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Article in *British Educational Research Journal* · May 2020

DOI: 10.1002/berj.3635

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What PISA and ASPIRES studies tell us about the nuanced influence of cultural capital on student learning: Construct complexity, student outcomes, and contexts

Abstract

This article juxtaposes the evolving scholarship investigating the influence of cultural capital on student learning and the developing trajectory of sociologists employing quantitative research methods. It critically reviews results from 34 studies analysing PISA or ASPIRES data to generate three key insights demonstrating complexities in relationships between cultural capital and student outcomes. First, cultural capital is a complex construct with many variables (different forms of cultural capital, highbrow/non-highbrow cultural capital) varying in their association with student literacy and parents' cultural capital affecting student literacy both directly and indirectly. Second, the influence of cultural capital may vary with types of student outcomes measured. Specifically, there are cultural variables associated with student literacy in different subjects, some cultural capital variables are more important for student literacy for a subject, and cultural capital influences student aspirations in addition to their literacy. Third, the influence of cultural capital on student literacy may vary with educational and social contexts. Cultural capital is more important in decentralized education systems, in low-achieving schools within differentiated education systems, in higher-quality schools, and in more unequal, developed societies. In contrast, it matters less in high-achieving and standardized education systems, and in societies valuing education. Given the complexity in cultural capital, future research can ascertain how each cultural capital variable contributes to student learning and compare their effectiveness. It is also important to identify which cultural capital variables matter for specific student outcomes. Lastly, these insights highlight the need to recognize contextual differences in studies of social inequality.

Keywords: ASPIRES, cultural capital, PISA, student achievement

What PISA and ASPIRES studies tell us about the nuanced influence of cultural capital on student learning: Construct complexity, student outcomes, and contexts

Cultural capital theory is one of the most comprehensive theories used by scholars to elucidate the relationship between social origins and school achievement. For example, Davies and Rizk's (2018) systematic review found that U.S. cultural capital research started with studies allied to Bourdieu's quintessential ideas (e.g., participation in highbrow activities by individuals with higher socioeconomic status (SES) yielding educational returns because such activities are normatively valued in schools). The scholarship then evolved to researchers asserting that all students can use cultural capital to excel academically (DiMaggio, 1982; DiMaggio & Mohr, 1985) and demonstrating how middle-class parents use 'concerted cultivation' parenting strategies to meet school evaluation standards (Lareau, 2011). Despite this proliferation of research, we have few generalisations about the nuances associated with the process by which higher-SES students benefit from their familial cultural resources to succeed in school. For example, cultural capital influences student learning, but do different aspects of cultural capital influence student learning in the same way? How does the association between cultural capital and student learning vary with different outcomes? We also know that it is important to relate cultural capital to fields, but what specific field conditions moderate the influence of cultural capital? The knowledge gap arises because resource constraints often preclude researchers from collecting the comprehensive data that are required to unravel these complexities systematically.

The availability of data from international large-scale assessments (ILSAs) such as the Programme in International Student Assessment (PISA) and ASPIRES ('Young People's Science and Career Aspirations' project) presents immense opportunities for researchers to interrogate 'big data' to understand the complexities of cultural capital influence. These opportunities are made possible because more sociologists are beginning to use quantitative methodologies in their research (Schwemmer & Wieczorek, 2020). In recognition of this trajectory, Halford and Savage (2017) distilled the concept of 'symphonic social science', integrating theoretical awareness with the judicious selection of big data to ascertain long-term social trends and make broad comparisons. Many researchers have analysed PISA and ASPIRES data to understand the relationship between cultural capital and student learning. However, the results of these studies have not been critically reviewed, and we have therefore missed out on an opportunity to advance our knowledge of cultural capital theory. Accordingly, this article aims to (a) illustrate how researchers have used PISA and ASPIRES data to examine the relationship between cultural capital and students' learning outcomes; (b) derive theoretical insights into the influence of cultural capital by synthesising results from these studies; and (c) identify unresolved puzzles that scholars can address to advance cultural capital research.

The present study employs Tan, Peng, and Lyu's (2019) conceptualization of cultural capital as encompassing home educational resources, parental education, parental emphasis on children's school readiness and education, parents' academic expectations of their children, parent-child cultural participation (e.g., visiting museums, owning classical literature books), parent-child academic discussions on learning and school, parent/child reading, parents' support of their children's learning at home, parental supervision of children (e.g., monitoring homework completion), parent-teacher communication regarding children's learning, and parental participation in school activities. Given the diversity of indicators used to measure the construct, cultural capital can sometimes be confused with SES, which measures individuals' access to socioeconomic resources and signals their hierarchical position in society (Sirin, 2005).

However, cultural capital theory contends that these resources need to fulfil two conditions to be converted to ‘capital’ to profit their bearers (Bourdieu, 1984). First, resources must be aligned to the logic of the field (e.g., school expectations) in which competition for valued outcomes occurs. Second, there must be a relative scarcity of these resources so that bearers can effectively maintain their privileged positions and ensure social reproduction (Krarup & Munk, 2016).

