



Family Language Transmission Under Institutional Language Regimes Shapes Adolescent Mental Health Through Peers

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Family Language Transmission Under Institutional Language Regimes Shapes Adolescent Mental Health Through Peers

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Abstract

In many societies, institutional languages shape participation, recognition, and belonging, while families transmit language backgrounds across generations. These inherited backgrounds may contribute to children’s communication and, once children enter shared peer environments, to the experiences of their classmates. I show evidence that family language backgrounds travel across households through classroom peer exposure and affect adolescent well-being. Using nationally representative data from China and the random assignment of students to middle-school classrooms, I estimate the effect of being assigned peers whose family language aligns with the language of instruction. Exposure to language-of-instruction-aligned peers reduces students’ mental-health symptoms by 0.18 standard deviations ($\hat{\beta} = -0.181$; 95% CI, -0.316 to -0.046; $P = 0.009$) and improves peer relations, classroom climate, teacher feedback, school satisfaction, and other noncognitive outcomes. The findings show how institutional language environments can turn inherited family language backgrounds into peer-mediated spillovers that shape adolescent development beyond the household.

Keywords: Institutional language ; Intergenerational transmission ; Peer effects ; Adolescent mental health ; Home language

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Introduction

Some important social boundaries persist across generations even when formal institutions create common spaces for participation. Language is one domain in which institutional arrangements can create consequential differences in access to education, participation, and institutional inclusion (Laitin and Ramachandran, 2016; DeGraff, 2018). In multilingual societies, schools, labor markets, and public institutions often rely on a common or official language, making language policy consequential for education, economic exchange, and human development (Angrist and Lavy, 1997; Laitin and Ramachandran, 2016; Lazear, 1999). Yet children’s language exposure begins in families, and home-language practices may not align with the language used in schools and other public institutions (Casey and Dustmann, 2008; King et al., 2008; De Houwer, 2007; Hoff et al., 2012; Unsworth, 2016; DeGraff, 2018). Language can therefore be understood not only as a medium of communication, but also as a form of family-transmitted capital connected to identity, participation, and institutional access (Casey and Dustmann, 2008; King et al., 2008; Montrul, 2010; Valdés, 2005; Norton, 1997).

Language-related barriers have been linked to classroom social integration (Bredtmann et al., 2021). More broadly, research on adolescent development shows that social connection, isolation, and peer belonging are closely associated with mental health and behavioral outcomes (Loades et al., 2020; Orben et al., 2020). If inherited language environments shape how adolescents communicate with peers and experience belonging (Ahn and Jepsen., 2015; Bredtmann et al., 2021), then family language background may have downstream consequences for psychological well-being, since peer disconnection and social isolation are important risk factors for adolescent mental health (Loades et al., 2020; Orben et al., 2020). Existing research links language proficiency, immigrant background, minority status, and classroom linguistic diversity to children’s educational outcomes and social integration (Bleakley and Chin, 2008; Ahn and Jepsen., 2015; Cho, 2012; Diette and Oyelere, 2017; Bredtmann et al., 2021). Yet we know less about how family language environments persist across generations, enter children’s peer networks, and shape social belonging and psychological well-being through peers (Casey and Dustmann, 2008; King et al., 2008; Ahn and Jepsen., 2015; Bredtmann et al., 2021).

I focus on peer transmission because peer environments are a central channel through which family background, social interaction, and inherited beliefs affect students’ academic and noncognitive development (Ammermueller and Pischke., 2009; Black et al., 2013; Lavy and Sand, 2019; Eble and Hu, 2022). In multilingual settings, classroom language environments are shaped not only by students’ own families but also by the peers with whom

they interact each day (Ahn and Jepsen., 2015; Cho, 2012; Bredtmann et al., 2021). Family language input shapes children’s language use, and children’s language backgrounds may then become part of the peer environment faced by classmates (Casey and Dustmann, 2008; De Houwer, 2007; Hoff et al., 2012; Unsworth, 2016; Ahn and Jepsen., 2015). Because adolescence is a period in which peer acceptance and belonging are closely related to mental health, these everyday communication environments may have psychological consequences (Kessler et al., 2007; Fruehwirth et al., 2019; Loades et al., 2020; Orben et al., 2020; Kiessling and Norris, 2023). This suggests that even when public institutions provide a common language, family language differences may continue to shape social integration and psychological well-being through peer networks (Laitin and Ramachandran, 2016; Bredtmann et al., 2021; Ahn and Jepsen., 2015; Kiessling and Norris, 2023).

Experimentally studying this peer transmission is difficult and ethically problematic: inducing communication frictions could harm peer interaction and mental health, while lab randomization cannot reproduce everyday classroom relationships. Prior research shows that family language exposure shapes children’s language development, but home-language environments are not randomly assigned and are closely tied to parental education, socioeconomic status, rural or urban origin, migration history, and ethnicity (Casey and Dustmann, 2008; De Houwer, 2007; Hoff et al., 2012; Unsworth, 2016; Bergelson et al., 2023; Bleakley and Chin, 2008; Cho, 2012; Diette and Oyelere, 2017; Bredtmann et al., 2021). Simple comparisons across adolescents from different language backgrounds therefore cannot separate language environment from other dimensions of social background (Cho, 2012; Bredtmann et al., 2021).

To address these challenges, I exploit quasi-random classroom assignment within Chinese middle schools, drawing on methods from the peer effects literature (Eble and Hu, 2022; Gong et al., 2021; Chen et al., 2025). Classroom assignment creates variation in the peers students encounter each day (Ammermueller and Pischke., 2009; Lavy and Sand, 2019; Golsteyn et al., 2021). In the CEPS, some classmates have parents who report using Mandarin at home, whereas others come from families that rely more heavily on local dialects. In China, Mandarin is institutionally promoted as the standard national language and the basic language of schooling (Standing Committee of the National People’s Congress, 2000; Ministry of Education of the People’s Republic of China, 2021). Because students in the same school and grade are assigned to different classrooms, they experience different peer family language environments. I estimate the effect of exposure to more peers from language-of-instruction-aligned families, while accounting for school-grade environments and other peer characteristics (Ammermueller and Pischke., 2009; Lavy and Sand, 2019; Golsteyn et al., 2021; Eble and Hu, 2022).

The setting has three features that make it well suited to this study. First, adolescence is a sensitive period for social integration and mental health (Kessler et al., 2007; Loades et al., 2020; Orben et al., 2020). During this period, students acquire academic skills while also developing peer relationships and a sense of belonging that are closely connected to well-being (Lavy and Sand, 2019; Loades et al., 2020; Orben et al., 2020). Second, many Chinese middle schools assign students to classrooms in ways that previous studies have used for quasi-random peer-exposure designs, allowing comparisons among students in the same school and grade who face different peer family language environments (Eble and Hu, 2022; Gong et al., 2021). Third, China combines an institutionally promoted public language of instruction with substantial family language variation, making it possible to study how alignment between home language and institutional language is transformed into opportunities for social integration in everyday interaction (Standing Committee of the National People’s Congress, 2000; Laitin and Ramachandran, 2016).

The data come from the China Education Panel Survey (CEPS), a nationally representative survey of Chinese middle-school students. The survey sampled seventh-grade classrooms and ninth-grade classrooms in each school and surveyed all students in those classrooms. I use student, teacher, and parent reports on adolescent mental health, peer interaction, classroom experience, teacher feedback, students’ own language use, and parents’ language use. Appendix Tables S1 presents summary statistics. Appendix Tables S2 compares students by family language background. Appendix Tables S3 and S4 reports classroom-assignment tests, which fail to reject the null that students were quasi-randomly assigned to classrooms within schools.

The CEPS asks parents what language they usually speak with the child at home, distinguishing Mandarin Chinese, mixed Mandarin and hometown dialect, and hometown dialect. I code parent LOI use as speaking Mandarin, and treat Mandarin as the institutional language of instruction because national law designates it as the standard spoken language and the basic language for schooling and official public use (Standing Committee of the National People’s Congress, 2000). Using this question, I construct a leave-one-out measure of peer exposure: for each student, the proportion of classmates, excluding the student herself, whose parents report using Mandarin at home. I refer to this variable as peer parent language-of-instruction (LOI) exposure. It captures exposure to classmates whose family language environments are more closely aligned with the institutional language used in school.

My primary outcome is adolescent mental health. The CEPS asks students how often they feel blue, unhappy, that life is meaningless, unable to enjoy life, or sad. I use these five emotional distress items to construct standardized mental-health indices, using both the item

mean and the first principal component. Higher values correspond to more severe mental-health problems. This focus is consistent with evidence that mental-health problems often emerge early in life and that adolescent social experience is central to emotional well-being (Kessler et al., 2007; Collins et al., 2011; Loades et al., 2020; Orben et al., 2020).

The main results show that family language environments become peer environments in school. Parents' use of the language of instruction is strongly associated with children's own Mandarin use. This pattern is consistent with prior evidence on intergenerational language transmission and the role of family language input in children's language development (Casey and Dustmann, 2008; De Houwer, 2007; Hoff et al., 2012; Unsworth, 2016; Bergelson et al., 2023). Students assigned to classrooms with more peers from language-of-instruction-aligned families report substantially better mental health and school experience. A one-standard-deviation increase in peer parent LOI exposure reduces poor mental health by approximately 0.18 standard deviations. The same exposure improves peer relations, classroom atmosphere, teacher feedback, school attachment, and perceived academic value. By contrast, exposure to classmates from dialect-only home-language environments predicts weaker classroom interaction outcomes and does not generate comparable improvements in mental health.

The evidence is consistent with a communication-friction interpretation. Language-of-instruction-aligned peers may lower the social and cognitive costs of peer conversation, classroom participation, and teacher-facing interaction (Horwitz et al., 1986; MacIntyre and Gardner, 1994; Ahn and Jepsen., 2015; Bredtmann et al., 2021). Students in these classrooms report stronger peer integration and school attachment, suggesting a more supportive social environment. Because peer belonging is closely tied to adolescent psychological well-being, these improvements provide a plausible pathway linking peer language alignment to mental health (Loades et al., 2020; Orben et al., 2020).

