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## CONCEPTUAL REVIEW ARTICLE

# (Why) Are Open Research Practices the Future for the Study of Language Learning?

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**Abstract:** Open research practices are relevant to all stages of research, from conceptualization through dissemination. Here, we discuss key facets of open research, highlighting its rationales, infrastructures, behaviors, and challenges. Part I conceptualizes open research and its rationales. Part II identifies challenges such as the speed and cost of open research, the usability of open data and materials, the difficulties of conducting replication research, and the economics and sustainability of open access and open research generally. In discussing these challenges, we have sought to provide examples of good practice, describe and evaluate emerging innovations, and envision change. Part III considers ongoing coevolutions of culture, infrastructure, and behaviors and acknowledges the limitations of our review and of open research practices. We argue that open research is indeed a large part of our future, and most—if not all—challenges

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A one-page Accessible Summary of this article in non-technical language is freely available in the Supporting Information online and at <https://oasis-database.org>

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are surmountable, but doing so requires significant changes for many aspects of the research process.

**Keywords** open science; open research; replicability; reproducibility; language learning; research methodology

## Conceptualizing Open Research and Its Rationales

Discussion about open research seems to have hit the mainstream in language learning research: Books and conference proceedings have chapters on the topic (Handley & Marsden, 2014; Marsden, 2019a; 2020); special issues of journals feature articles on open practices (Bolibaugh et al., 2021; Saito et al., 2020); methodological syntheses argue that open research is an important way forward (Gass et al., 2021; Marsden, Thompson, & Plonsky, 2018); a burgeoning metascience is examining the extent of transparency (Derrick, 2016) and has flagged the benefits to researchers of doing open research both within (Marsden, 2019b; Plonsky & Derrick, 2016) and outside (McKiernan et al., 2016) the field of language learning; infrastructure has been established (IRIS in 2011, Marsden & Mackey, 2014; the Tromsø Repository of Language and Linguistics, <https://site.uit.no/trolling>); a small but increasing number of journals ask for materials and data to be made open and award open science badges, with editorials announcing open practice innovations (Gerrig & Rastle, 2019; Marsden, Crossley, et al., 2019); and social media can sizzle with advocacy.

The breadth of this activity in language learning research reflects the breadth of the term open research itself. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) has defined open as consisting of four attributes: discoverable, accessible, reusable, and transparent (Hampson et al., 2020), and this definition applies to all open research<sup>1</sup> endeavors. Talking about and operationalizing these attributes require highly complex and multifaceted domains of activity, captured by the Framework for Open and Reproducible Research Training (FORRT) taxonomy of terminology and definitions (Azevedo et al., 2019; FORRT, n.d.). The taxonomy in Figure 1 clearly demonstrates that one article, including this one, cannot do justice to the vast topic of open research. The term defies easy definition, but we are broadly content with Vicente-Saez and Martinez-Fuentes's (2018) definition (for which we have included our suggested additions in square brackets): Open research is “transparent and [freely] accessible knowledge that is shared and developed through [freely accessible] collaborative networks, [infrastructures, and methods]” (p. 428).

Indeed, open research arguably represents seismic changes in all aspects of the research endeavor. In some disciplines, the open research movement

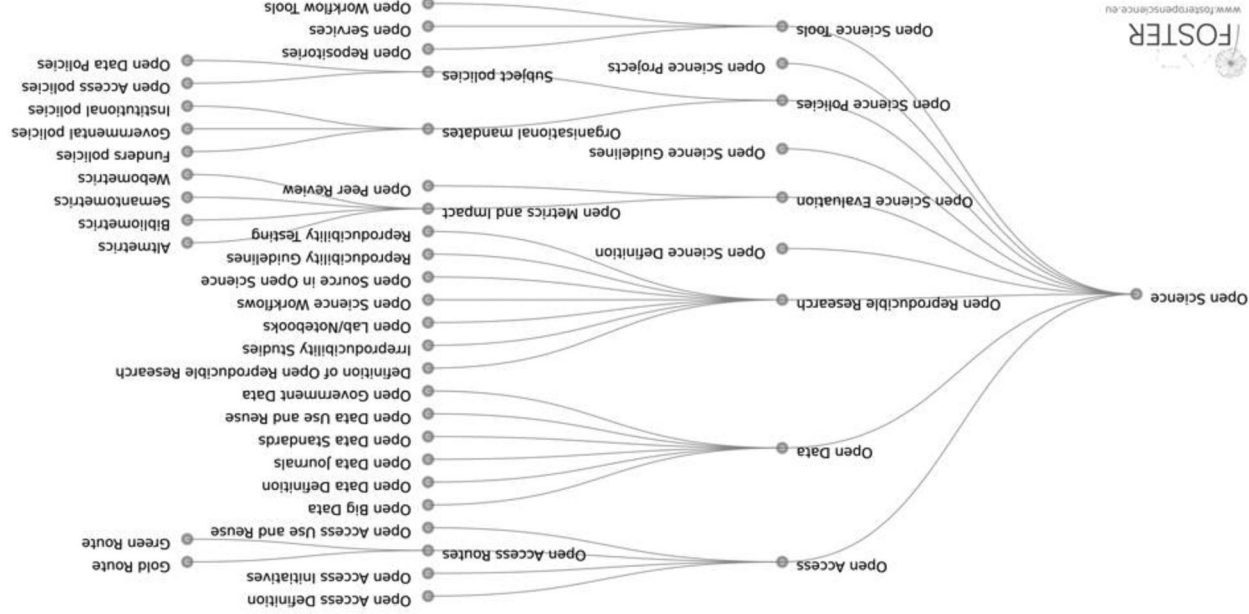


Figure 1 Open science taxonomy adapted from Pontika et al. (2015, p. 3).



has even been hailed a renaissance (Nelson et al., 2018), and some aspects of the movement could summon shifts akin to those of democratization in the sociopolitical sphere. It has parallels in other step changes that have defined eras in the development of human knowledge, such as the enlightenment or the digital age, and in social spheres, such as disruptive innovations like Uber or Airbnb. All of these step changes have deranged established ways of operating, shifting balances of power and knowledge from smaller to larger groups.

