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Review article

A scoping review of co-production between researchers and journalists in research communication

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ABSTRACT

Co-production is rapidly gaining purchase as an approach to making research matter more to diverse audiences. There exists a wealth of information about co-production in areas such as public administration and sustainability science, but comparatively little within the specific area of research communication. In particular, little is known about the harnessing the potential of researchers and journalists engaging in co-production to generate evidence-based knowledge, foster an informed public, and achieve societal impacts. This review aimed to address that gap in the knowledge base by systematically mapping the theoretical and empirical literature related to co-production between researchers and journalists in research communication. Given the paucity of study in this area, we advanced this aim by synthesizing the extant literature that has explored the more general concept of interactions between researchers and journalists. Following a scoping review methodology, a total of 60 articles were selected for inclusion in this review. We analyzed the included articles following a systematic method of using a data extraction framework to synthesize and interpret contextual (country of the study or author [s], publication type, sector, and methods) and thematic (objectives, theoretical framework, findings) information. Three cross-cutting themes were identified that help to elucidate important considerations for researchers and journalists engaged in or considering engaging in co-production in research communication: (a) the roles of researchers and journalists; (b) the pitfalls and promises of co-production; and (c) the barriers and facilitators of co-production. Following an in-depth examination of these themes, we conclude with a synopsis of the literature along with identifying two major topics for progressing current knowledge and practice.

1. Introduction

Co-production is rapidly gaining purchase as an approach to making research matter more to diverse audiences (Bammer, 2019; Beckett et al., 2018; Nicholas et al., 2019; Oliver et al., 2019). Broadly, co-production refers to a process through which research actors "aim to shift the research paradigm from one in which the researcher is the sole expert to one in which researchers and stakeholders co-lead research activities and collectively apply their expertise, knowledge and skills within a team" (Hoekstra et al., 2020, p. 2). Within the scope of research communication, co-production thus concerns the formulation, production, and extension of knowledge products in which the inputs of diverse research actors are valued and the reciprocal, mutual potential of interaction is foregrounded (Heaton et al., 2016; Sherriff et al., 2019). However, while there exists rich bodies of literature for co-production in areas such as public administration and sustainability science, there remains relatively limited focus on co-production in research communication. In particular, little is known about the harnessing the potential of researchers and journalists engaging in co-production to generate evidence-based knowledge, foster an informed public, and achieve societal impacts.

The purpose of this article is to report the findings of a scoping review conducted to systematically map the empirical and theoretical literature related to co-production in research communication, with focus on the interactions between researchers and journalists. The research question guiding our review was, "What can the existing literature of interactions between researchers and journalists tell us about co-production in research communication?" Findings from this review provide a portrait of the extant literature as well as insights into promising avenues for progressing current knowledge and practice.

2. Method

A scoping review methodology (Arksey & O'Malley, 2005; Levac et al., 2010) was employed to collect and analyze the extant empirical

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and theoretical literature related to co-production in research communication. Scoping reviews are a type of rapid review that utilize replicable strategies to profile the extent, range, and nature of research activity for a given topic, offering basis for future reviews and research. Five stages framed our review: (1) clarifying the research question and core constructs; (2) identifying relevant articles; (3) selecting articles; (4) charting the data; and (5) collating, summarizing, and reporting findings.

2.1. Stage 1: clarifying the research question and core constructs

Initially, the research question was phrased as follows: "What can the existing literature tell us about co-production between researchers and journalists as an approach to research communication?" However, following a preliminary scan for relevant literature using the core constructs *co-production* and *research communication* in the EBSCOhost, JSTOR, and Google Scholar electronic databases, it became evident that co-production was too narrow a construct to generate a breadth of relevant literature. We thus clarified the research question by integrating the more general construct *interactions*, which we defined from a relational perspective (Wasserman and Faust, 1994) as one- or two-transfers of resources (material or nonmaterial) between researchers and journalists. This choice was grounded in the expansive literature found using interaction as a core construct (e.g., Yeo and Brossard, 2017; Peters, 1995; Peters et al., 2008). An important delimitation to note is that our framing of *researcher* and *journalist* maintains a distinction between actors in research production and research mediation contexts (Levin, 2013), respectively. While it is increasingly acknowledged that the boundaries of these contexts are not clear cut—as exemplified by roles such as boundary spanners and knowledge brokers (Haas, 2015)—we uphold that "clarity over boundaries and roles is vital if problems within and between professions are to be avoided" (Flinders et al., 2016, p. 276). Research communication[1] was defined as all activities undertaken to generate broader engagement with research (Metcalfe, 2019), including both traditional (i.e., information delivery) and non-traditional (i.e., public engagement) models for how research can be communicated (Amend et al., 2014). With this general definition in mind, another delimitation of this scoping review was that while we acknowledge the expanding role of citizen science activities (e.g., see Metcalfe, 2019), our principal focus was on the interactions between researchers and journalists, without prespecifying the inclusion of other research actors.

2.2. Stage 2: identifying relevant articles

Targeted search strategies were used to identify relevant articles by entering keyword strings (Table 1) into the EBSCOhost (all indexed databases), JSTOR, Web of Science, and Google Scholar electronic databases (i.e., some of the most complete and widely used electronic databases for research literature; ProQuest Libguides, 2017). The selected keywords were based on the major concepts represented in the research question. Search limits included *language* (English only), *publication type* (peer-reviewed academic journal articles) and *publication date* (between 2006 and April 2019). The publication window was chosen in recognition of the apparent "shift in the cultural outlook of the sciences toward public communication" (Yeo and Brossard, 2017, p. 6) that occurred post-2005. An additional limit was requiring that search keywords be present in either the titles or abstracts of identified literature.

2.3. Stage 3: selecting articles

Article selection followed three steps. Step 1 involved an initial screening of the titles and abstracts of the first 200 articles returned from each search against two general inclusion criteria: (a) interactions between researchers and journalists were explicitly or implicitly considered, and (b) the topic of research communication was the primary focus of the article. The reference lists of articles that met the inclusion criteria ($N = 68$) were manually searched for potentially relevant literature that was missed in the targeted searches ($N = 21$).

Step 2 involved the double-blind screening of all retained articles ($N = 89$), wherein two members of the research team scored abstracts based on perceived relevance to the research question: core paper, of some interest, marginal, not relevant. Articles scored as at least *of some interest* from either reviewer were acquired for full-text analysis ($N = 66$), reflecting our interest in collecting a breadth of literature.

