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Discourse synthesis: Textual transformations in writing from sources

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Abstract

Research into *discourse synthesis* examines the ways in which writers make use of, and transform, multiple other texts in writing their own. It is intertextual research that has blurred boundaries of various kinds, not only the boundary between the processes of reading and writing but also boundaries across disciplines as well as regions of the world. Guided by a cognitive constructivist perspective, this research into discourse synthesis drew at its origin—and continues to draw now—from multidisciplinary theoretical and empirical work. This article, which establishes the foundations for this research and traces its development, attends to writers' transformations of multiple source texts resulting from operations of organizing, selecting, and connecting. Studies into synthesis writing for varying academic tasks have shown that, by applying these operations to multiple textual sources, writers produce discourses that function as new texts in new contexts. Following a discussion of historical background, attention in this article goes to three major issues: the variation in synthesis associated with different academic genres; the kinds of insights into product and process that come from different research approaches; and the nature of new instructional approaches that emphasize elements of discourse synthesis. All facets of this research reveal continuity as well as change, the latter occurring, in large part, through contact and convergence of discourse synthesis research with related bodies of work. The conclusion, which centers on the notion of transformation, summarizes research conducted thus far and points to future directions.

Keywords Discourse synthesis · Writing from sources · Synthesis writing · Reading-writing connections · Academic writing · Textual transformations · Integrated assessment

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Like many authors who preceded us, we seek to map the terrain of a body of research. The mapping metaphor seems appropriate for this piece, particularly if one thinks of *mapping* as interpreting and ordering (as well as orienting) and of *terrain* as historical ground with contours and complexities. Readers will note use of other geographic and spatial metaphors, especially boundary, since the work being reviewed exemplifies the blurring of boundaries of various kinds. The focus of the article is the textual transformations that occur through what we have labeled *discourse synthesis* (Spivey, 1984; Spivey & King, 1989) but is also called *synthesis writing*—and, if writers use multiple texts as sources, is also called *reading-to write* and *writing* (or *composing) from sources*. To avoid confusion in our use of "we" or "our" in this article, it should be noted that the one of us who writes here as Nancy Nelson published much of her discourse synthesis research as Nancy Nelson Spivey. Our attention is on literate acts in which the sources that writers use are identifiable, but we acknowledge that, in a sense, all writing can be seen as synthesis. Much of a writer's knowledge comes from texts that have been read and heard, and thus no text is truly original.

In acts of discourse synthesis, people, as writers and readers, draw from multiple textual sources to compose their own texts, which may be reports, arguments, essays, reviews, or any number of other kinds of discourse. In doing so, they transform the source material through operations of organizing, selecting, and connecting as they seek to meet their discourse goals and produce texts that function in new contexts for new audiences (N. Nelson, 2001a, 2008; N. Nelson et al., in press; Spivey, 1984, 1990, 1991, 1992, 1997; Spivey & King, 1989). In organizing, writers disassemble the structure of the source texts and supply their own organizational patterns as they incorporate material from different sources. For some tasks, organizing may be a matter of only recombining and reordering, but, for many tasks, it entails generating a different pattern. In selecting, writers employ some criterion or criteria of relevance as they preferentially choose particular semantic content from the sources for inclusion in the syntheses. And in connecting, they generate linking material to provide for perceived flow and continuity as well as interdependence of elements within the textual content. This perceived interwoven unity, often called coherence, is a crucial feature of textuality (or text-ness). These three transformational operations of organizing, selecting, and connecting are central to the complex process of constructing meaning *from* texts *for* texts. They would be applied not in a fixed sequential order but recursively and sometimes even concurrently over the course of composing, as a writer progresses from initial plans to completed version.

For this terrain mapping, we summarize historical grounding, both theoretical and empirical, for research in discourse synthesis and also point to major insights into this process that blurs boundaries between reading and writing. Our review shows discourse synthesis to be a *hybrid* act of literacy, to borrow a term from Bracewell et al. (1982), that occupies a *liminal* (in-between) space, to borrow a term from Bhabha (1994). The review also shows that discourse synthesis research does not belong to a single discipline, since researchers investigating synthesis writing have many different disciplinary "homes," which include, among others, literacy studies, psychology, educational psychology, applied linguistics, language teaching, and English studies. Besides the varying disciplinary homes, researchers also have different national homes, making

the specialization notably international and even transnational. Early studies were conducted mainly in North America, but the lead in much of the recent work is taken by European researchers, including cross-national research teams. Although a dominant role is played by Europe and North America, contributing researchers from other continents also participate in the globalized research community. Despite this diversity and concomitant theoretical and methodological differences, contributing researchers, who have a shared focus, can be said to comprise a focal community (Swales, 2016).

Providing some motivation for the increasing attention to synthesis writing have been developments in educational policy and practice, including curricular requirements, such as a relatively new emphasis on synthesis writing in the Netherlands' secondary curriculum (Expertgroep Doorlopende Leerlijnen, 2009), the influence of Common Core Standards for Writing from Sources in the U.S. (Council of Chief State School Officers, 2010), and inclusion of a discourse synthesis task in assessments of proficiency in English (e.g., TOEFL iBT®). Moreover, as we point out in what follows, there is increased international research activity investigating related processes, especially readers' comprehension of multiple texts (e.g., Bråten et al., 2020; Goldman., 2004).

Our mapping, which is diachronic as well as synchronic, shows changes over time. We first present historical background beginning with research developments in the 1970s that contributed to a constructivist orientation in which both reading and writing were viewed as processes of building meaning. That was the motivation for—and the underpinning of—initial inquiries in the 1980s when the term *discourse synthesis* was coined (Spivey, 1984; Spivey & King, 1989). Then we address three major long-standing issues that continue to be of critical importance today. The first is the nature of textual transformations associated with different academic genres, which is a matter of much interest to discourse synthesis researchers today. That discussion highlights various complexities, including those associated with discourse form. The second issue addressed is research method: the characteristic features of researchers' "traditional" and relatively new computer-assisted approaches to understanding discourse synthesis. Here we employ a long-standing division between text-based and process-tracing methods, which, though useful for organizational purposes, is somewhat artificial, since analyses of writers' texts provide insights into the reading-writing process and since tracing of the process means also tracing the evolution of the text. The third issue to be raised and discussed centers on pedagogy, a matter of concern to educators as well as educational researchers, which is just now receiving the attention it deserves. We point to interventions, some embracing multiple facets of synthesis and others emphasizing specific features, all of which are intended to help students be more successful in their writing. Our conclusion summarizes the previous sections in terms of what has been learned and points to future directions.

An intertextual void: How did this research begin?

Within a domain of scholarship it is pretty much impossible to identify origins of lines of research, since academic work builds upon what came before. As Kaufer and Geisler (1989) emphasized in their treatment of novelty, scholarly contributions are

never "out of the blue." Instead they are "carefully tied to and shown to grow from existing knowledge" (p. 288). For our mapping of discourse synthesis research, we go back about 50 years to the era that has been called the *cognitive revolution* (Gardner, 1987). In the 1970s, after the break from behaviorism, much attention in the U.S. and elsewhere was going to discourse processes, especially discourse comprehension, in a zeitgeist composed of researchers from multiple disciplines. The term *discourse* in *discourse processes* refers to connected language comprising complete, intact texts, which are considered to be large linguistic units. Although discourse, in this sense, may be written or spoken, almost all of the research was being conducted with written texts and was thus reading research or writing research. This textlinguistic focus for reading was an important distinction from previous research, which centered on the reading of single words, phrases, or sentences. This use of *discourse*, as employed then and in the discourse synthesis research we review, should be distinguished from Foucault's (1972) use of the word for historically contingent knowledge produced by powerful forces in a social order. Gee (1989) distinguished between these meanings in terms of little *d* and big *D*, with lower-case *d* referring to the use employed in the cognitive process research and capital *D* referring to Foucault's use. We employ the label *discourse synthesis* to show ties to previous research in discourse comprehension and discourse production.

Reading and writing as constructive processes

As mentioned above and reviewed in more detail elsewhere (Spivey, 1987, 1997), a large and rapidly accumulating body of international and interdisciplinary research into the constructive facets of reading began in the 1970s. To summarize a huge body of work—and to acknowledge its influence on discourse synthesis research—let us just say that, in general, this research, which investigated the reading of single texts, emphasized readers' active construction of mental representations of meaning. It showed proficient readers *organizing* (making use of organizational patterns signaled by the texts they read or, under certain circumstances, replacing them with their own patterns); *selecting* (making selections of content on the basis of what was placed prominently in a text hierarchy or was particularly relevant to their own perspective or task); and *connecting* (generating inferences that provided coherence to the semantic content in their recall) (e.g., Meyer, 1975; Pichert & Anderson, 1977). The dominant research approach being employed was read-recall: Participants read texts and then provided recalls. The texts-to-be-read had typically been parsed meticulously into propositions (very small semantic units consisting of a relation, which was usually a verb, adjective, adverb, or preposition, and the "arguments," usually nouns, that went with it) to create templates; and the content of recalls was matched against those templates. Comparisons through this template approach showed replication but—importantly—also showed transformation. Theoretical conceptions at that time included a constructivist model developed by (Kintsch, 1974; Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983), which was based on his research employing a read-recall, proposition-based template approach to investigate transformations associated with reading, understanding, and remembering.

The national Center for the Study of Reading in the U.S., established in 1976 at the University of Illinois at Urbana-Champaign, also supported a cognitive constructivist theory of reading (e.g., Anderson et al., 1977).

