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Examining Relation Formation Across Consistent and Conflicting Texts

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ABSTRACT

When using the Internet to learn about complex topics or issues, students often encounter information that is both complementary and conflicting. Building on prior work identifying differences in how students reason about multiple conflicting texts, we examine students' connection formation and summative conceptualization of texts systematically designed to vary in a number of ways. We examine students' connection formation and summative conceptualization of texts introducing consistent or conflicting main ideas, accompanied by supporting reasons that are overlapping or distinct. We investigate the extent to which students form three types of connections across texts: *evidentiary* (i.e., corroborating specific information across texts), *thematic* (i.e., connecting main ideas), and *contextual* (i.e., comparing texts' meta-features such as author). Moreover, we analyze how students summatively describe texts related to one another in a variety of ways. In general, the text condition reflecting the greatest degree of cross-textual consistency (i.e., texts that included consistent main ideas and that presented overlapping supporting reasons) resulted in students being able to form a greater number of cross-textual connections, overall, and more evidentiary and thematic connections, in particular, as compared to the most discrepant text condition (i.e., when texts had conflicting main ideas and presented distinct supporting reasons). Discrepant main ideas across texts were found to increase students' contextual connection formation.

When reading about complex topics on the Internet, it is common for individuals to encounter a variety of complementary and conflicting texts. For instance, in researching the topic of cities' restricting urban centers to pedestrian access, a recent controversy in the news (e.g., Bellafante, 2020; Diaz, 2020), learners may expect to encounter information from environmentalists and retail owners who support such a measure and from disability-rights activists and motor-vehicle trade associations who oppose the measure. How individuals learn about such topics, informed by a variety of partially complementary and partially conflicting perspectives, has been a topic of much investigation in the literature on learning from multiple texts (List et al., 2019; Stadler & Bromme, 2007; Stahl et al., 1996). The general consensus in this area of work has been that effective learning about complex topics requires students to form an integrated mental model or a cognitive representation of the varying perspectives on a topic introduced across multiple texts (Britt et al., 1999; Perfetti et al., 1999; Wiley et al., 2009). Developing an integrated mental model requires students to not only understand each of the perspectives introduced across texts, individually, but also to form connections across these, linking the unique, redundant, complementary, and conflicting information introduced. In this study, we conduct an in-depth investigation into the types of connections that students make when asked to reason about texts that are related to one another in a variety of ways (i.e., texts that introduce

consistent or conflicting main ideas and overlapping or unique supporting reasons). We specifically investigate how successful students are in making different types of connections across texts related to one another in these various ways and in how students holistically represent information introduced across variably related texts after reading.

Integration

The construct of integration has been widely investigated in the literature on students' learning from multiple texts. Within this literature, integration has been examined as both students' connection formation during processing (i.e., integrative reasoning) and as the cognitive representations of multiple texts that students ultimately construct after reading (i.e., integration performance), with these latter cognitive representations often assessed through writing. Within this latter area of inquiry, integration in students' writing has often been found to be quite limited (List et al., 2019; Wiley & Voss, 1999). At the same time, students seem to demonstrate at least some facility with cross-textual connection formation during processing (e.g., Anmarkrud et al., 2014; Wolfe & Goldman, 2005). We seek to address this seeming disparity. We examine integration as both the number of intertextual connections that students form during processing, when explicitly instructed to do so, and the degree to which their cognitive representations of multiple texts, constructed after reading, are, indeed, integrated.

In addition to examining both students' integrative reasoning and integration performance, we further build on prior work in two primary ways. First, we consider students' integration across a set of texts related to one another in a variety of ways. In this study, we adopt an analytic approach to text construction to create simple stimulus materials with main ideas that are consistent or conflicting, accompanied by reasons that are overlapping or distinct. Prior work has already documented that students reason differently about texts related to one another in a variety of ways. This work has primarily been motivated by the Discrepancy-Induced Source Comprehension (D-ISC) Hypothesis, which suggests that the provision of conflicting information across texts, as compared to consistent information, results in students' attending more carefully to source or document information during reading and their better recollection of source information. The association between the provision of conflicting information across texts and sourcing has been repeatedly established in prior work (Braasch & Bråten, 2017; Braasch et al., 2012; Saux et al., 2017). In addition to this association, Braasch et al. (2016) have suggested that there may be a "trade-off" between learners' attendance to source or document information and integration or connection formation across texts, described by Kim and Millis (2006) as sourcing promoting the "segregation of memory" (p. 62). In particular, Braasch et al. (2016, Experiment 3) demonstrated that while conflicting information increased participants' memory of source information, congruent information, presented across texts, increased both the amount of time students spent reading and the number of congruent claims and pieces of evidence students included in the written responses they composed. We investigate this trade-off hypothesis. We consider whether students' integrative reasoning and integration performance across texts is facilitated by the provision of consistent or conflicting main ideas, accompanied by overlapping or distinct supporting reasons. In part, we build on Braasch et al.'s (2016) work by examining differences in content integration across texts not only with consistent or conflicting claims but also across texts featuring overlapping or distinct supporting reasons.

As a second innovation we examine the level of specificity at which students may form integrative connections across texts. Consistent with the analytic views of texts, as including document information and content, some researchers (Braasch et al., 2016), List et al. (2019) have recently suggested that students may form connections across texts on at least three different levels of specificity. When students corroborate specific information across texts, they form *evidentiary links*. When students compare main ideas or central claims across texts, they engage in *thematic integration*. Finally, when students compare meta-textual features, like author trustworthiness or disciplinary perspectives, they draw *contextual links* across texts. In two studies (List et al., 2020, 2019), students were found to

commonly draw evidentiary and thematic links but to experience more difficulty in forming contextual connections across texts. Nevertheless, the extent to which students form these different types of connections across texts, related to one another in a variety of ways, remains an open area for investigation.

Present study

In this study, we build on prior work to examine the types of connections that students form across texts when texts are purposefully designed to present either consistent or conflicting main ideas that are supported by reasons that are overlapping or distinct. At the most basic level, expository texts are structured to include main ideas and key supporting points (Braasch et al., 2016; Bohn-Gettler, 2020; Meyer & Poon, 2001; Singer & Alexander, 2017). When reading expository texts and seeking to form connections across them, students may use structural features in determining whether particular texts offer main ideas that are consistent or conflicting in nature. In addition to mapping texts as centrally in agreement or disagreement with one another, students may further attend to the conceptual overlap across texts or to the information included in the key points provided (Nash et al., 1993). For instance, Latini et al. (2019) presented students with two complementary texts addressing social-media use. These texts, in addition to offering the same overarching main idea regarding the controversial nature of social media, discussed four specific aspects of this topic (e.g., gender differences in social-media use, effects on relationships) in an overlapping fashion, such that the same information was presented across both texts. In a different vein, Stang Lund et al. (2017) introduced students to four texts on sun exposure, two introducing the benefits of sun exposure and two discussing its harms. Nevertheless, across two of the texts for and against sun exposure, issues of physical health were discussed; that is, two texts considered the impact of sun exposure on physical health as increasing either skin-cancer risk or vitamin D production. But, despite considering content that overlapped conceptually, these texts introduced conflicting main ideas regarding the impact of sun exposure on physical health. The other two texts used by Stang Lund et al. (2017) similarly introduced conflicting main ideas based on the overlapping conceptual issue of the effects of sun exposure on mental health. This text set is distinct from that used by Kienhues et al. (2011), which included 15 websites that argued for and against the use of medicine to control high cholesterol and addressing one of four areas of conceptual overlap (e.g., setting cutoff values in defining high cholesterol, food high in cholesterol increasing cholesterol levels). As demonstrated in these examples, texts provided to students in studies of multiple text use have included consistent or conflicting main ideas, supported by reasons that have been either conceptually overlapping or distinct. Nevertheless, little work has deconstructed these particular aspects of texts. Few studies, if any, have analyzed the extent to which students may attend to main ideas vis-à-vis supporting reasons when drawing connections across texts.

In this study, we systematically manipulated texts' main ideas and supporting reasons to create texts that were either consistent or conflicting with regard to their main ideas and offering either overlapping or distinct supporting reasons. Specifically, in this study, we present students with texts in favor of or in opposition to building new structures (e.g., park, shopping mall) in a fictional town, based on considerations of various overlapping or distinct conceptual factors. We further consider the extent to which these different elements of text construction facilitate students' formation of evidentiary, thematic, or contextual cross-textual links when students are directly prompted to engage in integrative reasoning and asked to holistically integrate information in the texts after reading. Our research questions (RQ) and discussion follow.

RQ1. To what extent do students identify connections across texts including consistent or conflicting main ideas and supported by either overlapping or distinct reasons? What is the specificity of these connections (evidentiary, thematic, or contextual)?

