses and primary studies and can be reviewed in Table C1 and C2.

Forms of Acceleration with Large Social-Emotional Effects

Due to the way that research studies have measured various constructs within the domain of social and emotional development, broad categories make the findings more interpretable. Rogers has utilized social adjustment and psychological adjustment to encompass a multitude of constructs [91], [93]. Social adjustment constructs mainly address interpersonal skills, while psychological adjustment constructs address mostly intrapersonal skills.

Social adjustment effects. Talent search programs seem to have a greater effect on social adjustment than they do on the academic achievement for gifted students. In her 2008 symposium paper discussion, Rogers shared that talent search programs had a large positive effect size of 1.35, on social adjustment [93]. This could be due to the structure of these programs being more intense, meaning they are often year-round and may involve weekend or summer camps. The following forms of acceleration were found to have large positive effects on either social or psychological outcomes. Similar to Kim's (2016) findings, where mentorships have an effect size of .55, on social-emotional outcomes, Rogers reported that mentorships have a large positive effect of .71, on social adjustment for gifted students [41], [93]. In the areas of psychological adjustment, the top form of acceleration is homeschooling with an effect size of .82, followed by accelerated honors/special classes at .60 [91]. Interestingly, accelerated honors/special schools were measured in Rogers' earlier synthesis [89], and demonstrated negative effects of -.30, on social adjustment, but when newer studies were analyzed, they were found to have a small and positive effect size of .11 [91].

Forms of Acceleration with Moderate Social-Emotional Effects

Of the reviewed research presently, none were identified in Rogers' analyses for having moderate

effects on her construct of social adjustment. The only form to have a moderate effect on social-emotional outcomes was honors classes on a university campus [91]. Kim's analysis found honors' classes at a university campus to have a moderate and positive effect on social-emotional development with an effect size of .55 [41]. Alternately, research on the psychological adjustment effects of acceleration discovered that the following forms can have a moderate and positive effect: radical acceleration .42, grade skipping .42, summer university classes .40, and computer courses online .40 [91], [93]. Similarly, another meta-analysis found accelerated elementary students who participated in grade-skipping experienced improved competence in forming friendships with increased academic self-concepts and overall higher self-concepts than gifted peers who were not accelerated [47].

Forms of Acceleration with Small Social-Emotional Effects

Research has additionally focused on social aspects of the effects of acceleration [62], while others have looked at career or professional outcomes [5]. Advanced Placement (AP) courses have become exceedingly popular in high schools, and they provide positive effects on academic outcomes, but given their limited duration, they likely do not increase social or psychological outcomes drastically. According to the research reviewed, AP courses have small positive effects on psychological adjustment with an effect size of .10 [93], .19 [90], and they have small positive effects ranging from .12 to .14, on various outcome measure regarding future STEM career aspirations [5].

Similarly, to the effects of honor's classes at university campuses on social-emotional outcomes, they also effect psychological adjustment with a small positive effect size of .37 [91]. The remaining forms of acceleration also have small positive effects approaching zero effects for psychological adjustment: summer university classes .36, single-subject acceleration .35, early entrance to university .35, talent search programs .34, compacted curriculum .17, mentorships/coaching .16, and International Baccalaureate (IB) .03 [91], [93]. Additionally, several forms of acceleration (e.g., early entrance to kindergarten) have manifested seemingly negative or no effects on social or psychological outcomes, and are frequently noted as not significant or their effect sizes are so minute that they really cannot account for palpable amount of the variation in gifted students' psychological adjustment levels.

Summary and Conclusions of the Academic and Social-Emotional Effects of Acceleration

"Acceleration is the most effective academic intervention for gifted children," [3]. Research has consistently demonstrated the substantial gains acceleration brings to the educational or socio-emotional lives of gifted students [12], [45], [91], [102], [103]. Acceleration provides significant and moderate to large effects on academic achievement with small positive effects on social-emotional outcomes in the best cases, and no negative effects in the worst cases [3]. Review of the studies on acceleration yielded several themes: advocating with evidence for policy change, positive academic effects, positive effects or no-negative effects on social-emotional development, and positive career/professional impacts. For a visual reference, the following synthesis is provided in supplemental files Figure 1. with more detailed descriptions for each service option are available in Appendix D, Table D1.

Acceleration is by far, the gifted service option with the most empirical evidence in favor of its efficacy for gifted learners. The academic effects are positive and in forms of acceleration, academic effects are positive and large. However, the achievement effects of accelerating through independent study and enrichment may be depressed by the nature of assessments used to measure achievement and lack of matching the learning outcomes (Rogers, 2007).

9 Conclusion and Discussion

The present study aimed to review and summarize the literature on enrichment, grouping, and acceleration to determine the effects of each service option on gifted students' academic achievement and social-emotional outcomes. Review of the research on these services revealed positive effects from most of the forms/types of intervention strategies within each service option. However, defining the effects for enrichment in isolation was a complex task.