It is important to acknowledge the influence of Sir Frederic Bartlett (1932), a British psychologist whose work was published earlier in the twentieth century, on this newly initiated research. His rediscovered work, which emphasized transformations, was influential not only on constructivist theory but also on the research approach employed. In his theorizing, Bartlett had himself been a boundary-crosser by applying concepts from social and cultural inquiries to the constructive nature of individuals' cognition when he reported these studies in the 1932 book. His research approach was comparing people's recalls with a story they had experienced. These comparisons showed that, in recalling the text from an unfamiliar culture, people reorganized it to accord more closely with their own cultural schemas. Recalls also revealed that they gave selective attention to certain facets and made "links of connection" in efforts to construct coherent understandings (p. 85). Bartlett was cited almost religiously in the new reading research and theories of reading of the 1970s and 1980s.

Research in the U.S. into the writing process can also be dated to the 1970s. Often considered seminal is Emig's (1971) inquiry into the composing processes of twelfth graders, which, most significantly, showed writing to be a recursive process. However, a very important development influencing past and current research into writing arose from an international symposium on cognitive processes in writing held in 1978 at Carnegie Mellon University. This symposium resulted in an edited collection, which included co-authored contributions from Hayes, a cognitive psychologist, and Flower, a scholar in English studies, specifically rhetoric, at that university. These researchers, who had crossed disciplinary boundaries in this collaboration, contributed a chapter presenting their cognitive process model of writing (Hayes & Flower, 1980), which was revised in minor ways when published in journal form (Flower & Hayes, 1981). This model, which employed the problem-solving metaphor that predominated in much of cognitive psychology at that time, integrated concepts and terms from cognitive science, including *mental representation*, with rhetorical theory. Elements of the model were based on Hayes and Flower's research employing the thinking-aloud procedure, a process-tracing approach developed at their university (Ericcson & Simon, 1980). Throughout much of the research in writing, including discourse synthesis, one can see continuing recognition of Hayes and Flower's work, not only in elements of the writing process but also in recurring use of the thinking-aloud research approach. Also contributing to the 1978 symposium was Bereiter (1980) from Canada, whose work also became—and remains—influential, especially his collaborative research with Scardamalia, which distinguished between *knowledge-telling* and *knowledge-transforming* (Bereiter & Scardamalia, 1987). The latter, knowledge-transforming, takes place when writers, through reflection and problem-solving, apply rhetorical concerns (e.g., goals, audience) to their writing. By doing so, they produce different kinds of texts than would have come from simply "telling" knowledge. During this early period the cognitive research in writing was focused almost exclusively on situations in which writers produce

essays without the material use of source texts. The summarizing of single texts was the only source-based writing being studied extensively (e.g., Brown & Day, 1983).

Blurred boundaries between reading and writing

During this highly generative period, researchers studying discourse processes tended to consider themselves as either *reading* people or *writing* people, as intense attention was on either reading or writing, following traditions of these specializations (reviewed in N. Nelson, 2008; N. Nelson & Calfee, 1998; Spivey, 1997). However, there were signs of a blurring of these boundaries marked by the forementioned reference to hybrid tasks of literacy (Bracewell et al., 1982). Although the hybrid task of summarizing single texts was being studied, some researchers were arguing for investigating the writing process when writers make use of more than one textual source (e.g., Kennedy, 1985). At this time, dialogic theory from Russian scholars, expecially Bakhtin (1981), as well as poststructural notions from the Tel Quel scholars in France crossed disciplinary and continental boundaries and made academics across various fields aware of the concept of *intertextuality*. Kristeva (1980/1966), who introduced the term in a French publication, later translated into English, described a text as a "mosaic of quotations" and claimed that "any text is the absorption and *transformation* of another" (italics ours, p. 37). Intertextuality also became a concern of textlinguists, who described it in simpler terms as *between-text relations* (Beaugrande & Dressler, 1981). Clearly, there was an intertextual void in research that needed to be filled, since so much writing involves use of other texts.

Initial research in discourse synthesis: Crossing the reading-writing boundary

The discourse synthesis research initiated in the 1980s was itself a synthesis because it drew from the theoretical and empirical work associated with reading and also from the theoretical and empirical work associated with writing. First was an initial study (Spivey, 1984), conducted by the first author of this article, into textual transformations in synthesis writing, also described in Spivey (1992); and it was followed by a second study for which the two of us collaborated (Spivey & King, 1989). Both inquiries, conducted in the U.S., addressed those same transformations—organizing, selecting, and connecting—that were so important in the discourse comprehension research. In the 1984 study, university students had three informational texts on a single topic, "the armadillo," to use as sources for writing reports that would be comprehensive treatments of the topic. These sources were unattributed encyclopedia articles, presenting general and authoritative knowledge. All were organized with a text pattern called *collection* (Grimes, 1975; Meyer, 1975), which held together thematic clusters, composed of subtopics of the main topic. Collection is one of five major text patterns for informative writing identified by Meyer and Freedle (1984) from Grimes's (1975) descriptions. In the 1989 study we also focused on report writing but as performed by younger students, who were at three levels of education (sixth, eighth, and tenth grades). As with the 1984 study, students

received three texts on a particular topic, this time "the rodeo," which, as in the previous inquiry, were organized with collection patterns. These students too were to write synthetic reports. For analysis of the reports in both investigations, a template approach was used to identify source content that writers included: Source texts had been parsed into the small semantic units called propositions, described above, to see which were selected and how they were combined. For this synthesis research, instead of a single template for a source text, composite templates were created, which indicated whether a unit was in one source, two sources, or all three.

Analyses, which showed differences associated with reading ability and with grade level, yielded findings regarding the transformative operations of organizing, selecting, and connecting. In both studies, almost all writers produced texts organized as topical reports employing collection patterns, but the arrangements that they created differed from any single source text. (Two students of 60 in the second study wrote texts that employed a pattern other than collection.) Holistic quality ratings were related to the tightness of organization, which resulted from writers combining subtopics. For example, one writer in the first study integrated historical information on ancient armadillo-like forms with current species information by saying, "The armadillo is an animal that has survived for many years in different forms" (p. 34). In both studies, writers made selections based on intertextual importance; that is, they preferentially included content that was repeated across the sources. And, in both studies, there were findings relative to connectivity, which along with organization and quantity of content was related to holistic quality. Some writers, who tended to be less proficient readers or younger students, failed to provide sufficient content-to-content linkages, leaving it to the reader to infer connections, as in resolving a contradiction, clarifying an ambiguity, or perceiving a logical relation between two elements. An illustration comes from that first inquiry. One writer, who had selected the armadillo's classification information from one source and some descriptive information from another, wrote: "*Edentata* means 'lacking teeth.' Armadillos have rootless, peglike teeth with no enamel" (p. 17). This excerpt with its break in connectivity contrasts with an excerpt from another student who added the contrastive link *however*: "Armadillos have been given the order name *Edentata* (meaning toothless); however, they are not a toothless mammal. Their teeth are rootless and have no enamel on them" (p. 35). The connecting facet of writing seemed to present the most difficulty to youngest writers in the 1989 research, who likely did not yet have command of linguistic resources for providing links when they pieced together information from different sources.

From the onset, discourse synthesis was viewed as an act of reading and writing in which construction of meaning *from* reading and construction of meaning *for* writing could not be clearly differentiated if someone approaches source texts with the intent to write. If reading is for the purpose of writing, the composing process would already be underway when the person reads, and the building of meaning for one's own text would occur concurrently with building meaning from reading the source text. There would not be a clearly differentiated reading phase followed by a composing phase. Material evidence of this composing could be seen in the notes writers made in margins of source texts as well as sketchy written plans that some made as they read. We should point out that insights into textual transformations

in both initial studies came from detailed textual analyses. The order in which the transformative operations—organizing, selecting, and connecting—were discussed in either publication did not indicate a particular sequence in which the operations were employed by the writers. In both studies evidences of the three operations could be seen across initial notes and plans as well as drafts. For the 1984 study, organizing was discussed first because differences in text organization were particularly interesting and were of major importance to the overall findings. For the 1989 study, selecting was discussed first because differences in content selection as well as connectivity were found for both reading ability and grade level, but differences in text organization were found only for reading ability.

Contact and convergence with related bodies of work

Research into discourse synthesis and other hybrid practices of writing from sources, such as summarizing and critiquing, continues. If one considers a more extensive terrain, the research we review for this article would fit within the larger body of work called *reading-writing connections* or *reading-writing relations* (e.g., Graham, 2020; Graham et al., 2018; N. Nelson, 2008; N. Nelson & Calfee, 1998; N. Nelson et al., in press; Shanahan, 2016; Tierney & Shanahan, 1991). In addition to the hybridity of discourse synthesis, addressed in this article, other reading-writing connections include facets of discourse knowledge that are employed in both processes and also social interactions that occur between authors and audiences. Another connection is the epistemic capacity of both processes in *writing to learn*: It goes without question that reading leads to learning, but writing also has epistemic qualities, as it too leads to new knowledge (e.g., Ackerman, 1993; Galbraith & Baaijen, 2018; Graham et al., 2020; Klein et al., 2014; N. Nelson, 2001b).

Reading research, including research into reading comprehension, continues to expand voluminously (Alvermann et al., 2018; Moje et al., 2020). We cannot, of course, address all facets of this research, but we do want to point to a body of work, mentioned earlier, that has major relevance to research into discourse synthesis. This is the relatively new line of multiple-text reading research, which began in the 1990s. Building on prior inquiry into reading comprehension, this research focuses on the nature of mental representations formed when people read multiple texts on a single topic. Of much theoretical importance is the documents model framework, originally from Perfetti et al. (1999) but developed further by Rouet and Britt (2011), Britt and Rouet (2012), and Britt et al. (2013).[1] It portrays a reader's mental representation in multiple-text tasks as composed of an intertext model, which is a network of nodes for different sources that are interrelated by intertextual predicates, such as opposes, supports, and corroborates. This intertext model is tied to the reader's situation model, which represents circumstances of the particular situation or phenomenon and includes interrelated source content. In addition to the intertext

[1] For the remainder of the article we do not include these citations for the documents model framework. We hope that our readers will understand that, each time we refer to the documents model framework, we are also referring to authors of the relevant publications for this framework.

and situation models, a RESOLV (REading as problem SOLVing) model represents goals relative to context and task and also procedures for performing the specific activity (Rouet et al., 2017). Research based on the documents model framework has been reviewed recently by Bråten et al. (2020), who also discuss features of other models of multiple-text reading (cf. List & Alexander, 2019).