This paper makes three contributions. First, it contributes to evidence that peer environments matter for adolescent mental health and noncognitive development, while highlighting ordinary classroom communication as a distinct channel (Kiessling and Norris, 2023; Chen et al., 2025). Existing work links mental health to family shocks, neighborhoods, poverty, and peers, but less is known about how everyday peer communication environments shape psychological well-being during adolescence (Kling et al., 2007; Persson and Rossin-Slater, 2018; Ridley et al., 2020; Kiessling and Norris, 2023; Giulietti et al., 2022). Second, the paper introduces family language alignment as a distinct dimension of peer exposure. Unlike standard peer characteristics studied in prior work, such as ability, socioeconomic background, gender composition, or personality, classmates' language-of-instruction background may affect the ease with which students communicate, participate, and socially integrate (Ammermueller

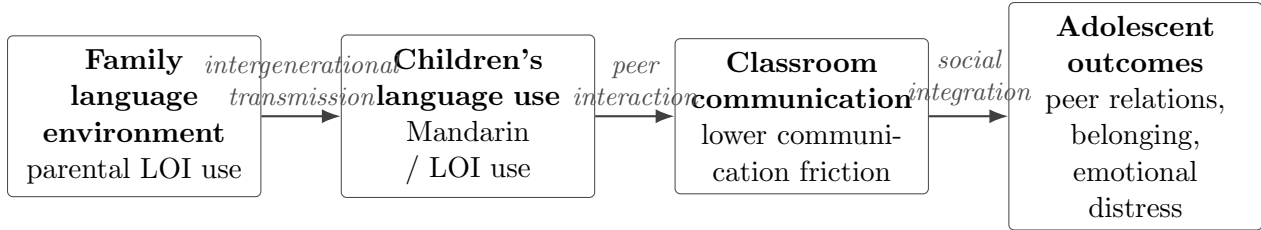


Figure 1: **Family language transmission as classroom peer exposure.** Family language environments can become peer communication environments in school. Parents’ use of the language of instruction is transmitted to children’s own language use, which enters peer interaction and lowers classroom communication friction. Improved classroom communication may then support social integration and adolescent outcomes, including peer relations, school belonging, and emotional distress.

and Pischke., 2009; Black et al., 2013; Gong et al., 2021; Golsteyn et al., 2021; Feng et al., 2026). Third, the paper extends research on intergenerational language transmission by examining whether family language capital generates peer externalities beyond the household (Casey and Dustmann, 2008; King et al., 2008; De Houwer, 2007; Hoff et al., 2012; Unsworth, 2016). Building on research on peer effects and intergenerational transmission, I show that parents’ home-language practices can enter peer networks and generate spillovers for classmates’ social and psychological development through quasi-random classroom peer exposure (Ahn and Jepsen., 2015; Lavy and Sand, 2019; Eble and Hu, 2022; Bredtmann et al., 2021; Casey and Dustmann, 2008).

Results

Family language environments as peer communication environments

Figure 1 illustrates the proposed pathway. Family language environments enter school through children’s language use, shape peer interaction, reduce communication friction in the classroom, and may ultimately affect adolescent social integration and mental health.

Peer language environments and adolescent well-being

I first examine how being assigned to a classroom with more classmates whose parents use the language of instruction at home relates to classmates’ own language use and students’ mental health. I show these results in Table 1. Column 1 uses peer LOI as the outcome. Columns 2 and 4 report the reduced-form estimates for student mental health, and columns 3 and 5 add peer LOI to examine whether classmates’ own reported language use accounts

Table 1: Mapping of exposure to peers whose parents use the language of instruction onto adolescent mental health

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Peer LOI	Mental health, PCA index	Mental health, PCA index	Mental health, mean index	Mental health, mean index
Peer parent LOI	0.465 (0.292, 0.638) [0.000]	-0.181 (-0.316, -0.046) [0.009]	-0.141 (-0.281, -0.002) [0.047]	-0.169 (-0.304, -0.035) [0.014]	-0.137 (-0.276, 0.002) [0.053]
Peer LOI			-0.087 (-0.244, 0.069) [0.274]		-0.071 (-0.229, 0.088) [0.380]
Observations	8,508	8,236	8,236	8,357	8,357
R-squared	0.981	0.012	0.012	0.012	0.012

Notes: This table reports estimates of exposure to peers whose parents use the language of instruction at home. Column 1 examines whether peer parent LOI predicts peer LOI, while columns 2–5 estimate its relationship with student mental health. Peer parent LOI and peer LOI are standardized leave-one-out classroom shares based on parents’ and students’ reported use of the language of instruction at home, respectively. Higher values of the mental-health indices indicate worse mental health. All specifications include baseline student and family controls and school-by-grade fixed effects, with standard errors clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

for part of the relationship.

In column 1 of Table 1, I estimate that a one-standard-deviation increase in peer parent LOI is associated with a 0.465-standard-deviation increase in peer LOI (CI 0.292 to 0.638; $P < 0.001$). This peer-level mapping indicates that classrooms with more classmates from language-of-instruction-aligned families also contain more classmates who themselves report using the language of instruction at home. This pattern is consistent with intergenerational language transmission: Appendix Table S12 shows that, within the same school-grade and conditional on baseline controls, students whose parents use the language of instruction at home are 48.7 percentage points more likely to report using it themselves (CI 0.456 to 0.518; $P < 0.001$).

Columns 2 and 4 report the main reduced-form estimates for student mental health. A one-standard-deviation increase in peer parent LOI is associated with a 0.181-standard-deviation reduction in the PCA index of poor mental health (CI -0.316 to -0.046; $P = 0.009$) and a 0.169-standard-deviation reduction in the mean index of poor mental health (CI -0.304 to -0.035; $P = 0.014$). Thus, students assigned to classrooms with more peers from language-of-instruction home environments report fewer mental-health difficulties.

Columns 3 and 5 add peer LOI to the specification. The coefficient on peer parent LOI remains negative in both columns, although the magnitude declines: the estimate is -0.141

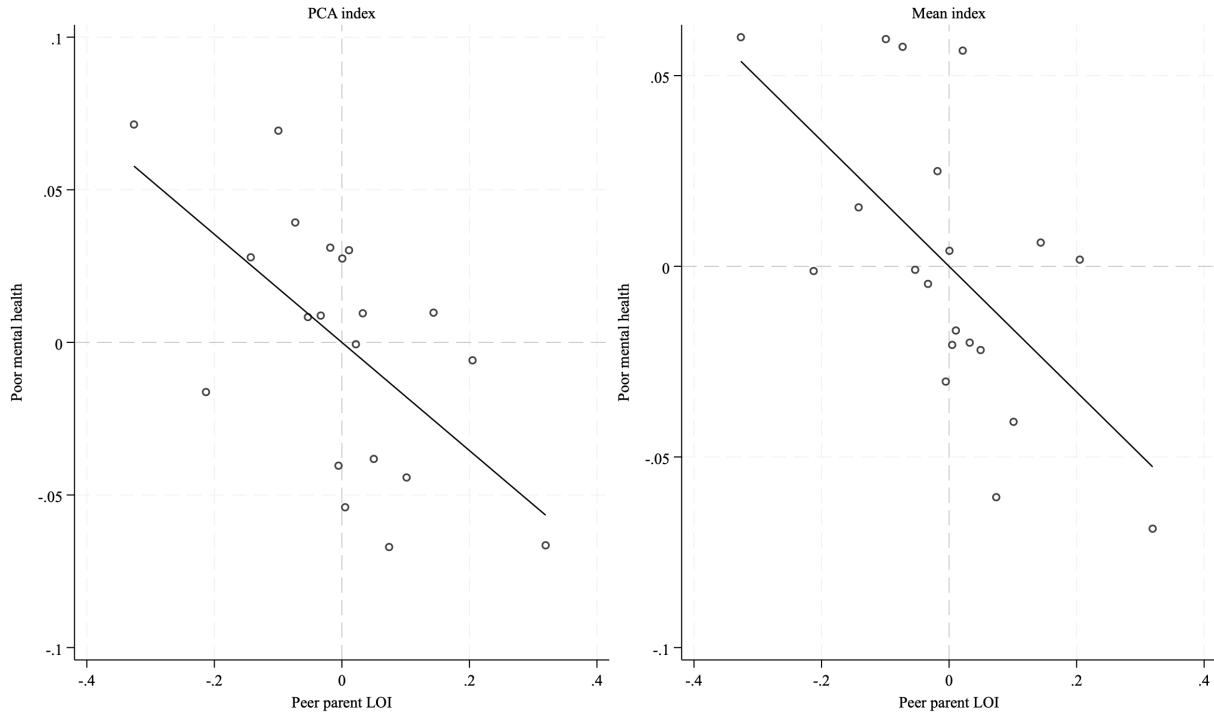


Figure 2: **Peer parental language alignment reduces adolescent mental-health difficulties.** The figure plots residualized student mental-health outcomes against residualized peer parental language exposure. Both variables are residualized with respect to baseline student and family controls and school-by-grade fixed effects. Peer parental language exposure is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. Higher values of the mental-health indices indicate worse mental health.

for the PCA index (CI -0.281 to -0.002; $P = 0.047$) and -0.137 for the mean index (CI -0.276 to 0.002; $P = 0.053$). The coefficient on peer LOI is also negative, but imprecisely estimated (columns 3 and 5). These patterns suggest that classmates' own reported language use may account for part of the relationship, but they do not support a narrow interpretation in which peer LOI is the only channel. I therefore interpret peer parent LOI as a reduced-form measure of classmates' family-language background and the broader classroom language environment it creates.

We also present the reduced-form relationship graphically. Figure 2 plots binned residualized values of student mental health against residualized peer parent LOI, after residualizing both variables with respect to the same baseline controls and school-by-grade fixed effects used in Table 1. The fitted line slopes downward, consistent with the regression estimates: students assigned to classrooms with more peers from language-of-instruction home environments report fewer mental-health difficulties.