But why all this activity, which ultimately strives to change deeply rooted research traditions, cultures, infrastructures, and communities of practice? The different rationales for open research have been evolving for many years (for an overview, see Bartling & Friesike, 2014). An exceptionally broad range of rationales have been used to advocate open research practices, including economic arguments (e.g., improving efficiency), ambitions for social justice (e.g., improving global equity in the knowledge economy), achieving better inclusivity and diversity (of researchers, participants, and research questions), moral arguments (e.g., fulfilling researchers' sense of epistemic responsibility to share their knowledge), and personal incentivization (e.g., improved visibility, impact, and status of individual researchers).

Perhaps the most persuasive arguments for many researchers and for a wide range of open research behaviors emanate from *scientific* rationales: that science (at least, hypothesis-testing approaches) needs to create evidence that is observable across multiple instances and, therefore, should be self-correcting (Popper, 1959) and that for this to happen properly, researchers' behaviors and data should be fully transparent and reusable by others to permit open challenge by anyone. These views align with Mertonian norms and values that underpin and conceptualize the scientific endeavor (Merton, 1942/1973). The argument is that open research practices are expected to improve the quality of the scientific endeavor by improving research reliability and validity and by facilitating scrutiny (see Appendix S1 in the Supporting Information online for further discussion; also available on the OSF [Open Science Framework] at <https://osf.io/ru5n4>). These scientific rationales suggest that many open research practices have emerged from the needs of epistemologies that demand confirmatory approaches that seek generalizability (such as formal experimentation, hypothesis testing, quantitative data collection, random sampling, and inferential statistics). Indeed, these epistemological roots are reflected in the (largely quantitative) focus of many of our arguments and examples in this article. However, several practices and resources, a few of which we mention throughout, are emerging for improving qualitative research with open research practices.



(only) narrowly perceived overall efficiency, acceleration, value accumulation, and growth rather than useful new understanding (Haider, 2018). Others argue that the open research movement will impede research and constrain the thinking and behavior of active researchers (Baumeister, 2016; Stroebe & Strack, 2014). Osborne (2013), expressing the only such viewpoint that we located, has even argued that open access publication is not necessary or helpful and that it could indeed be harmful because only those who currently have access to research publications are capable and need to understand their content. A further argument against an open collaborative ethic is that fostering competition between researchers is, in fact, beneficial for progressing knowledge (see Fang & Casadevall, 2015, for discussion).

For most, however, the question “Why open research?” is not the problem. But, rather, “How do we get there?” is the primary concern. For example, researchers express the need for caution to ensure nonintimidating (Derksen & Field, 2022) and incremental (Liu et al., 2022) approaches to change. We agree that seismic change does not happen overnight, and only very few succumb to epiphanies. For most individuals, the open research movement will consist of gradual changes in thinking and behaviors for clearly identifiable components within the research process, from conceptualization to engagement with those beyond the academe. And it is this conceptualization of open research that inspired the current article. Rather than espousing a grand philosophy, we have broken down the open research movement into tangible constructs, practices, mechanisms, infrastructures, and incentives (see Appendix S1 for a full discussion establishing why open research practices are expected to improve the quality and scope of the scientific endeavor in the first place). Below, we continue our discussion with a forward-thinking perspective (a) to consider the challenges of open research practices and how to address them and then (b) to envisage coevolutions of culture, infrastructure, and behaviors for the future of open research. The totality of these changes will no doubt emerge with the feel of a new philosophy, a new way of being and doing—and with hindsight, this is what researchers in the field of language learning may observe in the future. But, while getting there, most researchers in the field will experience individual starlings, not a flock.

### **The Challenges of Some Key Open Research Practices and How the Field Might Address Them**

Many benefits for open research practices have been proposed, some of which have been evidenced (see Appendix S1). However, engaging in them has not always been straightforward and many open research ideals pose serious







suggestions about what graduate programs can do to support students by, for example, (a) adding a preregistration requirement for qualification milestones, (b) using open materials and data in training, and (c) incorporating open research teaching into the curriculum, supported by the rich materials available through the FORRT (FORRT, n.d.; Azevedo et al., 2019). Journals can also promote open research by enabling open access publication and by encouraging or requiring certain practices. Evidence has suggested that open practices can be encouraged by awarding open science badges. For example, the open data badge was found to be associated with increased data sharing in psychology (Giofrè et al., 2022), at least in conjunction with guidelines that encouraged data sharing (cf. Rowhani-Farid et al., 2020, for evidence that open data badges themselves did not increase data sharing in biology). Also, by offering the registered report article type, preregistration, open materials, and open data all become part of the publication process. By incorporating open research practices into publication processes or graduate programs, such practices would not impose additional time commitments beyond the publishing and program requirements.

However, adjustments may still be needed as it may take longer to reach graduate program milestones or submit an article. In other words, these steps do not reduce the time commitment for researchers, but rather they ensure that the time is integral to the research process itself. Thus, researchers might have to choose between somewhat longer routes to publication involving open research practices versus shorter routes that may not require such practices. Given the fact that current systems reward quantity (along with quality) of research in hiring, promotions, and funding, it may be rational for certain researchers to choose routes that do not involve open research in order to produce more research in the same amount of time. Thus, it is critical that the system changes so that rational choices related to quality, including adopting open research practices, are more strongly rewarded. But, how can this be achieved?