Enrichment
By design, enrichment is frequently combined with other services or takes the form of a framework or special program. These can include programs such as art, music, and sports often combined with enrichment that focuses on social-emotional learning within academia. For these reasons, the findings on enrichment are difficult to decipher with accuracy. In sorting effects of enrichment by delivery and intensity, the current study found that enrichment offered small-to moderate positive academic effects and no negative social-emotional effects.

Grouping

As with enrichment, when grouping is combined with accelerative forms, (e.g., homogeneously grouped acceleration forms), and curriculum is enriched and differentiated appropriately, the grouping effects on academic achievement are positively impacted. As mentioned earlier, grouping yields approximately one month of additional growth per academic year for gifted learners, and about four to five months of additional growth ($d=.40$), when combined with appropriate instruction and delivery [44]. The best grouping arrangement for meeting the needs of gifted children is a flexible combination of heterogeneously grouped acceleration with enriched curricula. Overall, grouping alone is not enough to consistently increase academic outcomes [87]. Grouping arrangements must be coupled with differentiated instruction and consistency in implementation to yield the effects shown in studies [44], [105].

Acceleration

While large effects on academic achievement and social-emotional factors have occurred from combining principles of these gifted services together, the service area with the most substantial singular effectiveness is academic acceleration. All forms and types of academic acceleration have demonstrated positive academic growth for gifted students. By comparing overall effect sizes across the overarching categories within all three service options, academic acceleration yielded the highest and most consistently positive effects (see supplemental materials, Table C1 & C2).

Results of this study have shown that each gifted service option demonstrated positive academic effects in some form, and within each option, some types/forms of interventions were more or less effective than others. Interventions that blend service options together are most impactful on achievement and social-emotional outcomes. Gifted students should have access to multiple options of acceleration with flexibility throughout development. Where tailored classes or curriculum are not available at a given school and grade level, simple acceleration may be helpful for gifted students. Furthermore, it is helpful to have teachers who are eager to discuss the complex, big ideas and dilemmas surrounding curriculum with their gifted students as an avenue to enriching content. Support from the home environment also serves as a means for enriching discussions and development when parents provide nurturing support and scaffolding for their gifted children [87].

Limitations and Implications for Future Research

The field of gifted education has provided decades of research substantiating the effectiveness and utility of several gifted service options

(enrichment, acceleration, and grouping). While the body of research for gifted education is plentiful, it is also fractured by varying definitions for constructs, methodological issues, and incongruent measures. More cohesive methods across the field for defining and measuring constructs of interest could improve understandings of how these services function. There is also room for more research outside of the constructs of mathematics or reading achievement, such as other academic disciplines or new/refined factors for socio-emotional effects. Also, the present study reviewed more quantitative research than qualitative research due to the limiting factor of effect sizes. Meta-analyses included in the present study included research that had quantitative analyses which could be calculated for statistical effects. This limit excludes most qualitative research studies.

In terms of expanding the research for gifted education service options, the field could benefit from meta-analyses combining results from both quantitative and qualitative studies, particularly to explore social-emotional effects and to provide a more comprehensive picture of all service options and their effects on all types of gifted learners. While these are limiting factors in the present study, they present interesting areas for new research.

10 Future Research

Given the status of gifted education research, the present study can interpret service option effectiveness for minority groups in majority-minority settings within the gifted population, but few studies have examined service option effects for specific, underrepresented populations within majority white settings. To add to and clarify what is currently known about gifted education and the efficacy of service options, future studies could investigate these gaps in the literature. A host of broad questions are available for future research: 1) what contributes to gifted students' achievement in less studied domains (e.g., science, language arts), 2) which service options positively impact gifted students' affective development, 3) which service options are most effective across ability levels and how does maturity impact these, 4) which service options have long-term positive effects academically and/or affectively, and 5) which service options are effective among various groups within the gifted population?

Another area of research in need of more exploration is gifted students' environmental perceptions. Although research has begun to explore the contexts in which gifted students in secondary schools may build positive environmental perceptions [6], there is much to be learned about younger gifted learners' environmental perceptions.

Additionally, future research endeavors may explore which pillars of support (e.g., parents, teachers, peers) are most influential in shaping positive environmental perceptions [6].

The options for grouping have been explored within the research to a degree, yet more specific research questions remain unanswered [57], including: 1) what types of ability grouping and under what conditions are they most effective among underrepresented groups of the gifted population, and 2) how do teacher behaviors or training levels affect the outcomes of ability grouping? 3) which types of grouping promote or reduce positive student outcomes across varying ability levels? Future studies could explore the ways that interventions can help underrepresented populations in gifted education and the findings could inform the use of current strategies or development of new interventions specifically for these groups..

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