



A bibliometric mapping of shadow education research: achievements, limitations, and the future

Anas Hajar¹ · Mehmet Karakus²

Received: 12 November 2021 / Revised: 18 March 2022 / Accepted: 20 March 2022 / Published online: 9 April 2022
© Education Research Institute, Seoul National University, Seoul, Korea 2022

Abstract

This study aims to map the literature on shadow education using metadata extracted from 488 publications indexed in the Web of Science database. It is termed as shadow education because much of its content mimics what is learned in schools. The study uses bibliometric procedures to describe and visually represent available literature on shadow education in terms of main sources, key authors, institutions, and countries leading the production and dissemination of research on shadow education. Further, the study elaborates on h-classics publications to obtain an in-depth understanding of the most influential scientific outputs in this domain. Key findings of the study are that research on shadow education (a) has experienced steady growth over the last decade; (b) is disseminated through a wide range of outlets, mainly in the disciplines of sociology of education, economics of education, educational psychology, and language education; (c) is published mainly by scholars working in East Asia and the United States; (d) has focused on tangible (quantifiable) benefits related to improved examination results; and (e) reveals how this form of instruction primarily benefits students hailing from high socioeconomic backgrounds, thereby contributing to greater educational inequality. This study also suggests pedagogical implications and areas for ongoing research.

Keywords Shadow education · Bibliometric analysis · Literature review · Science mapping · VOSviewer

Introduction

The term “shadow education” is widely used as a metaphor for varied forms of private supplementary tutoring that operates alongside regular schooling and, to some extent, replicates its curriculum (Bray, 2021a). It is paid and can take various forms, including individual or small-group tutoring at tutors’ or students’ homes, in large classes, or even in lecture theaters with video screens. Stevenson and Baker (1992) used the shadow education metaphor in the title of a sociological research and education policy paper titled “Shadow education and allocation in formal schooling: Transition to university in Japan.” The authors defined the term as “a set of educational activities that occur outside formal schooling and are designed to enhance students’ formal school

career” (Stevenson & Baker, 1992, p. 134). More than two decades later, Baker (2020, p. 311) reflected on this seminal paper, recalling how he and his colleague thought it was “an exotic Japanese cultural oddity” at that time, and how “although infrequently cited over the subsequent decade, in the new century our once obscure article began to be widely referenced, reaching over 500 citations as of early 2020.” Bray (2010, p. 4) highlights that although Stevenson and Baker used the metaphor of shadow education in the title of their article about Japan in 1992, this metaphor was initially employed by Marimuthu et al. (1991) while describing private tutoring (PT) in Malaysia. Marimuthu et al., (1991, p. vi) stated as follows:

The study ... found that a considerable percentage of youths attended private tuition [in Malaysia] in order to prepare themselves for the selective national examinations ... the practice of private tuition was so prevalent that it could be considered as a ‘shadow educational system’. (Marimuthu et al., 1991, p. vi)

Bray (2010) further indicates that this metaphor was also used in Singapore by George in (1992). Elsewhere, Zhang

✉ Anas Hajar
anas.hajar@nu.edu.kz

¹ Graduate School of Education, Nazarbayev University, ROOM: 5028, Nur-Sultan, Kazakhstan

² Research Centre for Global Learning, Coventry University, 5 Whitefriars St, Coventry CV1 2DS, UK

and Bray (2020) highlight that shadow education has distant origins in the mid-nineteenth century; however, it only emerged as a specific topic in the academic literature in the 1980s and 1990s (e.g., Hemachandra, 1982; Hussein, 1987; Stevenson & Baker, 1992). Zhang and Bray (2020) further contend that these studies focused only on individual countries with some scattered national and subnational literature, but the first global comparative study of this phenomenon appeared in 1999 in Bray's book published by UNESCO: *The Shadow Education System: Private Tutoring and Its Implications for Planners*.

Recently, shadow education has witnessed growing recognition from researchers, educators, and policymakers owing to its influential implications for social equality, economic growth, and the operation of formal education systems (Entrich, 2021). This is evidenced by its increasing presence not only in books (e.g., Bray & Lykins, 2012; Bray et al., 2020a, 2020b; Bray, 2021a; Entrich, 2018a, 2018b; Kim & Jung, 2019) but also in special issues in scholarly journals, such as *Asia Pacific Education Review* (Bray & Lee, 2010), *East China Normal University Review of Education* (Zhang & Bray, 2019), *European Journal of Education* (Gordon Györi, 2020), and *Orbis Scholae* (Šlastný & Kobakhidze, 2020). UNESCO's *Global Education Monitoring Report* (GEM) (2021) of nonstate actors in education also recognizes the focal role that shadow education can play in education systems. Nevertheless, research on shadow education has not kept pace with its global expansion. This is primarily because it is less structured, and some tutors and tutees are reluctant to provide data, considering it an illegitimate form of education, and its prevalence is still viewed by some governments as reflecting criticism of the mainstream schooling for which the state is responsible (Hajar et al., 2021; Zhang & Bray, 2020). In fact, Malik (2017, p. 19) suggested that the field of shadow education "seems to be building more floors upwards before looking at the foundations and strengthening it."

This paper provides a comprehensive view of shadow education research since its emergence from a bibliometric perspective. Bibliometric overviews offer an objective and systematic approach by measuring, tracking, and analyzing print-based scholarly literature in a specific field to reveal its scientific roots, identify emerging thematic areas and gaps in the literature and, ultimately, contribute to moving the field forward (Karakus et al., 2021). Consequently, this is the first study that has employed several bibliometric indicators to explore the evolution of shadow education research based on publication and citation trends, as well as venues contributing to this research field. It presents the most prominent authors, countries, institutions, and sources in the domain of shadow education, coupled with the recurring research themes explored in literature. Hence, mapping research on shadow education is essential to identify contributions and

challenges to the development of the field to allow researchers to identify areas, populations, and contexts that should be further explored, which, in turn, can deepen its conceptualization and theorization. As Bray (2021b, p. 2) aptly remarks, "shadow education has growing significance, and needs to be more firmly on research agendas in all branches of educational studies, including comparative and international education."

The present study

Study aims

Systematic literature reviews and content analysis can offer significant insights into the theoretical and methodological underpinnings of shadow education research. However, the scope of studies that employ these approaches is limited, and the process is time-consuming. An alternative approach is a bibliometric review of the literature, which can "process a considerably higher volume of studies published over a longer timespan with a lower investment of time and resources while providing a comprehensive picture of the development and the current status of a field" (Hernández-Torrano & Ibrayeva, 2020, p. 3). As previously stated, research on shadow education has been slow to catch up with reality and perhaps viewed as the hidden secret in the education system of some parts of the world. However, it is now established as an important subfield of educational studies. While this study identifies and researches parts of the big picture of this phenomenon, it can still help educators, researchers, and policymakers to better understand the shadow education phenomenon, especially because it can exacerbate social inequalities, a major concern standing in the way of the achievement of equitable and inclusive, high-quality education. More precisely, the study describes the evolution of shadow education research, examining the publication trends and citation data. It also reveals the main sources and research areas that have contributed the most to the development of this domain, as well as the key authors, institutions, and countries leading the generation and dissemination of research on shadow education. Further, the study identifies and elaborates on the main themes, shedding light on the research gaps and the agenda ahead.

Materials and methods

This study took a bibliometric approach to map the literature on shadow education using metadata extracted from the six indexes of the web of science (WoS): the social sciences citation index (SSCI), the arts and humanities citation index (AHCI), the science citation index-expanded (SCI-Expanded), the emerging sources citation index (ESCI),

the book citation index–social sciences and humanities (BKCI-SSH), and the book citation index–science (BKCI-S). The WoS database was selected for this study because it has broad coverage in educational research and most other research disciplines (Ivanović & Ho, 2019). The WoS Core Collection covers more than 82 million records, 1.8 billion cited references (from the 1900s to date), and 21,800 journals in the fields of arts and humanities, social sciences, and science (Clarivate Analytics, 2022). The WoS and Scopus are the most used databases in scientific mapping studies (Mongeon & Paul-Hus, 2016). Thousands of researchers have especially preferred to use the WoS as the main database within the last two decades. However, the WoS database has limitations, the main criticism being that its coverage is *particularistic*, influenced by journals' place of publication, discipline, and language (Chavarro et al., 2018, p. 107). The WoS mainly covers journals on natural and engineering sciences produced in the United States, the United Kingdom, Germany, and the Netherlands, and this database is biased against the items published in languages other than English and the ones in the fields of social sciences, arts, and humanities (Mongeon & Paul-Hus, 2016). Nevertheless, Chavarro et al. (2018) claim that indicators obtained from the WoS can provide insights into scientific publications on the phenomenon under investigation.

Search strategy

The metaphor “shadow education,” like many other metaphors, is imperfect mainly because students may receive fee-paying PT before rather than after their classes in mainstream schooling (Bray et al., 2016). Also, it does not always precisely imitate the curriculum of mainstream schooling because some private tutors go beyond the activities included in school textbooks (Bray, 2021c). This paper uses the terms “PT” and “shadow education” interchangeably, although sometimes, as Bray (2021b, p. 2) suggests, individuals use “private” to refer to “activities conducted privately, i.e., outside the public education space but possibly without financial remuneration.” In this paper, the focus is on only fee-charging tutoring. Kobakhidze and Suter (2020) point out that shadow education is an umbrella term for several activities, so the comprehensive list of terms given by Kobakhidze and Suter (2020, p. 316) was used to search for key terms employed in the literature. That is, the topic search field contained the key English terms in the literature to find matches in author keywords, keywords plus, abstracts, and document titles. These terms are shadow education, private tutoring, private tuition, private supplementary tutoring, private supplementary tuition, cram school, and supplementary tutoring. Other key terms associated with shadow education used in certain countries, namely, *juku* (Japan), *hagwon* (South Korea), *buxiban* (Taiwan), *parapedia* (Greece), and

repetitorstvo (Russia) (Kobakhidze & Suter, 2020, p. 316) were added. Proceedings, editorial materials, book reviews, news items, and notes were excluded from the search. All the searches were conducted in the last week of December 2021. Each item was examined, with only the most relevant included in the analysis. The study authors found 670 documents in the first search, but after the irrelevant items were excluded, 488 remained. The key terms (*juku*, *hagwon*, *buxiban*, *parapedia*, and *repetitorstvo*) used in certain countries to refer to shadow education accounted for 39 publications in the final corpus. Regarding the document types, there were 481 articles, 64 book chapters, and four books. The books were: Bray et al. (2013); Kim and Jung (2019); Kobakhidze (2018); and Park (2013). The present authors found out that several books in the field of shadow education were not included in the WoS database (e.g., Bray, 1999, 2003, 2009, 2011; Entrich, 2018a, 2018b; Kim, 2016), although some of these books (e.g., Bray, 1999, 2009) are available in different languages other than English such as Chinese, Farsi, French, and Japanese. Each of these translations had its own ripple effects in the academic and professional fields of the relevant societies across the (non-English-speaking) world. Also, most of the book chapters are recurrently included in the articles category of the WoS. The distribution of the selected items by database was as follows, with the number of items indicated in parentheses: SSCI (333), ESCI (83), AHCI (17), SCI-Expanded (9), BKCI-SSH (68), and BKCI-S (1). Some of the items indexed in BKCI-SSH are repeatedly listed in SSCI and AHCI indexes. As Leydesdorff and Felt (2012) pointed out, many books and book chapters in the BKCI database are also labeled as articles or reviews by the WoS and recurrently appear in the other relevant databases, which sometimes confuses readers.

