A Comparison of Adolescents' Friendship Networks by Advanced Coursework Participation Status

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Abstract

Friendships serve as a source of support and as a context for developing social competence. Although advanced coursework may provide a unique context for the development of friendships, more research is needed to explore exactly what differences exist. Using the National Longitudinal Study of Adolescent Health and the Adolescent Health and Academic Achievement Study, we compared the friendship networks of students taking advanced mathematics and English coursework to those of similar nonparticipants. Groups were compared on the number of sent or received nominations based on students' listings of friends, the presence and reciprocation of best friendships, and friends' academic engagement and diversity. Controlling for background, advanced coursework participants had larger networks and more engaged friends than did nonparticipants. Small differences in age heterogeneity and in the likelihood of reciprocal best friendships with female friends were found in English course-taking. Participants' networks were also somewhat less racially diverse.

Keywords

social and/or emotional development and adjustment, high school, age/developmental stage, hierarchical linear modeling, quantitative methodologies

Peer relationships in general, and friendships more specifically, begin to play an increasingly influential and complex role in the lives of adolescents, making such interactions and relationships especially important to study during this developmental period. In fact, Rubin, Bukowski, and Parker (1998) stated that as the time spent with peers in general increases, friendships become a support system that is equal to or stronger than that provided by the family. More specifically, classes provide a proximal social context, nested within the broader school, where socialization and friendship development evolve, as students develop relationships that grow stronger and more influential as their time together increases (Barry & Wentzel, 2006). Such interaction has the potential to impact the social and academic development of all students (Eccles & Roeser, 2005; Kubitschek & Hallinan, 1998; Riegle-Crumb, Farkas, & Muller, 2006; Wentzel, Barry, & Caldwell, 2004), and as such, the development of friendships in educational contexts is important to consider. Furthermore, the formation of friendships is uniquely important to study for gifted and talented youth, whose path from ability to eventual eminence is thought to be supported both externally by positive social contexts and internally by the social skills developed through peer interaction (Subotnik, Olszewski-Kubilius, & Worrell, 2012).

Classes are often defined within schools based on students' achievement, ability, and interests (Kubitschek & Hallinan, 1998). Special curricular programming, such as Advanced Placement (AP), International Baccalaureate (IB), and other honors and advanced courses, are common offerings for adolescents demonstrating exceptional talent and potential (Bleske-Rechek, Lubinski, & Benbow, 2004; Curry, MacDonald, & Morgan, 1999; Olszewski-Kubilius & Limburg-Weber, 1999). For this reason, the roles of courses providing advanced academic experiences, including AP, IB, and honors courses, are especially important to consider when understanding the contexts in which academically talented students may develop the most supportive peer relationships and friendships. Generally these course offerings are recognized for providing appropriate developmental placement for talented adolescents, as the faster pace of the classes fit well to their faster rate of learning (Bleske-Rechek et al., 2004). Additionally, these programs have been perceived to place students with an appropriate, high-achieving peer group (Frank et al., 2008), from which their friends are drawn (Reis & Dìaz, 1999). Indeed, Coleman (1995/2014) posited that the unique social context of specialized

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programming for talented students was partially shaped by the presence of groups of talented students and the competition and cooperation among them, while a meta-analysis by Park, Caine, and Wimmer (2014) found peer supports to be a common theme in qualitative research on AP and IB programs. As students work with educators, counselors, and parents to select specific curriculum programs, an understanding of the typical experiences of students in such programs could be helpful in the decision-making process.

Much of the previous work on the social aspects of schooling for academically talented youth has focused on the social impact of acceleration, an important but less common method of adapting more typical curricular programming (Colangelo, Assouline, & Gross, 2004). Acceleration, however, creates a different set of social and developmental considerations, as students may be placed with other students much older. Other research has focused on advanced students' self-concepts, as they relate to friendship and romantic relationships (Wright & Leroux, 1997), or on students' self-reported academic and social experiences in advanced coursework. Although these self-reported perceptions are important to understand, they may not reflect the actual relationships students have. It is possible, for instance, that gifted youth may be especially hard on themselves for experiencing what could be considered typical social challenges (Peterson, 2009; Rimm, 2002). Additionally, prior research on this topic has important methodological limitations; Neihart (2007) generally described the research in this area as descriptive and lacking adequate control groups. In an effort to build understanding of the social context of advanced coursework, the purpose of this study is to examine whether students who participate in advanced coursework in high school have friendship networks that are quantifiably different from those with similar backgrounds who do not participate, as examined by patterns of nominated friendships and reports from the nominated friends themselves.

Relevant Theoretical Frameworks

Several frameworks can be used to understand and describe social aspects of giftedness and possible effects of advanced coursework on the social experiences of high-ability youth. Two relevant and commonly used frameworks from the field of gifted education are the forced-choice dilemma (Gross, 1989), which speculates that high-ability youth must decide between social and academic fulfillment, and the stigma of giftedness paradigm (SGP; Coleman, 1985), which hypothesizes that high-ability youth are labeled as different by peers and that this label causes a perceived stigma that must be managed in some way. Research conducted using these paradigms, however, also often considers how specialized programming may mitigate these dynamics.

Coleman (1985) introduced the SGP, suggesting that gifted adolescents perceive themselves as different from their peers. According to the SGP, gifted students are thought to perceive their high intellectual abilities as a social stressor. In fact, Cross, Coleman, and Stewart (1993) found that when comparing themselves to nonidentified peers, 40% of gifted students indicated perceiving themselves as different. This feeling of being different may impact students' social and academic behaviors. Swiatek and colleagues (Cross & Swiatek, 2009; Swiatek, 1995, 2001; Swiatek & Cross, 2007; Swiatek & Dorr, 1998) identified these changes in behavior as giftedness as social coping, because they serve to reduce social stigma. In addition, Gross (2002) noted that gifted children often perceive being different negatively. According to the SGP, the gifted adolescents' belief that others view them as different influences their social interactions. There is evidence that this sense of feeling different may lead to these students perceiving themselves as less competent in social situations or as having difficulties creating and maintaining relationships (Cross et al., 1993; Silverman, 2002).

Academic acceleration or ability grouping may moderate these dynamics; however, findings related to the impact of acceleration and ability grouping on social experiences of high-ability adolescents are mixed (Vogl & Preckel, 2014). Lee, Olszewski-Kubilius, and Thomson (2012), for example, reported that students who were grade accelerated reported more interpersonal competence than others who were not; there were not differences in other areas of competence or for other forms of acceleration. Furthermore, although experience with academic acceleration was negatively correlated with satisfaction with peer relationships, these differences were not robust enough to be found in more complex multivariate analyses. Alternatively, in a study by Cross and Swiatek (2009), high school students attending a special boarding school for gifted adolescents were surveyed at two time points (on entering the boarding school and after 2 years of enrollment). The authors found the gifted students reported more social acceptance and better psychosocial adjustment when they had peer networks that included peers of equal ability, as was the case in the boarding school. Whether similar dynamics occur in subject-specific advanced programming nested within a more general academic context, however, remains to be seen.