Step 3 involved a final screening of full-text articles against exclusion criteria: (a) plain-language summary of an article already included; (b) non-peer reviewed book review or practitioner-focused article; (c) book or book chapter; (d) a focus on the importance of research communication rather than co-production as a way of operationalizing research communication; (e) a focus on historical developments within research or journalism systems, without attention to the implications for co-production; (f) a focus on either researchers' or journalists' perspectives on journalism policies, but not their perspectives on the implications of those policies for co-production. In total, 60 articles were selected for inclusion in this review.

2.4. Stage 4: charting the data

Included articles were charted to synthesize and interpret the salient themes. Analysis adhered to the constant comparative method (Glaser and Strauss, 1967), which involved an iterative and recursive process of reading and re-reading articles, extracting data from each article, and updating the charting form (Levac et al., 2010). Extracted data were both contextual (i.e., country of the study or author [s], publication type, sector, and methods) and thematic (e.g., objectives, theoretical framework, findings). Our approach was therefore akin to a narrative review, which foregrounds how information from different contexts can be synthesized to improve understanding (Arksey & O'Malley, 2005). Three overarching themes surfaced for co-production in research communication: (a) the roles of researchers and journalists; (b) the pitfalls and promises of co-production; and (c) the barriers and facilitators of co-production. However, rarely were the distinctions between these themes sharp, with most included articles directly addressing more than one theme. For this reason, we refrain from presenting a categorization of the included articles by each theme, as such a categorization would be an artificial representation of each article; however, considering the included literature collectively, these themes provide an overarching structure for understanding co-production in research communication.

Included articles were approximately equally distributed across sectors (i.e., health, natural sciences, and social sciences and humanities). Most articles were empirical ($n = 51$), with few found to be theoretical ($n = 4$), review-based (i.e., systematic reviews, scoping reviews, or meta-syntheses; $n = 3$), or other publication types such as commentary pieces ($n = 2$).

3. Findings

Findings are organized according to the themes and sub-themes that surfaced during the charting process. For the purpose of clarity, all parenthetical citations should be read as providing examples—either empirical findings or theoretical reasonings—for the points raised (i.e., we refrain from including "e.g." in all parenthetical citations).

3.1. Researchers' and journalists' roles in Co-Producing research communication

3.1.1. Researchers

While seen to perform a variety of roles in research communication, researchers have generally considered scholar to be primary. Performing

[1] In this article, we do not distinguish between research communication and science communication.

Table 1. Keyword synonyms for systematic searches of electronic databases.

Media Terms	Researcher Terms	Interaction Terms
Media	Researcher	Co-creat*
Journalis*	Academi*	Collaborat*
Reporter	Universit*	Partner*
Press	Institution	Interact*
		Communicat*
		Engag*
		Utiliation*
		Knowledge *
		Informed
		Research-based
		Evidence-based

Note. * indicates where Boolean functions were used, when supported by the database.

a scholarly role foregrounds high scholarly output, as peer-reviewed academic publications remain a primary factor in tenure and promotion decisions (Liang et al., 2014) and a professional expectation within academe (Peters et al., 2008). Most researchers thus consider scholarly, peer-reviewed outputs to take precedence over broader research communication efforts (Allgaier et al., 2013); however, the literature was divided on the extent to which this view correlates with researchers' demographics or field (e.g., with increasing age, professional security, or seniority). For example, while Bauer and Jensen (2011) and Besley et al. (2012) found seniority to have a positive effect on researchers' likelihood of public engagement activities, Dudo and Besley (2016), Peters (2013), and Tsfati et al. (2011) found seniority to have no measurable effect on such activities. It was comparatively unambiguous that researchers are increasingly coming to see broader research communication as an important extension of their scholarly role (Ivanova et al., 2013; Peters, 2013; A. Petersen et al., 2009), and in some cases "less as an extension of inner-scientific communication and more as a distinct communication arena with its own rules and goals" (Peters et al., 2008, p. 271).

In co-production, researchers were described as scientific experts who can ensure research evidence is reliably and accurately communicated. Specifically, when interacting with journalists, researchers were the leading authorities in public policy debates and fora (Besley and Nisbet, 2011), contributors to the public's understanding of research evidence (Haas, 2007), popularizers of research and relievers of research-related hype or controversy (Petersen et al., 2010), and spokespeople for their research programs and institutions (Moses, 2007; Tsfati et al., 2011). However, the literature was again divided, with some studies suggesting that researchers are coming to see these new roles as part of their scholarly duty (e.g., Peters, 2013), and others suggesting that changing expectations are being met with apprehension and opposition (Chapman et al., 2014). For example, in a study of the media engagement strategies of leading health researchers in Australia, Chapman et al. (2014) found that researchers with high media profiles observed a sense of disdain from colleagues who viewed media-related work as an ego-driven pursuit. Drawing on earlier research, Chapman et al. also noted that some researchers view media interaction as efforts for those not cut-out for an academic career, a stigmatization occasionally termed the "Sagan effect" in relation to the apparent inverse relationship that Carl Sagan experienced between efforts to engage non-academic audiences in research and perceived credibility as a scholar. More recently, however, Besley et al. (2018) found limited support for the hypothesis that researchers' beliefs about their colleagues' views on research engagement activities are a strong predictor of their actual willingness to take part in those activities. Instead, willingness to engage in broader research communication appears to result from a confluence of factors including past behaviour in this regard, demographic characteristics, attitudes about broader research communication and non-academic audiences, and perceived self- and response efficacy (see Besley et al., 2018).

3.1.2. Journalists

Descriptions of journalism's primary role, and thereby the roles of journalists, varied widely from the "focal point for much broader ambitions for social change" (Dunbar-Hester, 2014, p. 564) to an "instant historical record of the pace, progress, problems, and hopes of society" (Bennet, 2002, p. 10, as cited in Boykoff, 2008). Even more general, Dentzer (2009) observed that some journalists consider their role to be simply a reporter of that which is new (i.e., the news). From a democratic vantage, journalists' roles were described in several key ways, including a filter for the vast amounts of information available to the public at any given time, ensuring important messages are communicated swiftly and accessibly (Vercellesi et al., 2010); an educator to the public, equipping the citizenry to engage in meaningful debates about public policy (Haas, 2007); a "double-barreled" influencer of both the public's engagement in and knowledge of politics (de Vreese and Boomgaarden, 2006); and the watchdog to the government, holding those with decision-making power to account (Moses, 2007). Stocking and Holstein (2009) labelled these journalistic roles, respectively, as *disseminator*, *interpretive/investigative*, *populist mobilizer*, and *adversarial*, stressing that how journalists' roles are conceptualized has implications for what is left in or out of their coverage.