To answer the first set of questions, we adopted a 2 (i.e., consistent or conflicting main ideas) \times 2 (i.e., overlapping or distinct supporting reasons) within-subjects design. We asked students to read and reason about four different text sets, featuring complementary or conflicting main ideas with

overlapping or distinct supporting reasons introduced across texts. We compared the volume of students' connection formation across these four different text conditions. Based on the trade-off hypothesis (Braasch et al., 2016; Kim & Millis, 2006), we expected that the presentation of maximally complementary information (i.e., consistent main ideas and overlapping reasons) would facilitate cross-textual connection formation vis-à-vis the presentation of discrepant information (i.e., conflicting main ideas and distinct reasons). Based on prior work examining the specificity of students' connection formation across texts (List et al., 2020, 2019), we expected thematic connections to be most commonly formed and contextual connections to be formed least often. Due to the novel nature of this study, we did not have specific hypotheses regarding whether students would form connections at different levels of specificity across texts related to one another in a variety of ways.

RQ2. To what extent do students engage in spontaneous sourcing when asked to draw connections across texts providing consistent or conflicting main ideas and supporting reasons that are overlapping or distinct?

Generally, we expected students to engage in spontaneous sourcing to a fairly limited extent (Strømsø et al., 2013). Consistent with the D-ISC, we expected the most divergent content presented across texts to stimulate the greatest degree of attendance to source information.

RQ3. What is the nature of students' summative understanding of texts that include consistent or conflicting main ideas and supporting reasons that are overlapping or distinct?

As with RQ 1, we expected students' summative understanding to be facilitated by the presentation of maximally complementary information across texts.

RQ4. To what extent is a student's prompted connection formation across texts associated with his or her performance when responding to a summative question?

This question explored the connection between students' integrative reasoning and integration performance, as reflected in students' responses to the summative question. Given that both directed cross-textual connection formation and overall summative performance were both considered to rely on students' integrative processing, we expected these to be associated, as in earlier studies (e.g., Anmarkrud et al., 2014; Du & List, 2020; Wolfe & Goldman, 2005).

Methods

Participants

Participants were 89 undergraduate students at a large university in the northeastern United States (age: $M = 19.44$, $SD = 2.19$). Sample size was considered more than adequate. Analyses using G*Power for a within-subjects repeated measures ANOVA, with a medium effect size ($f = .25$), $\alpha = .05$, $\beta = .80$, and four measurements suggested a requisite sample size of 24 subjects. Thus, we had sufficient power to detect differences in the effects of interest. In calculating this power analysis, the correlation among repeated measures was set to .50, by default, and we assumed that the sphericity assumption would be met—that is, that there would be equal differences between any pair of repeated measures. When we did not hold the sphericity assumption to be true (setting the nonsphericity correction to $\epsilon = 0.34$, the lowest value possible, reflecting the strongest correlation between different points of measurement), the requisite sample size was 49 subjects, holding all other values constant. This power analysis was done specifically in reference to the main analysis in RQ1. That is, we wanted to determine the extent to which we could ascertain differences in the total number of evidentiary, thematic, and contextual connections that students formed (i.e., the dependent variables) across the four different types of texts used in the study (i.e., the two within-subjects, independent variables).

The sample was 82.14% female ($n = 69$) and 21.43% male ($n = 18$), with two students reporting their gender as other. The majority of the sample was White (80.90%, $n = 72$); 11.24% ($n = 10$) of participants reported being Asian; 2.25% ($n = 2$) reported being Hispanic/Latino; and 5.62% ($n = 5$) of students reported biracial status. Students represented a variety of majors in the social and natural sciences and received extra credit for study participation.

Design

This study adopted a fully crossed, 2 (i.e., main ideas, as consistent or conflicting) \times 2 (i.e., supporting reasons, as overlapping or distinct), within-subjects design. Specifically, participants were asked to read each of four brief text sets about four topics. These were introduced to participants as “brief summaries of newspaper stories.” This is aligned with how brief texts have been introduced to students in prior work (Blanc et al., 2008, 2011; Kim & Millis, 2006; Millis et al., 2000; Saux et al., 2018). For each topic, participants were assigned to read two brief texts introducing either consistent or conflicting main ideas and overlapping or distinct supporting reasons. This resulted in participants reading two texts each that (a) agreed with one another and presented overlapping supporting reasons and (b) agreed with one another and presented distinct supporting reasons; (c) disagreed with one another but presented overlapping supporting reasons; and (d) disagreed with one another and presented distinct supporting reasons; thus, participants read eight texts on four different topics. Sample texts on the topic of building a new park are presented in Table 1.

Procedures

Participants were initially presented with this general set of instructions for the study:

You will be asked to read about four different issues concerning your town (i.e., your town’s plans to build a highway, a park, a school, and a shopping mall). You will be given two brief summaries of newspaper stories about each issue and asked to think about the connections or similarities and differences between them.

Each condition then included four components. First, participants were presented with a brief introductory screen. Specifically, participants were told: “The mayor of your town is planning to build a new highway/park/school/shopping mall.” Second, participants were asked to read two brief texts presenting consistent or conflicting information that was overlapping or distinct. Third, participants were explicitly directed to identify as many connections across the brief texts as they could; the two texts were still available to participants for this part of the study. Finally, participants were presented with an open-ended, summative question asking them to integrate the two texts provided.

Table 1. Sample Texts for Park Topic

	Text 1	Text 2
Consistent Main Ideas; Overlapping Reasons	From the <i>Morning Sun Times</i>: A canvas by the mayor’s office found that many are in favor of building a new park. It will provide a safe, recreational space for residents and their families, making the community a more desirable place to live.	From the <i>Evening Star Press</i>: A community straw poll found that many in the community are greatly in favor of building a new park. There will be more green spaces for activities. The park can be used for dog walking, bike riding, and community meetings.
Consistent Main Ideas; Distinct Reasons	From the <i>Morning Sun Times</i>: A canvas by the mayor’s office found that the community is greatly in favor of building a new park. It will have ecological benefits by introducing more green space to the area and protecting wildlife, including deer, raccoons, and rabbits.	From the <i>Evening Star Press</i>: A community straw poll found that many are in favor of building a new park. The park will be a community amenity that raises property values and makes the community a more desirable place to live.
Conflicting Main Ideas; Overlapping Reasons	From the <i>Morning Sun Times</i>: A canvas by the mayor’s office found that the community is greatly in favor of building a new park. It will have ecological benefits by introducing more green space to the area and protecting wildlife, including deer, raccoons, and rabbits.	From the <i>Evening Star Press</i>: A community straw poll found the community to be greatly opposed to building the park. It will expand nuisance wildlife in the area, including raccoons and rabbits that destroy gardens and deer, that spread Lyme disease.
Conflicting Main Ideas; Distinct Reasons	From the <i>Morning Sun Times</i>: A canvas by the mayor’s office found the community to be greatly in favor of building a new park. It will have ecological benefits by introducing more green space to the area and protecting wildlife, including deer, foxes, and rabbits.	From the <i>Evening Star Press</i>: A community straw poll found that many are opposed to building the park. It will reduce the number of stores and commercial properties in the area, leading to less tax revenue for the town and fewer social services.

Specifically, participants were asked to respond to the prompt: “What does your town think about the plan to build a new highway/park/school/shopping mall?” When responding to this final summative question, the two target texts were no longer available to participants. This methodological decision was adopted because, following some explicit direction to form connections across texts, we were interested in participants’ gestalt, or holistic conceptualization, of the information provided. Texts were provided to participants during the connection formation task to maximize the number of cross-textual links that participants were able to form and removed when students were responding to the summative question to capture the mental models that students constructed based on their processing of multiple texts. We were particularly interested in determining whether the cross-textual connections that participants formed, when directed to do so, were then reflected in their overall mental models. Participants completed this four-step procedure four different times, each time presented with texts that were either consistent or conflicting with regard to the main ideas they introduced and supported by reasons that were either overlapping or distinct. See Figure 1 for a summary of study procedures. Participants completed the study independently, online, at a time and location of their choosing.

Texts

Texts were created that were intended to be identical to one another in structure. As can be seen in the examples in Table 1, each text included four components. First, texts were ascribed to a newspaper source (i.e., the *Morning Sun Times* or the *Evening Star Press*). Second, texts specified a mode of data collection (e.g., survey, straw poll). Third, texts presented a central statement—namely, that the residents of a town were in favor of or opposed one of the four target initiatives. Fourth, each text presented a further reason or elaboration of the town’s support or opposition for each target initiative, with the reasons provided either overlapping or distinct.