PISA and ASPIRES

Results from studies examining PISA data are discussed in this article because PISA epitomises an influential source of open-access big data that can be used to examine the relationship between cultural capital and student achievement. PISA assesses students on their ability to use their knowledge and skills to address real-life challenges, instead of their mastery of the school curriculum, in reading, mathematics, and science (Organisation for Economic Cooperation and Development or OECD, 2012). OECD refers to these learning outcomes as literacies (i.e., reading, mathematics, and science literacies) but researchers analyzing PISA data have used the terms ‘achievement’ and ‘literacies’ interchangeably in the literature. In the present article, these learning outcomes in PISA will be referred to as literacies for consistency. PISA also collects student and parent survey data on many cultural capital indicators, including home educational and cultural resources; parental education; parents’ and child’s attitudes towards reading, mathematics, and science; educational expectations; cultural participation; parent–child academic and cultural discussions; parental supervision of the child’s learning; parents’ home support for the child’s learning; child’s engagement in reading, science, and mathematics learning activities beyond the school; and parental school involvement. Studies analysing ASPIRES data are also reviewed because key findings from the five-year project point to a science-related form of cultural capital—science capital—that predicts science educational and occupational aspirations of students aged 10–14 years in England (DeWitt & Archer, 2015). Therefore, results from studies examining ASPIRES and PISA data complement each other to provide a more complete account of the relationship between cultural capital and different students’ learning outcomes.

Identification of studies

A search of quantitative studies using PISA or ASPIRES data to examine relationships between cultural capital and student learning outcomes (published up to February 2020) was first performed using four computer databases (Academic Search Premier, British Education Index, Eric, and Family and Society Studies Worldwide). Two sets of search terms involving cultural capital and PISA were used to identify relevant PISA studies in the databases:

- (‘cultural capital’ OR ‘objectified’ OR ‘institutionalized’ OR ‘embodied’ OR ‘home resources’ OR ‘parent education’ OR ‘parent expectations’ OR ‘cultural participation’ OR ‘highbrow’ OR ‘beaux arts’ OR ‘parent reading’ OR ‘parent involvement’ OR ‘home involvement’ OR ‘school involvement’)
AND
- (‘PISA’ OR ‘Program for International Student Assessment’ OR ‘Programme for International Student Assessment’).

This yielded a preliminary pool of 219 studies. Abstracts of identified studies were then read to ascertain whether they examined the relationship between cultural capital and students’ reading, mathematics, and science literacies. Full texts of the studies were next read in detail.

Studies were included if they (a) analysed PSIA data; (b) examined the influence of one or more of the 11 cultural capital variables delineated in Tan and colleagues (2019); (c) included student reading, mathematics, and/or science literacies as outcome variables; and (d) were written in English. Studies were excluded if they (a) focused on specific groups of students (e.g., immigrant students); (b) compared gender or urban-rural differences; (c) examined student outcomes other than reading, mathematics, or science literacies; (d) focused on measurement issues; or (e) were commentaries, reviews, or dissertations. The inclusion and exclusion criteria yielded 28 relevant studies.

Next, the same set of search terms for cultural capital and another set of search terms for studies analysing ASPIRES data ('ASPIRES' OR 'Young People's Science and Career Aspirations' OR 'Young people's science and career aspirations') were used to identify relevant ASPIRES studies in the four computer databases (Academic Search Premier, British Education Index, Eric, and Family and Society Studies Worldwide). This yielded a preliminary pool of 125 studies. Abstracts of studies were read to ascertain whether they examined the relationship between cultural capital and students' science educational and occupational aspirations. Full texts of the studies were next read in detail.

Studies were included if they (a) analysed ASPIRES data; (b) examined the influence of one or more of the 11 cultural capital variables delineated in Tan and colleagues (2019); (c) included students' science educational and occupational aspirations as outcome variables; and (d) were written in English. Studies were excluded if they (a) reported exploratory studies (using a small sample) whose analysis duplicated that in the main study (using a large sample) (b) reported on school interventions, or (c) were commentaries, reviews, or dissertations. The inclusion and exclusion criteria yielded three relevant studies.

The database searches for PISA and ASPIRES studies were complemented by manual searches of two sociology of education journals (*British Journal of Sociology of Education*, *Sociology of Education*) and the reference lists of six review articles on cultural capital identified by a computer search of the same four databases (Academic Search Premier, British Education Index, Eric, Family and Society Studies Worldwide). These manual searches (i.e., journal scouring and referential backtracking respectively; Alexander, 2020) yielded three more PISA and 0 ASPIRES studies that met the same set of inclusion and exclusion criteria. Therefore, the final pool of relevant studies analysing PISA or ASPIRES data to be examined was 34.

Results

Results from the studies were reviewed next to generate three sets of insights on how they advanced the scholarship on the influence of cultural capital on student outcomes. These insights pertain to the complexity of cultural capital and varying influence of cultural capital according to student outcomes and educational/social contexts.

Complexity of the cultural capital construct

The first set of insights from the review of studies pertains to the relative importance of different cultural capital variables, contemporary relevance of highbrow cultural participation and patterns of findings for different sources of cultural capital (parents, children).

Forms of cultural capital

Bourdieu (1986) conceptualised cultural capital as comprising objectified, embodied, and institutionalised forms. Objectified cultural capital refers to physical resources at home that

enable students to develop dispositions, values, perceptions, knowledge, and skills that are rewarded in schools. Embodied cultural capital comprises predispositions, propensities, body language, intonation, and lifestyles that signify individuals' internalisation of normative attributes that are valued in schools. Institutionalised cultural capital is formed when embodied cultural capital is publicly recognised as a marker of social distinction.