This multiple-text reading research typically includes measures that take various forms, including, for instance, multiple-choice questions or verification tests (reviewed by Primor & Katzir, 2018). But, importantly for this article, in many of the studies, participants produce post-reading written responses as another means for researchers to learn about readers' mental representations. Sometimes called *protocols*, these responses are often written without access to sources and are thus relatively brief. The central objective of this research is the modeling of reading comprehension, not the process of writing, but analyses of these post-reading written products contribute significantly to understandings of synthesis writing in terms of participants' genre knowledge and also the kinds of textual transformations made in academic writing.

Also expanding dramatically over the years are research and theory relevant to writing (Bazerman, 2008; Horowitz, in press; MacArthur et al., 2016). Understandings of writing, including discourse synthesis, are enhanced by convergence with research in applied linguistics. Of particular relevance to our mapping is research focused on writing in English as a second language (EL2), where increased pedagogical attention is going to synthesis writing in specializations called *writing for academic purposes* and *writing for specific purposes*. This work overlaps with, and cross-fertilizes, research in discourse synthesis (e.g., Cumming et al., 2016; Zhu et al., 2021). Grabe and Zhang (2013) have described this relatively new interdisciplinary convergence on writing from sources in their article on "Reading and Writing Together." Important to note is the new form of assessment for EL2 proficiency called *integrated assessment*, to be discussed later, that employs discourse synthesis tasks (Plakans, 2009). Also to be noted is the current emphasis in EL2 writing on teaching students how to transform and frame linguistic material from sources so that it is incorporated effectively in their writing. The label some use for this generative activity is *transformative reuse* (Donahue, 2019), and we choose to use that term later in this article.

Text and task: What transformations are associated with which genres?

Since our early inquiries (Spivey, 1984; Spivey & King., 1989), a major feature of this research terrain is inquiry into various tasks and forms of discourse synthesis—how writers transform texts differently under different circumstances in accordance with different purposes. Variation in academic writing associated with task became a facet of research at the U.S. national Center for the Study of Writing and Literacy (CSWL) after establishment in 1985 at the University of California at Berkeley and Carnegie Mellon University. Task effects had been shown convincingly in the discourse comprehension research (e.g., Frederiksen, 1975;

Meyer & Freedle, 1984), and academic writing tasks had long been a major interest of those who studied or taught writing in U.S. higher education (e.g., Bridgeman & Carlson, 1984). Performance on a writing task is influenced by the writer's interpretation, or representation, of the task. A task representation includes goals for the kind of text to be written (its organization, content, and style) and also strategies to be employed in composing. Within the task representation a dominant element, as pointed out by Flower (1990), is an organizing plan, which is a "bridge between process and product," since it can "dictate" the form of the text as well as the means of achieving it (p. 44). For example, the report writing task given to students in our developmental study (Spivey & King, 1989) implied a particular kind of text organization as well as a principle for selecting content.

Eventually within rhetorical and writing studies, task became subsumed by a much-theorized construct termed *genre*, which refers to a community's recurring communicative practices that become typified and conventionalized (Bazerman, 2007; Berkenkotter & Huckin, 1995; Paré, 2014). Genres of arguing, reporting, and reviewing, for example, take discourse forms that are called argument, report, and review. Lemke's (2005) description captures much of the thinking about genre:

> A genre is maintained by the conventions of a community, and in most cases serves specific functions within the system of practices of particular institutions of that community. The forms which a given genre takes as text are the traces of social signifying practices in some community in some institutional, or at least recognized and regularly recurring situational context. (pp. 46–47)

Theoretical and empirical attention has gone to varying and overlapping forms associated with differing genres of academic discourse, as this review will show. Much of this attention has been directed to genres of academic writing associated with disciplinary communities. But there are also school genres—called *learner genres* by Swales (1990)—whose forms approximate some features of disciplinary writing but would not function in disciplinary forums. When encountering, representing, and performing academic writing tasks, individuals would employ their genre knowledge, which, according to Berkenkotter and Huckin (1995), is their "repertoire of situationally appropriate responses to recurrent situations" (p. ix)). Thus, differences in the extent and nature of genre knowledge would result in variability across writers in producing a particular genre. Those who are novices to a particular form of writing would not generate the kind of organizing plan or text that would be generated by those who have more experience with the practices of the community. It is important not to view genres as overly fixed and deterministic but to acknowledge variability within genres, since genres are situated in varying social communities and settings and also since writers interpret rhetorical situations and make rhetorical choices as they compose their texts.

We divide this section into four parts: source-based argument, other source-based genres, hypertext, and genre sets. Our treatment of argument comes first because of the great interest that argumentation is attracting today in education and scholarship. Following that, we try to untangle some overlapping and interconnected academic genres for which T. Nelson's (1987) term *intertwingled* applies, since there is no agreed-upon means of classifying or categorizing them. Then we move to hypertext,

which is not a genre itself but modifies the nature of extant genres and facilitates development of hybridized genres. And we conclude this section by pointing to interrelations among particular genres receiving research attention and then by suggesting genre sets (Devitt, 2004) as a matter for some future research into textual transformations.

Source-based argument

Within the research into academic writing, a major focus—we would say *the* major focus at this time—is argumentative writing. Arguing from academic sources has typically confronted and challenged students in higher education when they engage in disciplinary discourse and their studies become more specialized. To prepare students, U.S. universities typically include argumentation in composition courses. Arguing from sources is also, at the present time, becoming a priority for pre-collegiate students, not only in language arts classes but also in subject areas, especially history and science. This increased attention in the U.S. is associated with new curriculum requirements from the Common Core Standards (Council of Chief State School Officers, 2010; Shanahan & Shanahan, 2018). However, not only in the U.S. but elsewhere too, increased attention to source-based writing of arguments comes also from a global initiative to foster *scientific reasoning and argumentation* and *historical reasoning and argumentation* (e.g., Fischer et al., 2018; Stearns et al., 2000).

Facets of written argument

In writing an argument, a writer, situated in a background of varying positions on a topic or issue, asserts a position. In an effort to persuade or convince others of that position, the writer presents a sequence of claims and supports them with reasons and evidence. For arguing convincingly, an accomplished writer tends also to acknowledge contrasting positions and claims, pointing to their strengths and weaknesses, and to rebut counter positions and claims (Reznitskaya et al., 2009; Toulmin, 1958). For arguing from sources, this means appropriating source material to help characterize the problematic situation, including conflicting perspectives on it, and also, most importantly, to support one's own position. Organization often reflects one of two text structures identified by Meyer and Freedle (1984): the problem–solution text pattern, presenting a problem and then arguing for a solution to it (Hoey, 1983), or the cause-effect text pattern, arguing that something would have a particular effect, or, conversely, arguing that something had a particular cause (Voss et al., 1994). Writers typically support their positions with causal explanations—reasons that their particular positions or particular claims are best or correct or that others' positions or claims are not. Many kinds of connectives, including causal, temporal, contrastive, and adversative links, help provide logical flow of ideas.

Argument is usually understood, as we just described it, as presenting one's own position relative to positions of others in order to persuade or convince an audience. But among discourse synthesis researchers there is also interest in arguments that take an integrative position when there are two opposing views (e.g., Mateos

et al., 2018). We return to this conception when considering pedagogically oriented research into discourse synthesis.

Contrastive studies involving argument

A major means of studying argumentative writing from multiple sources has been through contrast: seeing differences between argumentative writing and writing that is informative instead of persuasive. The nature of arguing from sources becomes more visible when it is contrasted with performance for another task, showing differential use of the same source texts and differences in the transformative operations that are made. Although differences have been seen in temporal facets of the process (e.g. Vandermeulen et al., 2020), we center this review on textual factors, where much of the attention has been directed. Contrasts between arguments and informative texts began with three synthesis studies conducted in the 1990s, which analyzed transformations relative to text organization, selection of content (source content versus self-generated content), and connectivity of content within the syntheses. First was Greene's (1993) inquiry, conducted as part of the CSWL research, for which major findings related to organizational transformations. For this study, situated in an undergraduate history course at a U.S. university, students received contrasting assignments, both of which required writing syntheses from multiple historical documents over a period of several days. The students were asked to write either a report, presenting issues regarding a particular initiative, or an argument (called problem-based essay), proposing modifications in the initiative. Almost all report-writers organized their texts with a collection pattern holding together a set of issue discussions, whereas all argument-writers employed a problem–solution pattern to structure the content (which was both source content and self-generated content) as they described problems in the initiative and proposed solutions. Thinking-aloud data from the latter group indicated that they interpreted their task as presenting their view and supporting it by "weaving source information and prior knowledge" (Greene, 1993, p. 62).

A few years later, Wiley and Voss (1996, 1999) reported results of two related studies into similar tasks. Their undergraduate participants at another U.S. university were to "play historian" by writing like historians from multiple historical documents. These writers were asked to use the sources, at a single sitting, to produce either an informative text (a narrative, a history, a summary) about a historical period or an argument presenting reasons for a historical development that occurred during that period. As in Greene's (1993) research, a notable finding in both Wiley-Voss studies was in text organization: Different text patterns were employed by those writing arguments versus those writing the informative texts. Whereas writers of informative texts tended to provide chronologies as they assembled content linearly from the various sources, those writing arguments produced more texts with a causal pattern (i.e., cause-effect), since, in presenting a position and supporting it, they were arguing causes for a particular effect. As to selecting content, in both studies the argument writers who wrote from multiple sources included larger numbers of causative explanations that supported their claims, and in the second study they also included more integrative content (i.e., content units from more than one source

or combined with self-generated content). As to connecting, in both studies the argument writers provided more links of various kinds (e.g., conjunctions, temporal links, causal links, correlations) within the content than did those writing informative texts.