In co-production, journalists were described as the sourcing and storytelling experts who can communicate information in publicly accessible formats (Vercellesi et al., 2010). Descriptions of journalists' roles in co-production were usually detailed in relation to how they support researchers, such as providing researchers with opportunities to legitimize their research (Peters et al., 2008); engaging in "dynamic, 'sparring' relationships with experts brought in to provide information, depth, and perspective" (i.e., challenging the veracity and utility of knowledge claims; Albæk, 2011, p. 344); and providing thematic frames for research that improve public comprehension by chunking information into interpretive packages and storylines (Bubela et al., 2009). Like researchers, though, not all journalists have embraced these roles, with many championing traditional journalistic norms (e.g., balance and newsworthiness; Boykoff, 2007, 2008) or contesting their role as a conduit for research (Maier et al., 2016; Stocking and Holstein, 2009). For example, in a review of how 25 South African newspapers covered primary healthcare, Akintola et al. (2015) found that journalists often featured and framed research in a way that aligned with their perceptions of newsworthiness rather than focusing on research that reflected salient public health concerns.

3.1.3. Communities

Although communities—subgroups of the public with direct stake in one or more fields of research—were not a focus for this review, their roles in co-production were mentioned with some frequency. Researchers have traditionally considered the public to be uninformed or uninterested in research (Besley and Nisbet, 2011; Besley et al., 2012; Yuan et al., 2019), which has contributed to communities being viewed as beneficiaries rather than partners (Yuan et al., 2017). This viewpoint was regularly linked to deficit models of broader research communication, which have focused on improving the research literacy of communities through one-way transfers of information (Besley and Nisbet, 2011; Bubela et al., 2009). At the same time, there is acknowledgement that we are inevitably moving towards a "knowledge society" (Peters et al., 2008), wherein "public deliberation over critical issues can function to clarify contested values, increase public understanding, foster people's willingness to reconsider their own views, and increase communication between opposing sides on a given issue" (Moses, 2007, p. 162). By engaging in co-production, communities can become holders of the "special knowledge" (Peters, 2013, p. 14103) that has traditionally belonged to researchers as well as begin to challenge and overturn perceptions of being uninformed or uninterested in research.

3.2. Pitfalls and promises of Co-Production in research communication

3.2.1. Pitfalls

We identified three overarching pitfalls associated with co-production in research communication: (a) the troubled history of researcher–journalist interactions, (b) negative perceptions about interaction, and (c) the complex dynamics of interaction.

3.2.1.1. A troubled history. The first pitfall concerns what Dunwoody et al. (2009) termed "a historically thorny relationship" in which researchers and journalists "circle each other warily, routinely misperceive each other's motives, embrace different and sometimes conflicting norms, and encounter significant difficulties when interacting with each other" (Dunwoody et al., 2009, p. 300). For researchers, interactions with journalists have been characterized by research being uprooted from its specialized processes (i.e., methodological traditions; D. Rowe and Brass, 2008) to be popularized for broader consumption (Peters, 2013). The term *popularization* alone has tended to hold a pejorative undertone for researchers thinking about broader communication (Bauer and Jensen, 2011). Examples abound where the processes for translating research have initiated and contributed to a "hype pipeline," or "cycle of hype" (Bubela et al., 2009), whereby the benefits and costs associated with research findings were inaccurately presented and ensuing actions or inactions were resultingly misguided. Once initiated, the cycle of hype is driven by "enthusiastic researchers facing pressures from their institutions, funders, and industry; by the desire of institutions and journals to bolster their profiles; by a profit-driven media; and by the need of individual journalists to define events as newsworthy" (Bubela et al., 2009, p. 516). Yet, despite its various drivers (some extending from researchers themselves), the tendency of some journalists to fuel the hype pipeline by scandalizing findings and underreporting nuances has been a decisive factor in researchers' historical wariness towards interaction (Allgaier et al., 2013; Orr, 2010).

On the other hand, for journalists, interactions with researchers have been characterized by a working relationship that is largely one-sided (Corley et al., 2011), with researchers frequently unwilling to interact (Nielsen and Autzen, 2011) and skeptical of journalists' (and the public's) abilities and attitudes related to research (Peters, 2013). Additionally, interactions have rarely been initiated by researchers; Albæk (2011), for example, found that in analyzing the featured researchers in three major Danish newspapers throughout one month, researchers had initiated interactions in only 1–2% of cases, compared with journalists at 90% (the remaining interactions were initiated by third parties). Similarly, large-scale events like the Galathea 3 expedition—an attempt to stimulate co-production through shared space on a nautical research vessel—evidenced a troubled relationship that has yet to tap into its potential (Nielsen and Autzen, 2011). Despite enhanced research communication being a principal goal for the expedition, journalists tended to stereotype researchers, and researchers tended to ignore or exhibit a general distaste for working with journalists.

3.2.1.2. Negative perceptions. Owing to this troubled history, researchers and journalists continue to grapple with negative perceptions about interacting. The main concern expressed by researchers has been that journalists are either incapable or indifferent regarding the accurate coverage of research (Allgaier et al., 2013; Chapman et al., 2014; Lo and Peters, 2015; Maillé et al., 2010; Orr, 2010). This concern for accuracy has manifested as an expectation that coverage will be biased by journalists' lack of scientific understanding (Allgaier et al., 2013), misrepresented by "reducing scientific and conceptual complexity to sound bites" (Chapman et al., 2014, p. 62), or underreported by failing to systematically outline research methodologies (Amend and Secko, 2012). In fact, the latter concern—journalists omitting research methodologies—was identified by Maillé et al. (2010) as a main contributor to researchers' consternation for how journalists portray research; whereas researchers considered a detailed methodology as central to accurate and relevant reporting, journalists felt such information was ill-suited for a general audience and often omitted it from their own investigative reading.

A related concern expressed by researchers has been the uncritical and sensationalist framing of research that can occur before journalists solicit expert opinion (Amend and Secko, 2012; Chapman et al., 2014). Although the notion that journalists "shop around" for researchers willing to confirm a predetermined frame has been contested (Albæk, 2011), researchers remain wary of journalistic tendencies to frame scientific disputes as political battles that leave general audiences bewildered and apathetic to real issues and to research veracity (Antilla, 2010). Moreover, whereas researchers frame their work in the broader context of their field, journalists follow the incongruous framing practice of placing research within common, easily consumed frames often tied to current issues, politics, or acute events (Amend and Secko, 2012; Revers, 2009). The framing of anthropogenic climate change, for example, is often adduced for why researchers hesitate to interact with journalists (Antilla, 2010; Boykoff, 2007, 2008; Carvalho, 2007), which has sowed public confusion and ongoing environmental damage. Given that the purpose of framing is to present "a selective interpretation that provides causal narratives about problems and their solutions" (Wallington et al., 2010, p. 2), researchers may inadvertently contribute to inaccurate and salacious research narratives through co-production with journalists.