Eight studies compared the influence of more than one form of cultural capital on student literacy. First, Tan (2017) examined the relationship between three forms of cultural capital (namely objectified (home educational resources), institutionalised (parental education, occupational status), and embodied (parental valuing of mathematics; parental expectations of their children's education, future mathematics career, and school)) and students' mathematics literacy in eight countries using PISA 2012 data. Results showed that specific embodied cultural capital variables (the three parental expectations) had the largest effect sizes whereas the two institutionalised cultural capital variables were most weakly associated with students' mathematics literacy. These results indicated that embodied cultural capital was more important than objectified cultural capital, and the latter was in turn more important than institutionalised cultural capital for students' mathematics literacy.

Results from three other studies are consistent with those reported in Tan (2017). Specifically, Puzić, Gregurović, and Košutić's (2016) analysis of PISA 2009 data for Croatia found that embodied cultural capital (students' reading pleasure and frequency, parent-child discussions) was more important than objectified cultural capital (home cultural, book, reading resources) for students' science literacy (7.1% versus 5.7% variance respectively; computed from Table 3 in Puzic et al (2016)). Next, Tan and Liu (2018) compared the relationships between different institutionalised (paternal, maternal education) and objectified (home educational, cultural resources) cultural capital variables, and students' reading literacy in six Confucian heritage cultures (CHCs) and nine non-CHCs. They found that objectified cultural capital was more important than institutionalised cultural capital in CHCs (2.24% versus 0.59% variance respectively) and non-CHCs (1.71% versus 1.62% variance respectively; computed from Table 3 in Tan & Liu (2018)). Martins and Veiga (2010) reported from their analysis of PISA 2003 data that home book resources (objectified cultural capital) were positively associated with students' mathematics literacy in 15 European Union countries examined. In contrast, parental education (institutionalized cultural capital) was positively related to students' mathematics literacy in only six countries; in two countries, there was a negative relationship. However, three other studies found that objectified cultural capital was more important than embodied cultural capital. First, Xu and Hampden-Thompson's (2012) study showed that, compared to embodied cultural capital (students' cultural activity, parent-child cultural communication), objectified cultural capital (home cultural possessions, books, educational resources) was more strongly associated with students' reading literacy in Western industrialized countries, characterizing four types of regimes, in PISA 2000 (objectified 5.8% vs embodied 4.3% in social democratic regimes; objectified 5.5% vs embodied 2.1% in corporatist regimes; objectified 3.2% vs embodied 2.2% in Mediterranean regimes; objectified 7.5% vs embodied 2.9% in liberal regimes; computed from Tables 3-6 in Xu & Hampden-Thompson (2012)). In another study, Xie and Ma (2019) compared the role of objectified (home cultural possessions) and parental embodied cultural capital (perceptions toward reading) in explaining the relationship between SES and student literacies in reading, mathematics, and science using PISA 2019 data from 14 participating economies. Results showed that objectified cultural capital explained the influence of all three SES indicators (parental occupation status and education

level, family's wealth possession) whereas embodied cultural capital explained the influence of only two SES indicators (parental occupation, education) in most economies. Next, Chiu's (2010) studies of PISA 2000 data from 41 countries showed that home book resources (objectified cultural capital) were more important than intangible processes such as parent-child cultural communication (embodied cultural capital) for students' mathematics (Chiu, 2010) and reading (Chiu & McBride-Chang, 2010) literacies.

In sum, the eight studies reviewed have employed different measures of embodied (parental valuing of mathematics; parental expectations of their children's education, future mathematics career, and school; parent-child discussions; parents' perceptions of reading; students' reading pleasure and frequency; students' cultural participation), institutionalized (e.g., maternal, paternal, parental education), and objectified (home educational, cultural, and book resources) cultural capital. Results suggest that objectified and embodied cultural capital is more important than institutionalized cultural capital for student literacy. Between objectified and embodied cultural capital, the evidence is mixed as to which is more important. Given the diversity of variables used to measure embodied (vis-à-vis objectified or institutionalized) cultural capital, researchers need to examine different aspects comprising this form of cultural capital instead of making generalizations on whether embodied cultural capital is more influential than objectified or institutionalized cultural capital. Future research can also examine if embodied cultural capital mediates the influence of objectified and institutionalized cultural capital on student literacy.

Highbrow cultural participation

Cultural capital theory has traditionally been concerned with participation in highbrow cultural activities (e.g., appreciating poetry and literature, fine arts, classical music, opera performances) by individuals with higher levels of SES, compared with individuals with lower levels of SES enjoying popular forms of mass culture (Kingston, 2001). Individuals with highbrow cultural capital are more likely to own cultural artefacts such as poetry and literature books, paintings, and musical instruments at home, attend musical and theatrical performances, and visit museums. However, some scholars argue that the conceptualisation of cultural capital can be expanded to include linguistic and cognitive habits, knowledge, skills, and familiarity with school evaluative standards (Lareau & Weininger, 2003). These advocates question whether highbrow cultural participation is more legitimate than practices such as reading and parental involvement as a marker of social distinction (Reay, 2004; Vryonides, 2007).