The "forced-choice" dilemma provides a separate yet related set of assumptions for considering social dynamics of high achievement. Gross (1989) theorized that high-ability youth have a "forced-choice dilemma" in which they must decide between social or academic pursuits. More specifically, the drives for academic achievement and intimacy (friendships) are in opposition. If a gifted adolescent chooses academic achievement, he or she may risk intimacy/close friendship with peers. Alternatively, if adolescents make the choice to pursue membership in social groups they may be sacrificing high achievement (Gross, 1989). As with the SGP, Gross (1989) suggests these dynamics may be moderated by inclusion of peers who have equivalent abilities into their peer network.

More recent research calls into question the assumption of a forced choice. Jung, McCormick, and Gross (2012) tested the forced-choice dilemma and found that academic

motivation and desire for peer acceptance generally predicted the experience of a "forced choice." Foust, Hertberg-Davis, and Callahan (2008) conducted case studies with 84 AP and IB students to better understand the forced-choice theory. Their findings did not support the forced-choice dilemma and suggested that rather than making a choice between social and academic pursuits, the gifted students interviewed felt they could and should maintain both. Importantly, the authors noted that many IB participants described feelings of being separate from non-IB students due to course grouping (Foust et al., 2008). This indicates that they potentially feel as though they are part of a separate peer network. In fact, Foust et al.'s study further indicated that although such programming may separate advanced students from others, it might also provide social support and a feeling of acceptance within students' local group.

Such an observation speaks to Gross's (1989) notion that homogeneous grouping can serve as a possible solution to this forced-choice dilemma, as the peer networks of such students may have more shared motivations (i.e., not force each other to make a choice). This supportive environment may then serve as a protective factor, even if it comes at the expense of separating students from the larger (and possibly demographically different) peer group. Findings from Eddles-Hirsch, Vialle, McCormick, and Rogers (2012) provide additional support for the protective impact of advanced groupings on perceived acceptance and belonging of peers among gifted elementary school children. In fact, students reported that they shared more interests with their peers in gifted classrooms including what other students did not think were "cool" (Eddles-Hirsch et al., 2012, p. 56).

Characteristics of Friendship Networks in Advanced Curricular Programs

Both Coleman (1985), when outlining the SGP, and Gross (1989), in discussing the forced-choice dilemma, point out that high ability carries with it inherent differences from peers that these gifted adolescents must navigate. Although neither perspective considers the role of broader organizational contexts at its core, subsequent extensions of theory and research have begun to consider how advanced coursework and other forms of acceleration may shape how students experience and cope with these dynamics. In an attempt to identify possible specific differences in the social context of such courses that could result in a more (or less) positive experience for talented young people, we identify in this section specific characteristics of friendship networks that may differ for students who enroll in advanced programming.

To begin, it is possible that the networks of students taking advanced coursework differ in their size. Although many of the studies cited in the previous section appeared to suggest more positive social experiences in advanced programming, other research has found that students participating in such courses often report feeling that their participation sets them apart from their peers (Adams-Byers, Whitsell, & Moon, 2004; Hertzog, 2003). Given that such programming sets high-ability students apart from their same-age peers, who may be in other course programming, it is possible that these students may have a smaller pool of peers from which friends can be drawn. If this is indeed the case, students may have fewer peers that they can nominate as friends and, in return, have fewer peers who reciprocate.

Network size, however, may not necessarily be the most important factor in a student's friendship network for the purposes of supporting talent development and reducing stigma. Perhaps more important, it is possible that the friends that students do report having are more involved in school and higher achieving. Adams-Byers et al. (2004) found that the most common reported advantage of advanced programming (i.e., AP courses) was that the students who participate were "with peers who 'think alike'" (p. 12). This feeling of similarity could be what mitigates the feelings of stigma or forced choice (Eddles-Hirsch et al., 2012). Specialized curricular programming may provide students with access to peer groups, from which friends can be drawn, who are high achieving and connected to school. Friends' values and achievement orientations are important to consider, given that students who are successful in advanced programming often credit their success, in part, to involvement with a successful peer group (Hébert & Reis, 1999). Hébert and Reis identified groupings of high-achieving students as working within a "culture of high achievement," which they attributed to aiding the academic success of students growing up in poverty (p. 442).

In considering the characteristics of friendship networks broadly, it is important to remember that not all of these friendships are created equal. Students will often report having a closest "best friend," and the stronger level of intimacy and support that one receives from this closest friend may mean that the presence and reciprocation of such relationships are especially important to the support of talent development (see Nelson & DeBacker, 2008, for discussions in more general adolescent populations). Gifted adolescents' perceived ability to sustain especially close friendships has been a subject of prior study in advanced programming. Wright and Leroux (1997) surveyed gifted ninth-grade Canadian students on their social self-concepts before and after participation in a yearlong special program. Results indicated significant increases in self-ratings of romantic appeal and close friendship as measured by subscales of the Harter Self-Perception Profile for Adolescents (Wright & Leroux, 1997). Whereas these findings indicate a benefit of advanced programming, other research has suggested that such benefits are dependent on students' enjoyment of such advanced programming (Feldhusen & Dai, 1997), and still others found no statistically significant programmatic effects (Shields, 2002; Zeidner & Schleyer, 1999).

A final set of possible network outcomes of interest focus on dimensions of diversity within adolescents' friendship networks. Although having peers (and even best friends) who are high achieving and connected to school is considered a benefit to advanced program participation, and one with especially important implications for reducing stigma and encouraging talent development, students have reported that the lack of diversity in these courses is a distinct disadvantage (Hertzog, 2003). In Hertzog's study, the students generally had positive comments about participation in advanced coursework; however, many wished there had been a more diverse group of students in the program with whom they could develop friendships. Similarly, Adams-Byers et al. (2004) found that the two most common advantages reported by gifted adolescents to heterogeneous programs, rather than homogeneous advanced coursework, revolved around issues of cultural diversity. "Greater diversity" and "greater opportunity to adjust to other people" were tied as the second most common advantage offered to heterogeneous groupings. Students in such programs may be especially at risk of a lack of diversity along racial/ethnic lines, given the continuing underrepresentation of students of color in advanced programs (Ford & Harris, 1996; Grantham & Ford, 1998). For students of color, these patterns have clear implications for the potential for social support in advanced programs. For students from racial/ethnic majority groups, this could mean that students lose out on opportunities for intergroup contact—an experience that some researchers have linked to the development of leadership and other aspects of social competence (Kawbata & Crick, 2008).