When consistent main ideas were introduced, both texts stated that townspeople were in favor of or in opposition to some new type of structure. When main ideas conflicted, one text stated that townspeople supported the new initiative while the other text stated that the townspeople opposed this measure. When supporting information or reasons were overlapping, the same conceptual category of information was drawn on to provide further support for either consistent or conflicting main ideas. When supporting information was distinct, unique conceptual information was drawn on in support of each main idea. We considered this analytic approach to text design to reflect, in a simplified fashion, the range of information students encounter when learning about complex and multifaceted topics.

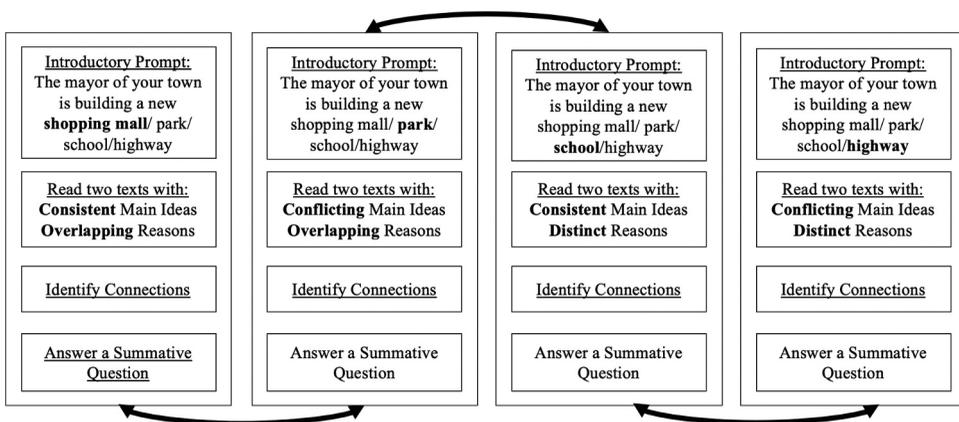


Figure 1. Representation of study procedures, with participants completing four multiple text tasks. The double-headed arrows indicate that texts were presented in counter-balanced order.

Here is an example of texts introducing conflicting main ideas, supported by overlapping information:

From the *Evening Star Press*: At a recent town hall, the community was greatly in favor of building a new school. The new school is expected to increase property values by 10%, making your town a more desirable place to live.

From the *Morning Sun Times*: A recent community survey found that many members opposed building a new school. Building the school will increase taxes. It's projected that each household will have to pay an additional 1,000 USD each year to fund the new building.

In this case, the reasons or specific information analyzed in these two texts pertained to financial aspects of a school's construction (i.e., referring to property values and taxes); at the same time, this common financial information was used to support one of two conflicting main ideas—either that the townspeople were in favor of or in opposition to the new school. We considered these texts' construction to correspond to the differential interpretations of analogous data commonly found across domains (e.g., Poortman & Kalmijn, 2002; White, 1973).

The elements included in the texts constructed were intended to allow students to form evidentiary, thematic, and contextual connections across the texts; students' ability to form evidentiary and thematic connections were specifically targeted in this study by creating texts that provided consistent or conflicting main ideas that were supported or elaborated using overlapping or distinct reasons. Contextual integration was not the focus of this study—with all texts attributed to the same two newspaper sources—as prior work has focused extensively on students' attendance to document information when reading conflicting information presented across texts (Braasch et al., 2016, 2012; Rouet et al., 2016; Saux et al., 2017). Texts were deliberately constructed to be brief and parallel in structure to maximally facilitate students' connection formation. Texts were randomly presented to participants in one of 16 different orders, with this counter-balancing intended to mitigate any order effects stemming from students being asked to find connections across four different text sets (see Figure 2 for a representation of how counterbalancing was done in this study). As a note, no differences across the 16 order conditions were found either in the total number of connections that students identified across texts ($p = .83$) or in students' response integration scores ($p = .12$). Word count and Flesch reading ease scores for each text are included in Table 2.

School	Highway	Shopping Mall	Park
A1 Topic: School Main Ideas: Consistent Evidence: Overlapping	B1 Topic: Highway Main Ideas: Consistent Evidence: Overlapping	C1 Topic: Shopping Mall Main Ideas: Consistent Evidence: Overlapping	D1 Topic: Park Main Ideas: Consistent Evidence: Overlapping
A2 Topic: School Main Ideas: Consistent Evidence: Distinct	B2 Topic: Highway Main Ideas: Consistent Evidence: Distinct	C2 Topic: Shopping Mall Main Ideas: Consistent Evidence: Distinct	D2 Topic: Park Main Ideas: Consistent Evidence: Distinct
A3 Topic: School Main Ideas: Conflicting Evidence: Overlapping	B3 Topic: Highway Main Ideas: Conflicting Evidence: Overlapping	C3 Topic: Shopping Mall Main Ideas: Conflicting Evidence: Overlapping	D3 Topic: Park Main Ideas: Conflicting Evidence: Overlapping
A4 Topic: School Main Ideas: Conflicting Evidence: Distinct	B4 Topic: Highway Main Ideas: Conflicting Evidence: Distinct	C4 Topic: Shopping Mall Main Ideas: Conflicting Evidence: Distinct	D4 Topic: Park Main Ideas: Conflicting Evidence: Distinct

Condition 1 (n=4)	Condition 2 (n=8)	Condition 3 (n=6)	Condition 4 (n=6)
A1, B2, C3, D4	A1, C4, D3, B2	A1, D4, C2, B3	A1, C4, B3, D2
Condition 5 (n=5)	Condition 6 (n=4)	Condition 7 (n=10)	Condition 8 (n=5)
C3, A2, B4, D1	D3, A2, C1, B4	C4, B3, A2, D1	D4, B3, A2, C1
Condition 9 (n=8)	Condition 10 (n=5)	Condition 11 (n=9)	Condition 12 (n=4)
C4, D2, A3, B1	B2, D4, C1, A3	B2, C4, D1, A3	D2, B4, C1, A3
Condition 13 (n=5)	Condition 14 (n=4)	Condition 15 (n=3)	Condition 16 (n=3)
B3, D2, C1, A4	B2, C3, D1, A4	B2, D3, C1, A4	C3, D2, B1, A4

Figure 2. Representation of texts' counter-balancing across conditions.

Table 2. Word Count/Flesch Reading Ease for Each Text

Topic	Consistent Main Ideas + Overlapping Reasons		Consistent Main Ideas + Distinct Reasons		Conflicting Main Ideas + Overlapping Reasons		Conflicting Main Ideas + Distinct Reasons	
	Text 1	Text 2	Text 1	Text 2	Text 1	Text 2	Text 1	Text 2
Highway	41 (58.0)	41 (53.9)	42 (44.5)	41 (58.0)	37 (50.8)	41 (45.7)	40 (57.5)	42 (50.5)
Park	45 (67.5)	43 (57.1)	45 (48.6)	41 (51.9)	41 (55.4)	45 (48.6)	43 (59.0)	45 (48.6)
School	39 (65.5)	50 (56.2)	39 (63.3)	45 (54.2)	41 (60.1)	41 (58.8)	41 (56.7)	39 (65.5)
Shopping Mall	39 (63.3)	49 (59.3)	39 (63.3)	43 (49.2)	41 (60.1)	41 (62.2)	41 (60.1)	45 (59.9)

Note. Cells contain a word count and the Flesch reading-ease score (in parentheses).

Measures

Connections formed

After reading each set of two texts, students were asked to identify as many connections as they could across texts. Specifically, participants were asked to “identify as many connections, similarities, or differences that you notice between the texts.” To aid in connection formation, texts were made available to students for this question. Students’ descriptions of connections formed across texts were, on average, 41.22 words in length ($SD = 25.17$), for texts with consistent main ideas and overlapping supporting information; 41.58 words in length ($SD = 25.65$) for texts with consistent main ideas and distinct supporting information; 42.78 words in length ($SD = 25.24$) for texts with conflicting main ideas and overlapping supporting information; and 44.15 ($SD = 23.38$) words in length for texts with conflicting main ideas and distinct supporting information. We further compared what proportion of total words generated, across all four connection-formation responses, students produced in association with each text condition. Students produced a balanced number of words across all four of the study text sets (i.e., 24.25% of words for texts with consistent main ideas and overlapping reasons, 24.26% of words for texts with consistent main ideas and distinct reasons, 25.18% of words for texts with conflicting main ideas and overlapping supporting reasons, and 26.61% of words for texts with conflicting main ideas and distinct reasons).