We did not exclude any language in our literature search. However, the following distribution, with the number of publications indicated in parentheses, shows that most of the items in the corpus were published in English: English (468), German (9), Spanish (3), Turkish (3), Russian (2), French (1), Japanese (1), and Portuguese (1). Hence, one of the limitations of the WoS database is that publications in other languages such as Arabic, Chinese, and Italian were not included, and hence the terms associated with shadow education used in certain countries (e.g., *durus khususiyya* in Arabic, 影子教育 in Chinese, and *lezioni private* in Italian) could not be identified. The distribution of items according to year of publication, with the number of publications in parentheses was the following: 1977 (1), 1992 (5), 1993 (1), 1994 (1), 1997 (1), 1998 (1), 1999 (2), 2000 (1), 2001 (2), 2002 (1), 2003 (3), 2004 (4), 2005 (2), 2006 (5), 2007 (1), 2008 (8), 2009 (8), 2010 (24), 2011 (10), 2012 (17), 2013 (40), 2014 (26), 2015 (28), 2016 (31), 2017 (35), 2018 (46), 2019 (62), 2020 (70), 2021 (51), and 2022 (1).

Chronologically, the first publication in the corpus (1977) dealt with Japan's private preparatory schools (*juku*), which attracted 60% of Japan's junior high students at that time (DeVault & Kato, 1977). Then, after a long period, five studies appeared in the WoS in 1992 related to shadow education and PT. One of them was Stevenson and Baker's (1992) seminal work in which they coined the shadow education metaphor. The other four studies were all related to students' test anxiety in Japanese *juku* environments and appeared in a special issue of *Anxiety, Stress, and Coping Journal* (Hawkins & Tanaka, 1992; O'Neil et al., 1992; O'Neil & Fukumura, 1992; O'Neil & Abedi, 1992). One article appeared in the WoS in 1993 and one in 1994, again focusing on the Japanese *juku* environments (Fujii, 1993; Harnisch, 1994). The distribution shows that there were sporadic publications annually until the last decade, when the number of publications increased each year significantly, revealing researchers' growing interest in the area of shadow education in recent years.

Data analysis procedures

Bibliometric analysis and bibliometric visualization methods were used to map the relevant literature. The researchers used VOSviewer software as a bibliometric analysis and visualization tool in the current study (Eck et al., 2017), and evaluative measures and in-depth analyses to map out the existing body of research outputs based on bibliographic data (Karakus et al., 2021). Bibliographic coupling analyses were performed to present the most prominent authors, countries, institutions, and sources in the domain of shadow education. Coauthorship analyses revealed the scientific collaboration patterns between authors. Co-citation analysis of sources provided evidence about the scientific disciplines underlying the research in shadow education. Finally, the bibliographic coupling of the author's keywords presents the topical focuses of the research in this area.

There are links between any pair of items in each stage of our analyses. The strength of a link denotes the number of publications in which two terms occur together (in the bibliographic coupling of the keywords), the number of publications two researchers have coauthored (in the coauthorship analysis), and the number of cited references that two items (authors, countries, institutions, and sources) have in common (in the bibliographic coupling analyses) (Eck & Waltman, 2019).

Bibliographic coupling links between countries are calculated according to the authors' affiliations (institutions) as they appear in the publications and the countries in which those institutions are based. For multiauthored articles, multiple links are calculated between countries, based on the affiliations of the authors that appear on the publication. In the bibliographic coupling of the keywords, the VOSviewer

uses the keywords provided by the authors. If no keyword appears in a publication, the software does not take that one into account when calculating the co-occurrence links. Moreover, such keywords may not be always used appropriately or consistently with other articles, and sometimes even the countries on which articles focus are not included in the keywords. All these issues are among the limitations that may lead to biases in the results.

The authors used varying levels of thresholds for the minimum number of citations or publications in creating the figures at different stages of the analyses. Bibliometric visualization gives researchers the flexibility to identify those threshold levels unless they wish to display all publications, which would cause visual clarity issues when the number of included publications is large (Linnenluecke et al., 2020).

In addition to overall citation counts and document numbers, the authors also used the average number of citations to compare the impact of the sources, authors, institutions, and countries. The overall citation count of a unit (source, author, institution, or country) is divided by that unit's number of publications to find an average number of citations (Eck & Waltman, 2019). The approach using the average number of citations is based on the assumption that citation count is an important indicator of the impact of publications. However, some of those papers might have received high citation counts due to reasons other than their academic merit. In that case, average values can favor less significant units, which would make those results biased. Notwithstanding all those limitations, if a unit (source, author, institution, or country) has a high citation count with a low number of publications, it is implied that the relatively high impact of this unit in literature will have a high average citation value. However, it does not mean that this unit is the most prolific one (total number of relevant publications) or has the highest overall impact in the literature (overall citation count of the relevant publications). Therefore, those average values should be interpreted with caution and be evaluated together with the overall number of publications and citation counts.

In addition to the bibliometric analyses, the researchers retrieved and reviewed the h-classics to obtain a clearer picture of the most cited works and most popular topics in the shadow education literature. H-classics are the most cited publications in specific literature that received $\geq h$ citations (Martinez et al., 2015). *H* refers to the *h-index*, or the number of publications with citation numbers $\geq h$ (Cancino et al., 2017). H-classics means the corpus of the highest-quality publications in a specific area (Cobo et al., 2014). In the current study, the h-index was 36. That is, the h-classics in this area comprised 36 highly cited publications with 36 or more citations. Notably, the authors of this paper were aware that the number of citations does not necessarily reflect the quality of publications for several reasons. First, some publications may be cited to show the data they presented were

insufficiently precise. Second, citations can have a “herd effect”: publications that are cited frequently may attract greater attention from new authors and therefore are likely to be cited even more frequently. Moreover, the large number of citations may also depend on the timing. For example, one of the reasons that Stevenson and Baker’s (1992) paper received so many citations might be that it was the earliest paper that used the metaphor of shadow education in its title.

Results

Leading authors and their collaborative networks

The bibliographic coupling of authors (Fig. 1) reveals the most prominent researchers in the shadow education field. Of 705 authors, 15 met the threshold of having a minimum of three publications and 50 citations. Bray has been the most productive researcher in the shadow education field with the highest number of publications (32), citation count (579), and total link strength (9440). Other prominent researchers in this field are as follows, with the number of publications, citation counts, and total link strengths indicated consecutively in brackets: Zhang (13, 187, 5137), Liu, Junyan (7, 79, 2330), Kwo (4, 155, 2275), Wang (4, 118, 2171), Park (6, 279, 1833), Yung (6, 75, 1809), Zhan (3, 105, 1743), Kobakhidze (8, 98, 1736), Byun (7, 342, 1659), Buchman (4, 247, 1352), Matsuoka (5, 70, 969), Kuan (3, 53, 635), Hamid (3, 98, 632), and Haag (3, 65, 7). Zhang has the second-highest number of publications (13) and total link strength (5137), while Byun has the second-highest citation count (342). In Fig. 1, the nodes are weighted by the authors’ overall citations and scores are weighted by their average number of citations (an author’s total citation count is divided by the same author’s number of publications).

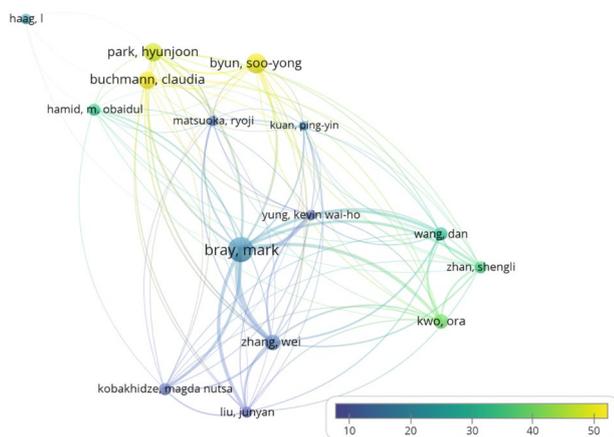


Fig. 1 Bibliographic coupling of authors. Note: Minimum number of publications: 3; minimum number of citations: 50

Bigger nodes show higher overall citation counts, while the yellowish nodes show the highest averages. Buchman (61.75), Byun (48.86), and Park (46.5) have the highest averages among the most prominent authors, implying that their papers received a comparatively higher number of citations than others based on the number of publications.

The coauthorship analysis of authors (Fig. 2) shows the patterns in the scientific collaboration between the leading researchers in this area and reveals three active research groups. Different colors in the network visualization show the clusters of authors collaborating with each other, and the thickness of the lines shows the frequency of coauthorship. The first group mostly comprises researchers from the University of Hong Kong (HKU) and East China Normal University (ECNU) led by Bray (HKU–ECNU) and his colleagues [Zhang (HKU–ECNU); Kobakhidze (HKU); Liu (HKU–ECNU); Wang (HKU); Kwo (HKU); Zhan (HKU); Yung (HKU–Education University of Hong Kong); and Mahmud (HKU–Bangladesh Open University)]. Bray is in the center of the coauthorship links between this group of authors. Different colors within this group show different authors and small groups of authors who frequently collaborated with each other under Bray’s leadership. Blue nodes show the two prominent authors’ (Yung and Mahmud) individual collaborations with Bray, while the yellow and green nodes reveal the prominent names of two groups of researchers who frequently collaborated with each other under Bray’s leadership. All these authors also have other coauthors in addition to with Bray, but the others did not meet the threshold values and thus, could not be included in that visualization.

The second group is from the United States but mostly worked on samples from East Asia, especially from South Korea and led by Park (University of Pennsylvania) and his colleagues [Byun (University of North Carolina), Buchman (Ohio State University), and Baker (Penn State University)]. The third one, “de Castro and de Guzman” is a pair at the same institution [University of Santo Tomas] in the Philippines. They focused on issues in shadow education in the Philippines in their four articles.