There is a movement toward slow research (Frith, 2020; Stengers, 2018), in which the focus is on less but better research. Realistically though, the whole field would have to slow down as one, otherwise some researchers would be hurt by engaging in slower practices. Therefore, incentivizing practices that enhance quality—as indexed by certain open research practices—even at the expense of quantity, is critical. One approach is to create award structures that prioritize open research practices, for example, the Replication Award (IRIS, n.d.) and the Registered Reports by Early Career Researchers Grant Program (*Language Learning*, 2021; Marsden, Morgan-Short, Trofimovich, & Ellis, 2018). Researchers can also create standards for documenting open research

undertakings on curricula vitae (CVs), such as the United Kingdom funder's (UKRI) narrative CV format and the Royal Society's *Résumé for Researchers*, thereby rewarding open materials, datasets, open science badges, and knowledge exchange and deprioritizing a focus on quantity of publications and journal impact factors so as to refocus attention on the merit (quality and impact) of individual articles. These have the potential to change the way institutions and society conceptualize an academic career, allowing institutions to adopt hiring and evaluation frameworks that are not (as) centered on bibliographic metrics (e.g., Benedictus et al., 2016; for wider discussions about incentivization, see McKiernan et al., 2016; Nosek et al., 2012). Crucially, the field must maintain equity as a central goal in implementing any such reconceptualizations and changes to incentivization (for further discussion, see Cole et al., 2022; Ross-Hellauer, 2022).

## Open Data

### *Challenges*

Access to data can improve validity and reliability and increase the range of researchers participating in the field of language learning (Marsden & Plonsky, 2018; see Appendix S1). Although incentivizing open data has increased the researchers' practice of making their data available, encouragement and requirements do not seem to be as effective as one might have hoped. For example, one journal editor noted that when they requested that authors submit data to accompany their submission, almost half of the authors withdrew their manuscripts (Miyakawa, 2020). For published articles, the rates at which data are provided when requested range from 0.07% to 44% (Gabelica et al., 2022; Stodden et al., 2018), even when the journal policy requires that data be made available upon request. When data are available, they may not be sufficiently transparent to allow reuse (Hardwicke et al., 2022; Obels et al., 2020; Stodden et al., 2018). For example, Stodden et al. (2018) found that they could only reproduce the findings from 26% of articles for which they had obtained data and code. Buck (2021) warned against performative reproducibility, in which researchers take actions like making data available but not in a way that is truly useful to reproducibility. Ideally, researchers would strive for the highest level of the TOP (Transparency and Openness Promotion) Guidelines that state that "[d]ata must be posted to a trusted repository, and reported analyses will be reproduced independently prior to publication" (Center for Open Science, n.d.-a). But, who does the work to ensure that accessible data are complete and reusable or that analyses are reproducible prior to publication? Should authors be required to have their data double checked independently to



(p. 4), allowing for the fact that authorization procedures may be needed to gain access to some kinds of data.

Such a plethora of resources may be more used if journals and organizations (e.g., professional associations and funders) encouraged or required data sharing. Indeed, the American Psychological Association's (n.d.) ethical principles state that researchers should freely share published data in public repositories and, as mentioned above, the COS (Center for Open Science) awards the open data badge (Center for Open Science, n.d.-b). Within the language sciences, journals may also consider offering registered reports, as the rate of data sharing and its reusability are greater in registered reports than in the standard literature (Obels et al., 2020). Although journals seem hesitant to require data sharing (even with caveats for when data cannot be ethically shared), there may be untapped will among the researcher community, as researchers have indicated that mandates would be most effective in leading them to share data (Houtkoop et al., 2018), a sentiment borne out by evidence that mandatory open data policies do indeed increase the frequency and quality of data sharing (Hardwicke et al., 2018). Together then, support for researchers along with structural changes to encourage or mandate data sharing should lead to more FAIR data sharing.

Importantly, we need to consider discipline-specific ways to increase data sharing. Some initial work has advanced the understanding of practices, benefits, and challenges relevant to the field of language learning (e.g., Berez-Kroeker et al., 2018; Bolibaugh et al., 2021), but to our knowledge, metascience has not yet specifically addressed this aspect of open research. We need (more) field-specific training and resources to facilitate data sharing. Local initiatives are valuable, such as department-level workshops addressing issues such as open data ethics, data readability by humans and machines, and assigning metadata, digital object identifiers (DOIs), and licenses (e.g., Bolibaugh, 2022). For widening reach, however, the proactivity of professional organizations and groups will be essential, such as the new network Open Applied Linguistics (n.d.) and the Linguistics Data Interest Group (Research Data Alliance, n.d.) that provide policy, education, training, and resources including a handbook featuring principles, methods, and case studies for linguistic data management (Berez-Kroeker et al., 2022; for educational networks in psychology, see Blincoe & Buchert, 2020; Hawkins et al., 2018). Critically, such education will also promote awareness and use of the growing sets of open data. For example, the Linguistic Data Consortium (n.d.) hosts numerous corpora and data-related resources, though accessible only by members. Fully open resources include The TalkBank (TalkBank, n.d.) with repositories in

14 research areas, including child language and multilingual corpora. In 2016, IRIS began hosting any type of dataset—including both qualitative and quantitative data—from peer-reviewed or dissertation research and now has over 240 datasets (as of the time of writing).