Alternately, the homogeneity of friendship networks among gifted adolescents participating in advanced coursework may have hidden benefits. It has been well established (Robinson, 2004) that gifted students have preferences for older peers in their social relationships. In these cases, students may have more heterogeneous friendship networks drawing from both older and same-age peers. To extend to the context of advanced coursework, specialized programming may afford a "more appropriate" peer group (i.e., more similar in terms of age), lessening the students' likelihood of seeking to find like-minded friends outside of their age or grade group and decreasing heterogeneity according to these dimensions.

Current Study

In sum, previous research has generally suggested that advanced curricular programs may mitigate feelings of stigma that talented young people feel in more general educational environments. This speaks to the important role that such coursework may play in providing a social context to young people that supports the development of strong social bonds by encouraging friendship between like-minded students. The current study contributes to prior research in this area by identifying and measuring specific characteristics of students' friendship networks (rather than relying on perceptions of friends), and comparing them among those who do and do not participate in advanced curricular programs. The major research question addressed in this analysis is the following: Do characteristics of social networks of high school students who participate in advanced curricular programs (e.g., those leading to AP coursework) differ in from those of students who do not participate? A secondary research question to consider is as follows: Are there differences in the nature of these patterns across various subject areas (e.g., comparing students in advanced mathematics coursework versus those in advanced English)? Given the focus that sociologists of education place on mathematics placement as a factor in determining overall curricular positioning within a school (Frank et al., 2008), along with possible differences in the social interactions of students with verbal versus mathematical gifts (Lee et al., 2012), this comparison is an important one to make.

Method

Data Sources

Data for this study come from two complementary sources: The National Longitudinal Study of Adolescent Health (Add Health; Harris, 2008) and the Adolescent Health and Academic Achievement Study (AHAA; Population Research Center, n.d.). The Add Health study is the source of information on students' friendship networks and background characteristics, whereas the AHAA study provides data on course-taking and grades received in specific courses.

The Add Health Study. The general purpose of Add Health was to examine how contexts of development in the adolescent years (e.g., schools, communities, friends, and families) worked with individual traits to shape physical, psychological, and social well-being. Researchers associated with the Add Health study sampled over 20,000 students from schools in 80 communities (selected using a stratified random sample) at Wave I, in 1994-1995. A second wave of data collection occurred in 1995-1996 (not considered in this analysis), and in 2002-2003, researchers followed up with approximately 15,000 of the original respondents during a third wave of data collection.

Wave I participants were administered both in-school questionnaires and in-home interviews. The in-school questionnaire, a 45- to 60-minute self-administered instrument, was completed in students in Grades 7 to 12 from September 1994 through April 1995. In addition to answering a series of questions about oneself (including, most important for this study, questions about demographic characteristics and experiences in schools), participants were also asked to identify up to five male friends and up to five female friends within their school or sister school (defined as the junior high school that feeds into the high school of a same neighborhood, or

vice versa). An additional data set (referred to here as the "social network" data set) was created by analyzing patterns of friendship nomination and recording information about participants' friends, also collected through the in-school questionnaire. As a result, this data set includes information about the overall number of nominations sent and/or received and best friendships nominated and reciprocated for each student, as well as information about the average grades and attitudes toward school of a student's group of friends (as reported by friends themselves) and the diversity of friends in terms of their grade level, age, and race. The social network data set also contains variables resulting from an analysis of overall social network patterns in schools, providing information on the broader context of friendships.

Computer-based, in-home interviews were conducted between April and December 1995. These interviews took between 1 and 2 hours to complete, depending on the respondent's age and experience. During the in-home interview, interviewers read less sensitive questions and recorded the responses, and respondents listened to more sensitive questions through earphones and recorded the answers themselves. In this analysis, demographic items and questions about adolescents' perceptions of social contexts were asked by the interviewers, whereas questions about parents' backgrounds and self-perceptions were considered sensitive and therefore self-recorded. Altogether the in-home interviews consisted of 40 sections. Those relevant to the current study include a general introduction as well as sections on academics and education, self-efficacy, information on mothers and fathers, relationships with parents, employment and expectations for the future, and personality and family. The Add Health version of the Peabody Picture Vocabulary Test (AHPVT), which has been used in other studies of gifted adolescents using the Add Health interview data (Barber & Mueller, 2011; Mueller, 2009), was also administered during the in-home interview. The majority of variables included in the propensity score modeling (discussed below) came from data collected during these interviews.

The AHAA Study. The AHAA study was conceptualized as an extension of the Add Health study and provides indicators related to educational achievement (primarily in the form of grades), course-taking patterns, curricular exposure, and educational contexts (Population Research Center, n.d.). In 2001-2012, as part of Add Health's Wave III data collection (which followed up with almost 15,000 of the original respondents), participants signed a Transcript Release Form that allowed access to their high school records. As described on the AHAA web page, transcript data were collected from all but two Add Health schools, as well as additional high schools attended by Add Health participants due to transfer. In this analysis, course-taking data from AHAA were used to identify students taking advanced coursework in math and English. Data from the AHAA study were also used to identify students' "local curricular positions" corresponding to Wave I data collection (i.e., their local position in 1994-1995). A "local position" has been described by Frank et al. (2008) as "a group of adolescents who, by virtue of their course-taking, share a social and academic space in school" (p. 1648). To use one high school as an example, one local position may represent students who tend to take advanced biology, calculus, and honors history together with music theory, whereas another position represents students who tend to take informal geometry, English, typing, and accounting together (Frank et al., 2008). The local curricular position allowed us to take into consideration that students who take common sets of courses together likely have more in common with one another than do students in the same school with very different course-taking behaviors. In other words, it can be considered as a within-school level of nesting.

Variables

Curricular Variables. To appropriately merge the Add Health and AHAA files, we first identified the grade in which participants were enrolled during the 1994-1995 academic year (when Wave I data were collected). As a result, all variables for the current analysis focus on courses taken in the 1994-1995 academic year. Two key variables of interest captured students' participation in specific advanced coursework in English and mathematics, respectively. In English, variables pertaining to participation in honors English and AP or IB English will be combined to assess participation in advanced coursework. (AP/IB can include survey-type AP or IB English courses as well as more specific coursework in literature or writing.) In mathematics, variables capture the level of math taken in any year (e.g., algebra, geometry, or calculus) but do not indicate whether the level taken was necessarily considered to be an "honors" course per se. To form an indicator of advanced course-taking that can be defined consistently across a variety of schools, regardless of specific math curriculum, we considered whether students were enrolled in coursework at a level above Algebra II in the 1994-1995 academic year. This coursework could include calculus, precalculus, college algebra, or other courses. Although these courses may not necessarily have been offered with AP, IB, or "honors" designations, this definition aligns to those presented in prior research examining enrollment in high-level mathematics coursework and its relation to success in the transition to postsecondary education (Adelman, 2006). In fact, such work finds that taking advanced levels of mathematics is more predictive of later success than whether the course was offered as part of the AP program.