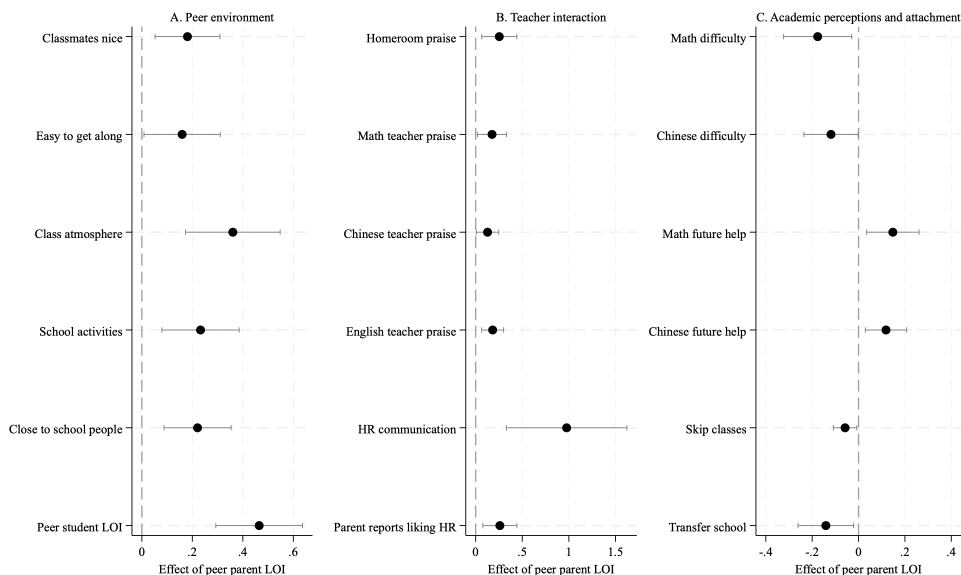


Figure 3: **Peer parental language alignment improves classroom social experience.** The figure reports the coefficient on peer parent LOI from separate regressions for each outcome. Outcomes are grouped into peer environment, teacher interaction, and academic perceptions and school attachment. Regressions include baseline student and family controls and school-by-grade fixed effects. Horizontal bars report 95% confidence intervals clustered at the classroom level.

Overall, these results are consistent with the proposed pathway from family language environments to peer communication environments. Exposure to classmates from language-of-instruction home environments predicts students' own reported language use, fewer mental-health difficulties, and a more supportive classroom environment. The attenuation after controlling for peer LOI is consistent with language transmission playing some role, while the remaining association suggests that peer parent LOI captures more than classmates' reported language use alone.

Communication frictions, classroom experience, and school attachment

I next examine whether peer parent LOI predicts classroom outcomes that should move if family-language environments reduce communication frictions. This analysis is not a formal mediation test. Instead, it asks whether the same peer exposure that predicts student mental health also predicts the everyday classroom margins through which mental health may be shaped.

If communication frictions are an important channel, peer parent LOI should matter along

three related dimensions. First, students should experience a more supportive peer environment, because classmates from language-of-instruction home environments may lower the social costs of interaction. Second, students may receive more positive teacher interaction, because better communication and classroom integration can make students more visible, responsive, and engaged in teacher-facing settings. Third, students should report more favorable academic perceptions and stronger school attachment, as lower communication frictions may make schoolwork feel less difficult, increase the perceived value of academic subjects, and reduce disengagement from school.

Figure 3 presents these estimates graphically; the full set of coefficients, standard errors, confidence intervals, and two-sided p -values is reported in Appendix Tables S5. Consistent with the peer-environment prediction, a 1 s.d. increase in peer parent LOI predicts more favorable peer relations and school social experiences. The estimates are positive for all five peer-facing outcomes: whether classmates are nice, whether the student finds it easy to get along with classmates, classroom atmosphere, participation in school activities, and closeness to people at school. The largest estimate is for classroom atmosphere (0.360 s.d., CI [0.172, 0.549], $p < 0.001$), and all five estimates are statistically significant at conventional levels.

The second set of outcomes points to the teacher-interaction margin. Higher peer parent LOI predicts more praise from the homeroom, math, Chinese, and English teachers, with estimates ranging from 0.128 s.d. for Chinese teacher praise to 0.254 s.d. for homeroom teacher praise. It also predicts substantially more homeroom-teacher communication time, measured in teacher-reported minutes after class (0.976 s.d., CI [0.326, 1.627], $p = 0.003$), and a higher parent-reported likelihood that the child likes the homeroom teacher (0.260 s.d., CI [0.076, 0.444], $p = 0.006$). Because these outcomes draw on student, teacher, and parent reports, the pattern is unlikely to reflect only students' reporting style. These results suggest that language-aligned peer environments affect students' integration into teacher-facing classroom life.

Finally, peer parent LOI predicts academic perceptions and school attachment in the directions implied by lower communication frictions. Students assigned to classrooms with higher peer parent LOI report lower math difficulty (-0.176 s.d., CI [-0.324, -0.029], $p = 0.020$) and lower Chinese difficulty (-0.119 s.d., CI [-0.236, -0.001], $p = 0.048$). They also report greater perceived future value of mathematics and Chinese, lower skipping of classes, and a lower desire to transfer schools. These patterns suggest that the same peer language environment that predicts better mental health is also associated with lower academic strain and stronger attachment to school.

Together, the results in Figure 3 and Appendix Tables S5 support the communication-

friction interpretation. Peer parent LOI predicts improvements across peer relations, teacher interaction, and academic attachment, rather than only one isolated margin. Appendix Tables S9 shows that this pattern is asymmetric: peer parent LOI predicts lower mental-health difficulties and better classroom-interaction outcomes, whereas peer parent non-LOI does not produce comparable mental-health gains and moves several social outcomes in the opposite direction. These findings suggest that classmates' family-language environments shape the day-to-day social and instructional conditions of the classroom.

Robustness of the result

A potential concern is that parental LOI use is observed after classroom assignment and may therefore partly reflect post-assignment influences rather than a pre-existing family-language environment. This concern can arise through three channels: students may transmit new classroom language practices back to parents, parent-to-parent networks may affect parental reports, and teachers or classroom environments may shape families' language practices or reporting behavior after assignment.

I assess these possibilities in three ways. First, I use the timing of the estimates. If parental LOI reports were mainly shaped by students' exposure to new classmates, this channel should be weakest in seventh grade, when students have only recently entered their assigned classrooms and parents have had little time to adjust home-language practices or reporting. Yet the mental-health estimate is already negative in seventh grade (Appendix Tables S6). This early association is difficult to explain solely by post-assignment changes in parental LOI reports, while the larger ninth-grade estimate is consistent with a cumulative peer-communication mechanism. Second, interactions with indicators for whether parents know the child's friends or those friends' parents are small and statistically insignificant, providing little evidence that parent-to-parent networks explain the result (Appendix Tables S7). Third, observed classroom and teacher characteristics do not jointly predict parental LOI use within school-grade cells. Their lack of joint predictive power provides little support for the interpretation that teacher or classroom environments contaminate parental LOI reports after assignment (Appendix Tables S8).

These checks do not prove that parent-reported home language is mechanically predetermined. However, home language use reflects family language policy, durable linguistic habits, and identity-related language practices (Norton, 1997; King and Fogle, 2006; King et al., 2008; De Houwer, 2007). It is therefore unlikely to change sharply in response to a child's middle-school classroom assignment. I interpret peer parent LOI as a plausibly predetermined measure of classmates' family-language backgrounds.

I next examine whether peer parent LOI is explained by other standard sources of peer effects. Table 2 adds peer parental SES, peer hukou composition, peer openness, peer female share, peer cognitive ability, and students' own language and ability controls. For mental-health difficulties, the coefficient on peer parent LOI remains negative and similar in magnitude across specifications: the baseline estimate is -0.181 s.d., and the most saturated estimate is -0.181 s.d. (CI [-0.322, -0.040], $p = 0.012$). For classroom atmosphere, the coefficient remains positive in every specification, with a baseline estimate of 0.360 s.d. and a saturated estimate of 0.281 s.d. (CI [0.079, 0.482], $p = 0.006$). These patterns suggest that peer parent LOI is not merely a proxy for standard peer quality or family background, but captures a distinct dimension of classroom exposure related to communication and social integration.

Table 2: Stability of estimates when controlling for other sources of peer effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A. Mental health, PCA index</i>							
Peer parent LOI	-0.181 (-0.316, -0.046) [0.009]	-0.176 (-0.309, -0.042) [0.010]	-0.196 (-0.335, -0.057) [0.006]	-0.206 (-0.346, -0.067) [0.004]	-0.206 (-0.347, -0.065) [0.004]	-0.213 (-0.352, -0.074) [0.003]	-0.181 (-0.322, -0.040) [0.012]
Observations	8,236	8,236	8,236	8,236	8,236	8,236	7,032
R-squared	0.012	0.013	0.013	0.013	0.013	0.013	0.019
<i>Panel B. Class atmosphere</i>							
Peer parent LOI	0.360 (0.172, 0.549) [0.000]	0.295 (0.101, 0.489) [0.003]	0.291 (0.086, 0.496) [0.006]	0.256 (0.060, 0.452) [0.011]	0.281 (0.078, 0.485) [0.007]	0.303 (0.100, 0.506) [0.004]	0.281 (0.079, 0.482) [0.006]
Observations	8,421	8,421	8,421	8,421	8,421	8,421	7,169
R-squared	0.142	0.143	0.143	0.144	0.145	0.145	0.147
Baseline controls	X	X	X	X	X	X	X
Peer parent SES		X	X	X	X	X	X
Peer parent hukou			X	X	X	X	X
Peer openness				X	X	X	X
Peer female share					X	X	X
Peer cognitive ability						X	X
Language and cognitive ability							X

Notes: This table examines whether the estimates for peer parent LOI use are stable after adding controls for other common sources of peer effects. Panel A reports estimates for the mental-health PCA index. Panel B reports estimates for classroom atmosphere. Peer parent LOI use is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. All regressions include baseline student and family controls and school-by-grade fixed effects. Standard errors are clustered at the classroom level. For each estimate, the coefficient is reported first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets. Column 2 adds peer parent SES controls, including parents' education and household income. Column 3 adds peer residency composition. Column 7 additionally controls for student LOI, parent LOI, and cognitive ability; the smaller sample reflects non-missing data for these additional measures.