Other, less frequently reported, perceptions further contribute to researchers' hesitation towards co-production, such as the potential for provoking unwanted attention from community groups (Allgaier et al., 2013); risks to professional reputation if coverage is of low quality (Chapman et al., 2014; Orr, 2010); fear that coverage could lead to embarrassment or an unwanted media profile (Revers, 2009); and, owing to researchers' growing understanding of the media, journalists lacking a comparable understanding of scholarly communication (Wien, 2014). Many of these concerns are fueled by a vocal minority of researchers who have experienced problematic interactions and promulgate their distaste of the media (Peters et al., 2008). Thus, while researchers may not experience negative interactions themselves, they can be deterred by negative perceptions that echo in some academic circles.

The perceptions held by journalists about co-production were less of a focus in the literature—a disparity that motivated Amend and Secko's (2012) meta-synthesis. Of the perceptions documented, journalists' main concern has been that researchers generally lack the ability to effectively communicate their research to a general audience (Chapman et al., 2014; S. Rowe and Alexander, 2010). In order to keep up with increasingly fast-paced journalism timelines, journalists require sources who can rapidly respond to their requests and readily distill complex research into sound bites (Leask et al., 2010). However, many journalists continue to see researchers "as isolated creatures in their ivory tower not able to communicate properly to the lay public" (Maillé et al., 2010) and as not appreciating journalistic processes (e.g., embargo systems; Amend and Secko, 2012).

Another common negative perception held by journalists is that interactions with researchers suffer from an inherent power dynamic (Amend and Secko, 2012). While some have explored how this dynamic can be understood in terms of different forms of power (e.g., researchers hold power as generators of "truth" and journalists hold power in how that truth reaches the public; Leask et al., 2010; Maillé et al., 2010), the fundamental tension is encapsulated by the argument that "scientists can do their job without the support of journalists, but editors and reporters have no scientific information to communicate without the support of scientists" (Rowe and Alexander, 2010, p. 73). Following from such reasoning, journalists have tended to engage with researchers under the pretense that there is a need to equalize the perceived power imbalance (Amend and Secko, 2012), which has been complicated by surveys finding that many researchers consider interaction with journalists beneath them (The Royal Society, 2006; as cited in Rowe and Alexander, 2010) and a "modern media ecosystem [that] grants scientists more

power than ever before to be proactive about their public communication" (Dudo, 2015, p. 770). Scholars have called for researchers to more frequently "step out of their role as researchers who are giving nominally objective, arguably authoritative assessments" (Albæk, 2011, p. 345) and to move beyond "the normal expert-reporter relationship" (Nielsen and Autzen, 2011).

Less frequently reported perceptions expressed by journalists included an ambiguous interaction agenda often held by researchers and their respective institutions as well as the challenges associated with finding researchers both willing to interact and able to do so within journalism timelines (Amend and Secko, 2012). Yet, the latter perception appears to be giving way to the former, with studies noting that researchers and research institutions are professionalizing in their journalism interactions (Peters et al., 2008; Wien, 2014), fueling interaction complexity.

3.2.1.3. Complex dynamics. While the complexity of co-production partly stems from the evolving roles of researchers and journalists, it has primarily grown out of the ferment of interaction dynamics, which is reflected in the language used to describe interactions: researchers are increasingly *mediatized*[2], and journalists are increasingly *scientized*.

That researchers are, to differing degrees, mediatized was the more frequently addressed dynamic (Allgaier et al., 2013; Dudo, 2013; Ivanova et al., 2013; Lo and Peters, 2015; Maier et al., 2016; Peters et al., 2008; Rödder, 2009; Rödder and Schäfer, 2010). Mediatization refers to the "closer connection between media and other spheres over time as well as the assumption of a causal change the media bring about in these other spheres" (Allgaier et al., 2013, p. 628), which for researchers has entailed more frequent interactions with journalists and an increasing willingness to make research decisions that favour media attention (Allgaier et al., 2013; Rödder, 2009). The mediatization of researchers continues to be met with unease by scholars who heed its potential to provoke changes in academe, including (a) program-level changes, in which the theories and methods of research are altered to better align with journalism criteria; (b) organizational-level changes, in which media resonance becomes a criterion for success that institutions use in evaluating researchers' work; and (c) interactional-level changes, in which research norms and quality criteria evolve to more closely reflect the norms and quality criteria of the media and the public (Lo and Peters, 2015).

Exemplifying some of these changes, Rödder (2009) found through a content analysis of 386 articles from German and British daily newspapers that "in the coverage of the human genome sequencing, the scientific discourse is intertwined with political, commercial and ethical discourses" (p. 459). Due to the public appeal of human genome research—specifically the race to the first full genome sequence draft—media attention for this research was intensified, and resultingly, researchers oriented their work to better align with media preferences. It has since been tendered that mediatization relates to specific temporal, topical, and social settings (Ivanova et al., 2013; Rödder and Schäfer, 2010). Moreover, at the program-level (Lo and Peters, 2015), the attendant changes of mediatization may depend on the individual researcher, with younger researchers more likely to adapt their work to media preferences than senior researchers (Allgaier et al., 2013). The researcher-specific nature of mediatization is echoed in studies that have found researchers' status and sector to be the two factors most commonly associated with media interaction (Albæk, 2011; Amend and Secko, 2012; Dunwoody et al., 2009; Peters, 2013; Yettick, 2015).

Less prominent in the literature, scientization is the media-directed dimension of mediatization (Rödder, 2009), referring to the influence that researchers exert on the media as they vie for their research (or opinions) to be featured in lieu of other coverage. As researchers and research institutions have sought to increase their media profiles (Brass and Rowe, 2009; Bubela et al., 2009), media outlets have increasingly featured researchers as expert sources (Albæk, 2011), which for journalists has meant less credence given to their own perspectives and knowledge. Scientization has aroused an air of skepticism for journalists' work when not accompanied by the authority of researchers; that is, journalists increasingly require *compensatory legitimation* (Wien, 2014). However, the veneration of research expertise has frequently failed to appreciate "the inherent limits of scientific expertise, especially in the contexts of policy making on complex issues, where pluralism in knowledge claims, values, and interests intermingle" (Petersen et al., 2010, p. 867). Coupled with findings that suggest many journalists lack the scientific training necessary to assess the quality of their sources (Maillé et al., 2010; Yettick, 2015), the scientization of journalists appeared understudied given its potentially adverse effects on co-production in research communication.