Leading countries and their collaborative networks

The bibliographic coupling of countries (Fig. 3) reveals that the United States, the People’s Republic of China (PRC), and South Korea have been most prominent in the field of shadow education, followed by Germany, Japan, England, Taiwan, and Australia. Hong Kong, which has leading institutions and authors in this area, is included in the PRC according to the records of the WoS. The order of the countries is as follows, with their number of publications, citation counts, and total link strengths given in brackets: PRC (90, 1131, 42,636), USA (97, 2060,

Fig. 2 Coauthorship analysis of the authors. Note. Minimum number of publications: 3, minimum number of citations: 20

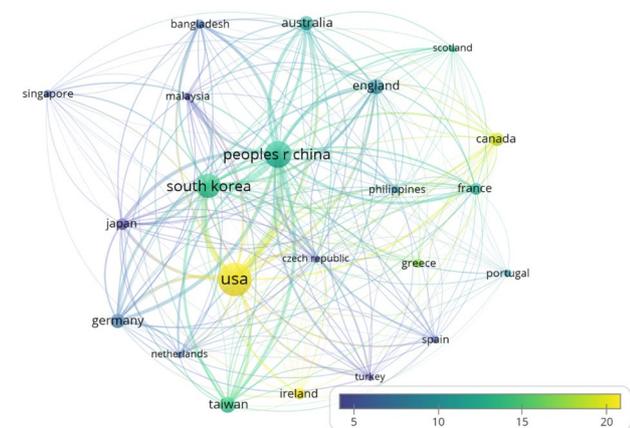
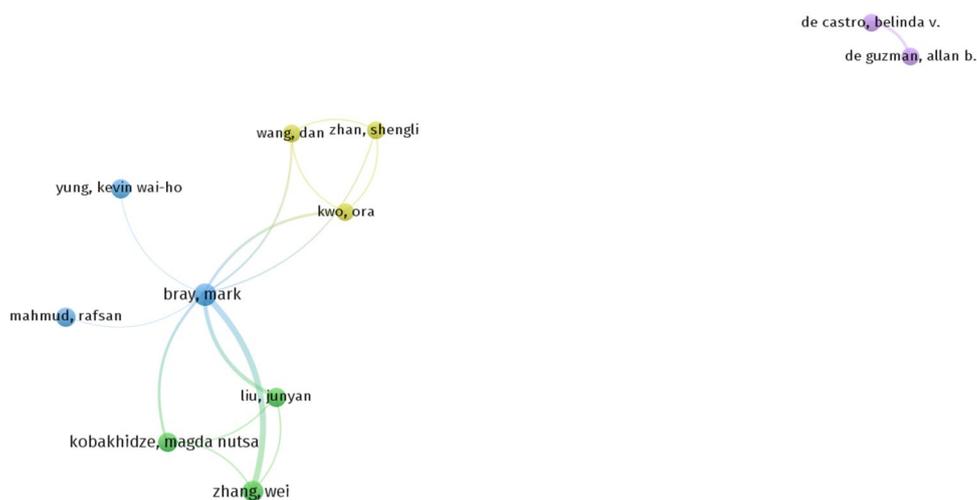
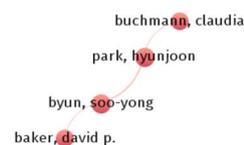


Fig. 3 Bibliographic coupling of countries. Note. Minimum number of publications: 3, minimum number of citations: 30

34,506), South Korea (65, 871, 30,580), Germany (32, 232, 10,944), Japan (31, 136, 10,517), England (26, 232, 9991), Taiwan (22, 305, 9571), Australia (20, 219, 9303), Bangladesh (10, 70, 6525), Malaysia (10, 47, 5945), France (11, 131, 5647), Czech Republic (9, 32, 5152), Turkey (13, 32, 4753), Canada (10, 187, 4225), the Netherlands (5, 34, 4136), Philippines (5, 44, 3905), Spain (7, 44, 3438), Scotland (3, 38, 2357), Singapore (7, 43, 1810), Ireland (5, 122, 1410), Greece (5, 83, 1147), and Portugal (5, 46, 805). These results show that the United States has



the highest number of publications (97) and citation count (2060), while the PRC has the highest total link strength (42,644). South Korea ranks in third place based on these indicators. In Fig. 3, the nodes are weighted by countries' overall citation counts, while the scores are weighted by each country's average number of citations (overall citation count of a country is divided by that country's number of publications). Bigger nodes show higher overall citations, while different colors denote different values of average citations. The yellowish nodes reveal that Ireland (24.4), the USA (21.24) and Canada (18.7) have the highest average citations, followed by (greenish nodes) Taiwan (13.86), South Korea (13.4), Scotland (12.67), the PRC (12.56), and France (11.91).

The coauthorship analysis in Fig. 4 shows the scientific collaboration patterns between the countries with which the most prolific authors are affiliated. In this overlay visualization, the scores are weighted by the total link strengths. Bigger nodes show higher total link strengths, while different colors denote different values of average citations. A thicker line also denotes a more frequent collaboration pattern between a pair of countries. Corroborating the bibliographic coupling results, this analysis reveals that the three most prolific countries, the United States, the PRC, and South Korea, are at the center of the scientific collaboration patterns of researchers in shadow education all around the world. These countries are followed by England, Australia, France, and Japan.

Fig. 4 Coauthorship analysis regarding countries the most prolific authors are affiliated. Note. Minimum number of publications: 3, minimum number of citations: 30

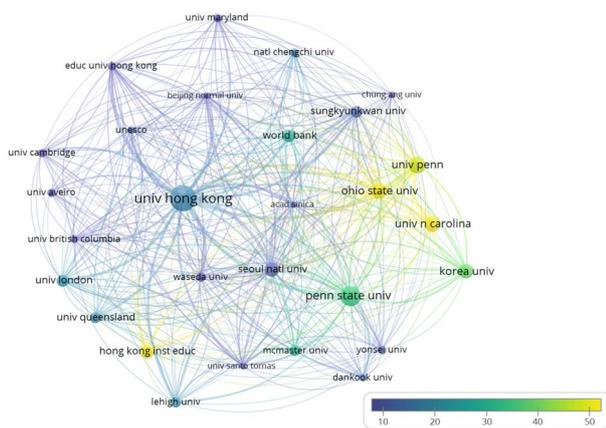
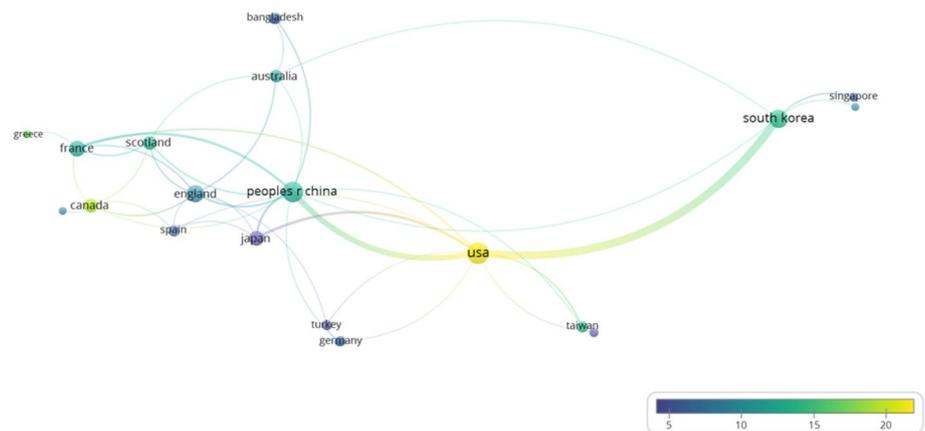


Fig. 5 Bibliographic coupling of institutions. Note: Minimum number of publications: 3, minimum number of citations: 30

Leading institutions

The bibliographic coupling of institutions (Fig. 5) shows the leading institutions in the domain of shadow education. The University of Hong Kong has been the most prominent institution in this area, followed by Seoul National University, Penn State University, University of Pennsylvania, and Sungkyunkwan University. The order of institutions follows, with the number of publications, citation counts, and total link strengths in brackets: University of Hong Kong [46, 861, 10,557 (Hong Kong–PRC)], Penn State University [13, 448, 3694 (USA)], University of Pennsylvania [6, 279, 2968 (USA)], Seoul National University [16, 183, 2790 (South Korea)], Education University of Hong Kong [10, 53, 2324 (Hong Kong–PRC)], Beijing Normal University [8, 33, 2313 (Beijing–PRC)], Sungkyunkwan University [8, 110, 2285 (South Korea)], Ohio State University [4, 247, 2230 (USA)], Waseda University [7, 65, 1648 (Japan)], Academia Sinica [4, 33, 1468 (Taiwan)], University of London [6, 127, 1466 (England)], University of Santo Tomas [4, 33, 1465 (Philippines)],

World Bank (5, 138, 1371), University of North Carolina [3, 212, 1208 (USA)], Korea University [5, 191, 1194 (South Korea)], University of British Columbia [4, 38, 1133 (Canada)], UNESCO (3, 38, 1113), University of Queensland [5, 99, 1078 (Australia)], Lehigh University [4, 76, 1074 (USA)], National Chengchi University [3, 53, 891 (Taiwan)], Dankook University [3, 45, 819 (South Korea)], University of Maryland [5, 47, 790 (USA)], McMaster University [3, 92, 770 (Canada)], Hong Kong Institute of Education [3, 171, 729 (Hong Kong–PRC)], University of Cambridge [5, 50, 675 (England)], Yonsei University [4, 50, 664 (South Korea)], Chung Ang University (South Korea), and University of Aveiro [4, 46, 397 (Portugal)]. Hong Kong Institute of Education is the former name of the Education University of Hong Kong, but the publications affiliated with the former name of this university make it appear as a separate entity in the WoS. When we count these two entries as a single one, three universities from the PRC (two of them are from Hong Kong), six each from the USA, and South Korea, two each from England, Canada, and Taiwan, and one each from Japan, Australia, Portugal, and the Philippines are among the most prominent institutions. The presence of the World Bank and UNESCO in this list shows the worldwide importance of shadow education for education policy. In Fig. 5, the nodes are weighted by the total citation counts of institutions, and the scores are weighted by their average citations (overall citation count is divided by the number of publications for each institution). Bigger nodes show higher citation counts, while the colors of the nodes denote different average values. The yellowish nodes reveal that the publications affiliated with the University of North Carolina (70.67), Ohio State University (61.75), the Hong Kong Institute of Education [previous name of the Education University of Hong Kong] (57), and the University of Pennsylvania (46.5) have the highest average citations.

The scientific venues and foundations of shadow education research

The bibliographic coupling of sources (Fig. 6) shows the most prominent places of publication on shadow education. The order of the journals (and a book) follows, with publication numbers (chapter numbers for the book), citation counts, and total link strengths in brackets: *Asia Pacific Education Review* (29, 634, 5265), *International Journal of Educational Development* (27, 365, 4920), *Asia Pacific Journal of Education* (14, 155, 3845), *Comparative Education Review* (10, 170, 3166), *KEDI Journal of Educational Policy* (15, 83, 2550), *Compare: A Journal of Comparative and International Education* (8, 114, 1946), *Private Tutoring across the Mediterranean: Power Dynamics and Implications for Learning and Equity* [book] [13 (chapters), 89, 1855], *Journal of Curriculum Studies* (5, 68, 1535), *Sociology of Education* (7, 441, 1427), *Oxford Review of Education* (6, 127, 1412), *Economics of Education Review* (5, 319, 1219), *British Journal of Sociology of Education* (5, 115, 859), *Discourse: Studies in the Cultural Politics of Education* (6, 71, 846), *Educational Studies* (6, 59, 788), *Journal of Education Policy* (3, 55, 701), and *Social Forces* (4, 177, 600).