Discussion

This study advances understanding of how institutional language boundaries and intergenerational language transmission shape adolescent development (Laitin and Ramachandran, 2016; DeGraff, 2018; Casey and Dustmann, 2008). Modern institutions often operate through

a common official or instructional language (Angrist and Lavy, 1997; Lleras-Muney and Shertzer, 2015), while children inherit home languages, dialects, and mother tongues through family language practices (Casey and Dustmann, 2008; King et al., 2008). I show that family language environments do not remain confined to the household. They enter classrooms through children’s peer networks and become part of the everyday communication environment in which adolescents form relationships, experience belonging, and develop socially and noncognitively (Ahn and Jepsen., 2015; Bredtmann et al., 2021; Lavy and Sand, 2019).

Directly estimating this mechanism experimentally is difficult for both ethical and logistical reasons. Researchers cannot randomly ask families to change their home language, nor can they randomly impose communication frictions on children to study whether their mental health worsens. I address these barriers by using quasi-random classroom assignment in Chinese middle schools, which generates variation in the share of classmates whose parents use the language of instruction at home (Eble and Hu, 2022; Gong et al., 2021). The results show that exposure to more peers from families aligned with the language of instruction predicts better mental health and more favorable school social experiences.

The core contribution is to move the study of intergenerational language transmission beyond the parent-child link (Casey and Dustmann, 2008; De Houwer, 2007; Hoff et al., 2012; Unsworth, 2016). Parents’ home-language practices shape their own children’s language use, but children also carry family language environments into peer groups. In this sense, family language capital has externalities: one household’s distance from the institutional language can affect not only its own child, but also the communication costs, social integration, and psychological experience of classmates (Ahn and Jepsen., 2015; Bredtmann et al., 2021). This reframes language disadvantage as relational rather than purely individual. Students’ experiences depend not only on their own language background, but also on the language environments of the peers with whom they interact each day (Ahn and Jepsen., 2015; Bredtmann et al., 2021; Lavy and Sand, 2019; Eble and Hu, 2022; Kiessling and Norris, 2023).

Two aspects of this study make it likely to underestimate the full importance of this exposure. First, I observe adolescent mental health and school experience at one point in time. If communication frictions compound through peer relations, teacher feedback, academic confidence, and school attachment, longer-term effects on educational trajectories, identity formation, occupational choices, and social mobility may be larger (Heckman and Rubinstein, 2001; Cunha and Heckman, 2007; Heckman et al., 2013; Deming, 2017). Second, I study an ordinary school environment rather than a setting of sharp linguistic disruption, such as migration shocks, colonial language regimes, minority-language suppression, or abrupt

language-policy change (Gould et al., 2009; Laitin and Ramachandran, 2016; Lleras-Muney and Shertzer, 2015; DeGraff, 2018). Even in this relatively common institutional context, peer family-language environments predict mental health and social integration.

There are several limitations. The first is that the process linking peer language environments to mental health remains partly a black box. The results show that peer relations, teacher interaction, academic perceptions, and school attachment move in directions consistent with lower communication frictions, but the design does not identify the relative importance of these channels. Smoother peer communication may improve mental health directly, or it may operate indirectly through participation, feedback, stress reduction, and belonging (Loades et al., 2020; Orben et al., 2020; Kiessling and Norris, 2023).

The second limitation is that this is not a randomized controlled trial. The analysis relies on quasi-random classroom assignment and variation in the share of peers whose parents use the language of instruction at home. It is therefore possible that an omitted factor affects both peer parent LOI and student outcomes. I address this concern with balance tests, grade-specific analyses, parent-network interactions, classroom-feature checks, and controls for peer parental SES, hukou composition, openness, gender composition, cognitive ability, and peers' own LOI use. These tests cannot rule out all omitted factors, but they suggest that the results are not fully explained by the main sources of peer effects emphasized in prior research (Ammermueller and Pischke., 2009; Black et al., 2013; Gong et al., 2021; Golsteyn et al., 2021; Feng et al., 2026).

The third limitation is that peer parent LOI is a single parent-reported measure of home language. It captures alignment between family language environments and the institutional language of schooling, but it cannot fully describe the complexity of multilingual family practices (King et al., 2008; Montrul, 2010; Norton, 1997). The interpretation is not that any language is inherently better. Rather, when institutions designate one language as the language of instruction, distance between home language and institutional language can generate communication frictions that travel through peer networks (Standing Committee of the National People's Congress, 2000; Horwitz et al., 1986; MacIntyre and Gardner, 1994).

More broadly, the findings suggest that institutional languages may not be neutral infrastructure (Laitin and Ramachandran, 2016; DeGraff, 2018). A common language can make large-scale coordination possible, but it can also convert home-language differences into unequal access to educational participation, social recognition, and institutional belonging (Angrist and Lavy, 1997; Lleras-Muney and Shertzer, 2015; DeGraff, 2018). Schools are an early, dense, and empirically useful setting in which this mechanism can be observed, but similar frictions may arise wherever institutions organize participation through a dom-

inant language: in immigrant communities, minority-language regions, workplaces, public services, health systems, courts, and urban labor markets. In these settings, language alignment may shape not only whether people understand formal rules, but also whether they can enter informal conversations, build trust, receive feedback, and become socially visible.

The broader lesson is that family language environments are social environments. They diffuse through peers and institutions, alter daily communication costs, and shape who feels heard, included, and able to belong. Understanding this mechanism moves language from a question of individual ability to a question of institutional inclusion: who can participate without translation, who must absorb the cost of adjustment, and how everyday communication frictions become inequality in mental health, social integration, and social mobility (Casey and Dustmann, 2008; Bredtmann et al., 2021; Loades et al., 2020; Orben et al., 2020; Ridley et al., 2020).

Materials and Methods

Quasi-experimental design

This paper studies whether family language capital affects adolescent mental health and noncognitive development through classroom peers. The key question is whether students assigned to classrooms with more peers from language-of-instruction-aligned families experience different communication, peer relations, teacher interaction, school belonging, and mental health (Ahn and Jepsen., 2015; Cho, 2012; Bredtmann et al., 2021; Kiessling and Norris, 2023).

A conventional randomized experiment is neither feasible nor ethical: family language environments are tied to culture, identity, classroom participation, and belonging (Norton, 1997; King et al., 2008; Montrul, 2010). Direct comparisons across students from different home-language backgrounds are also likely to be confounded, because home language is correlated with parental education, rural or urban origin, socioeconomic status, urbanization, migration history, ethnicity, and school quality (Casey and Dustmann, 2008; Bleakley and Chin, 2008; Cho, 2012; Bredtmann et al., 2021).

I therefore exploit quasi-random classroom assignment within Chinese middle schools. This design follows recent studies using the China Education Panel Survey and related Chinese middle-school settings to identify peer effects from random classroom assignment and within-school-grade variation in peer composition, including peer parental gender beliefs, peer gender composition, and peer personality (Eble and Hu, 2022; Gong et al., 2021; Chen

et al., 2025). Rather than comparing students by their own family language background, I compare students in the same school and grade who were assigned to classrooms with different peer family language environments. The treatment variable is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home, so the student’s own family language is excluded from the peer exposure measure. School-by-grade fixed effects absorb all school-grade-level differences, including local language environments, school resources, grade curricula, and regional context. The identifying variation therefore comes from within-school-grade differences in classmates’ family language backgrounds, rather than from cross-school, regional, or own-family language differences.

I assess the plausibility of this design using several checks. Balance tests show that predetermined student and family characteristics do not jointly predict peer parent LOI exposure after school-by-grade fixed effects are included (Appendix Tables S3). A complementary randomization-based check shows that the observed imbalance is not unusual relative to simulated classroom assignments within school-grade cells (Appendix Tables S4). The main mental-health estimates are also stable when I repeatedly re-estimate the specification after randomly dropping subsets of schools (Appendix Figs. S2).

Data and sample

I use the first wave of the China Education Panel Survey (CEPS), collected during the 2013–2014 school year. CEPS is a nationally representative survey of Chinese middle-school students, with schools selected from a national sampling frame using probabilities proportional to size. The sampling frame covers counties and city districts across the 31 provinces, municipalities, and autonomous regions of mainland China, excluding Hong Kong, Macau, and Taiwan; detailed geographic identifiers are suppressed to protect participant anonymity. The first wave surveyed approximately 20,000 students and includes linked student, parent, teacher, and school-principal questionnaires with measures of mental health, peer relations, school belonging, teacher interaction, academic attitudes, family background, home-language use, and classroom-assignment rules.

Following prior studies that use the random classroom assignment in the CEPS for quasi-experimental designs (Eble and Hu, 2022; Gong et al., 2018), I restrict the analysis to school-grade cells that report random or balanced classroom assignment. The final estimation sample includes 9,361 students in 215 classrooms across 86 schools.

Estimating equation

The main estimating equation is:

$$Y_{icgs} = \beta_0 + \beta_1 PeerParentLOI_{icgs} + X'_{icgs}\beta_2 + Z'_{icgs}\beta_3 + O'_{icgs}\beta_4 + \eta_{gs} + \varepsilon_{icgs}.$$

Y_{icgs} denotes student outcomes, including mental health, peer relations, classroom climate, teacher interaction, academic difficulty, and school belonging. $PeerParentLOI_{icgs}$ is the standardized leave-one-out share of classmates whose parents use Mandarin at home. X_{icgs} includes baseline controls. Z_{icgs} includes peer composition controls, including peer parent SES, peer agricultural hukou, peer openness, peer cognitive ability, and the share of female peers. O_{icgs} controls for the student's own family language environment, including whether the student's parents use Mandarin at home and whether the student uses Mandarin with parents. η_{gs} denotes school-by-grade fixed effects. Standard errors are clustered at the classroom level.

The coefficient of interest is β_1 . It captures the reduced-form effect of being assigned, within the same school and grade, to a classroom with a one-standard-deviation higher share of peers from language-of-instruction-aligned families. I interpret this as the overall effect of exposure to a more LOI-aligned peer language environment, not as the causal effect of any single mediation channel.