Ideally, the combination of general and field-specific metascience, training, and resources will move our field beyond individual examples of making data open (e.g., Saito et al., 2020) and advocacy for creative solutions (e.g., Berez-Kroeker et al., 2022) to a more systematic approach that will lead to increased computational reproducibility in the field as well as innovative uses of the data, such as through secondary data analysis (Weston et al., 2019) and multiverse analyses (Steege et al., 2016).

## Open Materials

### *Challenges*

The most obvious challenge for making the field's research materials openly available seems to be a very slow pace of change. For example, IRIS colleagues have been supporting and encouraging journal editors to ask their authors to make their materials open for over a decade, but so far, only three journals seem to achieve this with regularity—*Language Learning*, *Studies in Second Language Acquisition*, and *The Modern Language Journal*—although 36 journals in applied linguistics report that they routinely invite their authors to upload their materials upon acceptance of a manuscript. Marsden (2019b) examined the 10 journals that have published research with the most materials on IRIS and yet found that between 2013 and 2017 only approximately 13.6% of instruments were available on IRIS out of those that could be available, with a low rate of change: from 10.3% in 2013 to 15.2% in 2017. Whether authors in the field upload materials to repositories other than IRIS is unknown, but they would be expected to also do so at a low percentage rate.

Another associated obstacle relates to individuals' concerns about being scooped or, more simply, a sense of personal ownership over their materials. This concern is perhaps not strongly evidenced in general, and indeed Marsden (2019b) found that researchers did not strongly agree with the statements “I am worried that others will use materials/data that I spent a lot of time and effort developing/collecting” or “I still might use my materials (or data), and I don't think that others should be able to use them before I am certain I have finished with them,” but there were nevertheless large standard deviations around the mean ratings of concern ( $M = 17/100$ ,  $SD = 28$ ;  $M = 28/100$ ,  $SD = 35$ , respectively). These findings suggested that, for some people, these are important issues. Another hurdle for open materials is their commercial

sensitivity. A key manifestation of this problem for the language sciences relates to measuring proficiency. The use and reporting of valid and reliable proficiency measures have long been identified as problematic, threatening replication and reproducibility (Park et al., 2022). Many proficiency measures are commercially sensitive, thus restricting their availability and reuse. For example, *Language Learning* had to seek special dispensation from the COS to allow open material badges to be awarded even if the proficiency measure used by the researchers (e.g., TOEFL, IELTS) had not been made openly available. The directors of COS eventually agreed on the condition that any such material be clearly flagged in the article. This, however, is not a desirable situation, as replicating researchers should be able to use the same proficiency measure as those used in the initial study.

A further barrier to open materials is the rapid pace of technological change. At the start of IRIS, in 2011, one challenge was how to archive analogue recordings (audio and video cassettes) and paper materials (photographs and hand drawn pictures). Now, other concerns face the field, such as software code not always being future proof, broken urls, and updating the architecture and interface in pace with the ever-changing digital landscape. Open archiving of digital artefacts clearly requires serious public investment and personal effort.

Another challenge is ensuring the searchability of materials. For this, researchers need ontological systematicity: clear and consistent systems for classifying materials and tagging them with searchable metadata. Yet good practice for materials metadata has been slow to emerge and metadata must change in pace with our methodological advancements, thus posing challenges for the searchability and stability (i.e., version control) of materials. An illustration of the issue is that categories of material or research areas are not easily found on the OSF. This is because key terms are supplied by the uploaders, without external control, resulting in overlap, underuse, and redundancy of metadata, and ultimately poor searchability. In contrast, on IRIS, materials are associated with rich, searchable metadata that are based on a priori ontological categories, for example, for research area, instrument type, data type, participant type, language feature. However, these IRIS dictionaries require maintenance so that the metadata do not mushroom with synonyms, near-synonyms, hypernyms, and hyponyms, thus threatening the usefulness of the database. As anyone who has organized a conference knows, the labeling of subfields to define the conference submission parameters requires specific expertise in the field's ontologies, epistemologies, methodologies, and theories. Creating searchable ontologies involves decisions about where a construct or parameter







*Language Learning* now (since Nahatame, 2021) asks that materials (and data and code) be fully referenced with a DOI to the objects held on IRIS. We envision a related practice spreading so that more materials are open, citable, and recognized on CVs. That is, simply asking authors to reference their materials and obtain a DOI may concurrently promote open practices, as repositories (such as COS and IRIS) can assign DOIs. In contrast, if authors are only asked to put materials in supplementary material on the publishers' website or in appendices, this does not create a citable output. Thus, requiring that materials (and/or data and analysis scripts) be citable could achieve at least three goals: to make them findable, open, and rewardable.

Research materials also include tools, and open source tools are becoming increasingly available (such as text analysis software developed by Kyle and Crossley, <https://www.linguisticanalysistools.org>). Such tools reduce the total community work effort and, therefore, the cost of research. They can reduce human error and interstudy and intrastudy degrees of freedom, thereby enhancing validity. Just as referencing data collection instruments and data as research artefacts is important, it is also critical to recognize open source software as intellectual property. To address this, the Open Source Initiative, launched nearly 25 years ago, continues to defend the ethos inherent to open research by establishing many types of free and open source software (known as FOSS) licenses. While perhaps the least glamorous underbelly of open research, it is critical to recognize and sustain the digital technology that feeds it.