These contrastive studies were precursors to the rapidly expanding international research into multiple-text reading, referred to earlier, which is largely grounded in the documents model framework, as it has been elaborated. Much attention in this body of work has gone to contrasting tasks employing source texts. Although the central concern is reading comprehension, assessed in various ways, of most relevance to the current review are the post-reading written responses, to which we also referred earlier. These have often been an argument and some other form of informative writing, as in Greene's (1993) and Wiley and Voss's (1994, 1999) research. The informative text is often a summary (which means a summary of the totality of the content across sources, not single summaries of individual source texts), but in the case of history the alternative task might be narrative/chronology. For this article, we can present only general findings from this large body of contrastive research that are most relevant to our discussion, and our readers are referred to reviews for more detail (e.g., Bråten et al., 2020; Wiley et al., 2018). So, to summarize, we would point out that most findings from analyses of post-reading written responses tend to accord with, and to extend, conclusions from Wiley and Voss's (1996, 1999) early studies. Argumentative tasks have resulted in more integration between one's own ideas and source content, more integration among source texts, and more explanations from causal reasoning to support one's position, whereas informative tasks have elicited more use of source content (e.g., Bråten, et al., 2011; Le Bigot & Rouet, 2007). However, as shown in Barzilai and Strømsø's (2018) review, important individual differences moderate general findings. These differences include individuals' prior knowledge of the reading-writing topic (Gil et al., 2010; Tarchi, 2021) and their epistemic beliefs regarding the nature of knowledge (e.g., its complexity and its certainty) (e.g., Bråten, Britt, et al., 2011).

In addition to exploring task differences and individual differences, this research into multiple-text reading contributes substantively to discourse theory by highlighting factors that are relevant not only to argument but also to other kinds of academic literacy. These include intertextual relations among sources (Salmerón et al., 2010) as well as source attributes (e.g., author and publication information) and source quality (e.g., trustworthiness and bias) (Barzilai et al., 2015).

Overlapping source-based genres

For the process of writing from multiple sources, research attends largely at the present time to argument for persuasive purposes, but also of much significance in the discourse synthesis terrain is informative writing. When moving into the realm of informative discourse, one encounters multiple academic genres that are intertwingled, as we said previously. This is the case because forms of academic writing have been variously classified and categorized in theoretical conceptions (e.g., Britton, 1970; Kinneavy, 1971) and contrasting labels have been applied. As List et al.

(2019) have shown, students, even at the university level, have difficulty distinguishing what is meant by particular labels. Complicating all this is what Pedhazur and Schmelkin (1991) have called the *jingle/jangle fallacy*. The jingle fallacy is making the assumption that, just because two things have the same name, they are the same. And the jangle fallacy is making the assumption that, just because two things have different names, they are different. We do not claim to solve the genre identification issue, but this jingle/jangle notion, as Littell (2018) has suggested, can be helpful in thinking about it. This notion helps us—and, we hope, our readers—understand the overlapping academic genres to be discussed. Earlier we described a source-based genre that is common in school settings, an informative report addressing a single topic, as studied by Spivey (1984) and Spivey and King (1989), and now we consider other forms of informative writing that have been of major interest to discourse synthesis researchers: research papers, literature reviews, and comparative essays.

Research paper: Approaches to the task

Quite familiar in secondary education and higher education is the *research paper*, which is also sometimes called *term paper*, *seminar paper*, or *course paper*. These seem to be so similar and to overlap to such an extent that it would probably be the jangle fallacy to consider them distinct genres. As extended writing, the research paper has a major place internationally as a school genre in secondary education and higher education (Folman & Connor, 2005; Kruse et al., 2016; Samraj, 2004). Most typically, as with the kind of informative reports we studied (Spivey, 1984; Spivey & King, 1989), it is organized with a collection pattern holding together a set of subtopics. However, a research paper might be an argument or something else, depending on context as well as task, task interpretation, and writer's goals. This variability in form led Larson (1982) decades ago to argue that the research paper was a "non form"—"no distinctly identifiable kind of writing" (p. 813). A central feature, though, is the emphasis on library research, which is today usually accomplished online.

In synthesis studies investigating writing of the research paper, major attention has gone to different approaches taken to performing the task—how writers, over the course of producing their papers, interacted with source texts and how they transformed content drawn from them. In these inquiries to be discussed now, participating writers chose their own topics and located their own sources. Of much interest to those conducting this research have been artifacts now called *mediating documents*, which are composed of notes from the sources and also sometimes written plans. Along with the completed texts, these are examined for their extensiveness and the extent to which writers manipulate content included in them. Data sources used in these studies have not only been writers' written artifacts but also their self-report accounts of their process through interviews or process logs (where they kept track of, and reflected on, what they did and what they were thinking at particular points). J. Nelson 's (1992) and J. Nelson and Hayes's (1988) interrelated CSWL inquiries at a U.S. university identified a *high-investment approach* taken by some students, who engaged extensively with their sources and with their notes. These students interrelated ideas across sources, organized and reorganized, and

deliberated what to include in their papers. Their approach, which seemed to pay off in higher scores on holistic ratings of the papers, contrasted with a *low-investment approach* in which writers located "enough" sources (in some cases, just three) and from each source took notes, which remained separated by source. In this approach, writing was a matter of putting notes together, almost intact and still separated by source. In another investigation of research paper writing (actually research *booklet* writing) with Scottish adolescents, Many et al. (1996) found some students taking a *transforming-information* approach that had similarities to the high-investment approach mentioned above. In taking notes and manipulating them, these Scottish students made transformations as they considered what would appeal to, and would be appropriate for, their audiences and what they could present in an interesting and accessible way. They were thus concerned with the knowledge-transforming elements, especially goals and audience, that were described by Bereiter and Scardamalia (1987). Students taking other approaches were concerned almost solely with the informational content itself.

These two studies pointed to differences in the extent to which writers engaged with—and transformed—the source material for use in writing their research papers, especially with respect to the mediating documents. A third inquiry, in which Kirkpatrick and Klein (2016) studied Canadian twelfth graders writing from the Internet, provided a different kind of contrast. Whereas the prior inquiries had focused on *how* transformations were made, attention in this study was on *when* the transformations were made—their temporal distribution. Through screen captures and think-alouds as well as interviews, the researchers found a *mediating-document* approach and a *direct-writing* approach. The former entailed creating mediating documents through note taking and also subjecting the notes to much change. As with the high-investment writers in J. Nelson's (1992) and J. Nelson and Hayes's (1988) research, a good part of the synthesis process took place with those mediating documents. In contrast, the approach of students who wrote their electronic texts directly from the sources was characterized as "interleaved drafting and researching" (p. 30). These writers (whose synthesis process is of much interest to us) tended to employ an internalized global plan for text organization and to select content on an as-needed basis. When they saw that they needed more information for a paragraph, they would search for it. For these writers, there were no mediating documents; each writer produced only one evolving document.

The high-investment approach, the transforming-information approach, and the mediating-document approach—all are characterized by transformations of source material when writers create and manipulate mediating documents composed of notes from source texts. In contrast to these approaches, Kirkpatrick and Klein (2016) also identified that direct-writing approach. Ordinarily the idea of writing directly from electronic sources would raise concerns that writers were merely cutting and pasting. But for the students in this study, the direct-writing process was more complex than cutting and pasting, and it worked for most students who employed it. It seems that Kirkpatrick and Klein have pointed to an approach to writing from electronic sources that deserves more research attention, especially since students today are so competent with technology and so accustomed to electronic platforms. Now, before moving on from our discussion of the research paper,

we should say something relevant to the jingle fallacy: The research paper we have just discussed should not be confused with another form of writing sometimes called *research paper* but probably is more often called *research report* and, for publishing scholars, *research article*. The latter is a report based on original empirical research rather than library/Internet research.

Literature review: Engagement and authority

We move now to a related genre of academic writing, the literature review, which serves important functions in scholarly academic forums and also in the lives of advanced university students. It overlaps with the research paper in the central role played by library or Internet research and might be included in the same genre family. But the term *literature review* typically refers to scholarship that is embedded to a greater extent in disciplinary discourse and is performed by those who are, or are becoming, immersed in the conversations of their discipline. By means of this scholarly text, writers seek to demonstrate some authority over an issue or topic. It is a means for them to demonstrate their "knowledge of academic lineage" as well as their "allegiances, positioning, and authority" (Badenhorst, 2018, p. 59). In performing a literature review, a writer must synthesize, analyze, and evaluate a body of knowledge and reach a conclusion that purports to be a contribution. For publishing scholars, the literature review might be a journal article or a book chapter; but, for students, especially graduate or advanced undergraduate students, it might be a qualifying paper or a chapter in a thesis. Although intertwingled with the research paper, the literature review tends to be a more substantive piece, addressing in more depth an issue in one's academic specialization.

Discourse synthesis in the writing of a literature review was investigated by Segev-Miller (2007) in an inquiry conducted over two semesters with advanced Israeli undergraduates. For these students, the literature review was a concluding requirement for a body of specialized coursework. They chose their own topics and located their own sources, and they also provided data through process logs, think-alouds, and interviews as well as their drafts. Segev-Miller's analyses show how the operations of discourse synthesis—organizing, selecting, and connecting—tended to be performed recursively and often in tandem. Particularly important facets of the process were *conceptual restructuring,* which included writers' making intertextual connections by means of macropropositions that subsumed claims from two or more source texts, and *rhetorical restructuring*, which included summarizing and reorganizing. In addition, there was also *linguistic restructuring*, which was employing linguistic resources to achieve connectivity within the content through such means as lexical repetition. All show strategic maneuverings that can take place as writers deal with different perspectives, interrelate them, and point to, and sometimes resolve, agreements and disagreements among sources—and, thus, project authority over their sources. In doing so, writers position themselves as knowledgeable scholars who have contributions to make. This contrasts dramatically with the single-source stacking approach that J. Nelson (1992; J. Nelson & Hayes, 1988) called "low-investment" for some research paper writers.