Connection scoring. The similarities and differences that students identified across texts were coded as reflecting evidentiary, thematic, or contextual relations across texts. Students could potentially identify two evidentiary relations (i.e., the mode of data collection and reasons provided), one thematic connection (i.e., that main ideas were consistent or in conflict with one another), and one contextual relation (i.e., that both sources were newspapers) across texts. The reasons provided in support of claims systematically varied as overlapping or distinct in nature. The mode of data collection specified was similar across all texts, with data about public opinion gathered in a variety of ways (e.g., poll, community survey, town hall).

Students could identify a maximum of four cross-textual connections across texts and were also assigned separate binary codes for their identification of evidentiary, thematic, and contextual relations across texts. Two raters coded all students’ responses. Exact agreement ranged from 94.51% (Cohen’s $\kappa = .92$), for connections across texts that conflicted with one another and presented distinct reasons, to 96.82% (Cohen’s $\kappa = .95$), for connections identified across texts that were consistent with one another but presented distinct reasons, based on 528 and 534 connections coded, respectively. Disagreements were resolved through discussion.

Sourcing. We further examined whether or not participants included sources when asked to identify relations across texts. Sourcing was defined as direct references to the two newspaper sources included in this study, without an explicit connection being drawn between them. For example, one student

wrote, “The one from Evening Star focuses on the positive impact . . . the one from Morning Sun Times focuses on the negative.” In this example the two newspaper sources are reported only as a means of attribution rather than for making a comparison. This stands as a contrast to students who explicitly drew contextual connections across texts (e.g., “similarities: two news sources”). The sourcing coded for was spontaneous, rather than cued, since participants were instructed only to identify connections across texts, not to attribute such connections to sources. When students did elect to include sources among the cross-textual connections that they formed, all of these attributions were found to be accurate. Students’ sourcing ranged from $M = 0.28$ ($SD = 0.45$) in response to texts with consistent main ideas and distinct reasons and conflicting main ideas and overlapping supporting reasons, to $M = 0.29$ ($SD = 0.46$) in response to texts with consistent main ideas and overlapping supporting reasons, to $M = 0.38$ ($SD = 0.49$) in association with texts including conflicting main ideas and distinct reasons. These means can be interpreted as, for example, 37.50% of students engaging in sourcing when drawing connections across texts introducing conflicting main ideas and distinct supporting reasons.

Summative understanding

After being explicitly asked to identify connections across texts, participants were asked a summative question about how the people of the town felt about each new structure. Specifically, participants were asked, “What does the town think about the plan to build a new highway/park/school/shopping mall?” We asked participants to respond to this summative question without the two texts available. We included this summative question to determine the extent to which the connections that students formed then translated into their more global or comprehensive understandings of the two texts provided. In particular, students’ responses to this summative question were intended to correspond to integrated mental model formation (Britt et al., 1999; Perfetti et al., 1999) or students’ overall representation of information presented across texts. By including this overarching question, following the generation of connections across texts, we sought to determine the extent to which students’ integration in writing was limited because students were limited in their connection formation across texts, was limited because of students’ skill in writing, or was limited because of students’ willingness or ability to express cross-textual connections through writing.

Students’ overall summaries ranged in length from 14.96 ($SD = 10.97$) words for the texts with consistent main ideas and overlapping information provided, to 15.25 ($SD = 12.64$) words for texts with consistent main ideas and distinct reasons provided, to 22.72 ($SD = 19.15$) words generated in response to texts with conflicting main ideas and overlapping reasons, to 19.71 ($SD = 13.95$) words included for texts with conflicting main ideas and distinct reasons. Again, we compared students’ response lengths across text conditions as a percent of the total words that students generated in response to the four summative questions and we found some disproportionately (i.e., we would expect the percentage of words generated in response to each text set to be 25.00% if students’ responses were balanced, in terms of length). Rather, students produced 20.40% of words when summarizing texts with consistent main ideas and overlapping supporting reading; 20.95% of words when summarizing texts with consistent main ideas and distinct supporting reasons; 30.82% of words when summarizing texts with conflicting main ideas and overlapping supporting reasons; and 27.83% of words when summarizing texts with conflicting main ideas and distinct supporting reasons.

Summative response scores. Overall responses were scored using a four-point scale. A zero was assigned to responses that did not correctly integrate the main ideas presented across texts (e.g., reporting that people in town were in support of the new structure when presented with conflicting main ideas on the issue). A score of 1 corresponded to accurate integration (i.e., stating that residents were either in favor of or divided over the new structure). A score of 2 reflected the provision of correctly integrated main ideas and supporting information from the sources. Finally, we assigned a score of 3 to responses that correctly integrated the main ideas, provided supporting reasons, and attributed this information to corresponding newspaper sources.

In this way, the coding scheme reflected a composite of the types of connections that students were able to form when explicitly instructed to do so. At the same time, because texts were not made available to students when they were responding to the summative question, this was intended to capture students' general mental model of texts, constructed after reading. Thus, in our view, a complete mental model would have included all of the cross-textual connections that students previously identified in response to the connection-formation question. However, many students' summative responses were not found to do so. Two raters coded all responses, with exact agreement ranging from 83.15% ($n = 74$, Cohen's $\kappa = .78$) for texts that presented conflicting main ideas and distinct reasons to 98.88% ($n = 89$, Cohen's $\kappa = .99$) for texts that presented consistent main ideas and distinct reasons, based on a total of 89 responses scored. All disagreements were resolved through discussion. See [Table 3](#) for students' sample responses.

Results

RQ1. Types of connections identified across texts

For our first research question we examined whether the number of connections, out of a possible four, that students identified across texts differed when texts presented main ideas that were consistent or conflicting with one another and presented supporting reasons that were overlapping or distinct. A 2×2 repeated measures ANOVA was used with two within-subject factors with two levels each (see [Table 4](#) for descriptive information).

We found a significant main effect for main ideas across texts, $F(1, 87) = 4.36, p < .05, \eta^2_{\text{partial}} = .05$. Specifically, students identified significantly more connections across texts with consistent main ideas as compared to main ideas that were conflicting. When presented with consistent main ideas, participants identified an average of 2.18 ($SD = 0.59$) connections across texts, with only 2.07 ($SD = 0.60$) connections identified across texts with conflicting main ideas. No significant main effect was found for overlapping or distinct reasons provided ($p = .58$) nor for the interaction between types of main idea and supporting reasons included across texts ($p = .18$). We further considered whether the types of connections identified across texts differed by text condition (see [Table 5](#) for descriptive information).

Evidentiary integration

Two Wilcoxon's signed rank tests, the nonparametric alternative to a paired-sample t test, were used to compare students' identification of each type of connection across texts, introducing consistent or conflicting main ideas and overlapping or distinct evidence. We conducted the Wilcoxon's signed rank test using the `dplyr` package in R, with a continuity correction applied, to account for the ordinal nature of our data (i.e., with students able to identify between 0 and 2 connections of each type across texts). Using the Wilcoxon's signed rank test we recorded, for instance, whether students formed 0, 1, or 2 thematic connections across the two text sets they read with consistent or conflicting main ideas introduced; that is, students received a score of 0 or 1 for the number of thematic connections they identified in response to texts with consistent main ideas and overlapping reasons and in response to texts with consistent main ideas and distinct supporting information. We added these two scores to create a score (from 0 to 2) for the total number of thematic connections that students identified across texts with consistent main ideas. Likewise, we assigned to students a score of 0 or 1 to indicate their thematic connection formation across texts, introducing conflicting main ideas with overlapping supporting reasons and across texts introducing conflicting main ideas with distinct reasons. Again, these two scores were added so that students received a score, between 0 and 2, for the total number of thematic connections they formed across texts with conflicting main ideas, regardless of whether these included overlapping or distinct supporting reasons. Then, students' total scores (ranging from 0 to 2) for thematic connections identified were compared across students' linking of texts with consistent or conflicting main ideas.