3.2.2. Promises

Notwithstanding these pitfalls, the promise of co-production was evident in (a) the inaccuracy of commonly used metaphors and (b) the value of overlapping expertise.

3.2.2.1. Tired metaphors. A core finding in this review was that the oft-perpetuated metaphor of a "gap" between researchers and journalists is largely mischaracterized. The gap metaphor has been refaced in numerous ways when characterizing researchers and journalists engaging in co-production, such as likening interactions to that of oil and water (Peters, 2013). Although such characterizations paint the research-journalism interface as inauspicious, interactions between researchers and journalists generally appear rather positive and frequent (Allgaier et al., 2013; Dijkstra et al., 2015; Massarani and Peters, 2016; Peters, 2013). To be clear, historical troubles, negative perceptions, and complex dynamics *do* strain interactions, but the pervasiveness of these pitfalls is overstated in the language used to characterize interactions between researchers and journalists.

Most researchers report being satisfied with how their work is covered by journalists, and this appears to have been the sentiment since at least the early 1980s (Dunwoody et al., 2009). For example, in a study of the media motivations, perceptions, and strategies of 30 neuroscientists from the United States and Germany, Allgaier et al. (2013) found that even researchers who held negative feelings about the media were mostly satisfied with their interaction experiences. Rather than snub or condemn potential interactions entirely, the researchers exhibited a more acute preference: "they prefer to interact with qualified science journalists who work for influential and serious media outlets" (Allgaier et al., 2013, p. 426). It was not that researchers distanced themselves from journalists; rather, they distanced themselves from low-quality journalism. This finding was reinforced by the commonly overlooked aspect of the gap metaphor that researchers apply more stringent criteria when assessing peers' media coverage than their own (Bubela et al., 2009)—an observation supporting Wien's (2014) contention that interactions are more complex than evident in cursory examinations. Specifically, researchers have been found to accept some minor inaccuracies in their own coverage while rendering exacting critique of peers' coverage based on "the competence of scientists, the content of their statements, their self-presentation, the priority of scientific communication, and the reputation of the news organization" (Peters, 2013, p. 14106). It appears, then, that the apparent gap is reified by researchers who take an overly critical or negative stance on the broader communications of their field.

Evidence against the gap metaphor was also presented from the side of journalism. Using the example of anthropogenic climate change, for instance, Boykoff (2007) found "that 'balanced' reporting on scientific investigations of human-induced climate change in [high-quality United States and United Kingdom] newspapers is no longer evident, and thus suggests that we may now be flogging a dead norm" (p. 479). Further support for the improved alignment (and therefore reduced gap) between researchers and journalists was provided by Leask et al. (2010), who

[2] Also known as *medialized*.

explored journalists' reporting of health issues in Australia. They found that journalists were actively compensating for the shortcomings of media stories that otherwise drive researchers and journalists apart, "adhering as best they could to their tenets of quality journalism: being informative, responsible and critical." (Leask et al., 2010, p. 4). Additionally, journalists reported actively countering the tendency of administrative staff to sensationalize stories by maintaining accuracy and thoroughness as well as careful use of tone and choice of experts. Thus, while a gap may remain between researchers and journalists, its characterization belies the potential of overlapping expertise.

3.2.2.2. Overlapping expertise. The communicative value of researchers' and journalists' overlapping expertise appeared along two dimensions: (a) the professional value and (b) the public value. Visibility has become an important element of researchers' professional legitimization, both their visibility as a scholar and the visibility of their work (Peters et al., 2008). Reflecting researchers' evolving professional roles, the benefits of co-production are increasingly outweighing potential risks (Allgaier et al., 2013), and "a large proportion of scientists believe they have profited in their careers from media visibility" (Peters et al., 2013, p. 14105). Co-production with journalists provides researchers with a high-bandwidth channel to forward their research, opportunities to enact their dutiful role to taxpayers, and an avenue to engender public goodwill for their research (Wien, 2014). Although it has been called superficial to depict "the media and academia as two parts of the 'knowledge production and dissemination business'" (Orr, 2010, p. 30), soliciting journalists to partner in the production of research narratives is emerging as a valuable extension of the academic endeavour, especially with governments, funders, research institutions, and high-ranking journals (e.g., *Nature* and *Science*) expecting wider societal impacts (Peters, 2013). In contrast to traditional research narratives, those developed through co-production offer opportunities to modify the image of research as "ready-made" to research as "in the making," which "has researchers actively producing, negotiating, and communicating methods, results, and objectives" (Nielsen and Autzen, 2011, p. 475). That is, all types of research are viewed as a more human and social activity.

Journalists also reap professional value from co-production. By drawing upon researchers' disciplinary expertise, journalists can confirm and legitimize the framing of a story (Albæk, 2011). As previously mentioned, "framing" often holds a negative connotation; yet, a well-framed journalistic story serves at least four important functions:

> [To] (1) define problems—determine what a causal agent is doing and with what costs and benefits, usually measured in terms of common cultural values; (2) diagnose causes—identify the forces creating the problem; (3) make moral judgments—evaluate causal agents and their effects; and (4) suggest remedies—offer and justify treatments for the problems and predict their likely effects. (Wallington et al., 2010, p. 2)

The inclusion of researchers into these functions can abate the issues commonly associated with journalists writing independently about research (e.g., inaccurate or omitted information; Peters, 2013). Interaction with researchers can enable journalists to circumvent the need to fit research in fleeting news timelines (Nielsen and Autzen, 2011), while simultaneously ensuring stories exhibit depth, breadth, and perspective. Moreover, journalists do not exclusively report on research, and so "it is the capacity of researchers to comment on and assess the events of the nation and world – to give expert opinion rather than discuss research developments – that creates the need for experts' comments, interpretations and opinions" (Albæk, 2011, p. 344). This more general reliance on researchers' expertise was a relatively underexplored topic, despite its potential to make use of a wider range of journalistic styles than classical research journalism (i.e., journalism focused on research findings and projects) and to "draw a different picture of the sciences for the broad public" (Summ and Volpers, 2016, p. 787).