There is now a rich offering of platforms for open materials, organized by domain of interest (e.g., IRIS for language research), by medium (e.g., audio and transcriptions on CHILDES, <https://childes.talkbank.or>, or video data on Databrary, <https://nyu.databrary.org>), by instrument type (e.g., Engle's collection of working memory tests, <https://englelab.gatech.edu/taskdownloads>, or Meara's site housing vocabulary tests, [https://www.lognostics.co.uk/tools/LLAMA\\_3](https://www.lognostics.co.uk/tools/LLAMA_3)), or by type of object (e.g., Tromsø is for data only, as is LDBase, <https://www.ldbase.org>; Hart et al., 2020). Finding field-wide consensus about one unified infrastructure may seem desirable, but we suspect that some redundancy and duplication will improve the chances of long-term accessibility. What the field of language learning chooses to engage with should, in our eyes, be driven by a repository's sustainability, breadth, and searchability. Searchability, along both general and specific parameters, is likely to help serve a wide range of purposes and so should, in turn, garner community support. However, sustainability is unlikely if a repository relies on short-lived funding or on one individual's staying in an institutional post or alive (Obels et al., 2020),

and if researchers want a reliable and comprehensive repository, more effort is necessary in the language sciences. Recently a little support has been forthcoming from publishers (e.g., for IRIS, \$3,000 USD from Wiley and €500 from John Benjamins, in addition to £5,000 per year funding from the British Academy and support from the University of York). Fortunately, significant funding for open research is becoming more frequent from philanthropic societies. Professional associations are, we believe, in a strong position to apply for such funds to curate the discipline's materials.

Finally, we envision a coming together of open materials and data practices. The idea of gathering data using freely available instruments online is not new (e.g., see the much-used LLAMA tests, Meara & Rogers, 2019, and those discussed by MacWhinney, 2017). However, although these tools generate participants' overall scores, they do not output item level datapoints that would allow validity and reliability checks. In another kind of activity, researchers are beginning to conduct integrative data analyses—pooling related data collected by the same elicitation technique though not synchronously. Although not a new concept (Bauer & Hussong, 2009), it has rarely been used in the language sciences (cf., Isbell & Son, 2022). Bringing these endeavors together, we envisage freely available and accessible data collection tools (such as measures of individual differences) that output full datasets to facilitate the large-scale accumulation of ethically compliant open datasets that are tagged with meta-data and analyzable by those who did not collect the data. We acknowledge that such a vision presents a chicken-and-egg conundrum, inherent in much of the open research movement: On the one hand, before making materials and data openly available, consensus about validity and reliability is desirable; on the other hand, in order to reach any consensus, open practices are critically needed to allow accumulation of knowledge over time and space.

## Replication

### *Challenges*

Increasing replication research is largely viewed as desirable, but it is not without its challenges, including decisions about what and how to replicate. Given researchers' limited resources, should they replicate studies soon after or even before publication, or should they replicate studies that have been most influential over time, to check their findings' validity and generalizability? One issue in replicating some highly influential (older) studies is that, having been conducted several years ago, they may not reflect current methods or analytical practices. So, researchers need to decide whether to conduct a direct replication for confirmation purposes accepting the initial study's limitations, or to

conduct a partial or conceptual replication that includes one or more revisions that may have fewer known limitations but may not speak as directly to the initial research questions. An illustration of the difficulty of these decisions can be found in the line of replication research of the influential VanPatten (1990) study that examined attention to form and meaning using a reading passage and comprehension test provided in an appendix. Whereas some replications retained methods close to those of the initial study (e.g., Greenslade et al., 1999), others used a different reading passage and comprehension test in order to address concerns about the validity of the initial materials (e.g., Leow et al., 2008, with materials available in appendices). However, the most valid and reliable way to replicate the initial VanPatten study and to address its central research question is still a matter of debate because (a) low reliability has been observed for the more recent (Leow et al., 2008) comprehension test (e.g., Morgan-Short et al., 2018, Cronbach's  $\alpha = .197$ ; Son et al., 2021, Cronbach's  $\alpha = .293$ ), compared to the reliability reported in the initial study (Leow et al., 2008, Cronbach's  $\alpha = .915$ ) and (b) concerns about the more recently used reading passage have also been raised (Sanz & McCormick, 2021), even though those materials were introduced to address validity concerns about the passage used in the initial study. These details illustrate some of the tensions and difficulties in designing valid replication efforts.

The decisions about how to replicate become all the more challenging when materials from initial studies are not openly available. Marsden, Morgan-Short, Thompson, and Abugaber (2018) found that fewer than 1% of initial studies that had been replicated had provided full materials and that 17% of the initial studies had not provided any materials at all. Thus, in most cases, researchers must, at least partially, recreate materials based on descriptions provided within articles, materials that are often underspecified for the purpose of replication. This may make it harder to knowingly establish similarities and differences between initial and replication studies as well as to reproduce the initial study's findings. For example, Marsden, Morgan-Short, Thompson, and Abugaber found that replication results were less likely to support initial findings when materials were not provided in the initial study. Another problem is that a lack of availability of the initial materials probably increases the chances that a replication is co-authored with one or more of the initial authors, given that co-authorship can facilitate access to materials and/or data. However, Marsden, Morgan-Short, Thompson, and Abugaber found that co-authorship with the initial authors substantially increased the chances of a replication study supporting the findings of the initial study. An additional and perhaps related problem brought about by a lack of open practices is that having to



reports seem to mitigate publication bias (Chambers & Tzavella, 2021), and thus may be a particularly useful mechanism for replication. Indeed, replications are more common among registered reports than regular article types in psychology (Scheel et al., 2021), and within language learning research, a relatively high proportion of (the albeit small number of) registered reports are replications (e.g., Huensch & Nagle, 2021, and those in the *SLA for all?* initiative). An additional benefit of registered reports is that the peer review of the proposed study, which may include the author(s) of the initial study, can help researchers to conceive the most valid and reliable replication design, addressing the challenges illustrated above of deciding the methods for replicating a study (for an example from the *SLA for all?* initiative, see Ryan et al., 2023).