Table 3. Students' Sample Responses

	Sample Responses	
	Connections	Summaries
Consistent Main Ideas; Overlapping Reasons	They both want to build a new park. They believe it creates good space. [<i>Thematic connection</i>] The evening Star Press says the space can be used for dog walking, bike riding, and community meetings. The Morning Sun Times thinks it will provide a safe recreational space. [<i>Evidentiary connections based on conceptual overlap</i>]	both newspapers say the town wants the school and that it will be a larger facility. one newspapers says the town wants the school to reduce the size of the large classes, while the other newspaper says the town wants the school to add more classes and sports teams
Consistent Main Ideas; Distinct Reasons	Both represent the mall favorably and say that the community is largely in support of the mall . [<i>Thematic connection</i>] The community support comes largely from an economic standpoint as having the mall will boost the economy in the region. [<i>Evidentiary connection based on conceptual overlap</i>] They differ in that one gets the facts from a community meeting and one through interviews. [<i>Evidentiary connection based on methods</i>]	The town is in favor of [of building a highway] and community members want it because it decreases commute time and traffic. Community members also believe that it will help with local businesses and bring in more visitors.
Conflicting Main Ideas; Overlapping Reasons	Both deal with a new school . [<i>Thematic connection</i>] The Evening Star Press drew their information from a town hall meeting, but the Morning Sun Times conducted a survey. [<i>Evidentiary connection based on methods</i>] The Evening Star Press said that people are in favor of the school whereas the Sun Times said that people are greatly opposed to the new school. [<i>Evidentiary connection based on conceptual overlap</i>] Each source recognizes that property taxes will increase.	According to one news source, many people in town were in favor of building the new school , while the other news source states that many people were opposed to the plan to build a new school. It is tough to determine which source is accurately reporting the true thoughts of the town about the plan to build a new school.
Conflicting Main Ideas; Distinct Reasons	Both sources are newspapers. The names of the newspapers include time of day and an astronomy term. [<i>Contextual connection</i>] Both are finding out peoples' opinions on building this highway . [<i>Thematic connection</i>] The differences are that one utilized a poll while the other utilized a survey, one asked people their opinion in the community circular [<i>Evidentiary connection based on methods</i>] while one asked over a radio station, one found that more people are in favor of building the highway while the other found more people are opposed, one found commute times will be reduced by 10 minutes and reduce traffic during rush hour while the other found it to cost \$3 million and will draw funds away from other community spending. [<i>Evidentiary connection based on conceptual overlap</i>]	One newspaper says the town does not want the park because it will decrease the amount of stores and commercial properties causing the amount of revenue the town makes to decrease. the other newspaper says the town wants the park because it will provide more green space and a place to keep wildlife safe

Reasons provided. Two Wilcoxon's signed rank tests were used to investigate whether the number of connections that students generated, linking the reasons provided in support of main ideas, varied across texts introducing consistent or conflicting main ideas and overlapping or distinct evidence. First, we found that the number of connections students generated relating reasons provided to significantly differ across texts introducing consistent ($M = 1.62$, $SD = 0.70$) or conflicting ($M = 1.42$, $SD = 0.72$) main ideas, $Z = -2.54$, $p = .01$, $r = .19$, corresponding to a small to medium effect. However, the number of connections did not differ across texts introducing supporting reasons that were overlapping or distinct ($p = .91$) (see Table 5 for descriptives).

Mode of data collection. A Wilcoxon's signed rank test did not find the number of connections linking the modes of data collection to differ across texts introducing consistent versus conflicting main ideas ($p = .34$) and overlapping versus distinct supporting reasons ($p = .98$).

Table 4. Descriptives for the Total Number of Cross-Textual Connections Formed, Average Summative Question Performance, and Total Sourcing

Text Condition	Cross-Textual Connections			Summative Question Scores			Total Sourcing		
	<i>M (SD)</i>	Skewness (<i>SE</i> = 0.26)	Kurtosis (<i>SE</i> = 0.51)	<i>M (SD)</i>	Skewness	Kurtosis	<i>M (SD)</i>	Skewness	Kurtosis
Consistent + Overlapping	2.16 (0.64)	0.66	1.26	1.37 (0.55)	0.74	-0.03	0.29 (0.46)	0.93	-1.16
Consistent + Distinct	2.20 (0.71)	0.47	0.41	1.34 (0.56)	0.68	0.27	0.28 (0.45)	0.99	-1.04
Total Consistent Main Ideas	2.18 (0.59)	0.48	1.04	1.35 (0.50)	0.62	0.28	0.29 (0.40)	0.93	-0.77
Conflicting + Overlapping	2.11 (0.71)	0.22	-0.13	1.17 (0.87)	0.19	-0.76	0.28 (0.45)	0.99	-1.04
Conflicting + Distinct	2.02 (0.69)	0.18	-0.28	0.99 (0.79)	0.30	-0.63	0.38 (0.49)	0.53	-1.77
Total Conflicting Main Ideas	2.07 (0.60)	0.49	0.38	1.08 (0.71)	0.35	-0.23	0.33 (0.43)	0.73	-1.29
Total Overlapping Reasons	2.13 (0.57)	0.26	0.92	1.27 (0.59)	0.63	0.30	0.29 (0.41)	0.94	-0.81
Total Distinct Reasons	2.12 (0.50)	0.50	0.69	1.16 (0.52)	0.79	1.02	0.33 (0.42)	0.72	-1.21

Table 5. Descriptives for Total Evidentiary, Thematic, and Contextual Connections

Text Condition	Evidentiary Connections—Method			Evidentiary Connections—Reasons			Total Thematic Connections			Total Contextual Connections		
	<i>M</i> (<i>SD</i>)	Skewness (<i>SE</i> = 0.26)	Kurtosis (<i>SE</i> = 0.51)	<i>M</i> (<i>SD</i>)	Skewness (<i>SE</i> = 0.26)	Kurtosis (<i>SE</i> = 0.51)	<i>M</i> (<i>SD</i>)	Skewness	Kurtosis	<i>M</i> (<i>SD</i>)	Skewness	Kurtosis
Consistent + Overlapping	0.31 (0.47)	0.81	-1.37	0.81 (0.40)	-1.60	0.57	1.00 (0.00)			0.03 (0.18)	5.26	26.22
Consistent + Distinct	0.35 (0.48)	0.65	-1.62	0.81 (0.40)	-1.60	0.57	0.99 (0.11)	-9.43	89.00	0.06 (0.23)	3.92	13.68
Total Consistent Main Ideas	0.33 (0.41)	0.70	-1.12	0.81 (0.35)	-1.56	0.89	0.99 (0.05)	-9.43	89.00	0.04 (0.18)	4.28	18.64
Conflicting + Overlapping	0.38 (0.49)	0.49	-1.80	0.71 (0.46)	-0.93	-1.16	0.98 (0.15)	-6.55	41.91	0.04 (0.21)	4.47	18.38
Conflicting + Distinct	0.35 (0.48)	0.63	-1.64	0.70 (0.46)	-0.91	-1.20	0.91 (0.29)	-2.90	6.53	0.06 (0.23)	3.90	13.48
Total Conflicting Main Ideas	0.37 (0.40)	0.53	-1.27	0.70 (0.37)	-0.81	-0.70	0.94 (0.19)	-3.64	13.45	0.05 (0.17)	3.55	13.16
Total Overlapping Reasons	0.35 (0.42)	0.63	-1.31	0.76 (0.36)	-1.16	-0.10	0.99 (0.07)	-6.55	41.91	0.04 (0.15)	4.28	19.64
Total Distinct Reasons	0.35 (0.42)	0.63	-1.31	0.75 (0.35)	-1.07	-0.14	0.95 (0.17)	-3.55	13.16	0.06 (0.18)	3.27	10.97

Note. Because each type of cross-textual connection was coded on a binary scale (i.e., as present or absent), means can be interpreted as the frequency of students between 0 (0%) and 1 (100%) identifying each type of connection, across texts.

Thematic integration

Wilcoxon's signed rank test found the number of thematic connections that students identified to significantly differ across texts introducing consistent ($M = 1.99$, $SD = 0.11$) versus conflicting ($M = 1.89$, $SD = 0.38$) main ideas, $Z = -2.64$, $p < .01$, $r = .20$, reflecting a small to medium effect. The number of thematic connections students identified also differed across texts presenting supporting reasons that were overlapping ($M = 1.98$, $SD = 0.15$) versus distinct ($M = 1.90$, $SD = 0.34$), $Z = -2.55$, $p = .01$, $r = .19$, a small to medium effect.

Contextual integration

A Wilcoxon's signed rank test found the number of contextual connections generated to significantly differ across texts introducing consistent ($M = 0.09$, $SD = 0.36$) versus conflicting ($M = 0.95$, $SD = 0.34$) main ideas ($Z = -8.39$, $p < .001$, $r = .63$, a large effect) but not across texts introducing supporting reasons that were overlapping versus distinct ($p = .35$).

RQ2. Sourcing across texts

A final set of Wilcoxon's signed rank tests were used to determine whether students engaged in sourcing across texts introducing consistent or conflicting main ideas and overlapping or distinct supporting reasons. No differences were found ($ps \geq .15$).

RQ3. Summative response scores across text conditions

A repeated measures ANOVA, with students' four summative response scores as the dependent variable, found a significant main effect for the type of main ideas presented across texts, $F(1, 88) = 12.76$, $p < .001$, $\eta^2_{\text{partial}} = .13$. Again, participants' summative response scores were higher when texts presented main ideas that were consistent with one another ($M = 1.35$, $SD = 0.50$) rather than conflicting ($M = 1.08$, $SD = 0.71$). A marginal main effect was found for the inclusion of overlapping versus distinct reasons across texts, $F(1, 88) = 3.84$, $p = .05$, $\eta^2_{\text{partial}} = 0.04$. When texts presented overlapping reasons students' summative response scores were $M = 1.27$ ($SD = 0.59$), as compared to when the reasons introduced were distinct in nature ($M = 1.16$, $SD = 0.52$). There was no significant interaction effect found ($p = .15$).