Here, once again, to avoid the jingle fallacy, we point to a form with the same name: a literature review that does not stand alone as a discrete text but functions as an introductory element in a research proposal, research article, master's thesis, or doctoral dissertation. Keeping in mind that genres do things, we would suggest that function can be a means of distinguishing between the literature review discussed above and the literature review that serves as an introductory section of a research report/article or proposal. When becoming part of one of those other texts, the literature review becomes a component of an argument. It functions to help set up the problem that the other portion solves.

Comparison: Symmetry and balance

Comparison is an organizing pattern for texts and for parts of texts associated with various genres (Meyer & Freedle, 1984), including research papers and literature reviews, two genres already discussed. Thus, we could have dispersed this pattern across genres, but, because of the prominence of writing *the comparison* in educational practice (e.g. Kavytska et al., 2021; Savage & Mayer, 2006), we are here treating it as a genre. Writing a comparison, whether a comparative report or comparative essay, can present challenges, particularly with respect to the operation of organizing, since the text can be structured in a number of ways (Hammann & Stevens, 2003; Kirkpatrick & Klein, 2009). Major ways are by object (the things, people, or ideas being compared); by aspect (the features or dimensions on which they are compared); and by similarities and differences (similar aspects presented separately from different aspects). As shown in previous discourse synthesis research (Spivey, 1991), a need for balance and symmetry in this pattern can influence writers' selection of source material and also the generation of additional content regarding the objects being compared. An illustration comes from a study reported in *The Constructivist Metaphor* (Spivey, 1997), which was set in an undergraduate-level course in developmental psychology at a U.S. university. Asked to write reports based on multiple scholarly articles on the topic of perspective-taking, a number of students organized their reports as comparisons instead of using the anticipated collection pattern. These students, making intertextual inferences regarding similarities and differences among the source text authors, organized the authors into "camps": Piaget supporters versus Piaget opposers. And, drawing from their disciplinary knowledge, they did this even though Piaget was not the author of any of the sources. He was, however, mentioned and often cited (but not always) within them. The overarching comparison pattern was influential in constraining which source content was relevant and also what content writers generated relevant to the topic, since writers needed some degree of symmetry and balance in presenting the two camps. As Coe (1987) observed, form fills a heuristic function: It "creates a desire to find what might fill it" (p. 17).

The EL2 specialty areas will likely see increased attention to comparison, since the writing of comparative essays seems to be elicited by the integrated assessment in the Educational Testing Service's TOEFL ibt®, a widely used test of fluency in English. This assessment employs a discourse synthesis task, including reading, listening, and writing, which has been studied intensely by Plakans (e.g., 2009; H.-C.

Yang & Plakans, 2012; Plakans & Gebril, 2013). Test-takers are asked to interrelate positions from two sources by reading a brief text on a particular topic, listening to a lecture presenting a different view on that topic, and then producing an essay regarding what each source said about the subtopics addressed. This seems like a comparative essay, and even criteria for the highest score suggest this form by saying that, to achieve this score, the writer "successfully selects the important information from the lecture and coherently and accurately presents this information in relation to the relevant information presented in the reading" (ETS, 2021). One should note that not all of the newly developed integrated assessments from various publishers have the same kind of task. For some exams, test-takers are expected to read two texts presenting different opinions on a topic, summarize them, and then present their own opinion. So, for those tests, the text to be written is more an argument than a comparison. Differences across the various assessments raise questions about their comparability for making judgments about linguistic fluency (Homayounzadeh et al., 2019; Zhu et al., 2021).

Hypertext, multimodality, and a multiplicity of genres

Earlier we quoted Lemke (2005) for his explanation of genre. Here we return to Lemke for a point he also made in the same article almost two decades ago: "Genres are not what they used to be" (p.45). He was addressing the shift to multimodality and the resulting adaptation of print genres to the Web. He was also referring to the hybridiziation of conventional genres with electronic genres and to the emergence of new electronic genres (cf. Luzón & Pérez-Llantada, 2019). Multimodality has introduced new terminology that should be relevant to future discourse synthesis research, including *semiotic resource*, which can apply to source content in modes other than language. Playing a major role in the move to multimodality is hypertext, which encompasses hypermedia and is a computer-assisted way to produce various genres but is not a genre itself. When it first appeared, hypertext received much hype for disrupting author-reader relations—diminishing authorial guidance and transferring more power to the reader (Landow, 1992). Today the author is not gone, but the nature of composition has changed when hypertext is employed.

In composing with hypertext, authors create components called *lexias* (also called *nodes* or *blocks*) as well as links among them. Those operations of organizing, selecting, and connecting that we have described for discourse synthesis would apply to authoring hypertexts too. As to organizing, a writer can approach the task with an overall plan, perhaps tentative and subject to change, or a plan may emerge over the course of creation. As to selecting content, the component lexias would likely include content tied to diverse source texts or to other kinds of artifacts, or they could be entire texts that are incorporated, that is to say, *transcluded*, through hyperlinks (T. Nelson, 1982). Most important is connecting, which operates topographically, although it can also function hierarchically to signal the relative importance of particular material. In contrast to writing that is more linear in nature, the multilinearity of hypertext requires a different way of thinking about discourse. Consider, for instance, trying to present a convincing argument in a nonlinear way. As Carter

(2003) noted, it would be difficult in hypertext to employ a "brute force" approach to convince readers. Although there is much to learn about hypertext with respect to elements of the discourse synthesis process, as noted almost two decades ago (S. C. Yang, 2002), inspiration comes from some recent work being conducted in the Netherlands. Braaksma et al. (2018) have pointed to interesting contrasts between linear writing and multilinear writing; Braaksma et al.'s (2007) earlier study had shown more planning and analyzing when participants composed multilinearly in hypertext than when they composed for linear texts. Studies continue to present a complex picture of differences between linear writing and writing with hypertext, particularly with respect to performance of student writers differentiated by writing ability and content knowledge.

Genre sets

Research thus far provides glimpses into the kinds of transformations that characterize discourse synthesis in various academic genres: arguments, research papers, literature reviews, and informative reports and essays, including comparisons. Even though hypertext is not a genre, we have included it in this discussion, since it is a means of producing syntheses. Hovering over this treatment of discourse synthesis is the notion of intertextuality, which was a major breakthrough in theorizing communication. But here we point to the notion of *intergenre-ality*, which is also relevant, as we think that new understandings can come by investigating how synthesis texts themselves become components in aggregations of interrelated texts. The conception of *genre set*, which seems particularly useful for research in discourse synthesis, was developed by Devitt (2004), who claimed that texts are not only intertextual but are also intergenre-al, since genres overlap. Intergenre-al relations provide another way of seeing textual transformations—seeing "genre forms in action" (p. 44). An example helps clarify how this might work. Consider how a doctoral student's literature review changes as it moves across conventional genre boundaries: a course paper, a qualifying exam, the dissertation, a PowerPoint presentation, conference papers, and a published research article. Textual transformations would take place as genre changes. Although this is an example for a doctoral student, the concept would be relevant for writers who are in different circumstances. Further knowledge about students' synthesis writing and their development as writers can come from analyzing such sets of interrelated texts filling different genre functions. To continue to think beyond textual boundaries, one must begin to learn about the textual transformations that take place as a particular synthesis text "moves on"—as so many do.

Product and process: Which research methods are applicable to studies of discourse synthesis?

Our mapping of discourse synthesis research attends now to research *method*. But, in discussing method, we must give some attention to *methodology* by considering epistemological assumptions regarding how "a specific method 'captures' the 'object' of study" (Tuchman, 1994, p. 306). A researcher's assumptions are reflected in the "objects" that are not studied as well as in those that are, since researchers make choices about "what counts." Epistemic assumptions are implicit in the questions that are asked, the procedure that is employed, and the kinds of data and analyses that are needed. Research approaches to investigating textual transformations in discourse synthesis can be described in terms of two categories that have, for a long time, been employed in writing research (although they overlap): those that are text-based and those that are process-tracing. After reviewing both, we conclude this section with a brief discussion of the source issue: how in some studies source texts are provided to participants and in other studies participants employ sources that they find themselves.

Text-based approaches

Text analysis, which has played and continues to play a major role in discourse synthesis research, has entailed analyzing texts to see transformations that have been made. For decades it has been a major tool for studying reading comprehension, and it is, of course, central to a study of writing. A major epistemological assumption in this research continues to be that texts, as artifacts, can provide insights into the cognitive process from which they resulted and also into the social practices in which they are embedded (N. Nelson & Grote-Garcia, 2009).

Traditional text-based approaches

In conducting text analyses of source-based writing, decisions must be made about the units to be identified, classified, and, most likely, also counted. For some of the discourse synthesis research, as shown above, this has meant parsing source texts and syntheses into content units so that the researcher can perform classifications and counts. In those initial studies (Spivey, 1984, 1991; Spivey & King, 1989), which employed small semantic units called propositions, analysts could classify the origin of content included in the syntheses as either source content (sometimes called borrowed) or writer-generated content (sometimes called new or added). After those initial studies, much of the research employing text analysis has used clause-like syntactic units or even sentences as content units. These larger, syntactic units can include combinations of generated and source content or combinations of content from different parts of a text or from different texts. (e.g., Wiley & Voss, 1996). Units combining content from different origins are often called transformed. Detailed parsing of entire texts into small units is employed by researchers who are interested in the totality of content offered by sources and of content included in

the syntheses. Sometimes, though, researchers are interested in a specific facet or feature and would thus not conduct detailed text analyses. So, instead of the detailed parsing, they would perform targeted searches in the syntheses for particular elements, for instance, causal words or phrases.