As the field adopts open research practices to enhance replication efforts, researchers should continue to dialogue about what to replicate and why. Several perspectives on these issues have been offered both within and outside the language sciences (e.g., Field et al., 2019; Isager et al., 2021; Kobrock & Roettger, 2022; Marsden, Morgan-Short, Thompson, & Abugaber, 2018). Central among these perspectives is the need for replication to be driven by the contribution and impact of the initial and replication studies, rather than by the availability of open materials per se. Ultimately though, best practices for transparency would be combined with replication to serve an epistemological strategy of theory pruning to yield theories with stronger explanatory power (Tierney et al., 2020). The call for this process is already seeing uptake in the field, for example, Al-Hoorie et al.'s (2021) consideration of replication in regard to dynamic systems theory. Understanding how open research can support replication to serve theoretical progress may help convert the relatively positive views of replication (McManus, 2022) into a more systematic approach to replication in the field of language learning.

## Open Access

### *Challenges*

There are many benefits of open access, and progress is being made toward widening access to research findings (e.g., via open accessible summaries of research at <https://oasis-database.org>; Alferink & Marsden, in press; Marsden, Trofimovich, & Ellis, 2019). However, many challenges lie ahead, as the high number of articles that are behind paywalls indicate (see Appendix S1). Indeed, new journals are still emerging that are not born as platinum open access ones and thus produce more research behind paywalls or have article processing charges, such as *International Journal of Learner Corpus Research* (started in 2015), *Instructed Second Language Acquisition* (2017), and *Journal*

of *Research Methods in Applied Linguistics* (2022). One consequence of not moving forward with open access is that global inequities in the knowledge economy are perpetuated. Even though publishers sometimes reduce subscription fees for certain countries, the reductions are very often small and do not fully address inequities in resources between and, even within, countries. Moreover, the big deals to publish and read freely are happening in wealthy economies (e.g., a recent deal made by Elsevier means that around 80% of the research output in the United Kingdom can be published open access),<sup>2</sup> and as such these deals are likely to increase global inequality. Indeed, open access fees are described as a “particularly pressing issue” in potentially compounding inequities in research (Ross-Hellauer, 2022, p. 363). For example, two consequences of these deals—the open access citation advantage (Tennant, 2022) and the fact that access is granted only to certain demographics (Ottaviani, 2016)—are likely to perpetuate vicious inequitable circles. For example, the open Psychological Science Accelerator initiative has “recruited large numbers of laboratories in North America and Europe but far fewer labs in Africa, South America, and Asia” (Moshontz et al., 2018, p. 509).<sup>3</sup> Similarly, out of the 19 articles published on the theme of social justice and applied linguistics in a recent issue of the *Annual Review of Applied Linguistics*, only six were open access—thus reducing the chances that these studies might reach those who live in the communities that the studies addressed and who provided some of the data. Change in this domain of open research is clearly slow and probably the hardest to effect because the stakes are so high for academics and the game involves governments and multinational corporations.

The large publishing houses have several aces stacked in their deck, making change toward open access even harder. One is that they can afford the use of large platforms, such as ScholarOne, facilitating the review and editorial process, whereas the cost of use of such sophisticated platforms is prohibitive for platinum journals. A second trump card is the deals that they can strike with governments or institutions, whereas smaller publishers do not attract such deals, a situation that is therefore thought to inhibit growth of born platinum journals. Yet another ace card is the existing market share that the journals produced by large publishing houses have over the most established journals, including the one for which we are now writing, and these journals tend to have relatively high citation indices. At the time of writing, only a few platinum access journals, including *Language Learning and Technology* (started in 1997) and *Studies in Second Language Learning and Teaching* (started in 2011), have made it on to Clarivate’s *Social Science Citation Index*, which

provides rankings of citation counts (for full list, see Al-Hoorie, n.d.). Citation counts are used not just by publishers to sell a journal, but implicitly or explicitly, by authors, reviewers, editors, funders, and institutions when making decisions such as where to publish, whether to provide reviewing or editorial work, and whether to fund a project or to support a promotion. Thus, the value placed on citation indices presents challenges for increasing open access. In sum, weaning researchers off current funding and impact models and establishing new ones arguably represent the single biggest barrier for open access, and more critically, perhaps are the key to realizing the full potential of all other open research practices: Even if materials, data, and analyses are openly available, they cannot properly be used without the accompanying published peer-reviewed report.

One may argue that preprints as an open research practice (mentioned in Appendix S1) are one way to increase open access. However, they do not offer a reliable solution even though they are open. Their disadvantages include not displaying information to indicate credibility (see Soderberg et al., 2020); multiple versions circulating sometimes even with multiple DOIs; and compromising double anonymous peer review, still valued by many. The citation and altmetric (mentions on social media) advantages for articles posted as preprints (found by Fraser et al., 2020) cannot, we think, be interpreted as a quality index. Preprints may be useful where the rate of knowledge production can be life-critical and where the review workforce is large enough to validate preprints quickly. However, we do not consider preprints—at least, the early versions of articles before peer review and subsequent resubmission(s)—to constitute a route towards open access in the language sciences. However, preprints from later in the publication process (but prior to final acceptance) may offer one avenue towards greater availability of research findings.