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Supplementary Information

0.1 Data, sample, and variables

This paper uses the first wave of the China Education Panel Survey (CEPS), collected during the 2013–2014 academic year. The CEPS is a nationally representative survey of Chinese middle-school students. The baseline survey sampled seventh- and ninth-grade students and collected linked information from students, parents, teachers, and school principals. These data include student mental health, peer relationships, school attachment, academic attitudes, family background, parent-reported home-language use, teacher characteristics, and classroom assignment rules. I focus on the first wave rather than later follow-up data because later waves follow a smaller sample, no longer provide the same nationally representative cross-section of ninth-grade students, and do not contain several key measures, including parent-reported home-language use.

The analysis focuses on schools in which students were randomly or quasi-randomly assigned to classrooms. Following prior work using CEPS to study classroom peer effects (Eble and Hu, 2022; Gong et al., 2018; Chen et al., 2025), I restrict the sample to school-by-grade cohorts where principals and homeroom teachers report random or balanced classroom assignment. Ninth-grade cohorts are excluded if students were re-sorted after initial assignment. This restriction reduces the possibility that classroom composition reflects prior achievement, family background, or parent preferences. The resulting estimation sample contains 9,361 students in 215 classrooms across 86 schools.

The main peer exposure is classmates’ home-language alignment with the language of instruction. In China, Mandarin is the institutional language of instruction. The parent questionnaire asks what language parents usually speak with the child at home. I define an indicator equal to one if the parent reports speaking Mandarin Chinese, and zero if the parent reports mixed Mandarin and dialect, dialect, or another language. The measure is restricted to biological parents and stepparents. For each student, I construct a leave-one-out classroom measure: the share of classmates whose parents report speaking Mandarin at home, excluding the student’s own parent report when available. If the student’s own parent report is missing, the exposure is defined as the classroom mean among classmates with nonmissing parent reports. This exposure is standardized over the analysis sample. I interpret it as a proxy for exposure to classmates whose family language environment is aligned with the language of instruction, while recognizing that the survey measures parent-reported home-language use rather than mother tongue directly.

I also construct a student-reported language measure from the question asking what

language the student usually speaks with parents. The corresponding leave-one-out peer measure captures the share of classmates who report using Mandarin with parents. I use this measure to examine intergenerational language transmission, while treating parent-reported home language as the main exposure because it is closer to a family-language endowment brought into the classroom.

The main outcome is student mental health. The CEPS asks students how often, during the past seven days, they felt blue, depressed, unhappy, unable to enjoy life, and sad. Responses are coded on a five-point scale from never to always, with higher values indicating worse mental health. Following prior studies, I construct two mental-health indices: the row mean of the five items and the first principal component, oriented so that higher values indicate worse mental health (Gong et al., 2018; Chen et al., 2025). The main analysis standardizes both indices within school-by-grade cells; Appendix Table S10 shows that the results are robust to full-sample standardization.

Additional outcomes characterize the margins through which the peer language environment may matter. These include peer relations, classroom atmosphere, participation in school or class activities, closeness to people in school, teacher praise, homeroom-teacher communication time, parent reports of whether the child likes the homeroom teacher, academic difficulty, perceived future value of subjects, skipping classes, and desire to transfer schools. These outcomes are standardized over the analysis sample.

Control variables include student age, gender, minority status, agricultural hukou status, only-child status, preschool attendance, ever repeated a grade, and mother’s and father’s years of schooling. Robustness specifications also control for leave-one-out classroom characteristics, including classmates’ parental education, parental agricultural hukou, openness, cognitive ability, and the share of female classmates. All regressions include school-by-grade fixed effects, so identification comes from differences in classroom peer language composition among students in the same school and grade.

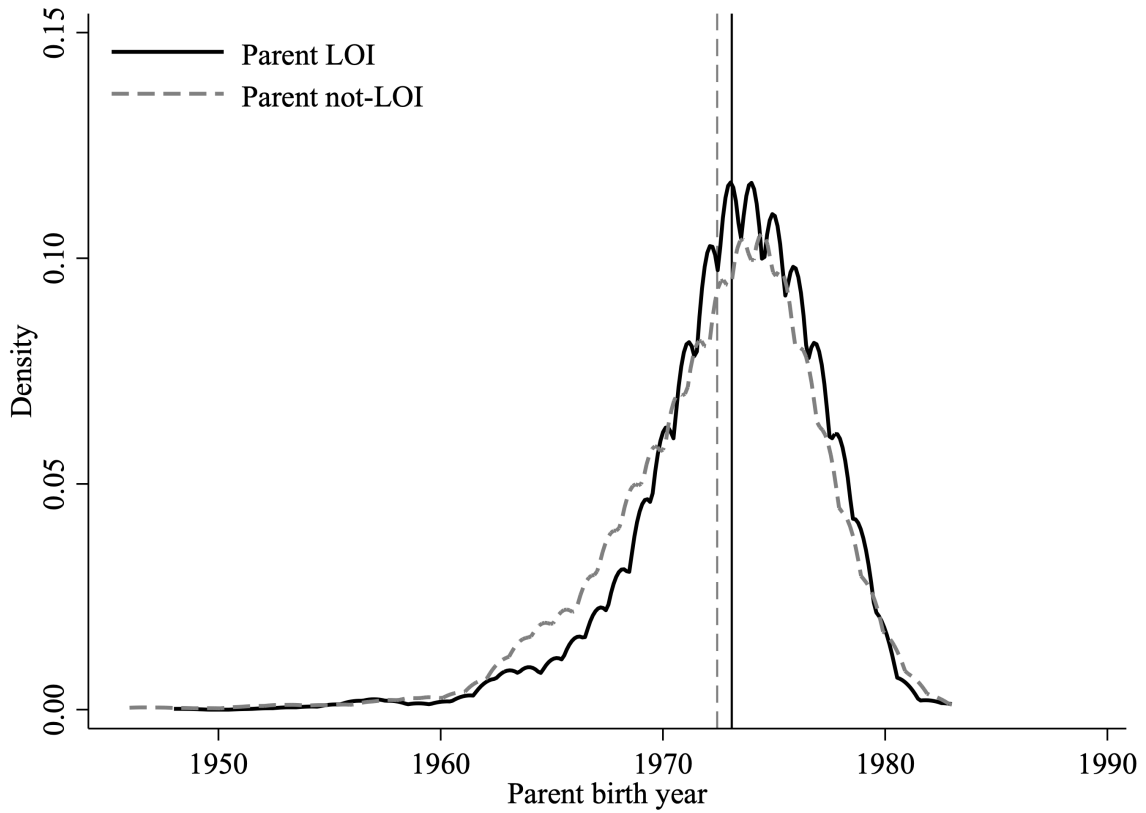


Fig. S1: Parent birth-year distributions by home-language group. The figure plots kernel density estimates of parent birth year separately for parents who report using the language of instruction (LOI) at home and parents who do not. Vertical lines indicate group means.

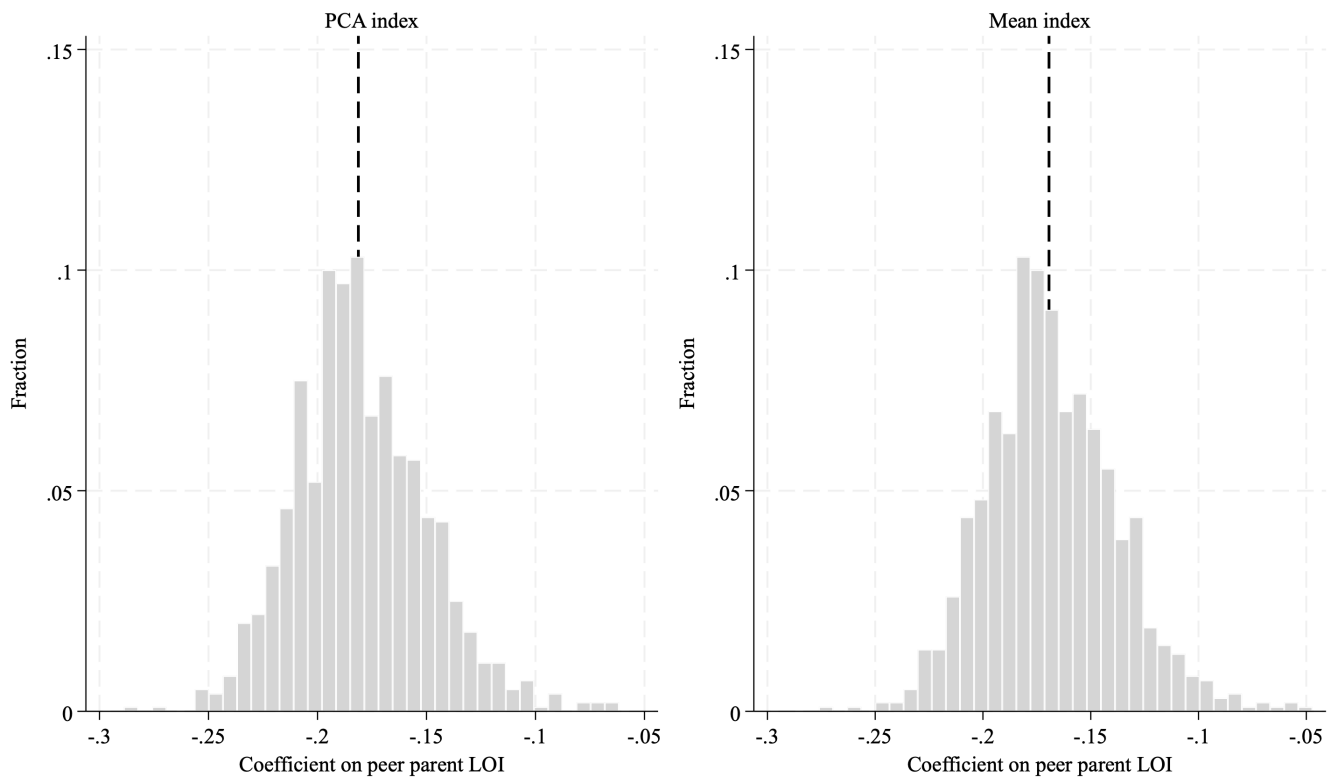


Fig. S2: Stability of mental-health estimates when randomly dropping schools. Each distribution is based on 1,000 re-estimations of the main mental-health specification after randomly dropping nine schools, approximately 10 percent of the estimation sample. Dashed vertical lines mark the full-sample estimates.