The public value of researchers' and journalists' overlapping expertise is signified by D. Rowe and Brass (2008) concluding statement: "Beyond the walls of the academy is the combat zone where questions of culture, history, race and education can be publicly debated" (p. 694). When researchers work with journalists to support the broader communication of research, the answers to these questions can be drawn from the best-available evidence. Researchers appeared to be well-aware of the media's sweeping influence and how interaction with journalists can enrich public discussions of salient issues and influence pertinent items on policy agendas (Dunwoody et al., 2009). As noted by Chapman et al. (2014), researchers are aware "that to absent oneself from the media [is] to almost guarantee the irrelevance of one's research to public and political debates about [science] policy" (p. 264). That is, just as researchers benefit from the increased visibility of their work, so too does the public. Additionally, the media offers a critical accountability function for public issues, as policymakers "cannot simply ignore scientific knowledge published in the media, since it is still publicly expected that legitimate policy has to be based on existing scientific knowledge" (I. Petersen et al., 2010, p. 881–882). As the media presence of research grows through researchers' and journalists' interactional work, policymakers must increasingly base their decisions on the best-available research evidence—to do otherwise could endanger their professional legitimacy.

3.3. Barriers and facilitators of co-production

3.3.1. Barriers

Beyond the pitfalls of co-production in research communication, we also observed that cultural and structural barriers can constrain interaction dynamics.

3.3.1.1. Cultural barriers. The core barrier to co-production between researchers and journalists has been their different professional cultures (Lo and Peters, 2015), engendering discordant norms and values (Amend and Secko, 2012) as well as differing conceptions of truth, objectivity, uncertainty, and significance (Leask et al., 2010; Post, 2015; Rice et al., 2015). Proceeding from a social constructivist viewpoint, Peters et al. (2008) summarize this epistemological barrier: Researchers and journalists "construct [and communicate] knowledge about the world according to different principles" (p. 269).

For researchers, constructing knowledge begins with identifying the limitations of current knowledge—an articulation of scientific ignorance followed by an articulation of "usable ignorance" (i.e., charting characteristics and measures of the unknown; Stocking and Holstein, 2009, p. 24). Considerable training and experience are tied to these articulations, and researchers have accordingly come to expect authority over the authorship of research narratives as well as control over what constitutes legitimate coverage and how coverage should be styled (Peters et al., 2008). A finding in Peter's (2013) composite of survey data, for example, was that most researchers believed knowledge creation and validation to be academic endeavors. Similarly, in a questionnaire that inquired about researchers' perspectives on public engagement, Poliakoff and Webb (2007) found many researchers avoided public engagement simply because related activities have never constituted what they perceive (or what they think their peers perceive) to be an academic norm or of scholarly value. However, how academic norms and values influence researchers' attitudes and behaviours towards broader research communication remains rather ambiguous. For instance, while some studies have shown academic leadership positions to be a perceived norm for media interaction (Dunwoody et al., 2009; Lo and Peters, 2015), such norms were rarely examined beyond their broad labels (e.g., status). Additionally, more recent work (Besley et al., 2018) has challenged the degree to which normative beliefs are an important influence on behaviours.

In comparison, extensive attention has been paid to how journalistic norms and values function as barriers to co-production. Regarding knowledge construction—or as it is more commonly labelled, story construction—journalists were less likely to begin from an articulation of ignorance, instead looking to convey an air of objectivity (Yettick, 2015). As illustrated by Carvalho (2007), who examined representations of climate change in three influential British newspapers, "there is a crucial cross-insemination between the normative and the descriptive, or the axiological and epistemological in the media's discursive reconstruction of science" (p. 237). In other words, journalistic norms and values become entwined in story construction, meaning that journalists' research narratives will often conflict with those expected by researchers (Amend and Secko, 2012; Canan and Hartman, 2007).

A categorization of the most prominent journalistic norms was offered by Boykoff and Boykoff (2007): *first-order* and *second-order* norms. First-order norms include personalization, dramatization, and novelty, which collectively hold a baseline influence over "both the selection of what is news and the content of news stories" (Boykoff and Boykoff, 2007, p. 1192). In relation to how these norms can act as barriers, personalization necessitates that individuals and personalities are viewed as more important than deeper social analyses; dramatization dictates a focus on the tantalizing aspects of research (however contrived) over more complex, nuanced aspects; and novelty requires that stories have an "issue-of-the-month" quality, meaning research is devalued if findings are perceived as tired or lacking elements that can be packaged as new or fresh. Second-order norms include authority-order and balance, which can lead to content not being situated in the larger picture of covered issue(s). Authority-order serves to amplify or diffuse important societal issues by journalists tending to consult perceived experts or authority figures. This norm can perpetuate cyclical relations between authority figures and the public, in which each actor draws upon the other, using the media, to understand the social importance of an issue while neglecting other sources of information. Balance, the most frequently discussed norm (Antilla, 2010; Rice et al., 2015), is the tendency to provide those with conflicting views on a scientific issue equal media attention, regardless of how unbalanced those views might be regarding scientific consensus. Balance has served as a powerful political tool for purveying apparent scientific uncertainty as well as for padding shallow investigative journalism (e.g., soliciting opinions from prominent yet opposing figures in a field without acknowledging the preponderance of evidence supporting a particular position).

Language differences further illustrate the dissimilarities of researchers' and journalists' professional cultures. At a general level, whereas journalists use the day-to-day language of the public, researchers employ a specialized and formal language that can introduce insider-outsider dynamics (Amend and Secko, 2012; Canan and Hartman, 2007; Peters, 2013). For instance, as Brass and Rowe (2008) note, it is not uncommon to hear academic language criticized for being "obscurantist, theoretically impenetrable and jargon-laden" (p. 677). Such language is at odds with the needs of journalists to construct stories that provoke broader appeal. At a specific level, language differences also arise in how researchers and journalists engage with key concepts in research communication, such as objectivity and uncertainty. Post (2015), for example, found that researchers' and journalists' "understandings of objectivity largely depend on their profession" (p. 742), and that many "journalists do not accept the scientific criteria of objectivity" (p. 743). Similarly, Maier et al. (2015) found divergent perspectives on scientific uncertainty, with journalists significantly more likely than researchers to emphasize scientific controversies in their communications, expecting such content to engage lay audiences. Collectively, these differences in knowledge production and communication have complicated researchers and journalists developing cultural empathy towards each other's unique worlds.