The *Asia Pacific Education Review* has the highest number of publications (29), citation count (634), and total link strength (5265), followed by the *International Journal of Educational Development* with the second-highest number of publications and third-highest citation count. In Fig. 6, the nodes are weighted by the number of publications and scores are weighted by average citations (overall citation count is divided by the number of publications for each source) to reveal the scientific venues of the most impactful publications in this area. Yellowish and greenish nodes reveal that

Economics of Education Review (63.80), *Sociology of Education* (63), *Social Forces* (44.25), and *British Journal of Sociology of Education* (23) have the highest average values. This finding offers an indication of the robust sociological and economic foundations of shadow education research.

The co-citation analysis of sources provided further evidence of the disciplines that underlie shadow education research. The sources with stronger co-citation links, which were assumed to be semantically related to each other, were grouped into the same cluster, represented by the same color in Fig. 7. The blue cluster comprises education sources from various disciplines, such as those with a broader scope and other journals related to comparative education, sociology of education, and Teaching English to Speakers of Other Languages. The green cluster mainly

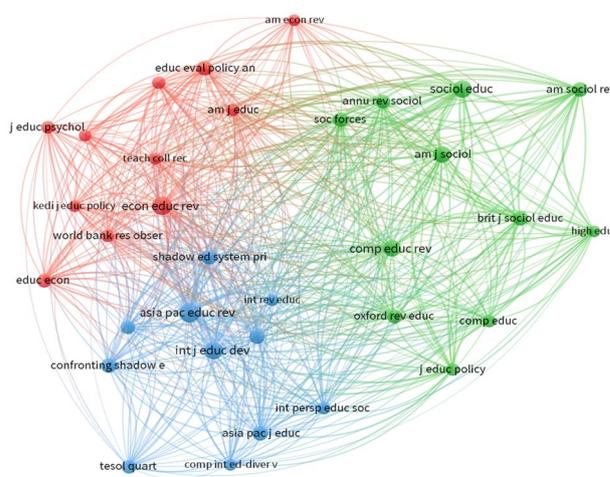
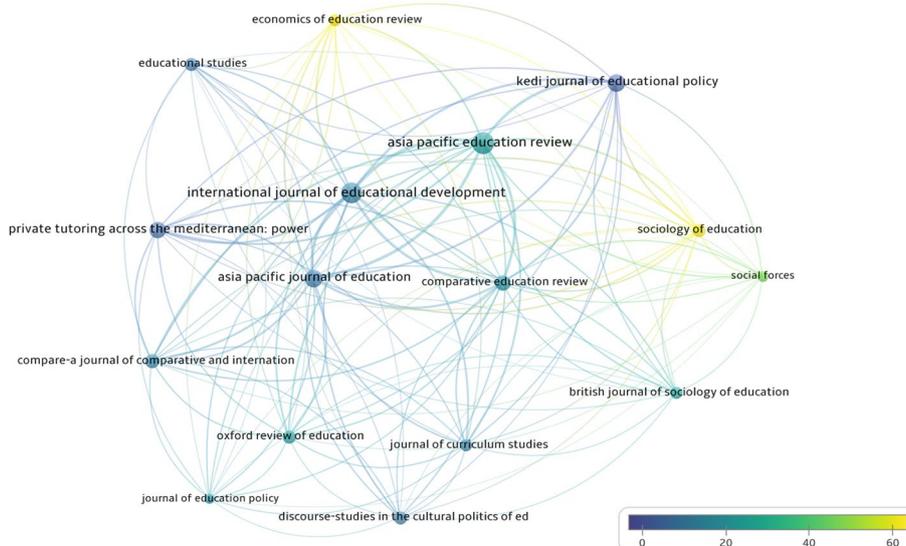


Fig. 7 Co-citation analysis of sources. Note: Minimum citation count: 50

Fig. 6 Bibliographic coupling of sources. Note. Minimum number of publications: 3; minimum number of citations: 50



comprises sociology sources. In the red cluster, most sources are related to educational economics, but there are also a few items associated with educational psychology, educational policy, and general educational research. These findings highlight the sociological and economic foundations of shadow education research as well as its relationship to a wide range of disciplines within educational sciences (see Bray, 2021b).

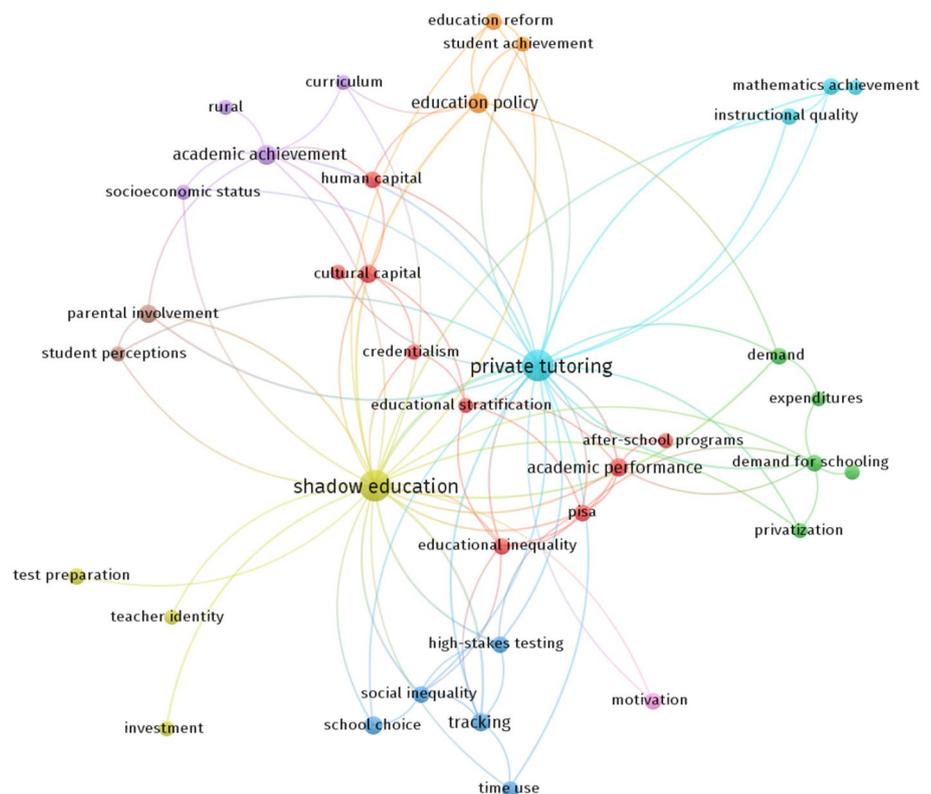
The distribution of the current corpus according to the WoS categories gives further clues about the wide range of disciplines underlying shadow education research. The number of documents is in brackets for each discipline: *Education: Educational Research* (352), *Sociology* (50), *Economics of Education* (44), *Linguistics* (18), *Area Studies* (17), *Development Studies* (12), *Educational Psychology* (11), *Social Sciences Interdisciplinary* (9), *Asian Studies* (8), *Education Scientific Disciplines* (6), *Public Environmental Occupational Health* (5), *Anthropology* (4), *Urban Studies* (4), *Psychology Multidisciplinary* (3), *Business Finance* (2), *Psychiatry* (2), *Cultural Studies* (2), *Education Special* (2), *Management* (2), *International Relations* (2), *Political Sciences* (2), *Psychology Social* (2), *Women Studies* (2), *Business* (1), *Ethics* (1), *History* (1), and *Philosophy* (1). Most papers are categorized under educational research, with a wide range of subdisciplines connected to shadow education research,

especially sociology of education, economics of education, educational psychology, and language education.

Topical foci of research in shadow education

The mapping of co-occurrence links of author keywords revealed the topic focus of shadow education research. Network visualization reveals the topics of research in this area, with keywords grouped in different clusters, represented by different colors (Fig. 8). *Private tutoring* and *shadow education* are the most frequently co-occurring keywords in selected studies. The most frequently co-occurring keywords were grouped together and denote the broad research topics in this field. First, academic performance was frequently studied in relation to after-school programs, cultural capital, human capital, credentialism, educational inequality, educational stratification, and parenting (red cluster). This cluster offers cues regarding the sociological foundations of shadow education. Second, the educational demand concept was frequently studied concerning PT expenditures and privatization (green cluster). This cluster is relevant to the economic foundations of shadow education. Third, high-stakes testing, school choice, time use, and tracking frequently co-occurred in the context of social inequality (blue cluster). Fourth, keywords such as investment in shadow education, test preparation, and teacher identity frequently co-occur (yellow cluster). Fifth, the role of socioeconomic status and

Fig. 8 Topic focus of research into shadow education. Note. Minimum number of occurrences: 3



curriculum in students' academic achievement is frequently studied in rural educational contexts (purple cluster). Sixth, the importance of instructional quality and self-regulated learning in mathematics achievement was frequently studied in PT contexts (turquoise cluster). Seventh, the role of educational policies and educational reforms in enhancing student achievement attracted the attention of shadow education researchers (orange cluster). Eighth, the relationship between parental involvement and students' perceptions was frequently studied (brown cluster). Ninth, the importance of student motivation in the effectiveness of shadow education was also studied frequently by researchers (pink cluster).

Review of h-classics

A citation analysis was performed for a total of 490 publications in the corpus. Up to December 23, 2021, all these publications had received 5357 citations (2501 citations without self-citations) by the publications indexed in the WoS, with the average citation count per item being 10.93. The h-index was 36, which means that 36 publications in the corpus received 36 or more citations. These 36 publications, which can be called the h-classics of shadow education, were reviewed by the authors of this paper to shed light on the most popular research themes and some influential research outputs in this area. The samples, methodologies, countries of origin, and the number of citations of the 36 h-classics publications are presented in Table 1 (see Appendix). Twenty out of 36 h-classics papers were quantitative studies, 10 were literature reviews, three were qualitative studies, and three adopted a mixed-methods approach. Several themes evolved from 26 empirical studies conducted in South Korea (7), the United States (3), Hong Kong (3), Taiwan (3), Japan (2), Bangladesh (2), Canada (1), Greece (1), Germany (1), Australia (1), Ireland (1), and China (1). In two papers, large-scale international data collected from many countries in different parts of the world were used in the analyses. Key findings of the h-classics were classified according to the geographical distribution of shadow education as described in the following subsections.