PISA collects data on home cultural resources and highbrow cultural participation. Therefore, researchers analysing PISA data are able to (a) compare which of the two highbrow cultural capital variables has a stronger association with student literacy and (b) ascertain whether these highbrow cultural capital or other cultural capital variables are more strongly related to student literacy. With regards to (a), Byun, Schofer, and Kim (2012) examined the relationships between two highbrow cultural capital variables and students' reading literacy using PISA 2000 data. Results for Korea, the country of interest, showed that home cultural resources were positively related to students' reading literacy whereas children's cultural participation was negatively related. Therefore, home cultural resources were more important than highbrow cultural participation.

Results from four studies investigating (b) yielded a nuanced pattern of results. First, Ho's (2010) analysis of PISA 2006 data for Hong Kong found that students' home cultural (not educational or material) resources positively predicted their science literacy. Next, Xu and

Hampden-Thompson (2012) found that highbrow cultural resources were more important than educational resources at home for the reading literacy of students from 22 Western industrialized countries, belonging to four welfare regimes (cultural 2.3% vs educational 1.2% of variance explained in social democratic regimes; cultural 1.8% vs educational 1.5% in corporatist regimes; cultural 1% vs educational 0.9% in Mediterranean regimes; cultural 3.5% vs educational 1.1% in liberal regimes), that participated in PISA 2000. These results are consistent with Ho's (2010) findings underscoring the importance of home cultural (vis-à-vis educational) resources. However, results were mixed as to whether cultural resources were more important than books at home (cultural 2.3% vs books 2.3% of variance explained in social democratic regimes; cultural 1.8% vs books 2.2% in corporatist regimes; cultural 1% vs books 1.3% in Mediterranean regimes; cultural 3.5% vs books 2.9% in liberal regimes; computed from Tables 3-6 in Xu & Hampden-Thompson (2012)).

In the third study, Andersen and Jaeger (2015) reported a different pattern of results for the relative importance of cultural resources as compared to educational resources. They examined the relationships between four indicators of cultural capital (home cultural and educational resources, students' reading engagement, parent-child cultural communication) and students' reading literacy using PISA 2000 data for Germany, Canada, and Sweden. Results showed that compared to home educational resources, home cultural resources had a weaker association with students' reading literacy in Canada. In Germany and Sweden, home cultural resources were not predictive of students' reading literacy whereas home educational resources were.

The fourth study by Tramonte and Wilms (2010) compared the contribution of (a) so-called 'static' cultural capital, comprising home cultural resources and parental participation in highbrow cultural activities (e.g., visiting museums), and (b) 'relational' cultural capital, comprising parent-child discussions on cultural, political, social, and school matters and students' reading of books, on students' reading literacy using PISA 2000 data from 28 participating countries. Results showed that relational cultural capital had stronger 'effects' than static cultural capital on students' reading literacy. Tramonte and Wilms (2010) argued that the results indicated the importance of parents activating and transmitting their cultural capital to their children (in relational cultural capital) over and above the mere possession of cultural capital reflecting parents' own choices and lifestyles (in static cultural capital).

Results from these studies point to three conclusions. First, home cultural resources are more important than highbrow cultural participation. Second, the evidence is mixed as to whether cultural resources are more important than educational or book resources at home. Third, compared to other cultural capital variables such as parent-child discussions and student reading, highbrow cultural capital is less associated with student literacy.

Parents versus children

Two studies examined the influence of different sources of cultural capital (parents, children) on student literacy. First, Acosta and Hsu's (2014) analysis of PISA 2006 data found that parents' valuing of science directly influenced their children's science literacy in Hong Kong. In another study, Ho and Lau (2018) clarified the magnitude of direct and indirect effects of cultural capital variables on students' reading literacy in Hong Kong using data from PISA 2009. They found that (a) parents' own reading motivation (and not their support of their children's early or current reading) predicted students' enjoyment of reading and diversity of reading materials and (b) students' enjoyment of reading (not diversity of reading materials or

online reading) and home educational and reading resources (not cultural or material resources) positively predicted their reading literacy. Therefore, parents' reading motivation might influence students' reading literacy indirectly through affecting students' reading enjoyment.

These studies affirm the important influence parents have on the development of students' academic literacy; parents' cultural capital affects students' literacy both directly and indirectly by shaping the latter's cultural capital. However, given the small number of studies examining parents and/or students' cultural capital, it is unclear whether the same pattern of results apply to different cultural capital variables and whether there are differences in the strength of association between different parental cultural capital variables and students literacy in different subjects.

Different outcomes

PISA assesses student literacies in reading, mathematics, and science, so researchers can use PISA data to generate insights on how cultural capital contributes to any of these literacies or compare the pattern of associations between cultural capital and two or more literacies. Additionally, researchers examining ASPIRES data complement colleagues analysing student literacies by investigating how cultural capital contributes to students' educational and occupational aspirations in science.