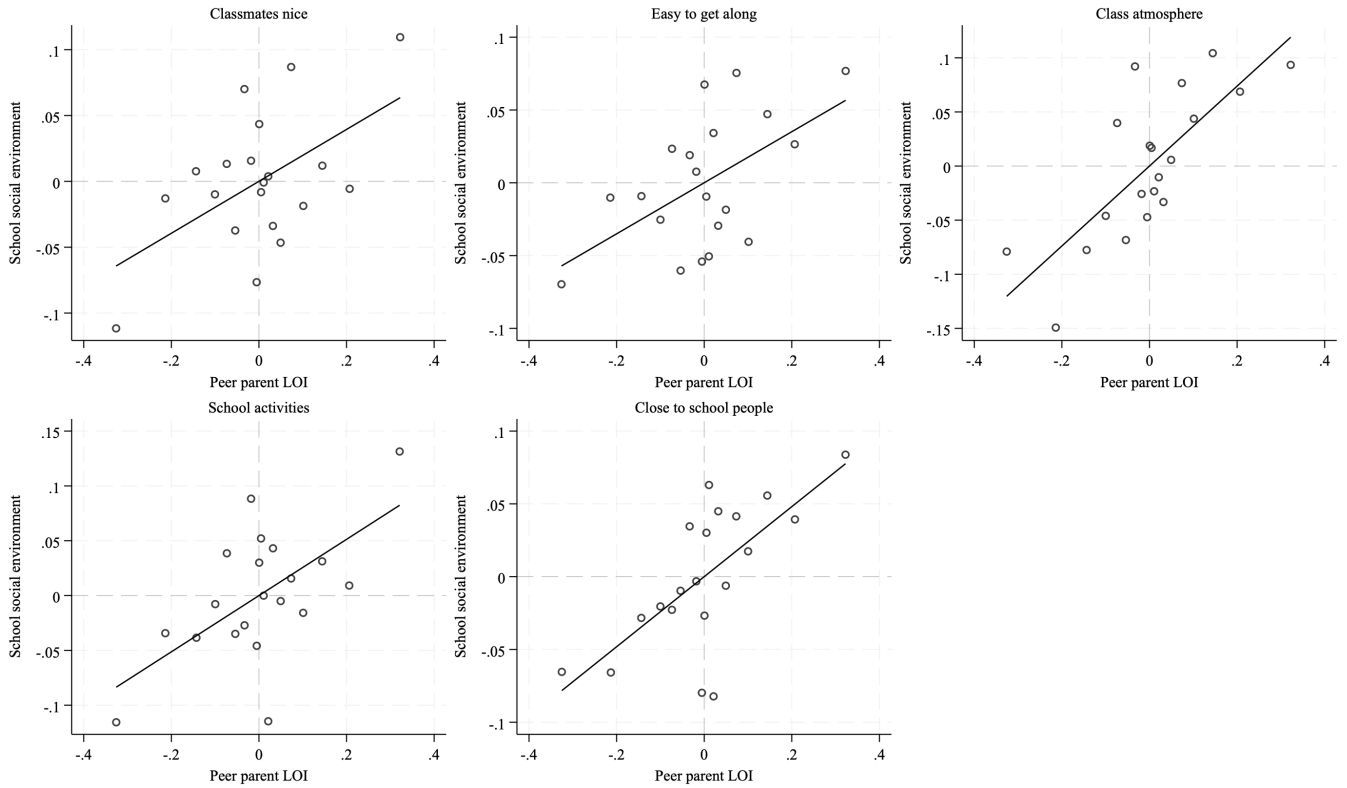


Fig. S3: Peer parental language alignment predicts stronger peer relations. Each panel plots residualized school social-environment outcomes against residualized peer parent LOI, after removing school-by-grade fixed effects and baseline controls. The fitted lines summarize the associations between peer parent LOI exposure and students' peer relations, classroom atmosphere, participation in school activities, and closeness to people at school.

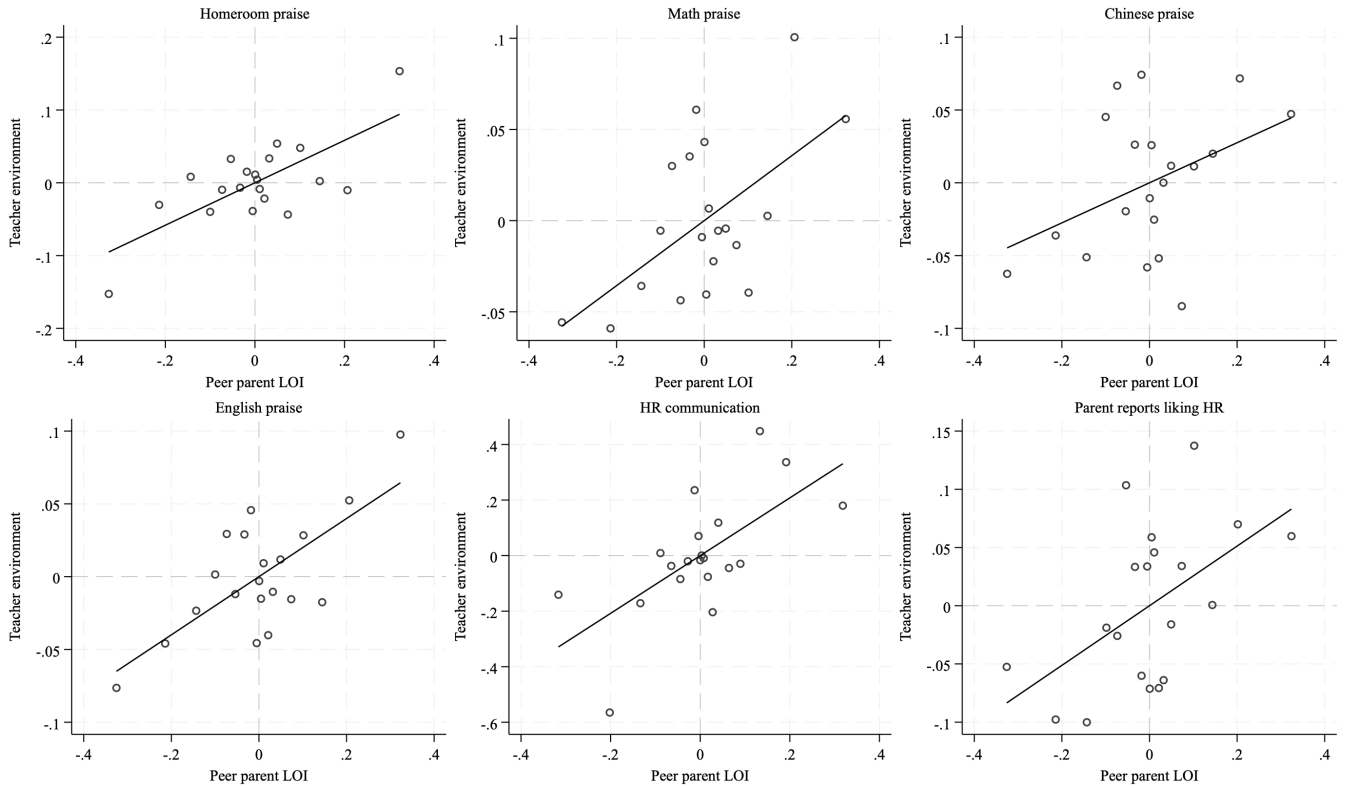


Fig. S4: Peer parental language alignment predicts more positive teacher interaction. Each panel plots residualized teacher-interaction outcomes against residualized peer parent LOI, after removing school-by-grade fixed effects and baseline controls. Outcomes include praise from the homeroom, math, Chinese, and English teachers, homeroom-teacher communication time, and parent-reported liking of the homeroom teacher.