H-classics articles in East Asia (China, Hong Kong, Japan, South Korea, and Taiwan)

Sixteen of 26 empirical studies were conducted in East Asia, underscoring that the phenomenon of shadow education has been principally prevalent in East Asian societies, which are deeply rooted in Confucian culture, that values education and diligence for social mobility, including notions of elitism (Yung & Bray, 2017, p. 99). Stevenson and Baker's (1992) quantitative study is the most cited paper among these studies, chiefly because most books (and particularly Bray's (1999) book) in the area of

shadow education were excluded from the list, which was also confined to the WoS with its biases. Stevenson and Baker's (1992) study was conducted in Japan to examine 7240 senior secondary students' perceptions of shadow education. The authors found that most participants had sought shadow education as an enrichment strategy to obtain higher scores in high-stakes examinations and secure a place at a prestigious university. Related to this, the authors questioned the issue of equity of access to universities in Japan because some students from disadvantaged households did not enjoy the privilege of shadow education. This finding was replicated in Yamamoto and Brinton's (2010) quantitative study in Japan, in which the authors used data from the 1995 Social Stratification, and Mobility survey that were collected from 1578 (724 male and 854 female) individuals between ages 37 and 50. Yamamoto and Brinton (2010) found that 40% of respondents participated in shadow education during elementary or middle school, and students from higher socioeconomic backgrounds had received more shadow education than others.

Bray and Kwok's (2003) mixed-methods study is the fourth most cited paper of the 26 empirical studies. The quantitative data were collected from 630 secondary pupils in six schools in Hong Kong during the 1998/1999 academic year. Semistructured interviews were also conducted with 47 teachers, 42 tutors, 34 members of the general public, 31 parents, 28 secondary school students, 12 principals or vice principals, and three school inspectors. The study found that 70.3% of Secondary Year 6–7 students received fee-charging PT, and most attended large-scale examination-oriented mass tutoring classes rather than individual or small-group sessions, especially in mathematics and English. Preparing for exams and meeting parents' expectations were the main reasons for most students to receive PT. The qualitative data showed that low-income households had lower participation rates in PT than their more affluent counterparts. For the lower-income group, 16.2% in Secondary Year 6–7 attended PT, whereas the percentage was 19.3% for the higher-income group. Bray and Kwok (2003) also found a positive correlation between participants' PT participation and parents' education level, because parents with less education probably earned less than those with more education. Zhan et al.'s (2013) mixed-methods study and Bray et al.'s (2014) quantitative study with Grade 9 and Grade 12 students in Hong Kong showed findings similar to those of Bray and Kwok (2003). Zhan et al. (2013) reported 61.1% had received PT during the previous 12 months, mainly in English and mathematics, to improve school subject learning and examination scores. Also, Bray et al. (2014) found that 53.8% of Grade 9 students and 71.8% of Grade 12 students had taken part in PT during the previous 12 months, mainly to prepare for examinations and, to a lesser extent, increase their

knowledge of school subjects. Like Bray and Kwok (2003), Bray et al. (2014) found a positive correlation between family income and receiving PT.

Kim and Lee's (2010) quantitative study of South Korea is the fifth most cited paper of the 26 studies. This study uses two data sets. The Survey on Private Tutoring by the Korea Institute for Consumer Protection in 1997 surveyed households with at least one child who was an elementary school or secondary school student. The second data set was the 1998 urban household expenditure survey (UHES) by the National Statistical Office of Korea. The UHES provided information regarding the income and expenditure patterns of households. Kim and Lee (2010) found that students with high academic ability, increased family income, and highly educated parents spent more money on PT. Park et al. (2011) quantitative study with 6,430 Grade 7 students in South Korea revealed similar findings to those of Kim and Lee (2010). Park et al. (2011) found that parents with more education were more involved in their children's education and PT-related activities. Also, students received PT mainly to improve their exam scores in mathematics and English.

Liu's (2012) quantitative study focused specifically on cram schools that provided examination drilling, and excluded individual and small-group tutoring in Taiwan. The author used information from the 2001 Taiwan Education Panel Survey when the students were in Grade 7. Liu (2012) found significant, positive effects of cram school attendance on analytical ability and mathematics performance, but the positive effects decreased as tuition hours increased. Liu (2012) also noted that the children of highly educated parents were less likely to attend cram schools, perhaps because these parents had invested in individual or small-group tutoring, which was excluded from the analysis. Tsai and Kuo's (2008) qualitative study also investigated 45 14-year-old students' experiences of attending cram schools. The authors reported that cram schools helped students develop certain conceptions of learning; students used a surface approach to learning; and their learning motivation was driven by external factors, like examination marks. Zhang (2013) quantitatively examined the effect of PT on students' achievement in China's National College Entrance Exam and found that the average effect of PT was not significant, but it had a somewhat positive effect on urban students with lower achievement.

H-classics articles in South Asia (Bangladesh)

The h-classics of shadow education included two empirical studies conducted in Bangladesh. Nath's (2008) quantitative study used five large-scale data sets of primary and secondary education in Bangladesh. Nath (2008) found

that 31% received PT in 2005. The study also reported that households with educated parents were economically better off and were more likely to live in urban areas. Hence, students of educated and well-off families were more likely to receive PT. Taking another approach, Hamid et al. (2009) conducted a mixed-methods study to investigate the nature and practice of PT in English in a disadvantaged rural area of Bangladesh. The quantitative data were collected from 228 Grade 10 students, followed by interviews with 14 students. The study found that over 75% of participants participated in English PT (PT-E). It also reported that students who had access to PT-E were 2.8 times more likely to achieve higher grades on the English test than those who did not have access to PT-E. The qualitative data showed that all participants had a positive attitude toward PT in English, believing it was imperative for achieving high examination scores. This was particularly the case with students from well-off families who could afford year-round PT.

H-classics articles in Australia, Canada, and the United States

One of the Australian h-classics is an empirical qualitative study by Sriprakash et al. (2016), who explored six Chinese-Australian individual parents' use of PT services for their primary school children in Sydney. The interview data found all the parents expressed satisfaction with their children's schooling, especially its emphasis on "creativity" and the breadth of an integrated curriculum. The authors found that fee-charging PT was not just a widespread cultural practice among migrant communities but also a contemporary pedagogical strategy to obtain an educational advantage. These parents were particularly concerned about "a lack of rigor, homework and examination practice" (Sriprakash et al., 2016, p. 433) in state schools. Regarding Canada, Aurini and Davies (2004) carried out 21 interviews with representatives of tutoring businesses in 2001. These companies indicated that their learning centers were "promoted less by short-term promises of improved school grades, and more by diffuse goals such as building a student's self-esteem, developing their talents, and closing skill gaps." In order to achieve long-term goals, some interviewees mentioned that learning centers intended to develop their own lessons, workbooks, and diagnostic tests.

Buchmann et al. (2010) quantitative study in the United States is the third most cited paper of the 26 studies. Using data from the National Education Longitudinal Study (NELS), Buchmann and her colleagues selected 8820 respondents in their senior year of high school to examine the association between receiving shadow education and passing the SAT test. This study found that students from the most advantaged families were significantly more

likely to enroll in PT for SAT test preparation, which suggests educational inequality associated with a family's socioeconomic background in the context of US education. Similarly, Byun and Park (2012) employed the NELS to explore possible differences in the effect of PT according to race and ethnicity. The authors found that East Asian American students were much more likely to take a commercial SAT test preparation course than any other racial/ethnic group of students, including other Asian American students. Therefore, they benefited most from this particular form of SAT coaching. A comparative study by Lee (2007) used the 1995 third international mathematics and science study (TIMSS) eighth-grade student and teacher survey databases to obtain information on participation in mathematics PT from 41 countries, including Korea and the United States. Lee (2007) sought to uncover the PT motivation differences between Korea and the United States. The author found that PT in Korea served already high-achieving students by providing enrichment or college preparation, whereas PT in the United States was aimed at helping low achievers for remedial purposes. Commenting on the use of large-scale international surveys such as TIMSS and PISA in the domain of shadow education, Bray and Kobakhidze (2014) point out that although these surveys have gained high visibility and respect among academics and policy makers, they produced ambiguous findings in this domain. The authors have encountered difficulties in the adaptation and translation of questions, and "some analyses have presented conclusions that are misleading" (Bray & Kobakhidze, 2014, p. 591). For example, the 1995 TIMSS asked about time usually spent on extra school lessons "during the week," but it did not specify the week (within the semester/academic year). This information is essential because students often receive more PT when exams are approaching. Also, problems in authors' misinterpretations emerged when the data sets of these large-scale international surveys appeared to provide precise measures but in reality did not. The authors reported what they would have liked the questions to have asked rather than what the questions actually did ask (Bray & Kobakhidze, 2014). Elsewhere, Bray et al., (2020a, 2020b) pointed out that there were two main weaknesses in the data of PISA related to PT: first, they did not clearly differentiate between fee-free and fee-charging PT and, second, ambiguities were compromised in translations. Therefore, Bray and Kobakhidze (2014) undermined Southgate's (2009, p. 40) claim that PISA "provides a precise measure of...tutoring and outside-school classes."

H-classics articles in Greece, Germany, and Ireland

In Greece, a 2000 survey of 3441 students enrolled in the eight major universities found that over 80% had attended group (cram) preparatory schools, half had received individual PT, and one-third had received both group and individual PT (Psacharopoulos & Papakonstantinou, 2005, p. 105). In Germany, Mischo and Haag (2002) evaluated the effectiveness of PT using a pre- and post-control group design. The study involved 122 students in a PT group and the same number in a control group. Both groups' school grades in English, French, Latin, and mathematics in the pretest and the posttest were recorded and compared. T-tests showed that the posttest scores of the PT group in all four subject areas were significantly higher than their pretest scores. In Ireland, Smyth (2009) quantitatively examined the characteristics of students receiving PT and its impact on academic outcomes. The author employed the School Leavers' Survey of 2004 (1496 respondents), and the Schools Database of 1994 (4813 respondents), and found that 45% of students participated in PT during their last year at school; however, PT yielded no apparent advantages in terms of upper secondary examination performance.

Discussion and implications

This study provides a comprehensive overview of the research on shadow education using bibliometric indicators. It is based on the data available in the WoS database. Bibliographic coupling analyses of authors, countries, institutions, sources, and author keywords; coauthorship analyses of authors and countries; and co-citation analysis of sources revealed prominent figures, collaboration patterns, and the evolution of shadow education research. In addition, h-classics publications were extracted and reviewed to give a clear overview of the most influential scientific outputs in this area.

As identified in the previous section, Bray (HKU–ECNU) and Park (University of Pennsylvania) are the most *prolific* and influential authors in the field of shadow education. Bray has been leading the most productive research team, comprised of authors from HKU (Hong Kong–PRC) and ECNU (Shanghai–PRC). Park and his coauthors have been working in the United States but frequently selected their samples from East Asia, especially South Korea. These authors have played a pivotal role in making the phenomenon of shadow education in East and Southeast Asia, in particular, better documented than in other parts of the world, highlighting its scale, nature, and policy implications. Bibliographic coupling and coauthorship analysis of the countries revealed that the PRC, the United States, and South Korea are the

leading countries with established scientific records, at the center of scientific collaboration patterns worldwide. However, Bray and associates, in collaboration with UNESCO, have offered a broader range of geographical coverage on the area of shadow education through the publication of several books, including Bray (2021a) about Africa; Bray (2011) about Europe; Bray et al. (2013) about the Mediterranean region; and Silova et al. (2006) about the post-Soviet states. In this regard, Bray (2021d, p. 460) associates the researching of shadow education with the “assembly of a jigsaw puzzle” with many pieces “missing; but many more pieces exist than in earlier decades, and there are ways to secure additional pieces for the picture.” Therefore, it is hoped that more empirical studies will be conducted to add other pieces to that jigsaw puzzle, especially because there is still little research into the nature of shadow education in other parts of the world, such as the Middle East and Latin America (e.g., Bray & Hajar, 2022; Mandikiana, 2021; Ventura & Gomes, 2013).