Subject-related cultural capital variables

Reading

Two studies identified cultural capital variables that predicted students' reading literacy. Atas and Karadag's (2017) analysis of PISA 2015 data found that paternal education was associated (but negatively) with students' reading literacy in Turkey whereas maternal education was not. Shukakidze (2013) compared the relationship between two cultural capital variables (students' reading attitudes, parental education) and students' reading literacy in Estonia (a developed country) and Azerbaijan (a developing country) using PISA 2009 data. Results showed that all items measuring students' reading attitudes except one ('Reading is one of my favorite hobbies') and maternal education were positively related to their reading literacy in Estonia. However, only three out of ten reading attitudes items were positively related while parental education was not predictive of students' reading literacy in Azerbaijan.

Mathematics

Two studies examined relationships between cultural capital variables and students' mathematics literacy. Sebastian, Moon, and Cunningham's (2017) analysis of PISA 2012 data showed that parent-initiated involvement was positively associated with between-school variation in mathematics literacy, whereas teacher-initiated involvement was negatively related to within-school variation in mathematics literacy in seven countries. The second study by Güzel and Berberoglu (2005) analysed PISA 2000 data for Brazil, Japan, and Norway. Results showed that parent-child discussions (on books, films, television programs, school) contributed to students' mathematics directly and indirectly through students' reading literacies.

Science

Five studies examined the relationship between cultural capital and students' science literacy. First, Turmo (2004) examined the association between different types of capital (cultural capital including home cultural/educational/book resources, parental education, home

cultural competence, student cultural activity; social capital including parent–child social communication at home; economic capital including home economy and family income) and students’ science literacy in five Nordic countries using PISA 2000 data. Results showed that compared to social (0–2%) or economic (2–10%) capital, cultural capital explained more variance in students’ science literacy (10–21%). Next, Liu and Whitford (2011) found from their analysis of PISA 2006 data that students with more books (e.g., more than 100), computer, and Internet at home and having parents with graduate education had higher levels of science literacy in the US. Third, Ho’s (2010) analysis of PISA 2006 data for Hong Kong found that home cultural resources and parental organisation of science activities for their children when young (and not other parental involvement activities such as parent–child communication, parent–school communication, or parental school participation) positively predicted students’ science literacy. In the fourth study, Perera (2014) found that parents’ attitudes toward science (perceptions of general and personal value of science, perceptions of importance of science in workplace) were positively related to the science literacy of students, from both low- and high-SES families, in 15 OECD and non-OECD countries who participated in PISA 2006. Lastly, Reparaz and Sotes-Elizalde’s (2019) analysis of PISA 2015 data found that some aspects of parental involvement, such as parents spending time talking to children and attending scheduled meetings or talks for parents, were positively associated with students’ science literacy in Germany and Spain. In contrast, other parental involvement variables (e.g., helping child with science homework, discussing with child’s teachers about child’s behaviour or learning, participating in local school government) were not.

To summarise, these studies showed that many cultural capital variables influenced student literacies in different subjects whereas others did not. Important variables included reading attitudes for reading literacy; parent-initiated school involvement and parent-child discussions for mathematics literacy; and home educational and cultural resources, parental education, cultural participation, and parental attitudes toward science for science literacy. The patterns of results for different subjects indicate that various aspects of cultural capital are needed for students to do well academically. They foreground the prospect of a research programme elucidating subject-related cultural capital variables. Archer, Dawson, DeWitt, Seakins, and Wong (2015) have proposed the concept of ‘science capital’ as a collation of science-related cultural capital to explain students’ science educational and occupational aspirations. The same idea may be applied to conceptualising mathematics- or reading-related cultural capital and empirically testing the validity of these constructs as second-order dimensions of cultural capital.

Comparison across subjects

Four studies compared associations between cultural capital and student literacy in different subjects. Results from these studies provide insights on (a) cultural capital variables that are associated with multiple student literacies and (b) the relative contributions of cultural capital to different student literacies. First, Hampden-Thompson, Guzman, and Lippman (2013) reported that parent-child discussions on books, films, television, and socio-political issues were more frequently associated with students’ reading than mathematics or science literacies in 21 countries participating in PISA 2000. In contrast, parents helping their child with homework was consistently negatively associated with all three types of students’ literacies. Next, Xie and Ma’s (2019) study of data from 14 economies participating in PISA 2009 found that cultural capital (home cultural possessions, parents’ perceptions toward reading) explained the influence of SES

on student literacies in reading (24%) and science literacies (23%) to a greater extent than on students' mathematics literacy (21%). In the third study, Gilleece, Cosgrove, and Sofroniou's (2010) analysis of Irish data from PISA 2006 found a nuanced pattern of association between different types of home resources and students' mathematics and science literacies. First, home book resources were positively related to students' mathematics and science literacies. Second, home cultural resources were positively associated with science literacy. Additionally, students with more home cultural resources were less likely to be low than average mathematics performers but high mathematics performers did not differ from average performers in their levels of home cultural resources. The last study by Belibas (2016) examined relationships between cultural capital and literacies of different students. Results from the analysis of Turkish PISA data showed that home educational resources benefited reading, mathematics, and science literacies of students from low-SES (but not high-SES) families whereas higher levels of maternal education benefited students from higher-SES (but not lower-SES) families.