Social Network Variables. The outcome variables considered in this study came from the social network dataset. First, the *network size* represents the total number of friendships sent or received, plus the student himself/herself. Second, *network heterogeneity* variables represent the extent to which students' networks of sent or received friendships are diverse

Table 1. Summary of Descriptive Statistics on Outcomes by Advanced English and Math Coursework Participation Status.

	English, %		Math, %	
	No	Yes	No	Yes
Participant has a best male friend	54	59	54	56
Participant has a best female friend	60	69	60	65
Best male friend reciprocates as best friend	35	35	33	39
Best female friend reciprocates as best friend	39	46	39	43
Network size (sent and received), *M* (*SD*)	7.83 (4.24)	9.20 (4.22)	7.79 (4.26)	8.89 (4.22)
Grade point average of network, *M* (*SD*)	2.75 (0.48)	3.10 (0.42)	2.74 (0.49)	3.08 (0.42)
Sense of belonging of network, *M* (*SD*)	3.55 (0.47)	3.59 (0.42)	3.54 (0.46)	3.64 (0.42)
Has age heterogeneity in network	93	92	93	89
Degree of age heterogeneity in network, *M* (*SD*)	0.53 (0.13)	0.50 (0.14)	0.53 (0.13)	0.50 (0.14)
Has racial heterogeneity in network	67	72	68	66
Degree of racial heterogeneity in network, *M* (*SD*)	0.38 (0.16)	0.37 (0.17)	0.39 (0.16)	0.36 (0.17)
Has grade heterogeneity in network	77	72	78	71
Degree of grade heterogeneity in network, *M* (*SD*)	0.44 (0.15)	0.40 (0.15)	0.44 (0.15)	0.39 (0.16)

Note. Means are reported for continuous variables with standard deviations in parentheses. Percentages of the sample responding in the affirmative are reported for dichotomous variables.

in terms of age, grade, and race. On each of these indicators, scores of 0 indicate complete homogeneity whereas scores of 1 indicate complete heterogeneity (i.e., every member of a network having a different value on a trait of interest). Third, specific *characteristics of network members* were also considered. To examine friends' academic achievement, we considered the average grade point average (GPA) of friends with sent or received nominations. This was computed by Add Health social network data analysts to be a composite of self-reported grades in math, science, social studies and English, each of which is reported on a scale of 1 (all As) to 4 (all Ds or below). We took the mean of the self-reported grades and reverse-coded it, such that a score of 1 indicates all Ds or below and a score of 4 indicates all As. In addition, we created an indicator to capture average sense of belonging among students in a reciprocated friendship network, relying on friends' ratings on five items from the social network data set: they feel close to people at the school, they feel a part of the school, they are happy to be at the school, they feel safe in the school, and the teachers treat students fairly ($\alpha = .81$, factor loadings .64-.84). The original items were scored from 1 (*strongly disagree*) to 5 (*strongly agree*). For the scale used in this analysis, we took the reverse-code of the mean across items, such that a score of 5 indicates the strongest sense of belonging. A final set of outcomes focused not on overall friendship networks but on *best friendships* more specifically. This analysis considered whether best friends (male or female) were identified and also whether the identified best friend (male or female) reciprocates the best friendship nomination. These items were dichotomously coded, such that a score of 0 indicates the absence of a best friend with the particular characteristics in question and a score of 1 indicates the presence of a particular best friend. Table 1 summarizes descriptive statistics for all social network variables.

Propensity of Advanced Coursework Participation. One limitation of the current research design is its cross-sectional nature. Building on the recommendation of Dornbusch, Glasgow, and Lin (1996), the selected individual-level controls focus on motivational, social, and demographic predictors of curricular placement in addition to those focused on ability and achievement. Motivational factors considered include the student's sense of belonging within the school, self-concept, level of difficulty concentrating on schoolwork, and personal expectations for attending college. Social factors considered included parental expectations for attending college and afterschool activities (including extracurricular activities, sports participation, and work for pay). Demographic factors include race/ethnicity, gender, mother's education (treated as a proxy for socioeconomic status), and age. Finally, ability/achievement controls considered include score in the Add Health version of the Peabody Picture Vocabulary Test, self-rating of intelligence, previous history of academic acceleration or grade skipping, and GPA in the corresponding subject during the previous (1993-1994) academic year. Data on extracurricular activity and sports participation came from the in-school questionnaire, while data on all other variables came from the Wave I in-home interview.

To calculate the propensity of advanced coursework participation given these characteristics, variables were entered into a hierarchical generalized logistic regression (nesting students within local positions within schools) and conditional probabilities of participation were saved. These conditional probabilities were then considered as covariates in the main statistical analyses. The propensity score models correctly classified 90% or more of students in terms of their curricular placement (depending on the exact subject area), speaking to the success of the propensity score equation in accounting for relevant background factors.

Other Control Variables. Finally, additional controls were considered at the school level to account for variations in overall norms of social networking across schools. The first control captured the overall network density in a school, or the number of friendship nominations sent or received among those in the school overall divided by the total number of potential nominations. A score of 0 indicates that there were no nominations sent or received, whereas a score of 1 indicates that every pair of students was considered to be a friendship. Actual values observed on this variable range from .00 to .08, meaning that between 0% and 8% of all possible pairs of students in a school have been identified as friendships by one or both members of the pair (M = .01, SD = .01). The second control is the mutuality index, which captures the extent to which the probability of an individual in a school being nominated as a friend is conditional on that individual reciprocating the nomination. It is calculated by considering the expected number of mutual nominations given a network with a particular distribution of out-ties (i.e., sent nominations) as observed within each school (Katz & Powell, 1955, as cited in Carolina Population Research Center, 2001; Wasserman & Faust, 1994). A score of 1 indicates that sent and received nominations are completely dependent on one another, whereas a score of 0 indicates that sent and received nominations are independent of one another (although some reciprocated friendships may exist by chance). Actual values observed on this variable range from .26 to .53 (M = .39, SD = .04). A third and final control is a set of variables that captures how salient race, grade, and age are in defining network ties across students in a school. In other words, if students in a school tend to nominate students of their own race/ethnicity as friends, then race/ethnicity can be said to be more salient in that school. A score of −1 on segregation indices indicates complete preference for out-group members, whereas a score of 1 indicates complete preference for in-group members. Actual values observed on this variable range from −.01 to .75 for racial segregation (M = .26, SD = .19), from .43 to .91 for grade segregation (M = .66, SD = .10), and from .08 to .33 for age segregation (M = .17, SD = .05). Additional information on the construction of these variables can be found in the Add Health *Network Variables Codebook* (Carolina Population Research Center, 2001).