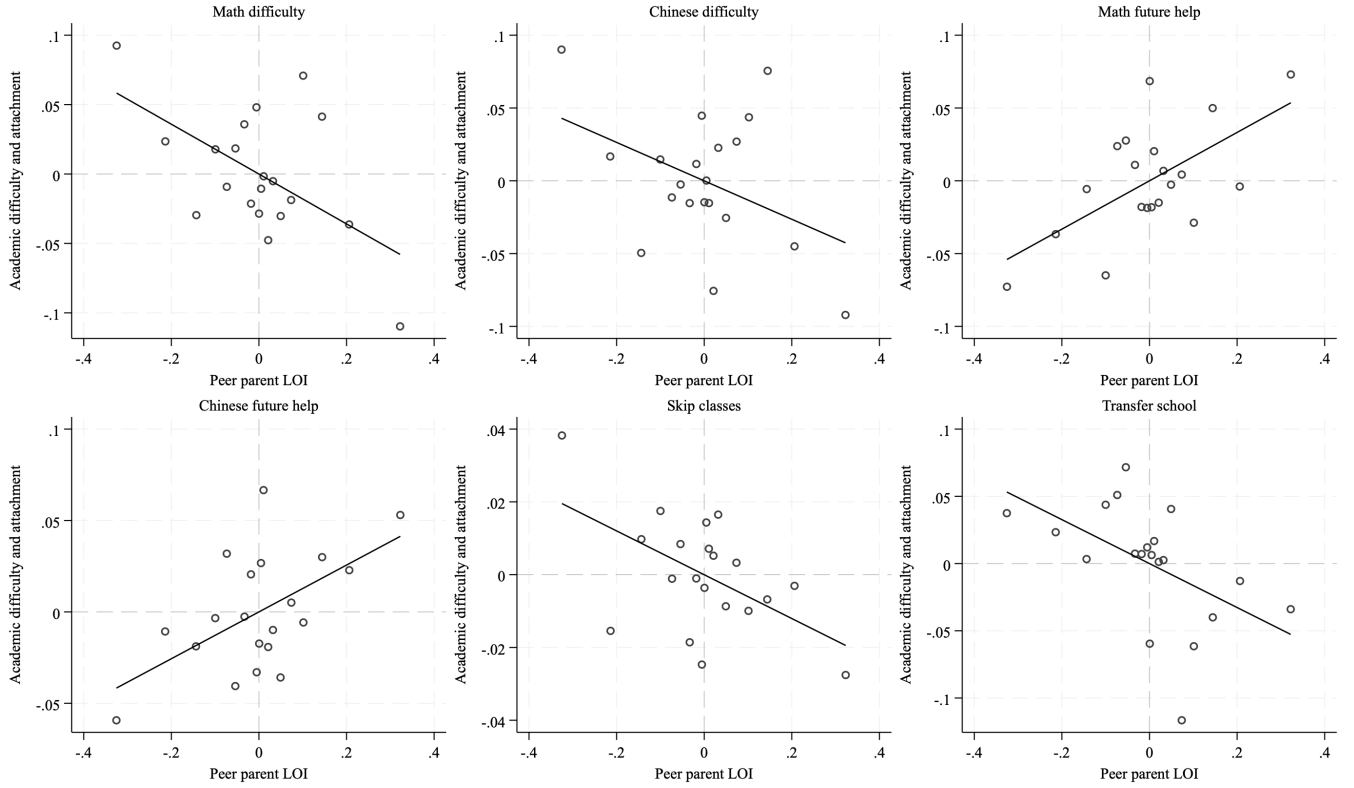


Fig. S5: Peer parental language alignment predicts lower academic difficulty and stronger school attachment. Each panel plots residualized academic-difficulty and school-attachment outcomes against residualized peer parent LOI, after removing school-by-grade fixed effects and baseline controls. Outcomes include perceived difficulty in math and Chinese, expected future help from math and Chinese teachers, skipping classes, and intentions to transfer schools.

Table S1: Summary statistics

	Mean	SD
<i>Panel A. Student characteristics</i>		
Age	13.927	(1.167)
Female (1=YES)	0.480	(0.500)
Ethnic minority (1=YES)	0.117	(0.322)
Only child (1=YES)	0.468	(0.499)
Agricultural hukou (1=YES)	0.481	(0.500)
Attended preschool (1=YES)	0.809	(0.393)
Ever repeated a grade (1=YES)	0.144	(0.351)
<i>Panel B. Mental health</i>		
Poor mental health, PCA index	0.000	(0.993)
Poor mental health, mean index	0.000	(0.993)
Sad	2.024	(1.024)
Not enjoying life	1.736	(1.067)
Unhappy	2.268	(1.039)
Depressed	1.956	(1.045)
Feeling blue	2.219	(0.983)
<i>Panel C. Family background and home language</i>		
Mother's years of schooling	9.875	(3.709)
Father's years of schooling	10.614	(3.278)
Household economic status	2.850	(0.586)
Parent has agricultural hukou (1=YES)	0.513	(0.500)
Parent uses LOI at home (1=YES)	0.378	(0.485)
Student uses LOI at home (1=YES)	0.439	(0.496)
Number of observations	9,361	

Notes: This table reports summary statistics for the analysis sample. Standard deviations are reported in parentheses. The number of observations varies across variables because of missing values; the full student sample contains 9,361 observations. The sample includes students in school-by-grade cohorts where classroom assignment was reported to be random or balanced. Mental-health indices are standardized within school-by-grade cells, with higher values indicating worse mental health. Household economic status ranges from 1 (very poor) to 5 (very rich). Mandarin is the language of instruction in this setting. LOI variables indicate parent- or student-reported use of the language of instruction at home.

Table S2: Descriptive statistics by parent home-language group

	Full sample	Parent LOI	Parent dialect-only	Difference	<i>p</i> -value
<i>Panel A. Home-language group</i>					
Parent LOI (1=YES)	0.378	1.000	0.000	1.000	< 0.001
Parent dialect-only (1=YES)	0.335	0.000	1.000	-1.000	< 0.001
Observations	8,371	3,165	2,802		
<i>Panel B. Family background and student characteristics</i>					
Mother's years of schooling	9.984	11.300	8.516	2.783	< 0.001
Father's years of schooling	10.702	11.686	9.613	2.073	< 0.001
Age	13.909	13.768	14.164	-0.397	0.005
Ethnic minority (1=YES)	0.112	0.075	0.203	-0.128	0.007
Only child (1=YES)	0.484	0.656	0.302	0.354	< 0.001
Agricultural hukou (1=YES)	0.470	0.334	0.620	-0.286	< 0.001
Attended preschool (1=YES)	0.815	0.870	0.747	0.123	< 0.001
Household economic status	2.861	2.955	2.714	0.242	< 0.001
Female (1=YES)	0.487	0.502	0.458	0.043	0.005
Ever repeated a grade (1=YES)	0.130	0.058	0.228	-0.170	< 0.001
<i>Panel C. Mental health</i>					
Feeling blue	2.204	2.111	2.306	-0.195	< 0.001
Depressed	1.936	1.824	2.066	-0.241	< 0.001
Unhappy	2.250	2.132	2.377	-0.245	< 0.001
Not enjoying life	1.724	1.690	1.772	-0.082	0.019
Sad	2.006	1.892	2.127	-0.235	< 0.001
Poor mental health, mean index	2.027	1.933	2.132	-0.200	< 0.001
Poor mental health, PCA index	-0.036	-0.241	0.197	-0.438	< 0.001

Notes: This table reports descriptive statistics by parent-reported home-language group. The difference column reports the parent LOI mean minus the parent dialect-only mean. P-values are from regressions of each variable on the parent LOI indicator among students in the two groups, with standard errors clustered at the classroom level. The large differences across groups illustrate why comparisons based on students' own home-language background are likely to be confounded. The main analysis instead exploits within-school-grade variation in classmates' home-language background generated by classroom assignment.

Table S3: Balance test for peer parent LOI exposure

	(1)	(2)
	No FE	School-by-grade FE
Mother's years of schooling	0.044 (0.033, 0.055) [0.000]	0.000 (-0.001, 0.001) [0.434]
Father's years of schooling	-0.002 (-0.018, 0.013) [0.769]	0.001 (-0.000, 0.002) [0.187]
Age	-0.007 (-0.101, 0.087) [0.886]	0.001 (-0.003, 0.004) [0.720]
Ethnic minority	-0.176 (-0.394, 0.042) [0.113]	0.004 (-0.003, 0.011) [0.277]
Only child	0.394 (0.283, 0.505) [0.000]	-0.001 (-0.006, 0.005) [0.810]
Agricultural hukou	-0.183 (-0.301, -0.064) [0.003]	-0.010 (-0.019, -0.002) [0.013]
Attended preschool	0.110 (0.041, 0.179) [0.002]	-0.001 (-0.008, 0.007) [0.891]
Household economic status	0.095 (0.036, 0.155) [0.002]	0.001 (-0.004, 0.006) [0.608]
Female	0.053 (0.007, 0.098) [0.024]	-0.002 (-0.006, 0.003) [0.404]
Ever repeated a grade	-0.291 (-0.407, -0.175) [0.000]	-0.002 (-0.013, 0.008) [0.669]
Observations	8,508	8,508
R-squared	0.196	0.981
Joint p -value	< 0.001	0.144

Notes: This table presents a randomization balance test for peer parent LOI. The dependent variable is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. Column 2 adds school-by-grade fixed effects. Standard errors are clustered at the classroom level. For each variable, the coefficient is reported first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets. The joint p-value tests whether the listed characteristics jointly predict peer parent LOI.

Table S4: Balance test for peer parental dialect-only exposure

	(1)	(2)
	No FE	School-by-grade FE
Mother's years of schooling	-0.042 (-0.053, -0.030) [0.000]	-0.000 (-0.001, 0.000) [0.356]
Father's years of schooling	0.004 (-0.009, 0.016) [0.549]	-0.000 (-0.001, 0.001) [0.555]
Age	0.039 (-0.049, 0.128) [0.382]	-0.003 (-0.007, 0.001) [0.095]
Ethnic minority	0.571 (0.286, 0.856) [0.000]	-0.004 (-0.018, 0.011) [0.616]
Only child	-0.382 (-0.487, -0.278) [0.000]	0.000 (-0.005, 0.006) [0.931]
Agricultural hukou	0.213 (0.098, 0.329) [0.000]	-0.006 (-0.016, 0.004) [0.238]
Attended preschool	-0.119 (-0.196, -0.042) [0.003]	0.003 (-0.005, 0.011) [0.516]
Household economic status	-0.203 (-0.266, -0.140) [0.000]	-0.001 (-0.007, 0.004) [0.627]
Female	-0.059 (-0.101, -0.017) [0.006]	0.001 (-0.002, 0.004) [0.561]
Ever repeated a grade	0.328 (0.181, 0.475) [0.000]	0.005 (-0.010, 0.021) [0.489]
Observations	8,508	8,508
R-squared	0.296	0.979
Joint p -value	< 0.001	0.437

Notes: This table presents a randomization balance test for peer parental dialect-only exposure. The dependent variable is the standardized leave-one-out share of classmates whose parents report speaking only a non-LOI dialect at home. Column 2 adds school-by-grade fixed effects. Standard errors are clustered at the classroom level. For each variable, the coefficient is reported first, followed by the 95 percent confidence interval in parentheses and the p -value in brackets. The joint p -value tests whether the listed characteristics jointly predict peer parental dialect-only exposure.