Taken together, the four studies elucidated a nuanced pattern of relationships between cultural capital and different student literacies. To reiterate, home book resources were important for mathematics and science literacies, home cultural resources and parental perceptions of reading were more important for reading and science literacies than for mathematics literacy, parent-child discussions were more important for reading than for mathematics or science literacies, and parents helping children with homework was not associated with reading, mathematics, or science literacies. Results also highlight the moderating effects of family characteristics. Specifically, associations between two cultural capital variables (home educational resources, maternal education) and student literacies varied according to family SES.

Educational and occupational aspirations in science

Three studies examined the relationship between cultural capital and students' science aspirations using ASPIRES data. First, DeWitt and Archer (2015) examined the relationship between cultural capital (parental education, books at home, visiting museums) and science educational and occupational aspirations for Year 6 and 9 students in England. Results showed that students with more cultural capital had higher levels of science aspirations. For example, Year 6 students with high or very high levels of cultural capital were respectively 1.27 and 2.03 times as likely to have high science aspirations when compared to peers with medium levels of cultural capital. Year 9 students with very high levels of cultural capital were 1.57 times more likely to have high science aspirations when compared to peers with medium levels of cultural capital. Next, DeWitt and colleagues (2013) also reported that the Year 6 students participating in ASPIRES had higher levels of educational and occupational aspirations in science if their parents had more positive attitudes toward science (perceiving science as being interesting, being happy if child became a scientist in future, affirming importance for child to learn science). In the third study analysing ASPIRES data for Year 6 and Year 11 students, Moote, Archer, DeWitt, and Macleod (2018) found that students' cultural capital (parental education, books at home, visiting museums) was a stronger predictor of their aspirations in science than in engineering (working in engineering, undertaking inventive work).

These results showed that many cultural capital variables were associated with science educational and occupational aspirations of students from different grade levels (Year 6, 9, 11) in England. These variables included objectified (home book resources), embodied (visiting museums, parental science attitudes), and institutionalized (parental education) forms of cultural capital. Furthermore, the influence of cultural capital variables was stronger for aspirations in

science than engineering. Results, from studies analysing ASPIRES data, showing that cultural capital affects students' non-achievement outcomes (i.e., aspirations) complement those from PISA studies demonstrating that cultural capital influences students' academic literacies.

Contexts and time

The third and last set of insights highlights how educational and societal contexts moderate the association between cultural capital and student literacies and compares the influence of cultural capital over time. Researchers analysing PISA data can examine these research issues because there is international participation from students from diverse education systems worldwide across many waves of assessment since 2000.

Educational contexts

Five studies investigated how educational contexts moderated the influence of cultural capital on student literacy. First, Xu and Hampden-Thompson's (2012) study of 22 Western industrialised countries participating in PISA 2000 found that, compared to peers whose parents had lower occupational status, the reading literacy of students whose parents had prestigious occupations benefited more from cultural capital (students' cultural participation; parent-child cultural communication; home educational, cultural, book resources) in education systems with less government intervention (e.g., liberal welfare regimes).

Next, Byun and colleagues (2012) compared relationships between highbrow cultural capital variables and students' reading literacy in four countries using PISA 2000 data. Results showed that home cultural resources were positively related to students' reading literacy whereas children's cultural participation was negatively related in Korea. Both cultural capital variables were positively associated with students' reading literacy in the other three other countries (Japan, France, US). The authors reasoned that Korea's unique educational characteristics, namely having a standardized curriculum, obsession with test preparation, and prevalence of shadow education, mitigated the influence of children's embodied cultural capital (cultural participation) on students' reading literacy.

In the third study, Andersen and Jaeger's (2015) study examined how tracking and school performance moderated relationships between four cultural capital variables (home cultural and educational resources, students' reading engagement, parent-child discussions) and students' reading literacy using PISA 2000 data. The sample pertained to three countries with different education systems (Germany - highly selective with early tracking; Canada and Sweden, - comprehensive with late tracking). Results showed that the influence of cultural capital was generally stronger in low- than in high-achieving schools. They also indicated that tracking strengthened the association between cultural capital and reading literacy. For example, students' home educational resources and reading engagement were better predictors in high-achieving schools in Germany as compared to Canada or Sweden.

In the fourth study, Marteleto and Andrade (2013) operationalised cultural capital as home cultural and book resources and demonstrated using PISA 2006 data for Brazil that school quality (measured by private schools, schools with educational resources, qualified teachers) strengthened the influence of cultural capital on reading and science literacies more than for mathematics literacy.

Fifth, Park (2008) compared interactive effects between family SES and parent-child discussions (on books, films, television programs, school) on students' reading literacy in 14 countries comprising standardized and non-standardized education systems using PISA 2000

data. His hypothesis was that it was more important for parents to engage with their children to understand the diversity of educational processes in non-standardized education systems. Results showed that while family SES and parent-child discussions were each positively associated with reading literacy in all countries (main effects), there was only partial evidence that students with higher-SES parents and more parent-child discussions benefited additionally in their reading literacy in non-standardized education systems (interactive effects in only two out of seven countries). In contrast, peers in standardized education systems did not benefit from having more discussions with higher-SES parents (no significant effects in four countries and negative effects in three countries).

Societal contexts

Six other studies examined the moderating influence of societal contexts. First, Tan's (2015) study using PISA 2012 data showed that, compared to peers in medium-SES gradient countries (2.82% of variance explained), students' level of mathematics literacy benefited from (a) more home educational resources (main effect); (b) higher parental expectations (main effect); (c) the combination of highly educated parents and more home educational resources (interactive effect); and (d) the combination of highly educated parents and higher parental expectations (interactive effect) to a greater extent in high-SES gradient countries (7.45% of variance explained).