The following journals stand out as the most significant ones that publish shadow education research: *Asia Pacific Education Review*, *International Journal of Educational Development*, *Sociology of Education*, *Economics of Education Review*, *Journal of Education Policy*, *Discourse: Studies in the Cultural Politics of Education*, and *British Journal of Sociology of Education*. The semantically related clusters appeared in the network and co-citation analyses as well as in the distribution of the publications according to the WoS categories, emphasizing the sociological, economic, linguistic, political, and psychological dimensions of shadow education research, along with its close relationship to the broader area of educational sciences. Recognizing the importance of shadow education from different aspects, Bray (2021b, p. 5), in a recent paper, employed “the lenses of physical, political, economic, cultural, and pedagogical geography” to provide a different but contemporary understanding of this phenomenon. Regarding physical geography, Bray (2021b) points out that shadow education is not considered a human right, and hence its provision is principally influenced by market forces and the decisions of entrepreneurs. For instance, private entrepreneurs tend to have limited interest in providing PT services to small population with modest income. The political geography includes policymakers’ responses to the increasing awareness of shadow education (Bray, 2021b). For instance, while some governments (e.g., Cambodia, Myanmar) have adopted an extreme approach to the increasing prevalence of shadow education by prohibiting it, other governments (e.g., China and United Arab Emirates) have attempted to regulate it (see Zhang, 2019). Meanwhile, a few government bodies (e.g., Jordan, United Kingdom) undertake a *laissez-faire* approach, where education outside mainstream school hours is not within their purview. Bray (2021b, p. 7) highlights that even

in unregulated settings, shadow education is influenced by political geography because “it mimics mainstream schooling that is shaped by political geography.”

Shadow education can also be a form of education business (Bray, 2021b). In Georgia, for instance, Kobakhidze (2018, p. 206) reported that some teachers in her study behaved similar to “business owners” using effective creative marketing strategies to promote their services, such as buy-one-get-one-free bonus tutoring. Likewise, Yung and Yuan (2020) analyzed the biographies of 41 private tutors on the websites of Hong Kong’s six leading tutorial companies. The authors determined that tutors were depicted in advertising material and tutorial websites as experts or even “gods” and “kings” who know the “best” way to teach. Concerning the cultural dimension of shadow education, Bray (2021b) asserts that shadow education has long been prominent in East Asian societies as they are deeply rooted in the Confucian traditions of learning beyond formal settings and the practice of examination systems. This notion is clearly echoed in the bibliometric indicators of this study. Further, Bray (2021b) notes how the influence of Confucian-heritage cultures was revealed among immigrants living in Western countries. This point was illustrated in the findings of some of the h-classics articles described above. In the United States, for instance, Byun and Park (2012) demonstrated that American East Asian students enrolled in SAT test preparation courses and other types of PT more than any other racial/ethnic groups of students, including other Asian American students. Concerning economic geography, Bray (2021b) highlights that the COVID-19 pandemic has disrupted the normal functioning of various activities worldwide; the pandemic has also impacted the educational sector. The unprecedented outbreak dramatically shifted the predominance of face-to-face teaching to emergency online learning in 2020, and thus, the concept of online tutoring intensified (Bray, 2021b). The effectiveness and intensity of online PT during the transition to emergency online learning warrants additional investigation, mainly because government bodies of some countries have banned all types of face-to-face PT in an effort to curb the spread of COVID-19. The United Arab Emirates, for instance, warned that anyone providing face-to-face PT in public or private places would be fined AED30,000; host venues also fined AED20,000 (Arabian Business, 2020). Consequently, Šťastný and Kobakhidze (2020, pp. 10–11) stress that “attention must also be given to emerging new forms of tutoring, such as ‘education pods,’ ‘Zutors,’ (i.e., Zoom tutors) and ‘micro schools,’ which have been propelled by parents’ initiatives worldwide as a result of the pandemic.”

The evolution of research and topic focusing on shadow education was revealed through the bibliographic coupling of author keywords. The study deduced that academic achievement was frequently studied in conjunction with

cultural capital, human capital, education policy, and school choice. Almost all h-classics studies have linked the effectiveness of shadow education to its tangible benefits in terms of measurable educational outcomes for students. Precisely, the benefits of shadow education are associated with keeping up with the school curriculum, improving students' scores in mainstream schools, and/or and passing high-stakes exams to secure a place at a selective school or institution. Bray and Kwo (2014, p. ix) highlight that shadow education tends to “reinforce only one dimension of education: learning to know” more than the other pillars proposed by UNESCO's *Delors Report* (1996): learning to do, learning to be, and learning to live together. Bray and Kwo (2014) have attributed this matter to the overemphasis on high-stakes examinations as the principal gate-keeping mechanism. Nevertheless, an h-classics study conducted by Aurini and Davies (2004) in 2001 with representatives of tutoring businesses refers to the “soft benefits” of shadow education in terms of increasing students' self-awareness and confidence, coupled with their attitudes toward learning. However, these benefits were articulated by entrepreneurs rather than students themselves. Therefore, further research on the impact of the intangible, soft benefits of shadow education on students' overall achievement, from the perspective of students, needs to be conducted (see Hajar, 2020, Hajar & Abenova, 2021).

The bibliographic coupling of author keywords also revealed that social inequality was frequently studied through tracking and tutoring concepts. Several h-classics articles found that private tutors were largely employed by educated and well-off families for their children as a tool to provide additional training in key university admission subjects. As a result, students from disadvantaged households often find themselves in a less favorable position because they can afford few or no PT sessions, adding to their social disadvantage. As Bray (2021a, p. xi) notes, shadow education can be “a major vehicle for maintaining and exacerbating social inequalities,” which raises concerns about how to achieve “equitable and inclusive quality education.” Consequently, some governments have attempted to regulate the shadow education market by introducing codes of practice (see Bray & Kwo, 2014; Zhang & Bray, 2020). In China, for instance, one regulatory PT mechanism states that tutorial companies are prohibited from covering the official school curriculum in advance, to protect schools and take the pressure off students from a disadvantaged background who cannot seek PT to catch up with their classmates (Zhang & Bray, 2020). Nevertheless, much work still needs to be done in this area.

Conclusion and limitations of the study

This study provides an overview of the evolution and current state of research into shadow education based on the data available in the WoS database. It shows that the scientific output in this emerging area is interdisciplinary in nature, and scholars from different perspectives and disciplines continue its development, the progress of which has been due primarily to a small group of scholars working in Asian countries, in particular, having built strong collaborative connections nationally and with nearby countries, and *to a lesser extent with other countries*. However, contributions to the scientific literature from researchers in countries of the Middle East, Africa, and the Commonwealth of Independent States region are considerably limited. The prominent scholars in the domain of shadow education could widen their scientific collaborative networks to include researchers from regions underrepresented in this specific literature. The editors of significant journals could also issue special calls to encourage more contributions from underrepresented regions and scholars with alternative perspectives, approaches, and conceptions of this area. However, this study has methodological limitations that should be acknowledged. Specifically, it only used the WoS Core Collection and did not include proceedings, theses, or gray literature. These publications may have many further citations in proceedings, theses, and all other publications that are not indexed in the WoS. Therefore, it might be fruitful if other researchers used other databases (e.g., Scopus, ProQuest, ERIC, PubMed, PsycInfo) and other publication types to extract a more comprehensive overview of the shadow education literature. Further, the WoS tends to cover mainly journals in English and produced in the United Kingdom, the Netherlands, and the United States, although an increasing number of studies of shadow education have been recently published in Chinese, in particular, as Zhang and Bray (2020) point out. Despite all these current limitations, this study provides insightful findings and comments about the current situation and development of this emerging area.

Appendix

See Table 1.

Table 1 Information on the h-classics

Author(s)	Citations	Sample	Method	Country of origin
Stevenson and Baker (1992)	220	7240 Japanese students in senior high schools	Quantitative	Japan
Buchmann et al. (2010)	168	8820 American students in their senior year of high school	Quantitative	United States
Baker et al. (2001)	163	Seventh and eighth-grade students from 41 countries using data from the TIMSS	Quantitative	41 countries
Bray and Kwok (2003)	137	Survey: 630 pupils (secondary 1–7); Interviews: 47 teachers, 42 tutors, 34 members of the general public, 31 parents, 28 secondary school students, 12 principals or vice principals, and three school inspectors	Mixed-methods	Hong Kong
Kim and Lee (2010)	109	The first data set has 6804 observations, and the second has 19,786 observations. The sample included households that had children in kindergarten, a primary school, a middle school, and a high school	Quantitative (two data sets in 1997 and 1998)	South Korea
Park et al. (2011)	107	First-year students in middle schools (i.e., 7th graders) from the Korea Education Longitudinal Study (KELS) conducted by the Korean Educational Development Institute	Quantitative	South Korea
Dang and Rogers (2008)	105	–	Literature review	–
Dawson (2010)	101	–	Literature review	–
Yamamoto and Brinton (2010)	95	1578 Japanese individuals (724 men and 854 women) aged between 37 and 50	Quantitative	Japan
Liu (2012)	86	13,978 Cram school students from Taiwan Education Panel Survey of 2001	Quantitative	Taiwan
Byun and Park (2012)	84	9760 American students who had taken or planned to take the SAT or in 12th grade	Quantitative	United States
Mori and Baker (2010)	82	–	Literature review	–
Byun et al. (2012)	79	4982 Korean (15-year-old) students from PISA 2000	Quantitative	South Korea
Hamid et al. (2009)	77	228 tenth-grade Bangladeshi students (15–16-year-olds) in the quantitative part and 14 students in the qualitative part	A mixed-methods approach	Bangladesh
Aurini and Davies (2004)	70	Twenty-one interviews conducted in 2001 with representatives of tutoring businesses	Qualitative	Canada
Park et al. (2016)	67	–	Literature review	–
Bray (2010)	67	–	Literature review	–
Zhang (2013)	66	University entrants taking the National College Entrance Exam (NCEE) of China in 2010	Quantitative	China
Lynch and Moran (2006)	64	–	Literature review	–
Silova (2010)	62	The data sets collected from various groups of students, parents, and teachers through cross-national studies of private tutoring in 12 countries	Quantitative	Eastern Europe and Central Asia

Table 1 (continued)