3.3.1.2. Structural barriers. Time emerged as the main structural barrier for co-production (Amend and Secko, 2012; Canan and Hartman, 2007; Leask et al., 2010; Revers, 2010; Rice et al., 2015; Wallington et al., 2010), despite some indications that time does not significantly predict researchers' likelihood of media interaction (Poliakoff and Webb, 2007). In effect, researchers and journalists operate within different time constraints; whereas researchers investigate phenomena that can take lifetimes to understand (Canan and Hartman, 2007), journalists often have only hours to assemble a story (Leask et al., 2010). This difference is further reflected in the time-lag associated with researchers' work achieving wider societal impact (Revers, 2009). Journalists, in contrast, rarely possess even the time necessary to check back with researchers about the accuracy of stories, regardless of how relevant the content may be for public issues (Rice et al., 2015).

Other structural barriers faced by researchers include academic incentive structures and the professionalization of research institutions' media relations (Brass & D. Rowe, 2009), the latter being relatively new territory (Rowe and Brass, 2008). Resulting from this professionalization, not only must researchers contend with interaction dynamics, they must also work within the socio-cultural purview of their institutions, including both the "organizational reputation, and risk associated with the legitimacy and legitimization of knowledge and expertise" (Brass and Rowe, 2009, p. 54). Illustrating the effect of institutional media orientations, Brass and Rowe (2009) concluded from a content analysis of 10 Australian universities' media policies that some universities had developed means to deal with risks arising from researchers perceived as "the enemy within" (p. 72). That is, rather than providing support, some institutions are actively opposing interactions perceived as a reputational risk.

Similarly, journalists face manifold structural barriers within modern media organizations, including dependence on influential figures who exert influence over coverage (e.g., political elites), dwindling budgets for investigative journalism and specialized reporters, editorial pressures and established hierarchies that direct topic prioritization, and the fleeting airtime provided for conveying complex research (Antilla, 2010; Amend and Secko, 2012; Declercq, 2019; Leask et al., 2010; Rice et al., 2015; Wallington et al., 2010). Moreover, paralleling the increased media orientation of research institutions, Rowe and Brass (2008) found that "academic–journalist relations may also be characterized as competitive," with each actor vying for time from a limited audience. Gatekeeping theory, or its associated language, was often used to frame these structural barriers (Antilla, 2010; Leask et al., 2010; Revers, 2009; Rice et al., 2015; Yettick, 2015). The most systematic use of this theory was Yettick (2015), whose study is one of the few that draws attention to the importance of journalists' education background. She notes that for education research—and indeed most fields of research—journalists are not well prepared by their education to evaluate research or researcher expertise.

3.3.1.3. Facilitators. The facilitators of effective research-journalism interactions occupied limited space in the literature compared to barriers. Informed by Wallington et al. (2010), facilitators were grouped by (a) interaction training, (b) building institutional capacity, and (c) developing a commensurate appreciation of timelines.

3.3.1.4. Training. The need for researchers and journalists to undergo interaction training was explored at length, yet studies were divided on the extent to which training is necessary for improving interaction dynamics. While Chapman et al. (2014) and Poliakoff and Webb (2007) found that interaction itself may be enough, others have advocated for forms of supplementary training (Dunwoody et al., 2009; Moses, 2007; Lo and Peters, 2015; Wallington et al., 2010). The conflicting recommendations seem to indicate a need to consider training alongside researchers' and journalists' self-efficacy for interaction (Besley et al., 2018; Dunwoody et al., 2009). More recently, discussions related to training

have highlighted (a) the need to consider "the objectives or goals that audiences bring to their interactions with scientists, the extent to which their goals complement scientists' objectives, and how any (di)similarities might affect the communication experience" (Dudo and Besley, 2016, p. 14), (b) the need to integrate more theoretically informed topics into training (Yuan et al., 2019), and (c) the need for some research communication programs to expand the focus from practical and technical communication skills to support researchers in developing their capacity for two-way communications (Yuan et al., 2017). An additional challenge is that detailed descriptions or evaluations of interaction training (e.g., content, structure) are mostly absent from the literature. One of the few examples is Canan and Hartman's (2007) study of a three-day training workshop described as "an experiment in building bridges between journalists and scientists" (p. 167). Their approach involved a series of pre-determined and ad hoc discussion topics for researchers and journalists as well as workshop assignments to build working relationships. Although this collaborative work was time- and resource-intensive, it enabled the development of trust and mutual intelligibility—relational factors identified as key for interaction dynamics in other studies (Rice et al., 2015).

3.3.1.5. Building institutional capacity. Another facilitator concerned building institutional capacity. For academic institutions, the altering of academic incentive structures to better align with research communication goals, despite frequent mention, has been suggested a suboptimal strategy for improving the frequency and quality of researchers' interactions with journalists (Canan and Hartman, 2007; Dunwoody et al., 2009; Poliakoff and Webb, 2007). Instead, appealing to researchers' moral and ethical values has tended to be more effective at driving interaction (Dunwoody et al., 2009), as "it is more appropriate to conceive of [researchers'] readiness to interact with the media as a more general orientation" (Peters, 2013, p. 14105). This contention was clarified by Poliakoff and Webb (2007), who, drawing from motivational theories, note that if researchers are inclined towards media interaction, extrinsic rewards such as academic incentives may disrupt intrinsic motivation and self-reported interest.

For media institutions, building capacity for research-journalism interactions is largely unexplored. As a profit-driven and politically aligned enterprise (Rice et al., 2015), devoting resources to exploring how research-journalism interactions can be improved is unlikely to align with a media organization's mandate. As such, journalists will likely need to build the capacity of their organizations, which Rice et al. (2015) propose is possible through *interface journalists*. Interface journalists are knowledgeable about and strongly engaged with research and are situated to ensure clear separation is made between research evidence and opinion.

3.3.1.6. Developing a commensurate appreciation of timelines. Few studies addressed how researchers and journalists can develop a commensurate appreciation of professional timelines. The resultant dearth of information is particularly striking when considering that time is the most pressing structural barrier to co-production. Nevertheless, several articles did emphasize the importance of an appreciation for timelines (Leimer, 2010; Moses, 2007; Wallington et al., 2010), and Leask et al. (2010) provided four recommendations to assist researchers in appreciating journalists' time pressures: timing when to solicit journalists' interest, being readily available to interact, having pre-prepared resources, and staying networked for later interactions. From the perspective of a journalist turned researcher, Leimer (2011) also provided several suggestions for researchers: know how to succinctly communicate why your research matters; think and act strategically, preemptively distilling important messages of your research; disseminate messages tactfully through appropriate mediums; and watch for and be prepared to create opportunities to promote research messages. Similar suggestions were not available for how journalists could work within researchers' professional timelines.