Sample

The analytic sample is limited to those who participated in both Wave I and Wave III (due to the reliance on transcript data), to those for whom social network data are available, and to those who took a high school–level course in 1994-1995 (to facilitate the matching of high school transcript data to Wave I interview and questionnaire data). In addition, for clean nesting of students within local curricular positions within schools, we limited our sample to those with valid data on their local curricular positioning and (to eliminate a few remaining seventh or eighth graders enrolled in high school coursework) to those attending high schools (i.e., not a junior high or middle "feeder school"). Finally, for cleaner matching of participants to nonparticipants, we considered only those participants who attended a school where at least one student reported enrolling in advanced curricular programming. As a result of these decisions, the analytic sample when considering advanced mathematics coursework participation was N = 3,697 in 73 schools (of whom 754 took advanced coursework), and the analytic sample when considering advanced English coursework was N = 3,818 in 73 schools (of whom 641 took advanced coursework). Of the 641 students taking advanced English coursework, 290 were also enrolled in advanced mathematics. Generally speaking, the most notable difference between those in the analytic sample and the complete Add Health data are that this sample skews older (due to the need to eliminate students not yet in high school). In addition, due to the requirement that schools offer advanced coursework and have valid data on within-school curricular positions, students from very small schools were underrepresented in this sample. For some analyses, the sample sizes are even smaller due to legitimate skips in responding to questions. For example, although all participants indicated whether or not they had a best friend, only those who reported having one could respond to a question addressing whether or not that best friendship was reciprocated. Similarly, network characteristics (i.e., demographic heterogeneity, GPA, and sense of belonging) could be calculated only for those participants who had at least one reciprocated friendship. Table 1 includes descriptive statistics for each outcome of interest.

Results

We ran a series of three-level multilevel models (students within local curricular positions within schools) to address our primary analyses in HLM 6.0 software (Raudenbush, Bryk, Cheong, & Congdon, 2004). Hierarchical linear models (HLMs) were estimated using full maximum likelihood estimation for continuous outcomes, specified as follows in Equation (1):

$$\begin{aligned} Y_{ijk} = {} & \gamma 000 + \gamma 001\,(\text{density}_k) + \gamma 002\,(\text{mutuality}_k) + \gamma 003 \\ & (\text{ageseg}_k) + \gamma 004\,(\text{raceseg}_k) + \gamma 005\,(\text{gradeseg}_k) + \\ & \gamma 100\,(\text{propen}_{ijk}) + \gamma 200\,(\text{advanced}_{ijk}) + \text{u}_{00k} + \text{r}_{0jk} + \text{e}_{ijk}, \end{aligned} \tag{1}$$

where γ000 is the intercept value for an individual's score on outcome Y, γ001 through γ005 are regression coefficients associated with school-level variables (density, mutuality index, and three indices of segregation), γ100 is the regression coefficients associated with an individual's propensity for advanced coursework, and γ200 is the regression coefficient associated with each individual's advanced coursework status. Error terms u_k, r_{jk}, and e_{ijk} are associated with the random error across k schools, across j curricular positions, and across i individuals, respectively.

Table 2. Summary of Hierarchical Linear Models Predicting Network Size by Subject Area of Coursework Tested.

	English (n = 3,798), B (SE)	Math (n = 3,840), B (SE)
Intercept	8.35 (0.16)***	8.31 (0.14)***
School network density	−1.36 (16.31)	1.57 (13.75
School mutuality index	11.81 (4.31)**	13.04 (3.37)***
School age segregation index	−1.13 (2.26)	−3.31 (2.13)
School race segregation index	−0.38 (1.03)	−0.28 (0.84)
School grade segregation index	−16.67 (3.24)***	−15.07 (3.09)***
Propensity of advanced course-taking	1.74 (0.49)**	1.31 (0.49)**
Advanced course indicator	1.07 (0.22)***	0.62 (0.22)**
	Variance components	Variance components
Position level	0.56***	0.76***
School level	1.28***	0.92***
Error	15.05	15.29

*p < .05. **p < .01. ***p < .001.

Hierarchical generalized linear models (HGLMs) employing a logit link function and unit-specific models using full penalized quasi-likelihood estimation were estimated for binary outcomes. The structural component of the HGLM was identical to the model specified in the HLM analyses; however, instead of directly modeling an individual's score on the outcome variable, the model predicted the log odds of an individual having the characteristic being predicted (represented as η_{ijk}). Equation (2) specifies the link function used:

$$\eta_{ijk} = \log(\varphi_{ijk}/[1 - \varphi_{ijk}]), \quad (2)$$

where φ_{ijk} is the probability of having the outcome characteristic in question.

In all models, the propensity of advanced coursework participation and the advanced coursework indicator were entered into the model at Level 1 as fixed effects, and variables at all levels were centered on their grand mean. We ran separate analyses for advanced math and English course-taking. In interpreting findings, we focus on results that are statistically significant when using robust standard errors, and discuss differences between advanced coursework participants and nonparticipants in standard deviation units as a measure of effect size (i.e., Cohen's d).

Network Size and Best Friendships

Table 2 summarizes the HLMs predicting network size for advanced English and mathematics participants. Those participating in advanced coursework in each of these subjects had friendship networks that were significantly larger (p < .001 for English; p = .006 for math). In each of these subjects, those participating in advanced coursework had approximately nine reciprocated friendships, compared to approximately eight reciprocated friendships for participants from similar backgrounds attending similar schools who did not participate in advanced coursework. These are equivalent to a .25 standard deviation difference in network size between the two groups in English and a .15 standard deviation difference between the two groups in mathematics. Altogether adding advanced course-taking to the models explains an additional 0.15% of the variance in network size over and above the included covariates.

Turning to best friendships, Tables 3 and 4 summarize the HGLM models predicting the presence and reciprocation of best friendships by subject and by gender of the best friend. Advanced mathematics participants were not more likely than nonparticipants to indicate that they had a best friend (male and female: p = .160 and p = .337, respectively), nor were they more likely to have that friendship reciprocated (p = .372 for reciprocated male friendships; p = .867 for reciprocated female friendships). In contrast, advanced English participants were 39% more likely to report having a best female friend (p = .003), and those reporting a best female friend were 27% more likely to have that best female friendship reciprocated (p = .035). Participation in advanced English coursework did not have a statistically significant effect on the presence or reciprocation of a best male friend (p = .050 and p = .115, respectively).