Supplemental analyses

We were particularly intrigued by students' seeming difficulties in describing conflicting main ideas presented across texts. Some insights into these difficulties are gleaned by examining the types of responses students constructed when asked to summarize discrepant texts. In some cases, students presented conflicting information from across texts sequentially, without explicitly identifying texts as conflicting or considering texts in a juxtaposed fashion. Such a sequential approach to conflict representation is reflected in responses such as, "One newspaper says the town does not want the park because it will decrease the amount of stores and commercial properties causing the amount of revenue the town makes to decrease. The other newspaper says the town wants the park because it will provide more green space and a place to keep wildlife safe." In other cases, students did identify texts' main ideas as conflicting. However, they did not elaborate on the nature of this conflict. This is demonstrated in responses such as, "There are varying opinions, some are in favor and some are opposed."

Both of these sample responses represent deficits in a summative understanding of multiple texts, when compared to a response such as this: "Overall all the town is split about opening the new school. On one hand it would bring down classroom sizes which would improve learning. However, on the other hand it would increase the taxes for homeowners which can be a burden for those in the community." As can be seen in this last response, the effective representation of conflict includes (a)

the explicit identification of discrepancy, (b) the separate elaboration of discrepant information within each text, and (c) the use of linking terms (e.g., *however*) to communicate conflict (List et al., 2020; Stadler & Bromme, 2014). Such descriptions of conflict were relatively rare. This indicates that even when students recognize conflict across texts, they may choose not to expend the cognitive effort necessary to fully elaborate on such conflicts.

RQ4. Cross-textual connections and summative response scores

We examined the associations among the number of connections students identified across texts and their summative response scores (see Table 6). While students' connection formation was associated with summative response scores for texts that were consistent with one another but offered distinct supporting reasons, $r(89) = .23, p < .05$, no significant associations were found in the case of the other three text conditions.

This lack of an association was unexpected. However, we considered it to arise from a number of statistical limitations in this study. These were (a) students' strong performance on the summative question, reducing the variability of this factor, and (b) the limited scale, only four points, used to score both the number of connections students identified across texts and students' summative responses. To address this restricted range, the number of connections identified and students' summative response scores were averaged across the four text conditions examined in this study. The average number of connections identified and average summative response scores were significantly associated with one another, $r(89) = .22, p < .05$.

Discussion

The goal of this study was to examine the extent to which students formed connections across texts related to one another in a variety of ways. In systematically varying the main ideas and supporting reasons presented across texts, we sought to understand how learners may integrate information across the variety of texts they encounter when trying to understand complex topics. All results presented should be interpreted with caution given the contrived nature of this study, with texts modified to maximally facilitate integration, potentially creating a ceiling effect in analyses. That is, we would expect students to experience more difficulties with integration when presented with more naturalistic texts.

Table 6. Correlation Coefficients Among Total Connections and Overall Summative Response Scores

	1	2	3	4	5	6	7
1. Total connections when main ideas are consistent and reasons are overlapping	1.00						
2. Response scores when main ideas are consistent and reasons are overlapping	0.16	1.00					
3. Total connections when main ideas are consistent and reasons are distinct	0.51***	0.18	1.00				
4. Response scores when main ideas are consistent and reasons are distinct	0.14	0.62***	0.23*	1.00			
5. Total connections when main ideas are conflicting and reasons are overlapping	0.41***	0.07	0.49***	0.19	1.00		
6. Response scores when main ideas are conflicting and reasons are overlapping	0.22*	0.37***	0.11	0.23*	0.15	1.00	
7. Total connections when main ideas are conflicting and reasons are distinct	0.41***	0.19	0.44***	0.16	0.46***	0.05	1.00
8. Response scores when main ideas are conflicting and reasons are distinct	0.09	0.22*	0.09	0.16	-0.04	0.47***	0.06

* $p < .05$

** $p < .01$

*** $p < .001$

What happens when texts have consistent main ideas and overlapping supporting reasons?

We examined two main types of outcomes in this study. The first target outcome was the number of cross-textual connections of various types that students were able to identify across texts. The second outcome captured the nature of students' overall summative understanding. Both of these outcomes were found to be facilitated by the presentation of texts that agreed with one another. For instance, the presentation of consistent, rather than conflicting, main ideas across texts was found to facilitate both students' overall connection formation and specific formation of connections linking main ideas and supporting reasons across texts.

This may be the case for a number of reasons. First, complementary texts may be easier for students to integrate as a result of these texts' ability to be cognitively represented via only a single node, in Documents Model terms (Britt et al., 1999; Perfetti et al., 1999). This stands in contrast to conflicting texts that need to be cognitively represented via two or more nodes, with a further conflicting relation specified across these. Second, we may simply have a psychological preference for concordance, as demonstrated by the literature on cognitive dissonance or cognitive conflict (Otero, 2002). Third, students may be more familiar with reading complementary, rather than conflicting, texts in schools, resulting in improved performance (Hess, 2008). Still these findings should be interpreted with caution as the effects identified were small, possibly due to students' generally strong performance on the summative questions. While we viewed the differences identified in students' ability to integrate content across complementary vis-à-vis conflicting texts to be theoretically important, the small magnitude of these differences may point to commonality in students' processing of multiple texts, overall.

What happens when texts have conflicting main ideas and distinct supporting reasons?

Although students' sourcing was not found to differ across text conditions, we did find, in this study, that students' formation of contextual connections differed across text conditions. That is, students linking texts with conflicting main ideas included significantly more contextual connections within their integrative reasoning than students linking texts with consistent main ideas. This finding seems to be in line with the D-ISC model (Braasch et al., 2012). That is, while conflicting main ideas across texts did seem to improve students' contextual connection formation, complementary texts, nevertheless, still resulted in a greater number of cross-textual connections developed, overall, and at the evidentiary and thematic levels, in particular. In light of the D-ISC, it seems to be the case that (a) discrepancy results in students' greater attendance to source, as reflected in the number of contextual connections formed, while complementary information fostered the greater integration of cross-textual main ideas and supporting reasons and (b) engagement in contextual connection formation potentially comes at the expense of cross-textual integration. Braasch et al. (2016) refer to this latter point as the "trade-off" hypothesis between attendance to source and content integration.

At what level of specificity do students form connection across multiple texts?

Based on prior work (List et al., 2019), we examined students' cross-textual connection formation at three levels of specificity. In both the connections identified and in students' summative response scores, the main ideas presented across texts, rather than supporting reasons, seemed to play the larger role in students' conceptualizations. There may be a number of reasons why consistent versus conflicting main ideas, rather than overlapping versus distinct reasons, result in differences in connection-formation and summative response performance. For one, students may attend more to main ideas, rather than to supporting reasons, when asked to connect texts with one another. That is, main ideas constitute the central organizing features of texts. As such, students may use these not only to support comprehension (McCrudden & Schraw, 2007; Stevens, 1988) but also to relate texts to one another. For another, texts in this study were structured to offer main ideas that were directly

consistent or conflicting with one another; whereas, supporting reasons were created to be overlapping or distinct. As such, main ideas may have been related to one another in a more direct or explicit fashion than were the reasons provided. That is, reasons did not align with an easily identifiable super-ordinal category of connection (i.e., agreeing or disagreeing). In contrast, it may have been more difficult for students to describe relations across reasons that were overlapping and, especially, distinct.

How do students perform when asked to identify connections across texts and to holistically understand multiple texts related to one another in a variety of ways?

Students generally performed well when asked to describe texts in a holistic fashion in response to the summative question. That is, they were able to succinctly report that texts agreed or disagreed with one another in the main ideas they introduced. Moreover, a substantial minority of students not only connected main ideas across texts but also provided reasons in support of these main ideas. This ranged from 24.72% ($n = 22$) of students receiving a summative response score of 2 or more for the conflicting main ideas/distinct reasons condition to 35.96% ($n = 32$) of students scoring a 2 or more in the consistent main ideas/overlapping reasons text condition. At the same time, it is important to recognize that the sample in this study represented college students and the target texts were short, easy to understand, and deliberately constructed to foster integration. As such, the results we identified may be expected to reflect the upper end of integration performance, relative to prior work that has found that students struggle with forming connections across texts (Britt & Aglinskias, 2002; Du & List, 2020; List et al., 2019; Rouet et al., 2016; Wiley & Voss, 1999). Moreover, when asked to summarize information presented across two conflicting texts, almost one-third (29.21%, $n = 26$) of students ignored the fact that these texts conflicted with one another and, rather, presented only one side of the target conflict. For instance, when texts included the main ideas: “A community meeting found the community to be greatly in favor of a new shopping mall” and “in interviews with the local paper, many were found to be opposed to the shopping mall,” one student concluded: “They think that building a new shopping mall is a good idea.”