Second, Chiu's (2010) study of PISA data from 41 countries showed that while the influence of home resources (books, cultural possessions) on students' mathematics literacy was similar across countries, intangible processes such as parent-child cultural communication were more important in richer countries. Chiu (2010) argued that intangible processes complemented the greater availability of public physical resources in these countries, thereby explaining the Heyneman-Loxley effect. In the third study, Chiu and McBride-Chang (2010) reported similar findings on the greater importance of parent-child cultural communication on students' reading literacy in richer countries.

Fourth, Notten and Kraaykamp (2009) compared the association between home media resources (books, television sets, computers) and students' science literacy across 53 countries with different levels of economic development using PISA 2006 data. Results showed that students had higher levels of science literacy if they had more books and computers but fewer television sets at home (main effects). Furthermore, books at home benefited students' science literacy additionally whereas having more television sets at home further depressed students' science literacy in more developed countries (interactive effects). Notten and Kraaykamp (2009) explained these findings on interactive effects by highlighting that parents in developed countries used more compensatory strategies to enable their children to optimise the use of their home physical resources (e.g., books).

In the fifth study, Tan and Liu (2018) compared the relationships between different cultural capital variables (paternal and maternal education, home educational and cultural resources) and students' reading literacy in six CHCs and nine non-CHCs with comparable educational and economic development. Their analysis found that associations of cultural capital variables (except home educational resources) with reading literacy were weaker in CHCs than in non-CHCs. Cultural capital could have a weaker association with reading literacy in CHCs because of Confucian beliefs in working hard for success, postponing immediate gratification for long-term educational benefits, and honouring parents through scholastic achievement (Tan & Liu, 2018). However, Confucian values are not immune from contestation, as some of these

values can also characterise non-CHCs, governments may exploit these values to mobilise the population for state development, and students may value achievement in lieu of learning.

Lastly, Evans, Kelley, and Sikora's (2014) analysis of PISA 2000 data for 42 countries found that students whose parents were university-educated and who were holding professional/administrative jobs had modestly higher levels of reading literacy if they had more books at home (0.5 grades higher for 500 versus 100 books). However, students whose parents had less than high school education and who were semi-skilled/unskilled had substantially higher levels of reading literacy (1.5 grades higher) if they had 75 as compared to no books at home. These results supporting the cognitive skills hypothesis held for different countries, regardless of their ideology, political history, or levels of economic development.

In summary, most of the studies showed that the influence of cultural capital on student literacy varied with either the educational or social context. It was stronger in education systems with less government intervention, in low-achieving schools in education systems with more tracking, and in schools with better quality. Cultural capital was also more strongly associated with student literacy in more unequal and more developed societies. In contrast, cultural capital influence was weaker in high-achieving and standardized education systems, and in societies valuing education (e.g., in CHCs). Evan and colleagues' (2014) study was the only one reporting that cultural capital influence did not vary with societal contexts (ideology, political history, economic development).

The different contexts are indicative of field conditions with their own 'rules of the game' for student literacy. Krarup and Munk (2016) argued that only when researchers shift their focus from the independent effects of individual cultural resources to the social structure of these resources in the field will they be able to understand how these resources are converted to cultural capital. Admittedly, investigations of field conditions are best served by qualitative research, but these studies reviewed provide a preview of how mixed-methods researchers can use quantitative data to obtain preliminary ideas to inform in-depth qualitative studies.

Time

There is one study comparing the influence of cultural capital on student literacy over time. Specifically, Bodovski, Jeon, and Byun (2017) found that the importance of three types of cultural capital (home cultural resources, number of books, students' reading habits) for students' reading literacy was roughly similar in the analysis of PISA 2000 (8.2%–15.2%) and 2009 (8.3%–16.3%) data pertaining to five post-socialist Eastern European countries. However, the three types of cultural capital had become more important in three developed countries (France, Germany, US) from 2000 (9.6%–11.7%) to 2009 (14.9%–18.5%) (computed from Table 3 in Bodovski et al (2017)).

These results underscore the enduring influence of cultural capital on student achievement over time, with a similar magnitude of influence for less-developed countries and increasing influence for more-developed countries. They support the Heyneman–Loxley Effect, which postulates that home matters more than school for student achievement in more developed societies where most schools are well-resourced, and therefore parents must do more to improve their children's achievement (Heyneman, 2015). They also provide support for the social reproduction (vis-à-vis social mobility) perspective. However, these results must be interpreted cautiously, as the time variable encapsulates a plethora of developments, some of which may strengthen whereas others may weaken the relationship between cultural capital and student achievement. Future research can clarify the relative impact of these different developments.

Conclusion

Three sets of insights emanate from studies examining PISA and ASPIRES data that are reviewed in this article. They elucidate the complexity of cultural capital, demonstrating that associations between cultural capital and student outcomes vary with types of cultural capital variables, types of student outcomes, and educational and social contexts.