Friends' GPA and School Belonging

Table 5 summarizes the HLMs predicting friends' GPA and sense of belonging at school. In both subjects, students who were in advanced coursework had friends who reported doing significantly better in school (p < .001 for both English and math) and who felt a significantly greater sense of belonging in the school (p = .045 for English, p = .005 for math), than did similar students attending similar schools. The difference between participants and nonparticipants in their friends' GPAs was approximately 0.15 (on a scale of 1 to 4), or one third of a standard deviation. The difference in

Table 3. Summary of Hierarchical Generalized Linear Models Predicting the Likelihood of Reporting a Best Friendship by Gender of Friend and Subject Area of Coursework Tested.

	English				Math			
	Best male friend (n = 3,798)		Best female friend (n = 3,798)		Best male friend (n = 3,849)		Best female friend (n = 3,840)	
	B (*SE*)	Odds ratio	B (*SE*)	Odds ratio	B (*SE*)	Odds ratio	B (*SE*)	Odds ratio
Intercept	0.20 (.04)***	1.21	0.53 (0.05)***	1.70	0.21 (0.05)***	1.23	0.51 (0.05)***	1.67
School network density	−7.43 (4.5)	0.00	0.44 (6.06)	1.55	−6.84 (5.77)	.00	0.87 (4.48)	2.38
School mutuality index	6.5 (1.07)***	663.27	6.76 (1.26)***	860.47	6.32 (1.02)***	553.24	7.05 (1.38)***	1148.5
School age segregation index	−2.20 (0.75)**	0.11	−1.93 (0.75)*	0.14	−2.28 (0.67)**	0.10	−2.67 (0.74)**	0.07
School race segregation index	−0.68 (0.30)*	0.51	−0.52 (0.30)	0.59	−0.62 (1.07)*	0.54	−0.51 (0.27)	0.60
School grade segregation index	−2.19 (1.08)*	.11	−3.13 (1.16)**	0.04	−2.20 (1.07)*	0.11	−2.3 (1.15)*	0.10
Propensity of advanced course-taking	0.16 (.18)	1.18	0.40 (0.18)*	1.49	−0.07 (0.18)	0.93	0.47 (0.18)*	1.60
Advanced course indicator	0.21 (0.11)	1.23	0.33 (0.11)**	1.39	0.15 (0.10)	1.16	0.11 (0.12)	1.12
	Variance component		Variance component		Variance component		Variance component	
Position level	0.03		0.02		0.03		0.03	
School level	0.04**		0.06***		0.04**		0.06***	

*p < .05. **p < .01. ***p < .001.

their sense of belonging was approximately one tenth of 1 standard deviation. In all cases, however, the average sense of belonging score was somewhere well above 3, indicating that nonparticipants' friends still felt generally positive, albeit slightly more tempered in how strongly they agreed that they were a part of the school that they attended. The addition of advanced English course-taking explained 1.25% of the variance in friends' GPAs unaccounted for by the covariates, while advanced math course-taking explained 0.71% of the variance in the outcome over and above covariates. Adding advanced course-taking in English and math to the models for friends' sense of belonging explained 0.18% and 0.17% of the variance unaccounted for by covariates, respectively.

Heterogeneity in Friendship Networks

There were no statistically significant differences between advanced coursework participants and similar nonparticipants in the likelihood that they would report absolutely no racial, grade, or age heterogeneity in their friendship network (English: p = .967 for race, p = .426 for grade, p = .633 for age; math: p = .421 for race, p = .959 for grade, p = .793 for age). However, in the subsets reporting at least some degree of heterogeneity in these areas, some differences were found, and they are reported on Table 6. Among those who had at least some degree of heterogeneity in the race/ethnicity of their friendship networks, both advanced mathematics and English coursework participants had just under two tenths of a standard deviation less heterogeneity than did their nonparticipating counterparts (p = .011 for English; p < .001 for mathematics). Adding in course-taking in English and math as a predictor into the models explains an additional 0.46% of variance and 0.17% of variance, respectively, over and above covariates. Advanced English coursework participants with some degree of network heterogeneity in terms of age also had networks that were one tenth of a standard deviation more homogenous (p = .047); however, it explains a negligible amount of variance over and above covariates. Differences were not observed in advanced math course-taking (p = .242). There were also no statistically significant differences at the p = .05 alpha threshold between advanced coursework participants and nonparticipants in the diversity of networks by grade (p = .059 for math, p = .070 for English).

Discussion

The purpose of this study was to compare the friendship networks of students enrolled in advanced mathematics and/or English coursework to those of similar nonparticipants. Overall, students in advanced programs had larger networks of friends who were more academically and affectively engaged in their schools. There were also some differences in terms of participants' likelihood of having a best friend evident when examining patterns associated with advanced English coursework, as students were more likely to report having a best female friend and to have that friendship with a female friend reciprocated. A more concerning finding, however, was the lack of racial/ethnic diversity in the friendship networks of students participating in advanced

Table 4. Summary of Hierarchical Generalized Linear Models Predicting the Likelihood of Reciprocated Best Friendships by Gender of Friend and Subject Area of Coursework Tested.

	English				Math			
	Best male friend (n = 1,671)		Best female friend (n = 2,006)		Best male friend (n = 1,692)		Best female friend (n = 2,027)	
	B (*SE*)	Odds ratio	B (*SE*)	Odds ratio	B (*SE*)	Odds ratio	B (*SE*)	Odds ratio
Intercept	−0.63 (0.07)***	0.53	−0.39 (0.05)***	0.68	−0.63 (0.08)***	0.53	−0.38 (0.05)***	0.67
School network density	7.14 (6.62)	1256.1	2.87 (4.69)	17.68	11.67 (7.97)	117180	2.97 (5.12)	19.56
School mutuality index	4.91 (2.86)	135.70	2.21 (1.64)	9.16	4.38 (2.81)	80.20	2.64 (1.37)	14.11
School age segregation index	−1.17 (0.89)	0.31	0.78 (0.53)	2.19	−1.37 (0.93)	0.25	0.79 (0.57)	2.21
School race segregation index	−0.33 (.43)	0.72	−0.32 (0.26)	0.72	−0.36 (0.43)	0.70	−0.14 (0.26)	0.87
School grade segregation index	−1.56 (1.35)	0.21	−1.90 (1.50)	0.15	−1.40 (1.45)	0.25	−2.12 (1.05)	0.12
Propensity of advanced course-taking	−0.49 (0.26)	0.61	0.19 (0.21)	1.21	0.34 (0.27)	1.40	0.34 (0.21)	1.40
Advanced course indicator	0.26 (0.16)	1.29	0.24 (0.11)*	1.27	0.15 (0.16)	1.16	−0.02 (0.14)	0.98
	Variance components		Variance components		Variance components		Variance components	
Position level	0.10		0.00		0.09		0.00	
School level	0.03		0.01		0.05*		0.01	

*p < .05. **p < .01. ***p < .001.