It may be that the simplicity of the texts introduced meant that students took for granted the various relations among these connections, electing not to explicitly identify or elaborate on cross-textual connections in the summative responses that they composed. Moreover, the relatively limited associations among the volume of connections that students formed when explicitly asked to do so and performance on the summative question suggests that students may have considered connection formation in response to the summative question to be redundant with the information that they had already provided when generating connections across texts. And the summaries students composed were generally shorter than students’ descriptions of connections formed across texts with, typically, no new connections identified in the summaries alone. Nevertheless, it is important to recognize that students demonstrated differential performance in their ability to identify relations across texts, structured in different ways. That is, students could better identify relations across consistent texts than across conflicting texts. If students considered cross-textual relations to only need to be suggested, rather than elaborated, in their summative responses we would have expected to see a deficit in performance across text structures rather than differentially manifested for some texts over others.

This study contributes to the literature in at least three ways. First, we systematically examined the types of connections students formed across different types of texts related to one another in a variety of ways. In particular, we considered the specificity of students’ integration when relating texts that included complementary or conflicting main ideas and that presented supporting reasons that were either overlapping or distinct. In this way, we inform prior work that has examined students’ sourcing and integration in response to texts related to one another in a myriad of ways (e.g., Bråten et al., 2009; Wolfe & Goldman, 2005). Second, we determined that although discrepancy across texts may contribute to an increase in contextual connection formation, as suggested by the D-ISC (Braasch et al., 2012), greater consistency or concurrence across texts facilitates integration overall. Third, we

specifically examined the variation in students' summative responses when presented with texts including conflicting main ideas and distinct reasons. We documented at least four approaches in students' integration of conflicting information. These included (a) ignoring the conflict, (b) sequentially presenting conflicting information with no further elaboration, (c) identifying texts as conflicting without any additional elaboration, and (d) identifying texts as conflicting, elaborating each side of the conflict and connecting these via a linking term. This study points to the need to carefully attend to the types of texts presented to students and the relations among the texts, with empirical support provided for the notion that students are able to connect different types of texts with differing degrees of effectiveness.

Limitations

First, as compared to previous multiple text studies that have presented students with six or seven texts on a given a topic (e.g., Salmerón et al., 2010; Strømsø & Bråten, 2009), we used only two brief texts. This methodological decision was adopted to allow us to specifically examine the types of connections students formed across texts, related to one another in a variety of systematic ways, and to facilitate students' connection formation to the greatest extent through the presentation of short and simple texts. Still, when researching information on the Internet, it would be unlikely for students to encounter only two brief texts, structured in a parallel way. The simplicity of the texts presented may have served to create a ceiling effect in students' task performance, particularly in as far as thematic integration was concerned. Future studies should build on this work to consider how students form connections across texts that are related to one another in a more complicated fashion. Doing so would further allow for an examination of the relative prevalence of students' connection formation across texts, when a relatively large number of cross-textual links are able to be formed. As a contrast, in this study, students could generate only four cross-textual connections. Thus, our results better speak to the types of cross-textual connections students may form rather than to their number.

Further, information provided in the texts included in this study may not have been interpreted as intended. For instance, the reasons, "It will expand nuisance wildlife in the area, including raccoons and rabbits that destroy gardens and deer, that spread Lyme disease" and "It will have ecological benefits by introducing more green space to the area and protecting wildlife, including deer, raccoons, and rabbits," were intended to be overlapping as these addressed a common conceptual issue (i.e., wildlife expansion as a result of park development). Yet these reasons could also have been differentially interpreted as effects impacting humans versus animals. Although participants seemed to interpret the study texts as we intended, as evidenced by the cross-textual connections that they drew, examining additional study materials to further validate the findings of this study remains an important direction for future work.

Similarly, participants in this study were not found to engage in different degrees of sourcing when introduced to consistent or conflicting main ideas across texts. This is both inconsistent with prior work (e.g., Braasch et al., 2016) and with students' increased formation of contextual connections in response to the presentation of conflicting main ideas across texts. We attribute this inconsistent set of results to the particular sources used in this study. That is, because we were not directly interested in students' sourcing, all study texts were attributed to two, fairly generic, newspaper sources. The repeated use of these sources across the four sets of study texts and their unfamiliar and relatively banal nature, may have served to decrease students' attendance to sourcing (e.g., Kim & Millis, 2006). Including sources both more familiar to students and more meaningfully connected to conflicting content in texts (e.g., introducing biased author perspectives) could serve to increase students' sourcing in the future.

We asked students in this study to, first, identify as many connections as possible across texts and, then, summarize the texts provided. This methodology was adopted to determine whether deficits in students' integration during writing were a result of an inability to generate cross-textual connections, at all, even when students were explicitly instructed to do so, or whether students were able to form

connections across texts but had difficulty expressing these through writing. Based on the results of this study, the latter explanation—that students cannot or choose not to express the connections that they identify when writing about texts—appears to be more likely. At the same time, this conclusion cannot be fully supported as the connection-formation task and the summative question were not counter-balanced in this study. As such, it may be the case that students did not incorporate all of the connections they formed into their summative responses because they considered these to be redundant or otherwise unnecessary. An important direction for future work will be to counter-balance these two tasks to further determine the extent to which students are able to form connections across texts vis-à-vis expressing them in writing.

Conclusion

This study uses a within-subject design to examine students' connection formation and integration when presented with texts introducing either consistent or conflicting main ideas supported by overlapping or distinct reasons. The types of connections students formed were classified according to their specificity, reflecting evidentiary, thematic, and contextual cross-textual connections. Overall, students seemed to struggle with forming integrative connections after reading multiple texts, with students, on average, identifying only half of the connections that were able to be formed. At the same time, findings from this study indicate that students form more connections when reading texts that agree with one another. Nevertheless, texts that disagreed with one another may have promoted students' attention to document information when forming contextual connections across texts. The presentation of consistent or conflicting main ideas across texts seemed to play a larger role in students' connection formation, relative to the introduction of overlapping or distinct supporting reasons. Implications of this study include the need to introduce students to texts related to one another in a variety of ways and the need to teach students about the types of cross-textual connections that may be formed.

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References

- Anmarkrud, Ø., Bråten, I., & Strømsø, H. I. (2014). Multiple-documents literacy: Strategic processing, source awareness, and argumentation when reading multiple conflicting documents. *Learning and Individual Differences, 30*, 64–76. <https://doi.org/10.016/j.lindif.2013.01.007>
- Bellafante, G. (2020, May 1). Streets should be car-free during lockdown. And after. *New York Times*. <https://www.nytimes.com/2020/05/01/nyregion/coronavirus-streets-closed-nyc.html>
- Blanc, N., Kendeou, P., Van Den Broek, P., & Brouillet, D. (2008). Updating situation models during reading of news reports: Evidence from empirical data and simulations. *Discourse Processes, 45*(2), 103–121. <https://doi.org/10.1080/01638530701792784>
- Blanc, N., Stiegler-Balfour, J. J., & O'Brien, E. J. (2011). Does the certainty of information influence the updating process? Evidence from the reading of new articles. *Discourse Processes, 48*(6), 387–403. <https://doi.org/10.1081/0163853X.2011.552844>
- Bohn-Gettler, C. M. (2020). Learning from multiple perspectives: Processes and strategies associated with texts. In P. Van Meter, A. List, D. Lombardi, & P. Kendeou (Eds.), *Handbook of learning from multiple representations and perspectives* (pp. 245–258). New York, NY: Routledge.
- Braasch, J. L., & Bråten, I. (2017). The discrepancy-induced source comprehension (D-ISC) model: Basic assumptions and preliminary evidence. *Educational Psychologist, 52*(3), 167–181. <https://doi.org/10.1080/00461520.2017.1323219>