A final but very substantial challenge is that open access, alone, does not directly improve knowledge transfer and coproduction—whether they are open access or not, academic publications are not read much beyond academia due to a complex mix of a lack of incentive, time, training, and shared goals among users or coproducers of research (Marsden & Kaspruwicz, 2017). Thus, even if researchers in the field were to succeed in identifying a globally equitable business model for publishing, would open access really improve knowledge transfer? Making research available to those outside academia needs brokers to (co)select and (co)consider appropriately hedged implications, as open access alone does not make research understandable, relevant, or trustworthy. We therefore suspect that moving open access forward has greater potential



to improve inequalities in the knowledge economy than interfaces between researchers and stakeholders.

### *Envisioning Ways Forward for Open Access*

On a practical level, journals need a platform on which to conduct the review and publication process, and so funders that value open research are commissioning free editing and publishing platforms, reviewed positively by Ross-Hellauer et al. (2018). One such platform is Open Journal Systems, an open source software application for managing and publishing used by over 25,000 journals. Originally developed by the Public Knowledge Project in 2001 (<https://pkp.sfu.ca/ojs>), it is now funded by South Florida University Library, a range of donors, development partners (including Canadian funding agencies), and research grants. The Linguistics Society of America uses Project Muse, another platform, to host their society journal. Project Muse contributes a small amount of money to the academic society for each download; such a contribution can help with journal running costs. We suspect and hope that such collaborative efforts will gradually gain traction and become self-sustaining, driven by community need.

Even with a move to these platforms, if researchers in the field are serious about achieving open access, a question that they must ask themselves is how much they value aesthetic uniformity over openness. In other words, do they value journal aesthetics enough to continue paying the cost of the typesetting that commercial publishers provide? Or perhaps, we would rather forgo this cost and be satisfied with publications broadly following style guides (e.g., American Psychological Association) but not with specific typesetting, as is currently true for preprints and postprints. However, in this case, more responsibility would fall to authors. For example, *Language Development Research* makes it clear that no anonymization checks or formatting will be undertaken and that authors must use an article template (prior to or after acceptance). From the first author's experience of publishing with this platinum journal (Bovolenta & Marsden, 2021), it can take a few hours to follow the guidelines to get the manuscript ready for production. Is this a price worth paying for a platinum model? We believe so, especially because the template can be used for future papers once an author has used it to format a paper. Moreover, if authors do want to maintain typeset documents, there are now free typesetting systems (e.g., CoLaTex), further permitting independence from commercial publishers. As for the more academic editorial responsibilities (e.g., initial desk triaging, arbitrating the review process, checking for rigor and clarity), in open access models this cost would no doubt simply continue





and we acknowledge some limitations of our review and of open research itself. We end by providing a concluding response to the question asked in our title.

### **Infrastructure and Process**

As should be clear from our review so far, shifts in ideologies and ambition are propelled by the emergence of new infrastructure and networks. For open research, networks continue to be established (e.g., the United Kingdom's multidisciplinary Reproducibility Network, Munafò et al., 2020; the International Association of Applied Linguistics Research Network on Open Scholarship in Applied Linguistics, [https://openappliedlinguistics.org/about\\_2](https://openappliedlinguistics.org/about_2) in 2022), and new systems of systems are emerging. For example, an European Union-funded project (2021–2024) is developing the European Open Science Cloud, where researchers can find, share, and process interoperable datasets, publications, code, and other research outputs, as well as workflows to support the lifecycle of data including managing, discovering, and reusing datasets.

These infrastructural innovations suggest a serious investment in fundamental change. But one cornerstone of research infrastructure and process that we have not really touched upon yet in this article is that of peer review—a key mechanism that has not escaped the lens of transparency that has been used to scrutinize the other aspects of the research culture and process. Peer review has traditionally been double anonymous. This system does not seem to be broken, at least according to a survey of linguistics researchers that found that consistently over 80% of their academic respondents valued peer review (D'Arcy & Salmon, 2021). However, many alternate, more open models of review are emerging, such as signed, transparent, collaborative, crowdsourced, post publication, and dynamic review types. So, what might these alternative models offer to the quality—or to other dimensions—of the scientific endeavor? Transparent peer review, whereby signed (nonanonymized) reviews are made publicly available alongside the article, has been advocated as it may increase transparency and reduce bias. The argument is that how and why an article changed during the review process should be open, given that this discussion between reviewer and author(s) is an integral part of knowledge creation (see Besançon et al., 2021, for useful discussion and strong recommendations for medical research). The argument for reducing bias is that, if transparent reviews are signed, then any bias (e.g., conflicts of interest that would otherwise be concealed) becomes a matter for the reader to evaluate. However, counterarguments include that making signed reviews open would change the validity of the reviews such that only certain reviewers would agree

to review the manuscript or the review would be flavored by the knowledge that they would be signed and open. Indeed, in a metascientific analysis of a model whereby reviewers have a choice to sign or not sign, there was an observed tendency for positive reviews to be signed more often than negative reviews (van Sambeek & Lakens, 2020). Other concerns include that signed open peer reviews may incur retribution and an increased burden on reviewers by imposing public responsibility for endorsing the study. There are practical concerns too: Peer review in some disciplines, including our own, can produce highly intricate and lengthy documents; if made open, these could not be edited so would appear warts and all. Another development is crowdsourced (or portable) peer reviews. These are not solicited by an editor but posted spontaneously next to preprints through dedicated platforms such as Pubpeer, Zenodo, or Review Commons, or they can be done post publication, thus complementing the journal's internal reviewing process. Such reviews are available to all and can be signed or anonymous. More informal steps include community endorsement of preprints via Plaudit.pub (whereby readers click a button to applaud a work). Overall, it seems to us that transparent reviews have many benefits, and the key disadvantage stems from reviews being signed. We envisage that gradually, perhaps over a decade or two, the practice will filter—perhaps in a basic form—into the language sciences, but signing reviews will, and has to, remain optional.

