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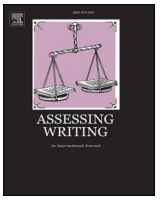

# Visual thinking and argumentative writing: A social-cognitive pairing for student writing development☆

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ABSTRACT

Though argumentative writing is a vital skill across diverse content areas and domains, most U.S. students perform below grade level in writing, and teachers are often unprepared to address this shortfall because their training approaches writing as a subspecialty of reading rather than its own unique discipline. Writing instruction and assessment need more approaches and broader perspectives to foster students' motivation and engagement. To that end, the research team developed an innovative formative writing assessment exercise and scoring rubric focusing on analytic skills and the personal meaning-making process of argument writing rather than the technical skills of grammar, punctuation, and spelling. Integrating a visual literacy and arts component into the writing protocol as an alternative to a text-based prompt to enhance students' engagement in writing. The scoring rubric design aimed to be generally applicable to a variety of different prompts, providing anchors alongside detailed criteria for each aspect of argumentative writing included. The team also surveyed students' perceptions of different factors including self-efficacy for argumentation, self-efficacy for close observation, critical thinking, intrinsic enjoyment to write, openness to different perspectives, and sense of belonging in the class. The results emphasized the importance of students' self-efficacy in argumentative writing and provide initial evidence that the proposed approach has promise.

## 1. Introduction

Developing skill in writing is a core competency to becoming an effective communicator and to a learner's ability to make meaningful claims, interpret sources, and express a personal perspective (Graham et al., 2013). As a form of storytelling and sharing of personal experience, writing plays a role in our connection to others, self-expression, and overall quality of life (Graham & Perin, 2007). Writing skill development requires more than just technical skills such as grammar, vocabulary, spelling, and sentence structure. Students' skill development in writing is a mixture of cognitive, affective, and behavioral engagement in the writing process (Madison et al., 2019; Graham & Perin, 2007). As Camacho et al. (2021) recently identified in their review, the field of writing assessment and instruction needs more approaches to writing skill development that incorporate this broader perspective on motivation and engagement.

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Most U.S. students perform below grade-level proficiency in writing (National Center for Education Statistics, 2012; Salahu-Din et al., 2008). Researchers have referred to students' development and motivation in writing as a negative spiral as they progress through K-12 grades, where students become less motivated and more anxious about writing (Cleary, 1991; Pajares, 2003; De Smedt et al., 2019). This negative spiral is, in part, due to the focus of writing becoming more evaluative and less about expressing knowledge, ideas, and feelings, which is less engaging and motivating for students (Hidi & Boscolo, 2006). That negative spiral can create a barrier to students' overall writing skill development and communication of their ideas. Moreover, teachers are generally unprepared to provide quality writing instruction and formative assessment for students because writing instruction in teacher preparation is often encompassed by reading instruction (Myers et al., 2016).

This study focuses on the development of an innovative formative writing assessment exercise and rubric within a larger study that integrated critical thinking, argumentative writing, and the verbal group analysis and discussion of visual art works. Those art works serve as the open-ended stimuli to generate student thinking, autonomy, cultural interpretation, and personal exploration through writing. In addition to a description and testing of this writing assessment, this study explores the results from a survey protocol, informed by social-cognitive theory (Bandura, 1986), to learn about the alignment of arts-based argumentative writing skill to student motivation and engagement within the classroom. The integrative framework proposed and initially tested in this study sought to fill an existing gap in writing assessment and inform future instructional and curricular design toward students' writing development.

### *1.1. Argumentative writing as interdisciplinary learning skill*

In the context of critical thinking, making a sound argument can be defined as a set of connected statements that supports the truth of a claim (Hillocks, 2011). Developing skill in argumentation can be seen as a path toward grasping complex content and assessing the merit of one's own or others' evidence, positions, and statements (Anonymous, 2020). Teaching argumentation can be challenging, due to the amount of background knowledge and difficult thinking that may be needed (Newell et al., 2011), which often leads teachers to forgo argumentation instruction (Hillocks, 2011). According to the Common Core State Standards, argumentative writing carries important weight as a skill for students across different content areas and domains (CCSS; Council of Chief State School Officers, 2010). That integration across domains was, in part, a response to a well-documented neglect for writing development across grade levels when compared to reading and arithmetic (Puranik et al., 2017). The CCSS defines argumentation writing tasks as those that require students to take a position and show a convincing set of evidence and reasoning for their position and claims (Council of Chief State School Officers, 2010).