- Braasch, J. L., McCabe, R. M., & Daniel, F. (2016). Content integration across multiple documents reduces memory for sources. *Reading and Writing*, 29(8), 1571–1598. <https://doi.org/10.1007/s11145-015-9609-5>
- Braasch, J. L., Rouet, J. F., Vibert, N., & Britt, M. A. (2012). Readers' use of source information in text comprehension. *Memory and Cognition*, 40(3), 450–465. <https://doi.org/10.3758/s13421-011-0160-6>
- Bråten, I., Strømso, H. I., & Britt, M. A. (2009). Trust matters: Examining the role of source evaluation in students' construction of meaning within and across multiple texts. *Reading Research Quarterly*, 44(1), 6–28. <https://doi.org/10.1598/RRQ.44.1.1>
- Britt, M. A., & Aglinskias, C. (2002). Improving students' ability to identify and use source information. *Cognition and Instruction*, 20(4), 485–522. https://doi.org/10.1207/S1532690XCI2004_2
- Britt, M. A., Perfetti, C. A., Sandak, R., & Rouet, J. F. (1999). Content integration and source separation in learning from multiple texts. In S. R. Goldman, A. C. Graesser, & P. Van den Broek (Eds.), *Narrative comprehension, causality, and coherence: Essays in honor of Tom Trabasso* (pp. 209–233). Lawrence Erlbaum Associates.
- Diaz, J. (2020, April 11). Cities close streets to cars, opening space for social distancing. *New York Times*. <https://www.nytimes.com/2020/04/11/us/coronavirus-street-closures.html>
- Du, H., & List, A. (2020). Learning and instruction. *Researching and Writing Based on Multiple Texts*, 66. <https://doi.org/10.1016/j.learninstruc.2019.101297>
- Hess, D. (2008). Controversial issues and democratic discourse. In L. S. Levstik & C. A. Tyson (Eds.), *Handbook of research in social studies education* (pp. 124–136). Routledge.
- Kienhues, D., Stadler, M., & Bromme, R. (2011). Dealing with conflicting or consistent medical information on the web: When expert information breeds laypersons' doubts about experts. *Learning and Instruction*, 21(2), 193–204. <https://doi.org/10.1016/j.learninstruc.2010.02.004>
- Kim, H. J. J., & Millis, K. (2006). The influence of sourcing and relatedness on event integration. *Discourse Processes*, 41(1), 51–65. https://doi.org/10.1207/s15326950dp4101_4
- Latini, N., Bråten, I., Anmarkrud, Ø., & Salmerón, L. (2019). Investigating effects of reading medium and reading purpose on behavioral engagement and textual integration in a multiple text context. *Contemporary Educational Psychology*, 59, 101797. <https://doi.org/10.1016/j.cedpsych.2019.101797>
- List, A., Du, H., & Lee, H. Y. (2020). How do students integrate multiple texts? An investigation of top-down processing. *European Journal of Psychology of Education*. <https://doi.org/10.1007/s10212-020-00497-y>
- List, A., Du, H., Wang, Y., & Lee, H. Y. (2019). Toward a typology of integration: Examining the documents model framework. *Contemporary Educational Psychology*, 58, 228–242. <https://doi.org/10.1016/j.cedpsych.2019.03.003>
- McCrudden, M. T., & Schraw, G. (2007). Relevance and goal-focusing in text processing. *Educational Psychology Review*, 19(2), 113–139. <https://doi.org/10.1007/s10648-006-9010-7>
- Meyer, B. J., & Poon, L. W. (2001). Effects of structure strategy training and signaling on recall of text. *Journal of Educational Psychology*, 93(1), 141–159. <https://doi.org/10.1037/0022-0663.93.1.141>
- Millis, K. K., King, A., & Kim, H. J. J. (2000). Updating situation models from descriptive texts: A test of the situational operator model. *Discourse Processes*, 30(3), 201–236. https://doi.org/10.1207/S15326950dp3003_1
- Nash, J. G., Schumacher, G. M., & Carlson, B. W. (1993). Writing from sources: A structure-mapping model. *Journal of Educational Psychology*, 85(1), 159. <https://doi.org/10.1037/0022-0663.85.1.159>
- Otero, J. (2002). Noticing and fixing difficulties while understanding science texts. In J. Otero, J. A. LeCn, & A. C. Graesser (Eds.), *The psychology of science text comprehension* (pp. 281–307). Lawrence Erlbaum Associates, Inc.
- Perfetti, C. A., Rouet, J. F., & Britt, M. A. (1999). Toward a theory of documents representation. In H. van Oostendorp & S. R. Goldman (Eds.), *The construction of mental representations during reading* (pp. 88–108). Lawrence Erlbaum Associates, Inc.
- Poortman, A. R., & Kalmijn, M. (2002). Women's labour market position and divorce in the Netherlands: Evaluating economic interpretations of the work effect. *European Journal of Population*, 18(2), 175–202. <https://doi.org/10.1023/A:1015520411449>
- Rouet, J. F., Le Bigot, L., de Pereyra, G., & Britt, M. A. (2016). Whose story is this? Discrepancy triggers readers' attention to source information in short narratives. *Reading and Writing*, 29(8), 1549–1570. <https://doi.org/10.1007/s11145-016-9625-0>
- Salmerón, L., Gil, L., Bråten, I., & Strømso, H. (2010). Comprehension effects of signaling relationships between documents in search engines. *Computers in Human Behavior*, 26(3), 419–426. <https://doi.org/10.1016/j.chb.2009.11.013>
- Saux, G., Britt, A., Le Bigot, L., Vibert, N., Burin, D., & Rouet, J. F. (2017). Conflicting but close: Readers' integration of information sources as a function of their disagreement. *Memory & Cognition*, 45(1), 151–167. <https://doi.org/10.3758/s13421-016-0644-5>
- Saux, G., Ros, C., Britt, M. A., Stadler, M., Burin, D. I., & Rouet, J. F. (2018). Readers' selective recall of source features as a function of claim discrepancy and task demands. *Discourse Processes*, 55(5–6), 525–544. <https://doi.org/10.1080/0163853X.2018.1463722>
- Singer, L. M., & Alexander, P. A. (2017). Reading on paper and digitally: What the past decades of empirical research reveal. *Review of Educational Research*, 87(6), 1007–1041. <https://doi.org/10.3102/0034654317722961>

- Stadtler, M., & Bromme, R. (2007). Dealing with multiple documents on the WWW: The role of metacognition in the formation of documents models. *International Journal of Computer-Supported Collaborative Learning*, 2(2–3), 191–210. <https://doi.org/10.1007/s11412-007-9015-3>
- Stadtler, M., & Bromme, R. (2014). The content–source integration model: A taxonomic description of how readers comprehend conflicting scientific information. In D. N. Rapp & J. L. G. Braasch (Eds.), *Processing inaccurate information: Theoretical and applied perspectives from cognitive science and the educational sciences* (pp. 379–402). The MIT Press.
- Stahl, S. A., Hynd, C. R., Britton, B. K., McNish, M. M., & Bosquet, D. (1996). What happens when students read multiple source documents in history? *Reading Research Quarterly*, 31(4), 430–456. <https://doi.org/10.1598/RRQ.31.4.5>
- Stang Lund, E., Bråten, I., Brante, E. W., & Strømsø, H. I. (2017). Memory for textual conflicts predicts sourcing when adolescents read multiple expository texts. *Reading Psychology*, 38(4), 417–437. <https://doi.org/10.1080/02702711.2016.1278417>
- Stevens, R. J. (1988). Effects of strategy training on the identification of the main idea of expository passages. *Journal of Educational Psychology*, 80(1), 21–26. <https://doi.org/10.1037/0022-0663.80.1.21>
- Strømsø, H. I., & Bråten, I. (2009). Beliefs about knowledge and knowing and multiple-text comprehension among upper secondary students. *Educational Psychology*, 29(4), 425–445. <https://doi.org/10.1080/01443410903046864>
- Strømsø, H. I., Bråten, I., Britt, M. A., & Ferguson, L. E. (2013). Spontaneous sourcing among students reading multiple documents. *Cognition and Instruction*, 31(2), 176–203. <https://doi.org/10.1080/07370008.2013.769994>
- White, H. (1973). Interpretation in history. *New Literacy History*, 4(2), 281–314. <https://doi.org/10.2307/468478>
- Wiley, J., Goldman, S. R., Graesser, A. C., Sanchez, C. A., Ash, I. K., & Hemmerich, J. A. (2009). Source evaluation, comprehension, and learning in Internet science inquiry tasks. *American Educational Research Journal*, 46(4), 1060–1106. <https://doi.org/10.3102/0002831209333183>
- Wiley, J., & Voss, J. F. (1999). Constructing arguments from multiple sources: Tasks that promote understanding and not just memory for text. *Journal of Educational Psychology*, 91(2), 301. <https://doi.org/10.1037/0022-0663.91.2.301>
- Wolfe, M. B., & Goldman, S. R. (2005). Relations between adolescents' text processing and reasoning. *Cognition and Instruction*, 23(4), 467–502. https://doi.org/10.1207/s1532690xci2304_2