For studying text organization, we have found Grimes's (1975) rhetorical relations, as operationalized by Meyer (1975) and Meyer and Freedle (1984) to be most useful. Meyer and Freedle pointed to five major global text patterns, four of which we noted in the research reviewed above: collection, problem–solution, cause-effect, and comparison. There is also description, which co-occurs with other patterns in providing more detail or specifics. For analyzing connectivity, the major issue is what Lybbert and Cummings (1969) termed "fixed interdependence and non-autonomy of parts" (p. 35), and numerous approaches have been applied to this facet of textuality. Early research (Spivey, 1984; Spivey & King, 1989) employed thematic overlap as well as a reader-based measure, for which higher ratings came from fewer perceived breaks in connectivity. Much of the research in the writing of arguments has considered various kinds of logical connectives, including causal, contrastive, additive, and temporal (e.g., Wiley & Voss, 1999). Also contributing to connectivity are the linguistic units that were called macropropositions by Segev-Miller (2007), since they interrelate different perspectives. Deserving more attention, we think, relative to connectivity, are linguistic devices that writers generate to (smoothly) incorporate source material through paraphrase, summary, and direct quotation into their own texts. We discuss the latter in a subsequent section when considering transformative reuse of language.

It seems that text analyses should also give more attention to author—the authors of source texts with whom a writer engages. Citation analysis has long been a major analytic element in studies of academic writing (Cronin & Shaw, 2002); and, for academic writing, citations provide some evidence of which authors and which texts were significant as writers create their own authorial identities (N. Nelson & Castelló, 2012). The intertext model of the documents model framework, which is associated with the multiple-text reading research, draws attention to important author-related elements, and it provides a conceptual scheme for studying author, including the author's credibility. The intertextual relations identified by the documents model framework would also be useful for naturalistic studies of discourse synthesis over longer periods of time, especially in terms of writers' self-positioning within disciplinary debates.

Computer-assisted approaches to text analysis

Researchers have access to computer-based tools that provide for more efficient analysis of source texts and synthesis texts and can also produce summaries, categories, and clusters. Elements within the texts can be identified, tagged, counted, and represented visually. Already in use is computer-assisted content analysis applied to texts associated with various genres, for which a researcher creates a dictionary, or codebook, including predetermined elements that are automatically tagged and counted. There are even specialized tools available for automatic analysis of text features most relevant to discourse synthesis, such as features related to connectivity

(e.g., Crossley et al., 2016). And numerous features of academic writing can be analyzed with Docuscope, a dictionary-based tagger for words or sequences of words (Ishizaki & Kaufer, 2012; Wetzel et al., 2021). This text-parsing tool has millions of items arranged into 36 rhetorical clusters. These clusters include multiple ways of analyzing such matters as citations, reporting verbs, cohesive markers, negative-perspective wording, and positive-perspective wording. Also seeming to have potential for research in discourse synthesis is a new algorithm for analyzing arguments based on multiple sources that identifies and classifies transformed elements (Raković et al., 2021). Most approaches attend to linguistic items, but, as texts become increasingly multimodal, approaches have been developed for analyzing multimodality, and numerous software tools are available (reviewed by Ledin & Machin, 2020).

Process-oriented approaches

Although understandings of the synthesis process can come through text analyses, there are other research approaches that are considered to be process-trac*ing* methods. Some are concurrent, and others are retrospective. A major assumption in concurrent approaches is that, despite the researcher's intervention, the process is not distorted significantly; and a major assumption in retrospective approaches is that reflections and memories, even after time, still have validity regarding the process.

Traditional approaches to process-tracing

A favored and much-used research method for many researchers seeking to understand the writing process, has been—and continues to be—the thinking-aloud procedure, also called concurrent verbalization (e.g., Ackerman, 1991; McGinley, 1992). It was employed in a number of studies of synthesis writing in various discourse forms discussed thus far in this article. Justification for employing thinking-aloud was made early on by Ericsson and Simon (1980), cited above, who argued that it provides access to a cognitive process as it transpires, and thus it can be contrasted with verbalizations that are retrospective. Guiding the thinking-aloud studies today are theoretical conceptions of the writing process, including those of prominent North American theorists who established it as a major approach to writing research, including Hayes and Flower (1980; Flower & Hayes, 1981), Bereiter and Scardamalia (1987), and Kellogg (1999) as well as theoretical perspectives coming from Europe (e.g., Torrance & Galbraith, 2006). Although thinking-aloud provides information about cognitive as well as temporal facets of writing, an ongoing issue has been reactivity (Smith & King, 2013): Does the research approach change the process? Often cited in response to that question is Ericsson and Simon's (1980) claim that thinking-aloud does not change the essential nature of the process, even though it does slow it down. A recent inquiry, cited above, by Tarchi (2021), conducted with Italian university students, showed no significant differences between source-based arguments that were written in a thinking-aloud condition and those that were not, although thinking-aloud may have affected students' assessments

of the source documents' trustworthiness. Thinking-aloud continues to be a major approach, often in combination with other methods (e.g., Escorcia et al., 2017).

As also shown in some research cited above, insights into the discourse synthesis process can come retrospectively through interviews with writers. These often take the form of stimulated recall, in which interviewees look at features of their writing while being questioned about their writing process (Greene & Higgins., 1994). Even though these interviews are more distant in time and more subject to reflection than thinking-aloud, they seem to be useful for eliciting the reasons that writers made particular transformations. For instance, how in using source material do writers distinguish between what should be paraphrased instead of quoted? Through interviewing EL2 undergraduates in Canada, Shi (2010) learned that these students were more likely to paraphrase instead of quote directly when they thought that they could adequately rephrase someone else's words. Another way to elicit introspection as the text evolves over time is an approach we mentioned earlier, the use of process logs in which writers record on a regular basis how their process has transpired (e.g., J. Nelson, 1992; J. Nelson & Hayes, 1988; Segev-Miller, 2007). Process logs seem to be particularly useful when writers are engaged in long-term projects, such as research papers and literature reviews, and when the sources vary across writers. Log entries, which typically include reflections on one's progress in writing, are self-reports of strategies, successful and unsuccessful, that were employed in performing the task.

Even though methods may be considered process-tracing, it is important to consider the ways in which process data become products. Concurrent or retrospective oral verbalizations are entextualized into typed protocols, and entries from process logs become time-stamped records. A researcher conducts analyses of these documents for elements of interest and, at some point, makes purposeful selections from them for illustration in reporting the study. King and Stahl (2015) have shown how discourse synthesis occurs in the writing of oral histories and psychotherapeutic discourses, since the process in which the author engages requires "blending" and "braiding" participants' transcribed verbalizations with his or her own interpretation.

Computer-assisted approaches to process-tracing

The above-mentioned process-tracing approaches continue to be used, but, as with text-based approaches, there are now computer-assisted possibilities. With electronic writing, writers' moves can be traced through such means as screen captures as well as histories of browsing from search engines. But there is also keystroke logging, which is both a text-based approach and a process-tracing approach (Baaijen et al., 2012; Leijten et al., 2019). It not only saves changes in the evolving text but also yields a record of the actions of the writer. By reading printouts from the logging data, one can replay the act of composing—seeing what was done and in what sequence it occurred. For example, in a study with secondary Dutch students, cited above, Vandermeulen et al. (2020) contrasted the temporal distribution of cognitive activities when students wrote arguments versus informative reports from sources. Successful argument writers spent considerable time, early in the process, in making transitions between the sources and their own texts, whereas successful report

writers made many transitions, early in the process, between the different sources. But why did they perform differently? As the researchers pointed out, the data do not provide answers. With keystroke logging, a major issue is interpretation—understanding the reason for a particular action or inaction. For example, a pause might reflect planning, revision, or rereading, or it might reflect difficulties in understanding a source text (Baaijen et al., 2012). Also being employed but to a much lesser extent in discourse research is eye tracking, which is the recording of eye gazes and movements. Eye location can, with more precision than keystroke logging, capture the portion of a text (whether a source text or writer's own text) to which the writer is attending. But, like keystroke logging, eye tracking does not provide answers to questions about the nature of cognitive processing associated with pauses or particular moves (Andersson et al., 2006). Even when used together, keystroke logging and eye tracking present an incomplete picture. So one or the other or both can be combined with retrospective interviews or some other kind of verbalization (e.g., Révész et al., 2019). As noted by Wengelin et al. (2019), by combining research approaches, "one data set is used to support or deepen the analysis of the other" (p. 43).

The source text issue

Thus, varying research approaches can be—and are—used to study synthesis products and processes, with different approaches addressing different facets. We close this section by mentioning another distinction that can be made regarding research method. As our readers have, no doubt, noted, discourse synthesis research includes studies in which participants are given a set of source texts to employ in writing their syntheses and also studies in which participants locate and select their own sources. The later is usually performed through Internet searches, often including library databases, but sometimes many sources may be accessible in a very large hypertext provided by the researcher (e.g., S. C. Yang, 2002). Although there may be some disagreement as to which kind of inquiry is "better," we would argue that both designs provide valuable but different kinds of understandings relative to discourse synthesis and to the forms of academic writing. When all participants have the same source texts, it is possible to see rather clearly how the sources are transformed under the influence of a particular factor. In much of the research, the factor has been a task variable associated with genre, but it can also be various other factors. In contrast to information from studies providing the sources, different kinds of information are gained from inquiries in which writers have freedom to select sources. In the latter, more attention is given to variability across individuals, especially when findings are reported as case studies. Both approaches contribute to understandings of writers' interactions with their sources and the transformations they make to create their own texts.

Instructional approaches: How can discourse synthesis be taught?