Table 5. Summary of Hierarchical Linear Models Predicting Friends' Average GPA and Sense of Belonging by Subject Area of Coursework Tested.

	English		Math	
	Friends' GPA (n = 3,675), B (*SE*)	Friends' sense of belonging (n = 3,683), B (*SE*)	Friends' GPA (n = 3,707), B (*SE*)	Friends' sense of belonging (n = 3,716), B (*SE*)
Intercept	2.87 (0.02)***	3.60 (0.02)***	2.85 (0.02)***	3.60 (0.02)***
School network density	8.35 (2.26)**	12.37 (2.81)***	8.36 (2.04)***	11.73 (2.86)***
School mutuality index	0.51 (0.52)	0.09 (0.54)	0.51 (0.52)	0.05 (0.52)
School age segregation index	0.80 (0.36)*	0.70 (0.25)**	0.27 (0.36)	0.58 (0.23)*
School race segregation index	−0.23 (0.14)	−0.08 (0.09)	−0.18 (0.14)	−0.06 (0.09)
School grade segregation index	−0.63 (0.51)	0.60 (0.37)	−1.21 (0.50)	0.66 (0.34)
Propensity of advanced course-taking	0.62 (0.04)***	0.17 (0.04)***	0.53 (0.07)***	0.11 (0.05)*
Advanced coursework indicator	0.17 (0.03)***	0.04 (0.02)*	0.13 (0.03)***	0.06 (0.02)**
	Variance component	Variance component	Variance component	Variance component
Position level	0.01***	<0.01*	0.01***	<0.01**
School level	0.03***	0.02***	0.03***	0.02***
Error	0.15	0.18	0.16	0.18

*p < .05. **p < .01. ***p < .001.

coursework. Overall, however, the effects over and above controls for the likelihood of selection into a program and general networking characteristics of a school were uniformly small.

Although this may initially appear to contradict the basic tenets of the "forced-choice" dilemma, these findings do make sense in light of Gross's (1989) corollary to the forced-choice dilemma, which states that advanced curricular programming may mitigate the feeling of choice between academics and a social life. An examination of the levels of school engagement reported by the friends of advanced coursework participants (especially as compared to nonparticipants) provides some insight as to why students may not experience a forced choice (or, indeed, why advanced coursework participation may even have some social benefits). On average, students participating in advanced math or English

Table 6. Summary of Hierarchical Linear Models Predicting Degree of Age, Race, and Grade Heterogeneity by Subject Area of Coursework Tested.

	English			Math		
	Age (n = 3,419), B (SE)	Race (n = 2,489), B (SE)	Grade (n = 2,892), B (SE)	Age (n = 3,446), B (SE)	Race (n = 2,526), B (SE)	Grade (n = 2,850), B (SE)
Intercept	0.53 (0.00)***	0.35 (0.01)***	0.44 (0.00)***	0.53 (0.00)***	0.36 (0.01)***	0.44 (0.00)***
School network density	0.45 (0.54)	−2.34 (0.75)**	1.25 (0.38)**	0.37 (0.56)	−2.57 (0.77)**	1.39 (0.40)**
School mutuality index	−0.06 (0.10)	−0.18 (0.22)	−0.07 (0.10)	−0.08 (0.11)	−0.17 (0.23)	−0.08 (0.12)
School age segregation index	−0.25 (0.06)***	0.10 (0.16)	−0.31 (0.06)***	−0.19 (0.06)**	0.15 (0.17)	−0.25 (0.06)***
School race segregation index	0.02 (0.02)	0.09 (0.06)	0.00 (0.02)	0.02 (0.02)	0.10 (0.05)	−0.00 (0.02)
School grade segregation index	−0.14 (0.09)	0.64 (0.23)**	0.02 (0.10)	−0.15 (0.10)	0.59 (0.23)*	−0.00 (0.12)
Propensity of advanced course-taking	−0.06 (0.01)***	−0.04 (0.02)*	−0.07 (0.02)**	−0.05 (0.01)***	−0.04 (0.020*	−0.06 (0.02)***
Advanced coursework indicator	−0.01 (0.01)*	−0.03 (0.01)*	−0.02 (0.01)	−0.01 (0.01)	−0.03 (0.01)***	−0.02 (0.01)
	Variance component	Variance component	Variance component	Variance component	Variance component	Variance component
Position level	0.00	0.00	0.01***	<0.01	<0.01	<0.01***
School level	<0.01***	< 0.01***	<0.01**	<0.01***	0.01***	<0.01**
Error	0.02	0.02	0.02	0.02	0.02	0.02

*p < .05. **p < .01. ***p < .001.

coursework had friends who performed better in school and who somewhat more strongly felt that they belonged in school than did nonparticipants. Moreover, this difference in the quality of networks comes without sacrificing network size; if anything, the networks of friends are slightly larger for students in advanced programs. In other words, the very characteristics that may have led the students themselves to seek out more challenging coursework (i.e., good grades, an affinity for their school) are reflected in their network of friends that they have. By having more "like-minded" peers in their courses, students may feel less social stigma due to their academic talents, thus allowing for the possibility for friendships to develop. In this way, these findings mirror previous research where academically talented students reported that being around similar students was one of the best benefits of their involvement in advanced academic programs (Adams-Byers et al., 2004; Hertzog, 2003). This finding is especially important when one considers that these friendships with involved, active friends may serve as a support to students in their future involvement and success in these programs. It also speaks to Coleman's (1995/2014) assertion that interactions among students with common backgrounds may contribute to the unique social context of advanced programming, and the potential benefits of such a context should be considered when advising potential students in their curricular planning.

Another consideration in the analysis was whether these dynamics were especially pronounced in one subject area over the other. Although research on the social organization of schooling focuses on the pivotal role that mathematics course placement has on the organization of coursework, and research in gifted education focuses on the different social presentations of mathematically and verbally talented young people, the findings here suggests that many of the dynamics play out in similar ways when considering advanced coursework in mathematics or in English.[1] Admittedly, part of the reason for this may be the overlap in who participates in these courses, as a sizeable portion of the respondents were enrolled in both advanced mathematics coursework and in AP, IB, or honors coursework in English. There were only two notable differences observed between the two subject areas. One was in examining best friendships: Participants in advanced English programs were more likely to report having best female friends than nonparticipants, but there were no statistically significant effects observed when comparing mathematics participants to nonparticipants. Similarly, there was slightly less grade heterogeneity in the networks of advanced English coursework participants, perhaps suggesting that students taking these courses may be somewhat better able to find friends in their own grade rather than looking at students from other, potentially later, grades.