4. Discussion

This scoping review set out with the aim of systematically mapping the literature of co-production between researchers and journalists in research communication. Given the current paucity of study of co-production in research communication, we advanced this aim by synthesizing the extant empirical and theoretical literature that has explored the more general concept of interactions between researchers and journalists. While our work maintains a distinction between co-production and interaction, we submit that the latter is informative for studying the former insofar as derivative research can be avoided, the integrity of research and journalism systems can be guarded, and directions for future study can be advanced. Three overarching themes emerged from our review that help to explicate important considerations for researchers and journalists co-producing research-informed narratives about salient societal issues: (a) the roles of researchers and journalists; (b) the pitfalls and promises of co-production; and (c) the barriers and facilitators of co-production. We conclude with a synopsis of the literature that gave rise to these themes in addition to several suggestions for future research.

4.1. A synopsis of co-production in research communication

Several characterizations about co-production between researchers and journalists in research communication can be made. First, descriptions of researchers' and journalists' roles appear to be converging on research communication as a joint venture. To be clear, peer-reviewed publication in academic journals will likely remain the de facto channel for research communication (Allgaier et al., 2013; Peters, 2013); however, both researchers and journalists are increasingly seeing broader research communication as an indelible component of what they do. For researchers, Peters (2013) said it best: "refusing media contacts without legitimate reason has become unacceptable" (p. 14105). For journalists, descriptions of their roles are increasingly entangled with how they can dynamically support researchers in research communication activities. At the same time, and somewhat countering this opening up of research and journalism silos to one another, "both scientists and journalists seem to overlook the fact that there can be other social actors of [research] popularization" (Maillé et al., 2010, p. 72). Indeed, despite promising inroads for tapping into the potential of researchers and journalists working together, "integrating the perspectives from all three groups of actors [researchers, journalists, communities] involved in science communication based on the different levels of theoretical and empirical evidence is a major challenge and also suggests the need for future research" (Maier et al., 2016, p. 260). It seems a next step will be to take seriously the implications of co-production by exploring how communities can become involved and thereby come to see their needs and interests represented in research narratives.

Second, an ongoing tension exists between the empirical reality of interactions between researchers and journalists and the apparent reality that continues to propagate in some academic and non-academic spheres. Beyond the genuine challenges resulting from a troubled history, negative perceptions, and complex dynamics, it appears that potential interactions also suffer from the inaccurate language used to characterize the research-journalism nexus. Inauspicious metaphors (e.g., likening interactions to that of oil and water) obscure the more positive and

frequent experiences of researchers and journalists who interact frequently and towards mutually beneficial outcomes. Researchers, while concerned with coverage accuracy and the framing of their research, are benefitting professionally from their increased visibility as scholars and the increased visibility of their work. Journalists, while vexed by many researchers' inexperience or disinterest around public communication and by a power dynamic that tends to favour researchers, are benefitting by ensuring their stories exhibit the qualities of depth, breadth, and perspective. There is mutual and unsettled concern, however, about how interactions between researchers and journalists might be re-shaping academia and the media.

Third, and finally, a range of barriers and facilitators exert considerable influence on the perceived effectiveness of interactions between researchers and journalists. The most discussed barriers can be categorized as cultural (i.e., constructing knowledge about the world according to different principles) or structural (i.e., job-related requirements and constraints that are misaligned with interactional work). The most discussed facilitators were interaction training, building institutional capacity, and developing commensurate understandings of professional timelines. Yet, as is the general case for studying how to more effectively support and promote the broader impacts of research, much work remains in determining the relative effectiveness of different facilitators given the local, organizational, and external barriers within complex research and journalism systems. What can be said is that improving interactions will likely require researchers and journalists to cultivate an appreciation of their different epistemological positions as well as their different professional goals and constraints.

4.2. Avenues for future research

While the field of research communication at large has matured over the past 30 years (Guenther and Joubert, 2017), important questions remain unanswered and many more are borne out by thin lines of evidence, particularly on the subject of co-production. We draw attention to two major topics for progressing current knowledge and practice, while acknowledging that many additional topics are likely to rise in importance over time.

4.2.1. Exploring Co-Production in research communication with communities

Although our focus was on co-production between researchers and journalists, we found it surprising how few articles addressed broader community participation in research communication. Our review echoes the findings from other studies that researchers, in particular, appear ready "to move beyond a broad, patronizing view of the public" (Simis et al., 2016, p. 410). Additionally, recent studies (e.g., Dommett and Pearce, 2019) have challenged claims that expert-public relations are becoming increasingly troubled. There is simultaneous interest and need for communities to engage more earnestly with research, and one of the most promising ways for stimulating that change is to include them in research narratives: a point regularly made by communication scholars who stress the value of two-way dialogue and engagement (Yuan et al., 2017, 2019). However, doing co-production effectively and with awareness for the myriad ethical considerations that accompany such work are topics with many unknowns. Drawing on examples like Greenhalgh et al. (2016), we believe there is great potential in drawing from related literatures, such as business (value co-creation), design science (experience-based co-design), and community development (participatory research).

4.2.2. Exploring the moderate- and long-term outcomes of interaction facilitators

A long-standing irony in the study of mobilizing research knowledge is the dearth of evaluations about different approaches and activities. Co-production as an approach to communicating research is not exempt from this quandary. Despite the impressive breadth of literature expounding the barriers to interaction in research communication, we know little about the mid-term to long-term impacts of various facilitators. Scholars in this field have called for "discussion about the value, quality, and effectiveness of what we are practicing and researching" (Jensen and Gerber, 2020, p. 4), and we amplify that call here. Moreover, we make the extension that this discussion needs to engage more critically with theories and conceptual frameworks that can inform not only the planning and implementation of co-productive efforts, but also the evaluation of those efforts.

4.3. Limitations and conclusion

The findings from this review should be considered against the limitations of our design. First, targeted keyword searches were limited to specific concepts as well as electronic databases for which we had institutional access, meaning it is possible some relevant articles were missed, despite our inclusion of several major electronic databases and identification of additional literature through reference harvesting. Second, due to time and resource limitations, any study published after early 2019 was not included, though we do not expect this limitation to diminish the saliency of our findings, as bodies of literature are always dynamic and without clear inflection points from which the literature ought to be reviewed. Third, and finally, although a preponderance of evidence exists for the findings highlighted in this review, presenting the breadth of research activity for understanding co-production in research communication meant it was not possible to show the weight of evidence behind many of the specific findings. As noted earlier on, however, many of the studies included in this review addressed more than one of the overarching themes. What this review thus offers is an overall mosaic for the multiple and diverse literatures that can help in understanding the key dimensions of researchers and journalists working in co-productive ways.

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