Last to be traversed in the terrain are instructional approaches intended to facilitate students' discourse synthesis. The process is known to present challenges to students at various levels of education and with varying familiarity with the academic tasks to be performed (e.g., Cumming et al., 2016; Lenski & Johns, 1997; Solé et al., 2013). How can discourse synthesis, or elements of it, be taught? In this section, we present findings from instructional research. First we review selected studies into specific genres that illustrate ways in which strategy instruction is being provided, and then we center on the teaching and learning of two facets of discourse synthesis receiving special attention: intertextual connections and transformative reuse of language. Because our treatment is limited in scope and length, readers are referred to previous reviews, which include those authored by Van Ockenburg et al. (2019) and Barzilai et al. (2018).

Form- and process-oriented pedagogy

When considering the teaching of writing, educators often distinguish between genre approaches and process approaches. Genre approaches, directed to textual form in written communication, attempt to demystify, for students, the ways in which language is used to create particular kinds of texts (Hyland, 2007). In the past, a genre approach had its focus almost solely on textual products, pointing to specific textual features and showing exemplars. But now approaches emphasizing form most often incorporate process-oriented elements attending to cognitive processes as well as social. In the following descriptions, we highlight cognitive strategies that have been taught, but should point out that all the interventions we now discuss included social elements to support students' learning, such as modeling and collaborative practice. This subsection, organized by genre, includes some interventions conducted with precollegiate students and others with university undergraduates.

Attention to argument

We begin with argument, which plays an increasingly important role in educational practice as well as research. Back when the spotlight was first directed to source-based writing in the U.S., Kaufer et al. (1989) and Higgins (1993) created instructional approaches for university students' arguing from sources, which included breaking down the sources and perceiving relationships among them to create and support a position. Although arguing from sources has not, until recently, been central in the precollegiate curriculum, we do want to call attention to an early inquiry, conducted by Young and Leinhardt (1988), which continues to be significant. These researchers traced instruction for a class of high school students learning to write the kind of document-based arguments required for the advanced placement examination in history. High scores on the exam, administered in the U.S., could give them college credit while they were still in high school. Their teacher's approach was solidly grounded in a view of historians as authors and of students as writers learning

to author historical arguments. She sought to have her students use the primary sources and engage in "developing a thesis and selecting, organizing, and connecting relevant ideas to create a text that makes claims and cites supporting evidence" (p. 35). But despite her coaching as well as responses to their writing, the students did not make the progress that was anticipated. Young and Leinhardt suggested that they would have benefitted from more specific attention to the genre itself and to the synthesis process. Specific attention—explicitness—characterizes many of the interventions receiving attention today, which we review now.

Explicitness can be seen in interventions conducted since Young and Leinhardt's (1988) inquiry that also address students' arguing from sources. They include a reasoning approach, a prompting approach, and an integrating approach. De La Paz and Felton's (2010) historical reasoning strategy, employed with U.S. secondary students, focused on four elements that they should consider when analyzing a controversial historical issue: (1) source text authors' credentials, (2) the authors' positions, (3) contrasts between authors' positions, and (4) evidence. The first element of the four encourages an informed approach to selecting sources, and the other three address positioning and support for positions. These elements, which are associated with reading, are all also relevant to composing one's own argument in relation to what the source text authors had claimed. In writing their arguments, students determined their position on the issue and then selected and ordered ideas to support it. Comparisons of arguments written by those who received this instruction with those written by those who did not showed beneficial effects of the reasoning intervention. Most notable were increased use of the sources and elaboration of claims and rebuttals. Whereas De La Paz and Felton's intervention centered mainly on the critical reading of sources, the prompting strategy of Klein et al. (2017) was directed more specifically to construction of the written argument itself. The middle-grade Canadian students in their study were given prompts, either content prompts or rhetorical prompts, as they took positions on controversial scientific issues and argued for their positions. Whereas content prompts encouraged writers to include relevant source information, rhetorical prompts asked writers to provide the following specific elements of an argument: "several reasons for [their] opinion, an alternative claim, reasons for the alternative claim, and a counterargument to the alternative claim" (p. 295). Differential effects were shown for the two kinds of prompts. Predictably, the content prompts contributed to inclusion of more detail, but it was the explicitly stated rhetorical prompts that led to arguments rated higher for persuasiveness, which included more complex propositions. One should keep in mind that both interventions—historical reasoning and prompting–were developed for students who were just beginning to write arguments from sources.

With explicit instruction like the reasoning approach and prompting approach, students can be taught ways to begin to write source-based arguments presenting their own positions on controversial issues. However, an intervention has been developed, influenced by Nussbaum and Schraw (2007), that has its focus not so much on development of one's own position but on integration of two contrasting positions presented by others. In some rhetorical situations an integration of two opposing views is what is needed. Research conducted in Spain by Mateos et al. (2018), Granado-Peinado et al. (2019) and Casado-Ledesma et al. (2021) had

university undergraduate students employ certain strategies in writing integrative arguments from a pair of source texts presenting contrasting perspectives. Strategies, applied recursively, included "arguing in support," "integrating by refuting," "integrating by weighing," and "integrating by synthesizing" (Mateos et al., 2018, p. 126). Employed in the studies was a written guide for recording relevant elements and selecting content for one's conclusion. But the crucial explicit instruction, confirmed across studies, came from a video-modeling element that showed students how to use text-to-text analysis to produce an integrative conclusion.

Attention to the literature review

Two lengthy (months-long) interventions designed to support writing of the literature review were Segev-Miller's (2004) inquiry with teacher education undergraduates in Israel and Boscolo et al.'s (2007) intervention with psychology undergraduate students in Italy. In both, students wrote on topics within their discipline based on disciplinary texts that were provided to them. Segev-Miller's intervention emphasized specific strategies for planning, revising, and assessing but—most importantly—included strategies for transforming the source material. These related to elements that Segev-Miller (2007) detailed in the study discussed previously: interconnecting content from different sources, changing the structural form of source material, and making linguistic changes. Explicitness relative to synthesis text itself came largely through criteria students were given for assessing their own writing, which related to organizing, selecting, and connecting: "appropriate rhetorical structure," "elaboration," and "explicit cohesion" (p. 12). Process logs kept by the students showed that they placed great value on explicit instruction of strategies as well as the explicit criteria that they were given for their writing.

As with Segev-Miller's instructional approach, Boscolo et al.'s (2007) intervention included explicit instruction in the literature review genre, which included illustrations with good and bad exemplars, as well as much demonstration and practice in writing this kind of text. Boscolo et al. saw improvement in most textual features of students' writing, including organization, connectivity, and extensiveness of content; but there was not improvement in all. Specifically, the students did not produce the kind of intertextual connections that the researchers had sought—and that Segev-Miller had emphasized as well. From our perspective, this negative finding of Boscolo's intervention can be seen as a major contribution. Although disappointing to the researchers, it highlights integration between and among sources as a challenge—perhaps the major challenge—of discourse synthesis. It emphasizes a need for more attention to this facet of writing, and it also provides a segue to our review of interventions centered specifically on intertextual connections, which comes later.

Attention to informative reports

Whereas literature reviews are associated with higher education and academia, informative reports are quite common in varying contexts in and out of education. They are familiar as a school genre at precollegiate and collegiate levels. Here we point to two interventions supporting report writing that have acronyms for

strategies that were taught: IPAN in one and SWSL in the other. With the full name Information-Aspect-Paragraph-Number, IPAN was created by Kirkpatrick and Klein (2009) to help students organize source-based comparisons, which can be challenging, as discussed earlier. Canadian eighth-grade students participating in this intervention employed the IPAN heuristic to sort source content into objects (the items being compared) and aspects (features on which the objects might be compared) and to determine a possible order for presenting objects and their aspects. This detailed approach to organizing content, which was taught through such means as modeling and textual analysis, was the basis for plans students generated to guide their writing. Use of the strategy resulted in more effectively organized texts that more clearly communicated comparison. The other instructional intervention, which featured SWSL, with the full name Strategies for Writing Syntheses to Learn, was conducted in Spain by Martínez et al. (2015) with sixth-grade students. Emphasizing self-regulation (Graham & Harris, 2006), this program targeted source-based writing by teaching students to employ five strategies. "(1) selecting important ideas from the source texts, (2) elaborating on the information, (3) organizing the content, (4) integrating prior knowledge with new knowledge, and (5) integrating information from both source texts" (p. 281). These strategies appear here in a numbered list, but they were taught recursively and in an integrated way with a variety of methods, which included modeling and use of a written guide. Students wrote informative reports, most likely topical reports of the type we had studied (Spivey & King, 1989), but the strategies would seem to be useful for other kinds of informative writing as well. As to effectiveness, results showed that, in contrast to students who did not receive the instruction, the students who participated in the intervention wrote syntheses of higher quality. Although these students employed the strategies in a fixed order when first learning them, they made more flexible use of the various strategies at the conclusion of the intervention. This flexibility included navigating more often and more actively between source texts and syntheses, as, for instance, returning to the sources to select more content when they were revising.

Before moving on, we should provide brief commentary on these and other interventions. The various instructional approaches that we reviewed show promise for fostering textual transformations and improving students' discourse synthesis in various genres. In designing the interventions, researchers have targeted particular features of genres and have identified cognitive strategies that would be employed in achieving them. Then they made components of the strategies explicit and, in some cases, provided acronyms to make them more memorable. The underlying assumption (or hope) is that the strategies will become internalized in students' cognitive repertoires and will be employed when the students encounter similar tasks in other contexts. But regarding these interventions—and probably any instructional program—most important to consider are long-term effects and application to other situations after the instructional program ends.