Author(s)	Citations	Sample	Method	Country of origin
Psacharopoulos and Papakonstantinou (2005)	60	3441 Greek first-year university entrants who had enrolled in the eight major universities	Quantitative	Greece
Tsai and Kuo (2008)	53	45 cram school students (around 14 years old)	Qualitative	Taiwan
Zhan et al. (2013)	51	1624 from Grade 9 and Grade 12 students completed a questionnaire, and 101 students were interviewed	A mixed-methods approach	Hong Kong
Kuan (2011)	50	10,013 cram school students from Taiwan Education Panel Study of 2001 and 2003	Quantitative	Taiwan
Bray et al. (2014)	48	1624 from Grade 9 and Grade 12 students completed a questionnaire	Quantitative	Hong Kong
Mischo and Haag (2002)	48	244 pupils attending German schools of classes five to eleven: 122 pupils receiving tutoring (treatment) and 122 pupils (controls) not receiving tutoring	Quantitative	Germany
Lee et al. (2010)	44	–	Literature review	–
Lee and Shouse (2011)	43	The Korean Education and Employment Panel survey in 2004 was completed by 2000 middle school students, 2000 academic high school students, and 2000 vocational high school students	Quantitative	South Korea
Lee (2007)	43	Secondary analysis of the 1995 Third International Math and Science Study (TIMSS) eighth-grade student and teacher survey databases	Quantitative	South Korea and the USA
Smyth (2009)	42	Two data sources: the School Leavers' Survey of 2004 (1496 respondents) and the Schools Database of 1994 (4813 respondents)	Quantitative	Ireland
Nath (2008)	42	Five large-scale data sets collected from the students from kindergarten to secondary level in Bangladesh	Quantitative	Bangladesh
Sriprakash et al. (2016)	40	Six Chinese-Australian parents	Qualitative	Australia
Bray (2017)	39	–	Literature review	–
Kim and Park (2010)	39	3605 parents of 12 th grade students	Quantitative	South Korea
Biswal (1999)	38	–	Literature review	–
Ventura and Jang (2010)	37	–	Literature review	–

Acknowledgements The authors would like to thank the anonymous reviewers and editors for their insightful comments and editorial support.

Funding Funding was provided by the Nazarbayev University Graduate School of Education [080420FD1903].

References

- Arabian Business. (2020). Private tutors breaking UAE coronavirus ban to face hefty. Retrieved September 2, 2021, from <https://www.arabianbusiness.com/education/453498-private-tutors-breaking-uae-coronavirus-ban-to-facehefty-fine>
- Aurini, J., & Davies, S. (2004). The transformation of private tutoring: Education in a franchise form. *Canadian Journal of Sociology*, 29(3), 419–438.
- Baker, D. P., Akiba, M., LeTendre, G. K., & Wiseman, A. W. (2001). Worldwide shadow education: Outside-school learning, institutional quality of schooling, and cross-national mathematics

- achievement. *Educational Evaluation and Policy Analysis*, 23(1), 1–17.
- Baker, D. P. (2020). An inevitable phenomenon: Reflections on the origins and future of worldwide shadow education. *European Journal of Education*, 55(3), 311–315.
- Biswal, B. P. (1999). Private tutoring and public corruption: A cost-effective education system for developing countries. *The Developing Economies*, 37(2), 222–240.
- Bray, M. (1999). *The shadow education system: Private tutoring and its implications for planners*. Fundamentals of educational planning (p. 61). Paris: UNESCO International Institute for Educational Planning (IIEP).
- Bray, M. (2003). *Adverse effects of supplementary private tutoring: Dimensions, implications, and government responses*. Series: "Ethics and Corruption in Education." UNESCO International Institute for Educational Planning.
- Bray, M. (2009). *Confronting the shadow education system: What government policies for what private tutoring?* (p. 132). UNESCO International Institute for Educational Planning (IIEP).
- Bray, M. (2010). Researching shadow education: Methodological challenges and directions. *Asia Pacific Education Review*, 11(1), 3–13.
- Bray, M. (2011). *The challenge of shadow education: Private tutoring and its implications for policy makers in the European Union*. European Commission.
- Bray, M. (2017). Schooling and its supplements: Changing global patterns and implications for comparative education. *Comparative Education Review*, 61(3), 469–491.
- Bray, M. (2021a). *Shadow education in Africa: Private supplementary tutoring and its policy implications*. Comparative Education Research Centre, The University of Hong Kong, UNESCO.
- Bray, M. (2021b). Geographies of shadow education: Patterns and forces in the spatial distributions of private supplementary tutoring. *Compare*. <https://doi.org/10.1080/03057925.2021.1915749>
- Bray, M. (2021c). Teachers as tutors, and tutors as teachers: Blurring professional boundaries in changing eras. *Teachers and Teaching*. <https://doi.org/10.1080/13540602.2021.2019700>
- Bray, M. (2021d). Shadow education in Europe: Growing prevalence, underlying forces, and policy implications. *ECNU Review of Education*, 4(3), 442–475. <https://doi.org/10.1177/2096531119890142>
- Bray, M., & Kobakhidze, M. N. (2014). Measurement issues in research on shadow education: Challenges and pitfalls encountered in TIMSS and PISA. *Comparative Education Review*, 58(4), 590–620.
- Bray, M. & Hajar, A. (2022). *Shadow education in the Middle East: private supplementary tutoring and its policy implications*. London: Routledge.
- Bray, M., Kobakhidze, M. N., & Kwo, O. (2020a). *Shadow education in Myanmar: Private supplementary tutoring and its policy implications*. Comparative Education Research Centre, The University of Hong Kong, UNESCO.
- Bray, M., Kobakhidze, M. N., & Suter, L. E. (2020b). The challenges of measuring outside-school-time educational activities: Experiences and lessons from the Programme for International Student Assessment (PISA). *Comparative Education Review*, 64(1), 87–106. <https://doi.org/10.1086/706776>
- Bray, M., & Kwo, O. (2014). *Regulating private tutoring for public good: Policy options for supplementary education in Asia*. Comparative Education Research Centre, The University of Hong Kong, UNESCO.
- Bray, M., Kwo, O., & Jokić, B. (2016). Introduction. In M. Bray, P. Kwo, & B. Jokić (Eds.), *Researching private supplementary tutoring: Methodological lessons from diverse cultures* (pp. 3–23). Comparative Education Research Centre.
- Bray, M., & Kwok, P. (2003). Demand for private supplementary tutoring: Conceptual considerations, and socio-economic patterns in Hong Kong. *Economics of Education Review*, 22(6), 611–620. [https://doi.org/10.1016/S0272-7757\(03\)00032-3](https://doi.org/10.1016/S0272-7757(03)00032-3)
- Bray, M., & Lee, C. J. (2010). Editorial [special issue]. *Asia Pacific Education Review*, 11, 1–2. <https://doi.org/10.1007/s12564-010-9070-8>
- Bray, M., & Lykins, C. (2012). *Shadow education: Private supplementary tutoring and its implications for policy makers in Asia*. Asian Development Bank, Comparative Education Research Centre, The University of Hong Kong.
- Bray, M., Mazawi, A. E., & Sultana, R. G. (Eds.). (2013). *Private tutoring across the Mediterranean: Power dynamics and implications for learning and equity*. Sense Publishers.
- Bray, M., Zhan, S., Lykins, C., Wang, D., & Kwo, O. (2014). Differentiated demand for private supplementary tutoring: Patterns and implications in Hong Kong secondary education. *Economics of Education Review*, 38, 24–37. <https://doi.org/10.1016/j.econedurev.2013.10.002>
- Buchmann, C., Condron, D. J., & Roscigno, V. J. (2010). Shadow education, American style: Test preparation, the SAT and college enrollment. *Social Forces*, 89(2), 435–461. <https://doi.org/10.1353/sof.2010.0105>
- Byun, S. Y., Schofer, E., & Kim, K. K. (2012). Revisiting the role of cultural capital in East Asian educational systems: The case of South Korea. *Sociology of Education*, 85(3), 219–239. <https://doi.org/10.1177/0038040712447180>
- Cancino, C., Merigo, J. M., Coronado, F., Dessouky, Y., & Dessouky, M. (2017). Forty years of computers & industrial engineering: A bibliometric analysis. *Computers & Industrial Engineering*, 113, 614–629. <https://doi.org/10.1016/j.cie.2017.08.033>
- Chavarró, D., Råfols, I., & Tang, P. (2018). To what extent is inclusion in the web of science an indicator of journal "quality"? *Research Evaluation*, 27(2), 106–118.
- Clarivate Analytics (2022). Web of science: summary of coverage. Retrieved January 2, 2022, from <https://clarivate.libguides.com/webofscienceplatform/coverage>
- Cobo, M. J., Martínez, M. A., Gutiérrez-Salcedo, M., Herrera, M., & Herrera-Viedma, E. (2014). Identifying citation classics in fuzzy decision making field using the concept of H-classics. *Procedia Computer Science*, 31, 567–576.
- Dang, H. A., & Rogers, F. H. (2008). The growing phenomenon of private tutoring: Does it deepen human capital, widen inequalities, or waste resources?. *The World Bank Research Observer*, 23(2), 161–200.
- Dawson, W. (2010). Private tutoring and mass schooling in East Asia: Reflections of inequality in Japan, South Korea, and Cambodia. *Asia Pacific Education Review*, 11(1), 14–24.
- Delors, J. (1996). *Learning: The treasure within. Report to UNESCO of the International Commission on Education for the Twenty-First Century*. UNESCO.
- DeVault, M. V., & Kato, K. (1977). Gakushu-juku: Japan's second system of education. *Phi Delta Kappan*, 58(10), 735–736.
- Eck, N. J., & Waltman, L. (2019). *VOSviewer manual*. Universitat Leiden.
- Eck, N. J., Waltman, L., & Glänzel, W. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111(2), 1053–1070.
- Entrich, S. R. (2018a). *Shadow education and social inequalities in Japan: Evolving patterns and conceptual implications*. Springer.
- Entrich, S. (2018b). *Shadow education and social inequalities in Japan. Evolving patterns and conceptual implications*. Springer.
- Entrich, S. R. (2021). Worldwide shadow education and social inequality: Explaining differences in the socioeconomic gap in access to shadow education across 63 societies. *International Journal of Comparative Sociology*, 61, 441.