Regardless of the transparency of the review that a publication undergoes, the knowledge conveyed in an article must still be subject to change, as per Merton's (1942/1973) scientific values discussed in the first section of this article. The drive for transparency increases our general sense of epistemological responsibility for pursuing and reporting true findings. So what is to be done about a researcher's own loss of confidence or new understandings of methods or analyses that render their own previous research questionable or invalid? Rohrer et al. (2021) suggested several mechanisms, such as author amendments to publication, that could facilitate researchers' making statements about loss of confidence related to validity and incentivize such behavior by formal publication. We look forward to seeing this debate enter discourse in the language learning sciences.

### **Community-Driven Ambitions**

Reflecting the democratic and community-spirited values of the open research movement, practices seem to be increasingly driven by networks of researchers with an ambition to change a particular practice, including via grassroots action campaigns (see Uhlmann et al., 2019, for numerous examples [Table 2])

and discussion). For example, signatories to the Peer Reviewers' Openness Initiative (Morey et al., 2016) refuse to review papers that do not have open materials and data. Other community-driven practices draw on crowdsourcing, citizen science, and other types of collaborative and multisite working that can occur in a surprising number of stages of the entire research process, including research team building (e.g., Moshontz et al., 2018), design decisions (e.g., Landy et al., 2020), data collection (e.g., Paquot et al., 2022, validation of community judgements of proficiency), community augmented meta-analyses that accumulate multiple datasets (see Many Babies Metalab, [https://langcog.github.io/metalab/documentation/using\\_ma\\_data/contribute\\_ma](https://langcog.github.io/metalab/documentation/using_ma_data/contribute_ma)), and analysis (Aczel et al., 2021, to improve analytical robustness). Even the writing process itself has attracted an open community-driven approach (e.g., Tennant et al.'s, 2020, discussion of massively open online papers [MOOPs] that involve between 10 and 100 [partially] self-selecting authors in an openly participatory format). With clear editorial rights and authorship assignment, we think that MOOPs may help to diversify the producers of research, though perhaps only for certain genres of academic writing such as narrative syntheses or scoping reviews. A final grass-roots initiative is that of Peer Community in (<https://peercommunityin.org>), established in 2016, which reviews preprints held on repositories and then publishes them as licensed articles with the Creative Commons Attribution CC BY if the preprints are approved by two recommenders (akin to editors who seek reviews and then write a recommendation of 300–1,500 words). The authors of the peer-community approved preprints can then submit their recommended work to a specific set of journals that have committed to either accept the article with no further peer review or seek further review. Thematic communities of recommenders are entitled Peer Community in [...], for example, Peer Community in Evolutionary Biology. One community that has emerged is that of Peer Community in Registered Reports (<https://rr.peercommunityin.org>), which operates as above except that participating journals do not retain the right to send the work for further review.

Perhaps the most striking indicator of the community-spirited ethos behind the open research movement is that of open grants, whereby researchers make their research proposals openly available (<https://www.ogrants.org>). This not only recognizes the effort invested, but also makes funding processes more transparent and potentially reduces inequities in understanding and accessing funding. If this infrastructure catches on in the field of language learning, this act of providing the intellectual property at the very core of the research process, would represent a very significant change in the research community's ethic.

The range and number of community-driven initiatives reveal a groundswell of interest in delivering open research practices in a collaborative manner. Which of these initiatives are sustained will depend, we think and hope, on the extent to which they can really address the scientific (i.e., quality-related) needs of the community. Most important, overall, these emerging practices reflect a changing culture whereby collaborative approaches involving open materials, data, analysis, quality-control, and dissemination are an inherent part of research. We prefer this vision to the rather bleaker view of open research as a mechanistic exercise in error-spotting or naming and shaming others within our communities (Rouder et al., 2019). In sum, the developments that we have reviewed suggest that open research practices could indeed feasibly be the future as innovation in infrastructure, process, and behavior coevolve with changes in culture.

### Limitations of Our Conceptual Review

Despite the many different components of open research that we have covered, we have by no means covered all. For example, Hardwicke et al. (2022) considered additional practices such as funding disclosure and conflict-of-interest statements. Certainly, the movement is mature enough to no longer belong under one catch-all term of open research, and the metascience needed to examine and evaluate open research must focus on its individual components.

We have also noted a certain circularity to some of our metascientific argumentation. As we have observed in various places above, in order to demonstrate a need for a change towards more openness, more evidence is needed. Certainly, more discipline specific metascientific evidence is needed—though perhaps more so for some practices (e.g., materials, data usability) than others (e.g., open access). Indeed, we have had to draw on work from outside the language sciences. However, in order to create this evidence base, open research itself is needed to facilitate robust scrutiny of validity, reliability, scope, and generalizability. Thus, we acknowledge that we have, to some extent, relied upon somewhat piecemeal and nondiscipline specific data to describe and, in many places, advocate a need for change. But the circularity is perhaps inescapable—to do both better scientific and metascientific work, open research offers much potential.

We also acknowledge that open practices alone, and thus our review of them, are unlikely to comprehensively address some problems with research. For example, in terms of opening research to more producers, epistemological and linguistic biases against the work of scholars from contexts outside of an Anglophone-center have been observed, and numerous obstacles cause









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### **Supporting Information**

Additional Supporting Information may be found in the online version of this article at the publisher's website:

### **Accessible Summary**

**Appendix S1.** Open Research and Its Role in Improving Research.