Identification of intertextual connections

The instructional studies, just reviewed, were largely successful in terms of students' synthesis writing through explicit attention to textual features as well as to synthesizing strategies. A major focus of all was relations between and among sources, but this integrative facet of synthesizing seems to present difficulties to many writers. It was, as noted, the facet of writing proving most difficult even for the university students participating in Boscolo et al.'s (2007) semester-long program. Fortunately, more is being learned about how to approach the matter of intertextual connections, as a number of studies have converged on this facet of source-based writing. Often included in the interventions are graphic representations by which writers lay out in visible form the connections that they perceive and that they generate. For example, key components of Zhang's (2013) months-long discourse synthesis program for ESL students at a U.S. university were modeling and connection guides for problem–solution essays (arguments) and for informative reports. Sastry and Mohammed (2013), who are in Trinidad and Tobago, developed a summary-comparison matrix (SCM) that provides guidance for students to categorize information from sources and also have a visual representation of the relations. And a source evaluation organizer in matrix form was developed for Israeli Arab students by Barzilai and Ka'adan (2017) to help the students engage in expert-like writing practices when dealing with multiple sources making divergent claims. The organizer asks questions for a particular source about the author's expertise, the people whom he or she cites, his or her point of view and purpose for writing, the publisher, and the currency of information. There is also an integration matrix for recording claims, sources, and relations between sources.

Also available now are computerized tools for interrelating sources presenting different perspectives on an issue. Perhaps best known is Britt and Aglinskas's (2002) Sourcer's Apprentice, which is grounded in the documents model framework. When confronting a controversial topic discussed by multiple sources, students are queried by the program about particulars, and, with computer guidance, they take notes on specified source elements. They use the notes (which are mediating documents), not the source texts, to write a brief essay. The tool seems to foster increased content integration and reference to sources. Another computer tool called Dialogical Reasoning Educational Webtool (DREW) (Corbel et al., 2002) can be used for students to map positions taken by source authors and to indicate the various links (pro, against) that they perceive between them. This tool, which was employed by Kiili and Leu (2019) with upper secondary students in Finland, should be attractive to researchers, since it can document elements of students' online synthesis process, and it does so, as Kiili and Leu pointed out, with very little intrusion or interruption. Yet another digital scaffolding tool, called the Knowledge Society Sandbox, is a reading-writing "environment" developed by Barzilai et al. (2020), which is informed by the documents model framework and builds on Barzilai and Ka'adan's (2017) earlier work, mentioned above. The digital epistemic environment that these researchers created enables students' mapping of intertextual elements, including links between sources, between claims, and between sources and claims (support, opposition, or reference). Also included are epistemic elements (i.e., trustworthiness

and reliability) for the sources. And, for writing a synthesis, there is also a writing screen, which allows reviewing of the map and also rereading of sources.

Transformative reuse of language

When writers perform discourse synthesis, they engage in linguistic reformulation of the language of source authors. Various terms are now being used for this element of synthesis writing, including *textual borrowing* (Pennycook, 1996), *language reuse* (Flowerdew & Li, 2007), *linguistic restructuring* (Segev-Miller, 2007), and *textual appropriation* (Shi, 2010). But we chose *transformative reuse*, the term employed by Donahue (2019), partly because of her inclusion of the adjective *transformative* but mainly because of her attention to the dialogic nature of language. She conceptualized linguistic reuse in terms of Bakhtinian dialogism, with special attention to the concept of *double-voicing*, as described by Vološinov (1986): "An author may utilize the speech set of another in his [or her] own aims and in such a way as to impose a new intention on the utterance, which nevertheless retains its own proper referential intention" (p.197). So, discourse synthesis can be described in terms of voices: the writer's voice appropriating—but still honoring—the previous author's voice. Along with other transformations, there is this linguistic reformulation that writers must make when integrating source material in their writing. Although transformative reuse of language is relevant to source-based writing across genres and across disciplines, it currently receives most attention in disciplinary areas associated with EL2.

Matters of paraphrase, summary, and quotation have traditionally been taught mainly as a means of avoiding plagiarism, historically considered an ethical transgression, the "theft" of another's words or ideas (reviewed by Bloch, 2012). But there has been a shift in thinking about novice writers' use of others' language and about ways to move students beyond such novice strategies as patchwriting (Howard, 1992). Researchers, working, for the most part, in the area of EL2, are learning more about the challenges writers face as they incorporate others' words and ideas in their own writing. And on the basis of those understandings, pedagogy is directed to teaching students explicitly how to include source material effectively in their own texts. For connectivity, the source material must fit semantically and syntactically in the progression of the text. Thus, paraphrasing and summarizing require "syntactically restructuring, interpreting and recounting... the source text with relevance to the new text" (Shi et al., 2018 p. 31); and direct quotations require framing that indicates how the quoted language should be interpreted—giving cues to the one's own stance (Petrić, 2012). This means adding one's own words and signaling one's own thoughts about source material. At the present time, pedagogy for transformative reuse of language often includes direct instruction with models and also much practice (e.g., Numrich & Kennedy, 2017). Included in these approaches is teacher-led collaborative modeling, in which teacher and students together write an academic essay from sources (Wette, 2015).

Conclusion: Centering on transformation

If a map of the discourse synthesis terrain today were compared with a map from three decades ago, viewers would see both old and new features. Here, in conclusion, we point to continuity as well as change, since the new builds on the old. When describing *worldmaking*, the philosopher Nelson Goodman (1978), known for theorizing epistemological transformations, showed how the *making* of any "world" is always a *remaking*. This remaking would be evident to the eye if we could draw, like a palimpsest, the current map of this research on top of the old, with configurations from the past still visible. It is obvious that discourse synthesis research, which examines textual transformations, has itself experienced transformation. Changes can be seen in the genres studied, the research approaches taken, and the pedagogical interventions employed.

Our interest has long been in textual transformations associated with organizing, selecting, and connecting when writers produce genres of academic writing. As to organizing, the research has shown that writers tend to generate expected patterns for those genres with conventional text organization, such as topical reports, comparisons, and arguments. For other genres, specifically research papers and literature reviews, researchers have not focused specifically on text organization, but nonetheless one would assume more variability. These texts can be written not only as topical reports but can take other forms as well. As to selecting, the studies reviewed here have shown some general criteria writers seem to apply when writing in particular genres. These include intertextual importance for topical reports, supportive content for arguments, and symmetry for comparisons. No doubt, there are many criteria for relevance that apply in various rhetorical situations, for instance, criteria relevant to writers' identity, goals, and audience and the nature and value of the source texts being used. Of the three discourse synthesis operations—organizing, selecting, and connecting—a difficulty for many writers at various levels of education seems to lie in connecting, which includes perceiving relations between ideas and between texts and signaling those relations in one's own emerging text. For this operation and` the others, there is much to be learned about variability associated not only with task and genre but also with writer attributes, including educational level and linguistic ability. Our review has shown that, for studying textual transformations, discourse synthesis research thus far has attended almost solely to the use of conventional, linear texts as sources, sometimes in hard copy but increasingly in electronic form. But we anticipate future mappings will include more research with multilinear sources and also to use of semiotic resources in other modalities, which would include, for instance, images, video clips, and oral language.

Researchers still employ both text analyses and traditional process-tracing approaches, such as think-alouds, interviews, and process logs. However, electronic means are now available for analyzing product and process. These include increasingly sophisticated tools for identifying, counting, and summarizing elements of writers' texts and of documenting writers' movement from sources to their own text sand from source to source. An issue to explore in more depth is the difference between using notes as mediating documents and writing directly from electronic

sources, as reported by Kirkpatrick and Klein (2016). Another matter that we mentioned earlier has to do with the presumed finality of the synthesis text writers produce. Much of the research, whether text-based or process-oriented, tends to view the synthesis as the final text. Yet we have suggested that some inquiries, particularly with university students, might have a larger scope—seeing how a writer's synthesis text moves on and is itself transformed by the writer into other kinds of texts that serve different purposes (Devitt, 2004). This would mean attending to intergenreality as well as intertextuality.

Particularly encouraging are developments in pedagogical research, wherein researchers have attempted to address in explicit ways the complexities writers experience in discourse synthesis. These underlying complexities lacked visibility back when students were expected simply to write academic papers from sources—without plagiarizing, of course—but were not taught how to do the synthesizing. Within the instructional research, one sees continuation of familiar pedagogical approaches, such as collaborative activities, but the nuance now is explicitness. Consider, for example, the modeling of discourse synthesis by actually producing a synthesis text collaboratively with the students (Wette, 2015). Critically important is writers' interrelation of sources, and thus of much interest to us are tools being developed, including computer tutorials, which guide writers in the kinds of connections that can be made. Also of import is students' learning how to reuse but transform the language of other writers and generate their own language to include the source material smoothly and appropriately in their writing. Finally, there is a need for more attention to the transfer of strategies being taught as well as to developmental patterns, perhaps through longitudinal research.

For this mapping, we also sought to emphasize the international and transnational nature of the research. When reviewing studies of students' academic writing, we referred to the countries where particular studies were conducted. Now, if we were somehow able to apply Geographic Information System (GIS) mapping technology to this terrain, certain areas would be highlighted for particular kinds of activity, such as the research in Spain investigating integrative argument or the research in the Netherlands employing keystroke logging. It would also show productive international collaborations. Along with the blurring of national and regional boundaries, the research into discourse synthesis has blurred disciplinary boundaries, and important convergences have taken place. These include convergence of writing research in discourse synthesis with the current work in multiple-text reading, which gives much attention to intertextual relations, including agreements and disagreements among authors of source texts. Also important is the boundary-crossing convergence with applied linguistics research in EL2, in which source-based writing and integrated assessment, based on discourse synthesis, receive attention.

In conclusion, we acknowledge that, since mapping is interpretation, this article is one view—our view—of the terrain of discourse synthesis research. We have attempted to show how this body of work has grown and where it stands now. As with any map, some areas appear more developed than others at the present time. Obviously there is much space for researchers to learn more about discourse synthesis as performed in different genres and social contexts by writers who differ in

various ways and also, through pedagogical research, to provide more guidance for promising approaches to instruction.

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