The first insight is that cultural capital is a complex construct with different variables (comparing the three forms of cultural capital, highbrow versus non-highbrow cultural capital, parent versus children's cultural capital) varying in their association with student literacy. For example, objectified cultural capital is more important than institutionalized cultural capital but more research is needed to clarify the relative importance between objectified and embodied cultural capital. Between the two aspects of highbrow cultural capital, home cultural resources are more important than cultural participation. It is unclear if highbrow cultural resources are more important than non-highbrow (educational and book) resources at home. Compared to other cultural capital variables (e.g., parent-child discussions, student reading), highbrow cultural capital is less associated with student literacy. It is also important to distinguish between parental and children's cultural capital given the evidence that parents' cultural capital affects students' literacy both directly and indirectly by shaping the latter's cultural capital. Given the complexity in cultural capital, future research can ascertain how different cultural capital variables contribute to student learning and compare their relative effectiveness. In recognizing the complexity of the construct, it may be more accurate to refer to myriad cultural "capitals" instead of a unitary cultural "capital" in the extant scholarship. Therefore, it is insufficient to ask if students have more or less of cultural capital; rather, the more relevant question is the composition of cultural capitals that they possess.

The second insight is that associations between cultural capital and student outcomes may vary with the subject area. First, there are specific cultural variables associated with student literacy in different subjects. Second, some cultural capital variables are more important for student literacy in a subject area than another. Third, cultural capital may influence students' educational and occupational aspirations in addition to their literacy. It is therefore important for researchers not to assume that students with more cultural capital will be more successful academically; rather, it is important to elucidate what cultural capital variables matter for the specific student outcomes they are investigating. Relatedly, researchers must not divorce their study of cultural capital from the type of student outcomes they are investigating.

The third insight is that the influence of cultural capital on student literacy may vary with educational and social contexts. Cultural capital is more important in education systems with less government interventions, in low-achieving schools in differentiated education systems, in schools with better quality, and in more unequal and more developed societies. In contrast, it matters less in high-achieving and standardized education systems, and in societies valuing education. The importance of cultural capital is more consistent in less-developed countries over time. In developed countries, there is evidence that student literacy is increasingly influenced by cultural capital in more recent periods of time. These results highlight the importance for studies of social inequality to recognize contextual differences. Identification of such contextual characteristics, especially those of education systems and social contexts that dampen effects of cultural capital, can inform education and social policy aimed at promoting educational equity.

Notwithstanding the insights gleaned, results discussed in the review need to be read with a few methodological limitations regarding PISA or ASPIRES data in mind. The first limitation

pertains to the sampling strategy adopted. For example, PISA sampling does not consider the racial/ethnic distribution within countries, so resulting samples may overrepresent certain sub-populations who excel at school. Furthermore, PISA samples 15-year-old students who are still in school, so it excludes teenage dropouts who may suffer from a lack of cultural capital. ASPIRES only sample students in England. Indeed, the present review found that associations between cultural capital and student literacy varied with different sub-populations of students (e.g., students with different SES; Belibas, 2016; Evans et al, 2014; Xu & Hampden-Thompson, 2012), so sub-populations of students who are excluded from PISA and ASPIRES may have different patterns of associations from those included.

The second limitation is that some PISA variables suffer from poor scale reliability, as is evident in the range of internal reliabilities for many variables across participating countries. For example, the internal reliability for home cultural resources in PISA 2015 ranged from .43 in Albania to .66 in the four Mainland China cities (OECD, 2017). Since substantive analyses rely on the use of valid and reliable measures, results from studies analysing countries with less-than-satisfactory scale reliabilities for cultural capital variables must be interpreted with caution.

The third limitation is that some analyses using PISA or ASPIRES data may suffer from the omitted variable problem. By way of illustration, items measuring students' highbrow cultural participation were only available in PISA 2000, so researchers using data from other PISA waves had to use students' access to home cultural resources when measuring highbrow culture. Another example is educational expectations, which were measured by a single item and available in only three PISA waves (2003, 2009, and 2012). There are also fewer parent variables than student variables (although there are student-reported data on parent variables), so researchers are limited in their ability to investigate the intergenerational transmission of cultural capital.

The fourth limitation is that neither PISA nor ASPIRES data are experimental, so we should not infer causality in results reported in studies using these data. In fact, none of the studies reviewed used techniques such as propensity score matching capable of estimating 'treatment' effects for observed data to at least compensate for the absence of experimental designs.

The last limitation is that some studies did not employ analytical approaches that accounted for the hierarchical nature of the data (e.g., students nested in schools), so results reported in these studies might not be unbiased. For example, there are five studies reviewed where researchers used ordinary least squares regression instead of multilevel modelling to analyse the PISA data (Bellibaş, 2016; Bodovski et al, 2017; Evans et al, 2014; Turmo, 2004; Xu & Hampden-Thompson, 2012).

There are also puzzles that PISA or ASPIRES studies have not resolved. For example, it is unclear how important highbrow cultural participation is in meritocracies or knowledge-based economies. Future research can more systematically analyse PISA data to resolve these puzzles and supplement the analyses with other sources of primary data, especially qualitative data that provide deep insights into the 'how' and 'why' aspects of the influence of cultural capital.

Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Ethical guidelines

Ethical approval is not required because there are no subjects involved in this study of published studies.

Conflict of interest

There is no conflict of interest in the work reported here.

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