- Fujii, Y. (1993). Construction of a test influence inventory (TII). *Shin-rigaku Kenkyu*, 64(2), 135–139.
- George, C. (1992). Time to come out of the shadows. *Straits Times*, April 4, p. 28
- Gordon Györi, J. G. (2020). Shadow education—opportunity for development [special issue]. *European Journal of Education*, 55(3), 305.
- Hajar, A. (2020). The association between private tutoring and access to grammar schools: Voices of year 6 pupils and teachers in south-east England. *British Educational Research Journal*. <https://doi.org/10.1002/berj.3587>
- Hajar, A., & Abenova, S. (2021). The role of private tutoring in admission to higher education: Evidence from a highly selective university in Kazakhstan. *Hungarian Education Research Journal*, 11(2), 1–19.
- Hajar, A., Sagintayeva, A., & Izenkova, Z. (2021). Child participatory research methods: Exploring grade 6 pupils' experiences of private tutoring in Kazakhstan. *Cambridge Journal of Education*. <https://doi.org/10.1080/0305764X.2021.2004088>
- Hamid, M. O., Sussex, R., & Khan, A. (2009). Private tutoring in English for secondary school students in Bangladesh. *TESOL Quarterly*, 43(2), 281–308. <https://doi.org/10.1002/j.1545-7249.2009.tb00168.x>
- Harnisch, D. L. (1994). Supplemental education in Japan: Juku schooling and its implication. *Journal of Curriculum Studies*, 26(3), 323–334.
- Hawkins, J. N., & Tanaka, Y. (1992). Japanese education: A context for test anxiety. *Anxiety, Stress, and Coping*, 5(3), 195–203.
- Hemachandra, H. L. (1982). The growing phenomena of tuition classes: The perceived reasons and some latent social factors. *Sri Lanka Journal of Social Sciences*, 5(2), 39–69.
- Hernández-Torrano, D., & Ibrayeva, L. (2020). Creativity and education: A bibliometric mapping of the research literature (1975–2019). *Thinking Skills and Creativity*, 35, 100625.
- Hussein, M. G. A. (1987). Private tutoring: A hidden educational problem. *Educational Studies in Mathematics*, 18(1), 91–96. <https://doi.org/10.1007/BF00367916>
- Ivanović, L., & Ho, Y. S. (2019). Highly cited articles in the education and educational research category in the social science citation index: A bibliometric analysis. *Educational Review*, 71(3), 277–286. <https://doi.org/10.1080/00131911.2017.1415297>
- Karakus, M., Usak, M., & Ersozlu, A. (2021). Emotions in learning, teaching, and leadership: A bibliometric review of Asian literature (1990–2018). *SAGE Open*. <https://doi.org/10.1177/2158244020988865>
- Kim, S., & Lee, J. H. (2010). Private tutoring and demand for education in South Korea. *Economic Development and Cultural Change*, 58(2), 259–296.
- Kim, J. H., & Park, D. (2010). The determinants of demand for private tutoring in South Korea. *Asia Pacific Education Review*, 11(3), 411–421. <https://doi.org/10.1007/s12564-009-9067-3>
- Kim, Y. C. (2016). *Shadow education and the curriculum and culture of schooling in South Korea*. Palgrave Macmillan.
- Kim, Y. C., & Jung, J. (2019). *Shadow education as worldwide curriculum studies*. Palgrave Macmillan.
- Kobakhidze, M. N. (2018). *Teachers as tutors: Shadow education market dynamics in Georgia*. Springer.
- Kobakhidze, N., & Suter, L. (2020). The global diversity of shadow education. *European Journal of Education*, 55(3), 316–321.
- Kuan, P. Y. (2011). Effects of cram schooling on mathematics performance: Evidence from junior high students in Taiwan. *Comparative education review*, 55(3), 342–368.
- Lee, C. J., Lee, H., & Jang, H. M. (2010). The history of policy responses to shadow education in South Korea: Implications for the next cycle of policy responses. *Asia Pacific Education Review*, 11(1), 97–108. <https://doi.org/10.1007/s12564-009-9064-6>
- Lee, J. (2007). Two worlds of private tutoring: The prevalence and causes of after-school mathematics tutoring in Korea and the United States. *Teachers College Record*, 109(5), 1207–1234.
- Lee, S., & Shouse, R. C. (2011). The impact of prestige orientation on shadow education in South Korea. *Sociology of Education*, 84(3), 212–224. <https://doi.org/10.1177/0038040711411278>
- Leydesdorff, L., & Felt, U. (2012). “Books” and “book chapters” in the book citation index (BKCI) and science citation index (SCI, SoSCI, A&HCI). *Proceedings of the American Society for Information Science and Technology*, 49(1), 1–7.
- Linnenluecke, M. K., Marrone, M., & Singh, A. K. (2020). Conducting systematic literature reviews and bibliometric analyses. *Australian Journal of Management*, 45(2), 175–194. <https://doi.org/10.1177/0312896219877678>
- Liu, J. (2012). Does cram schooling matter? Who goes to cram schools? Evidence from Taiwan. *International Journal of Educational Development*, 32(1), 46–52. <https://doi.org/10.1016/j.ijedudev.2011.01.014>
- Lynch, K., & Moran, M. (2006). Markets, schools and the convertibility of economic capital: the complex dynamics of class choice. *British Journal of Sociology of Education*, 27(02), 221–235.
- Malik, M. A. (2017). Shadow education: Evolution, flaws and further development of the term. *Social Sciences and Education Research Review*, 4(1), 6–29.
- Mandikiana, B. W. (2021). Choice and expenditure: A double hurdle model of private tutoring in Qatar. *Economic Analysis and Policy*, 71, 1–15.
- Marimuthu, T., Singh, J. S., Ahmad, K., Lim, H. K., Mukherjee, H., Osman, S., & Jamaluddin, W. (1991). *Extra-school instruction, social equity and education quality [in Malaysia]*. International Development Research Centre.
- Martínez, M. A., Herrera, M., Contreras, E., Ruiz, A., & Herrera-Viedma, E. (2015). Characterizing highly cited papers in social work through H-classics. *Scientometrics*, 102(2), 1713–1729.
- Mischo, C., & Haag, L. (2002). Expansion and effectiveness of private tutoring. *European Journal of Psychology of Education*, 17(3), 263–273. <https://doi.org/10.1007/BF03173536>
- Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of web of science and scopus: A comparative analysis. *Scientometrics*, 106(1), 213–228. <https://doi.org/10.1007/s11192-015-1765-5>
- Mori, I., & Baker, D. (2010). The origin of universal shadow education: What the supplemental education phenomenon tells us about the postmodern institution of education. *Asia Pacific Education Review*, 11(1), 36–48.
- Nath, S. R. (2008). Private supplementary tutoring among primary students in Bangladesh. *Educational Studies*, 34(1), 55–72. <https://doi.org/10.1080/03055690701785285>
- O'Neil, H. F., & Abedi, J. (1992). Japanese children's trait and state worry and emotionality in a high-stakes testing environment. *Anxiety, Stress, and Coping*, 5(3), 253–267.
- O'Neil, H. F., Baker, E. L., & Matsuura, S. (1992). Reliability and validity of Japanese children's trait and state worry and emotionality scales. *Anxiety, Stress, and Coping*, 5(3), 225–239.
- O'Neil, H. F., & Fukumura, T. (1992). Relationship of worry and emotionality to test performance in a Juku environment. *Anxiety, Stress, and Coping*, 5(3), 241–251.
- Park, H. (2013). *Re-evaluating education in Japan and Korea: Demystifying stereotypes*. Routledge.
- Park, H., Byun, S. Y., & Kim, K. K. (2011). Parental involvement and students' cognitive outcomes in Korea: Focusing on private tutoring. *Sociology of Education*, 84(1), 3–22. <https://doi.org/10.1177/0038040710392719>

- Park, H., Buchmann, C., Choi, J., & Merry, J. J. (2016). Learning beyond the school walls: Trends and implications. *Annual Review of Sociology*, 42, 231–252.
- Psacharopoulos, G., & Papanastasiou, G. (2005). The real university cost in a “free” higher education country. *Economics of education review*, 24(1), 103–108.
- Silova, I. (2010). Private tutoring in Eastern Europe and Central Asia: Policy choices and implications. *Compare*, 40(3), 327–344.
- Silova, I., Büdienė, V., & Bray, M. (Eds.). (2006). *Education in a hidden marketplace: Monitoring of private tutoring*. Open Society Institute.
- Smyth, E. (2009). Buying your way into college? Private tuition and the transition to higher education in Ireland. *Oxford Review of Education*, 35(1), 1–22. <https://doi.org/10.1080/03054980801981426>
- Southgate, D. E. (2009). *Determinants of shadow education: A cross-national analysis*. Ohio State University.
- Sriprakash, A., Proctor, H., & Hu, B. (2016). Visible pedagogic work: Parenting, private tutoring and educational advantage in Australia. *Discourse*, 37(3), 426–441. <https://doi.org/10.1080/01596306.2015.1061976>
- Šťastný, V., & Kobakhidze, M. N. (2020). Throwing light on shadow education. *Orbis Scholae*, 14(2), 5–12.
- Stevenson, D. L., & Baker, D. P. (1992). Shadow education and allocation in formal schooling: Transition to university in Japan. *American Journal of Sociology*, 97(6), 1639–1657. <https://doi.org/10.1086/229942>
- Tsai, C. C., & Kuo, P. C. (2008). Cram school students’ conceptions of learning and learning science in Taiwan. *International Journal of Science Education*, 30(3), 353–375. <https://doi.org/10.1080/09500690701191425>
- UNESCO GEM report (2021). Non-state actors in education: Who chooses? Who loses? Global education monitoring report, 2021/2: non-state actors in education: who chooses? who loses?—UNESCO Digital Library
- Ventura, A., & Gomes, A. (2013). Supplementary education in Brazil: Diversity and paradoxes. In J. Aurini, S. Davies, & J. Dierkes (Eds.), *Out of the shadows: The global intensification of supplementary education* (pp. 129–151). Bingley.
- Ventura, A., & Jang, S. (2010). Private tutoring through the internet: Globalization and offshoring. *Asia Pacific Education Review*, 11(1), 59–68. <https://doi.org/10.1007/s12564-009-9065-5>
- Yamamoto, Y., & Brinton, M. C. (2010). Cultural capital in East Asian educational systems: The case of Japan. *Sociology of Education*, 83(1), 67–83. <https://doi.org/10.1177/0038040709356567>
- Yung, K. W. H., & Bray, M. (2017). Shadow education: Features, expansion and implications. In T. K. C. Tse & M. Lee (Eds.), *Making sense of education in post-handover Hong Kong: Achievements and challenges* (pp. 95–111). Routledge.
- Yung, K. W. H., & Yuan, R. (2020). ‘The most popular star-tutor of English’: Discursive construction of tutor identities in shadow education. *Discourse*, 41(1), 153–168.
- Zhan, S., Bray, M., Wang, D., Lykins, C., & Kwo, O. (2013). The effectiveness of private tutoring: Students’ perceptions in comparison with mainstream schooling in Hong Kong. *Asia Pacific Education Review*, 14(4), 495–509. <https://doi.org/10.1007/s12564-013-9276-7>
- Zhang, W. (2019). Regulating private tutoring in China: Uniform policies, diverse responses. *ECNU Review of Education*, 2(1), 25–43. <https://doi.org/10.1177/2096531119840868>
- Zhang, W., & Bray, M. (2019). Private supplementary tutoring: Contexts, patterns, and developments [Special issue]. *ECNU Review of Education*, 2(1), 1–94.
- Zhang, W., & Bray, M. (2020). Comparative research on shadow education: Achievements, challenges, and the agenda ahead. *European Journal of Education*, 55(3), 322–341.
- Zhang, Y. (2013). Does private tutoring improve students’ National College entrance exam performance?—A case study from Jinan, China. *Economics of Education Review*, 32, 1–28. <https://doi.org/10.1016/j.econedurev.2012.09.008>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.