Table S5: Mapping of peer parental language exposure onto classroom-experience outcomes

<i>Panel A. Peer environment</i>						
Dependent variable	Classmates nice	Easy to get along	Class atmosphere	School activities	Close to people	
	(1)	(2)	(3)	(4)	(5)	
Peer parent LOI	0.181 (0.052, 0.310) [0.006]	0.160 (0.008, 0.312) [0.040]	0.360 (0.172, 0.549) [0.000]	0.232 (0.079, 0.386) [0.003]	0.221 (0.087, 0.355) [0.001]	
Observations	8,430	8,435	8,421	8,426	8,372	
R-squared	0.076	0.061	0.142	0.153	0.112	

<i>Panel B. Teacher interaction</i>						
Dependent variable	Homeroom praise	Math praise	Chinese praise	English praise	HR communication	Parent reports liking HR teacher
	(1)	(2)	(3)	(4)	(5)	(6)
Peer parent LOI	0.254 (0.065, 0.443) [0.009]	0.176 (0.019, 0.334) [0.028]	0.128 (0.007, 0.249) [0.039]	0.182 (0.064, 0.301) [0.003]	0.976 (0.326, 1.627) [0.003]	0.260 (0.076, 0.444) [0.006]
Observations	8,417	8,448	8,433	8,451	8,154	8,156
R-squared	0.118	0.156	0.139	0.147	0.679	0.113

<i>Panel C. Academic perceptions and school attachment</i>						
Dependent variable	Math difficulty	Chinese difficulty	Math future help	Chinese future help	Skip classes	Transfer school
	(1)	(2)	(3)	(4)	(5)	(6)
Peer parent LOI	-0.176 (-0.324, -0.029) [0.020]	-0.119 (-0.236, -0.001) [0.048]	0.148 (0.035, 0.262) [0.011]	0.119 (0.029, 0.208) [0.010]	-0.058 (-0.109, -0.007) [0.026]	-0.141 (-0.262, -0.020) [0.022]
Observations	8,447	8,412	8,460	8,457	8,466	8,444
R-squared	0.344	0.303	0.090	0.077	0.080	0.115

Notes: Each column reports a separate regression of the listed outcome on peer parent LOI. Peer parent LOI is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. All regressions include baseline student and family controls and school-by-grade fixed effects. Columns 1 and 2 of Panel C additionally control for the corresponding grade-6 subject difficulty measure. Standard errors are clustered at the classroom level. For each estimate, the coefficient is reported first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

Table S6: Effects on student mental health, by grade

	Dependent variable: Mental-health difficulties		
	Full sample (1)	Grade 7 (2)	Grade 9 (3)
Peer parent LOI	-0.181 (-0.316, -0.046) [0.009]	-0.164 (-0.333, 0.005) [0.057]	-0.244 (-0.463, -0.026) [0.029]
Observations	8,236	5,452	2,784
R-squared	0.012	0.013	0.014

Notes: This table reports estimates from regressions of student mental-health difficulties on peer parent LOI. Peer parent LOI is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. Column 1 uses the full sample; columns 2 and 3 report estimates separately for Grade 7 and Grade 9 students. All specifications include baseline student and family controls and school-by-grade fixed effects. Standard errors are clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

Table S7: Channels of peer parental language transmission through parental peer networks

	Dependent variable: Mental-health difficulties	
	Know child's friends (1)	Know friends' parents (2)
Peer parent LOI	-0.099 (-0.268, 0.070) [0.249]	-0.142 (-0.307, 0.023) [0.090]
Peer parent LOI × Know child's friends	-0.049 (-0.138, 0.041) [0.287]	
Know child's friends	-0.122 (-0.203, -0.042) [0.003]	
Peer parent LOI × Know friends' parents		-0.025 (-0.084, 0.033) [0.394]
Know friends' parents		-0.108 (-0.168, -0.048) [0.000]
Observations	7,180	6,382
R-squared	0.015	0.019

Notes: This table examines whether the association between peer parent LOI and student mental-health difficulties varies with parental knowledge of the child's peer network. Column 1 interacts peer parent LOI with an indicator for whether parents know the child's friends. Column 2 interacts peer parent LOI with an indicator for whether parents know the friends' parents. All specifications include baseline student and family controls and school-by-grade fixed effects. Standard errors are clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

Table S8: Predictors of peer parent LOI

	Dependent variable: Peer parent LOI
	(1)
Peer cognitive ability	0.005 (-0.014, 0.024) [0.616]
Peer female share	-0.132 (-0.309, 0.044) [0.141]
Female homeroom teacher	0.034 (0.010, 0.057) [0.006]
Homeroom teacher age	0.003 (-0.002, 0.008) [0.227]
Homeroom teacher experience	-0.002 (-0.006, 0.003) [0.413]
Observations	8,135
Adjusted R-squared	0.419
Joint p -value	0.104

Notes: This table reports a balance-style regression in which the dependent variable is peer parent LOI, defined as the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. The specification includes school-by-grade fixed effects, so the estimates are identified from within-school-grade variation in classroom peer language composition. The within R-squared is 0.0009, indicating that the listed predictors explain very little of the residual variation in peer parent LOI after removing school-by-grade fixed effects. The joint p-value tests whether the listed predictors are jointly associated with peer parent LOI within school-by-grade cells. Standard errors are clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

Table S9: Effects of alternative peer language exposures on adolescent outcomes

	Peer LOI(A) Peer dialect-only(B)	Mental health PCA index	Mental health mean index	Homeroom praise	Classroom atmosphere	Classmates nice
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A. Peer parent LOI</i>						
Peer parent LOI	0.465 (0.292, 0.638) [0.000]	-0.181 (-0.316, -0.046) [0.009]	-0.169 (-0.304, -0.035) [0.014]	0.254 (0.065, 0.443) [0.009]	0.360 (0.172, 0.549) [0.000]	0.181 (0.052, 0.310) [0.006]
Observations	8,508	8,236	8,357	8,417	8,421	8,430
R-squared	0.981	0.012	0.012	0.118	0.142	0.076
<i>Panel B. Peer parent dialect-only</i>						
Peer parent dialect-only	0.304 (0.149, 0.459) [0.000]	0.038 (-0.100, 0.177) [0.588]	0.032 (-0.108, 0.172) [0.654]	-0.223 (-0.358, -0.088) [0.001]	-0.184 (-0.389, 0.021) [0.078]	-0.099 (-0.189, -0.009) [0.032]
Observations	8,508	8,236	8,357	8,417	8,421	8,430
R-squared	0.984	0.011	0.012	0.118	0.140	0.076

Notes: Each column reports a separate regression. Panel A reports estimates for standardized peer parent language-of-instruction (LOI). Panel B reports analogous estimates for standardized peer parental dialect-only. All specifications include baseline student and family controls and school-by-grade fixed effects. Standard errors are clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

Table S10: Robustness to full-sample standardization of mental-health indices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Panel A. Mental health, PCA index</i>							
Peer parent LOI	-0.170 (-0.306, -0.034) [0.014]	-0.161 (-0.294, -0.029) [0.017]	-0.184 (-0.322, -0.045) [0.010]	-0.191 (-0.330, -0.053) [0.007]	-0.194 (-0.333, -0.055) [0.006]	-0.201 (-0.339, -0.064) [0.004]	-0.169 (-0.311, -0.026) [0.020]
Observations	8,236	8,236	8,236	8,236	8,236	8,236	7,032
R-squared	0.076	0.076	0.077	0.077	0.077	0.077	0.083
<i>Panel B. Mental health, mean index</i>							
Peer parent LOI	-0.160 (-0.295, -0.024) [0.021]	-0.149 (-0.283, -0.016) [0.029]	-0.169 (-0.310, -0.029) [0.019]	-0.176 (-0.317, -0.034) [0.015]	-0.181 (-0.321, -0.040) [0.012]	-0.189 (-0.327, -0.050) [0.008]	-0.152 (-0.294, -0.011) [0.035]
Observations	8,357	8,357	8,357	8,357	8,357	8,357	7,129
R-squared	0.076	0.076	0.077	0.077	0.077	0.077	0.082
Baseline controls	X	X	X	X	X	X	X
Peer parent SES		X	X	X	X	X	X
Peer parent hukou			X	X	X	X	X
Peer openness				X	X	X	X
Peer female share					X	X	X
Peer cognitive ability						X	X
Language and cognitive ability							X

Notes: This table reports estimates using full-sample standardized mental-health indices. Panel A uses the PCA index; Panel B uses the mean index. Peer parent LOI is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. Higher outcome values indicate worse mental health. All regressions include baseline controls and school-by-grade fixed effects; additional peer-level controls are indicated by X's. Standard errors are clustered at the classroom level. Coefficients are followed by 95 percent confidence intervals in parentheses and p-values in brackets.

Table S11: Robustness of homeroom-teacher after-class communication measure

	(1)	(2)	(3)	(4)
Dependent variable	Original standardized	Log standardized	99% winsorized standardized	95% winsorized standardized
Peer parent LOI	0.976 (0.326, 1.627) [0.003]	0.762 (0.080, 1.444) [0.029]	0.968 (0.319, 1.617) [0.004]	0.945 (0.306, 1.585) [0.004]
Observations	8,154	8,154	8,154	8,154
R-squared	0.679	0.707	0.685	0.726

Notes: This table reports robustness checks for homeroom-teacher reports of after-class communication time. Column 1 uses the original standardized measure. Column 2 uses the standardized log transformation, defined as $\log(x+1)$. Columns 3 and 4 use standardized measures winsorized at the 99th and 95th percentiles, respectively. Peer parent LOI is the standardized leave-one-out share of classmates whose parents report using the language of instruction at home. All regressions include baseline student and family controls and school-by-grade fixed effects. Standard errors are clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.

Table S12: Parent-child language alignment

	Dependent variable: Student LOI	
	No FE (1)	School-by-grade FE (2)
Parent LOI	0.649 (0.618, 0.681) [0.000]	0.487 (0.456, 0.518) [0.000]
Observations	7,233	7,233
R-squared	0.489	0.553
Baseline controls	X	X
School-by-grade FE		X

Notes: This table reports parent-child language alignment. The dependent variable is an indicator for whether the student reports using the language of instruction at home. Parent LOI is an indicator for whether parents report using the language of instruction at home. Baseline controls include mother's years of schooling, father's years of schooling, age, minority status, only-child status, agricultural hukou, preschool attendance, household economic status, gender, and grade repetition. Column 2 includes school-by-grade fixed effects. Standard errors are clustered at the classroom level. Each estimate reports the coefficient first, followed by the 95 percent confidence interval in parentheses and the p-value in brackets.