Two areas for further consideration are suggested by this finding. First, this suggests a gendered component to advanced course-taking, as best female friendships, rather than best male friendships, were associated with advanced English participation. Although the general finding regarding gender and advanced coursework is consistent with previous literature (Riegle-Crumb et al., 2006), more in-depth analyses comparing the experiences of male and female participants in such classes may be needed to fully understand the social dynamics of these classes. Second, although English may be less central in defining a student's curricular position within a school, it is still worth discussing when considering social issues relevant to schooling. In fact, the relative ease with which one can move in and out of advanced English coursework (compared to shifting levels of

mathematics coursework; Frank et al., 2008) may make social support even more compelling to consider in this subject area. Further research employing longitudinal research designs should consider the experiences of students moving in and out of these courses in greater depth.

Despite the many positive findings, there are some slight areas of concern. Most notably, these analyses suggest that students who are enrolled in advanced math and English programs have somewhat more limited degrees of racial/ethnic diversity in their network of friends. Although there is no significant difference in the proportions reporting *no* diversity, there is less diversity amongst those who do report having at least some. Although these patterns generally mirror racial and socioeconomic gaps in assessments of achievement and skill that have been observed by psychologists for decades (Petersen & Novick, 1976), they also echo concerns raised by sociologists of education about the social organization of schooling serving to reinforce such disparities, with members of historically underserved groups underrepresented in the most advanced course offerings (Oakes, 2005). Even if located in a school that is generally more racially/ethnically or socioculturally diverse, students enrolled in academic magnet programs or other advanced curricular programming (who most typically are from more privileged backgrounds) may not have much interaction with their peers taking other courses, potentially leaving few opportunities for cross-racial friendships to develop (Heck, Price, & Thomas, 2004; Staiger, 2004). This certainly has implications for the support perceived by the students of color who enroll in such programs, but it also has implications for White students who may have less opportunity for intergroup contact.

There are two related sets of implications that come to mind from these findings, each of which speak to addressing *why* there may be somewhat fewer opportunities for students in advanced programs to develop racially and ethnically diverse friendships. The first is to consider why there is such underrepresentation in these programs, and to consider ways to identify and develop talent among groups who have been underserved by educational systems (especially advanced academic programs) in the past. In the spirit of the current analysis, and keeping in mind findings from previous case studies of academically talented students of color (Grantham & Ford, 1998; Reis & Dìaz, 1999), such initiatives should consider the important role of social support in making advanced courses a welcoming, nurturing environment for all students. The second is to consider ways of increasing contact between students enrolled in advanced and traditional academic courses, so that students may have opportunities to interact with a broader cross section of their peers. In considering how such contact may look, however, it is necessary to keep in mind that many students in advanced academic courses report feeling different from peers outside of their courses (Eddles-Hirsch et al., 2012). As such, activities designed to promote intergroup contact should be carefully planned in order to encourage students to embrace their similarities, regardless of educational or demographic background.

The use of data from a large survey program that employed a nationally drawn sample allows us to consider these dynamics across a variety of schools, to easily draw a comparison group, and to control for a large number of possible reasons why advanced coursework participants could differ from nonparticipants even before enrolling in the classes to be examined. There are, however, limitations to this approach to consider. One consideration is the age of the data: This study focuses on the experiences of students in the late 1990s. Although the richness of the Add Health data (and the relatively more recent availability of transcript data) keep them in use by researchers today, changes in educational policy since the first wave of data collection should be taken into account when considering the findings' generalizeability to current-day contexts. In particular, the concerns over rigid requirements for selection into advanced coursework as they serve to reproduce social inequalities have led some schools to more open-enrollment policies regarding advanced coursework, particularly in AP programs (discussed as related to AP as a form of gifted programming by Gallagher, 2009).

A second limitation of the study is its focus on mathematics and English coursework at the expense of other modes of advanced academic experiences. Although these two courses represent opportunities for advanced coursework in two core subjects, it is possible that other students may have sought advanced opportunities in other subject areas (e.g., through the arts, foreign language, science, or social studies). Extending from subject-specific opportunities, students may have also sought advanced academic experiences by attending magnet schools or, outside of the academic year, through attendance at Governor's Schools or other summer camps. We attempted in this analysis to address some of this variation by considering the random effect of school attended (acknowledging that a very small number of schools reported having magnet programs) and local curricular positioning (defined across courses from multiple subject areas). However, further work should consider the roles of other types of programming more explicitly, and should also examine how out-of-school enrichment may have additional influences on networks. Moreover, in reflecting how outside contexts may have changed since the 1990s, further research may also want to consider how technology may further support the social networks of gifted and talented youth (e.g., through the use of social media).

A final limitation is the use of only a single time point: We analyzed course enrollment in the year corresponding to Wave I data collection. Longitudinal data would allow for the establishment of temporal order, where earlier coursework participation can be associated with later friendship network characteristics. A subsample of schools participating in the Add Health study (referred to as the "saturated

sample"; see Flashman, 2012) have enough data from the second wave of collection to begin to establish this order; however, the limited sample from which one can draw compromises many of the benefits of the current analysis outlined above. Nonetheless, future work is planned using these data as a complementary analysis.

In considering potential avenues for further research, several possibilities have already been outlined, including the need for longitudinal analyses and the consideration of differential experiences by gender and race/ethnicity. In addition, future work should conduct within-group analyses of advanced coursework participants to consider how friendship networks may relate to academic achievement once enrolled in these classes. Although friendships are important in and of themselves for students' socioemotional development, they may also serve to support students' academic development. Indeed, many previous studies examining friendships of advanced coursework participants have done so in order to understand how the presence of such relationships can support course-taking and achievement. Additional work planned by the authors (also using Add Health data) builds on other research in the field by considering a greater variety of friendship network characteristics as they may relate to achievement, and how this support might look different depending on subject area. Moreover, the current study is limited to the consideration of variables made available by Add Health researchers in their social network database. In future work, researchers could use the same social network techniques employed by Add Health researchers to study network characteristics that could be more specific to this particular group of students. In particular, students in advanced coursework have friends who get higher grades than do similar nonparticipants; however, it is unclear from this analysis whether the friends are actually enrolled in similar advanced courses.

In conclusion, this analysis appears to challenge the assumption that enrollment in advanced academic programming will have a negative impact on students' abilities to make friends. These results suggest that students in these programs have broad groups of friends who are academically successful and who enjoy school—two attributes that make them especially good potential sources of support to the students attempting to complete challenging coursework. That said, the potential for advanced coursework to limit students' opportunities for friendships with students from different racial and ethnic backgrounds should not be taken lightly. Overall, these social issues are complex and worthy of additional study, both for their own sake and for their ability to support talented young people and to help them work to their highest potential.

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Note

1. Previous analyses by the authors examined those participating in both advanced mathematics and English coursework as a separate group, and found that these students had friendship networks with higher average GPAs than did students participating in only one class or the other.

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