In argumentative writing students think like a historian—they must follow an inquiry, observe and analyze different types of sources (e.g., visual, text-based, music, etc.), identify claims, tie those claims to evidence, and develop their analysis through cohesive clear written arguments that can often become quite complex (Wineburg et al., 2012). Careful thinking can be evidenced in effective writing. Students locate and extract information from sources and make meaning through evidence-based claims. Developing those skills is important for constructing knowledge and expressing understanding across content areas but also quite daunting for teachers—new strategies are needed (Gierlach & Washburn, 2018). In this study, we focus on those analytic skills and the personal meaning-making process of argumentative writing rather than on the technical skills of grammar, punctuation, and spelling, among others.

#### *1.1.1. Background on writing rubrics*

The National Writing Project developed the Analytic Writing Continuum (AWC) to fill the need for coherence in how teachers respond to, grade, and give feedback on student writing (Smith & Swain, 2017). Generally, the National Writing Project partners found a concerning dearth of assessments and resources to support argumentative writing instruction. A driving purpose behind the development of that continuum was to create a tool that could be reinvented to serve different kinds of writing with different students at different grade levels and different developmental trajectories of writing skill. Moreover, the goal of the AWC was to embed writing assessment within writing instruction through a tool that offers specific guidance for improvement to students to build on their existing skills and effort, rather than using negative language to explain only what is not present and sufficient (DiPardo et al., 2011). To date, teachers and researchers have used the AWC for many purposes with positive results on technical, practical, and pedagogical levels (Bang, 2013; Gallagher et al., 2017; Smith & Swain, 2017). The continuum developed for argumentative writing in this project builds from the promising approach in the AWC and the Common Core State Standards for writing.

#### *1.1.2. Visual Literacy and Argumentative Writing*

Because argumentative writing is defined as taking a position or stating a claim and backing that claim up with evidence, visual works of art may be a fitting medium as a writing prompt. Visual works are not dependent on reading ability; they also offer numerous potential interpretations from which to make evidence-based claims and practice writing them out. In the context of visual thinking strategies, students generate and exchange a variety of ideas about the narratives within works of art (Smolkowski et al., 2020). Students develop personal inquiries about the narrative within the piece, find evidence, and elaborate with additional observations and analyses. These steps are essentially argumentation at work. In this way, open-ended art works may provide an especially effective stimuli to engage students' argumentation.

Another potential benefit to the use of visual arts stimuli is the greater sense of belonging and openness to different perspectives that can result from students forming their own ideas about a piece of visual art and freely discussing ideas about what they see (Smolkowski et al., 2020). Moreover, students need no prerequisite background knowledge, allowing teachers to focus on and assess concepts of argumentation and potentially developing students' self-efficacy in argumentative writing more inclusively (Abia-Smith

et al., 2020). This current study aimed to understand how the integration of visual literacy and argumentative writing development can inform a new assessment approach and rubric that can be applied as a self-directed writing practice for students; a process of formative feedback for students' writing development; and a flexible tool for researching interventions that target students' critical thinking, motivation, and argumentative skill development within the sociocultural context of a classroom. When linked to teacher-facilitated whole-classroom share-out and discussion, the formative writing protocol and rubric suggested in this study could contribute to a classroom climate that enhances students' motivation, engagement, and skill development in writing.

### 1.2. A social-cognitive framework for argumentative writing development

Discussed further in the Method section, this study developed and tested a writing assessment of students' critical thinking and writing skill in building an evidence-based argument using the narratives found within visual art works as the primary source material. To understand how students' skill in this exercise fits a social-cognitive framework, we also assessed students' perceptions of different factors that fit the social-cognitive theoretical framework (Bandura, 2018) for this context including: (a) self-efficacy for argumentation, (b) self-efficacy for close observation, (c) critical thinking, (d) intrinsic motivation in writing, (e) openness to different perspectives, and (f) sense of belonging in the class (see Fig. 1 for model). This proposed framework fits within Graham's (2018) revised Writer(s)-Within-Community (WWC) model of writing, described further in each section below. The current cross-sectional study will test how these factors relate to students' demonstrated argumentative writing skill cross-sectionally with the aim of providing an assessment protocol for future research on students' writing development from a social-cognitive perspective.

#### 1.2.1. Students' self-efficacy and motivation

Self-efficacy to both observe closely and write an argument develops through mastery experiences of success into *agentive stancetaking*—the confidence and capacity to form, hold, and share an opinion (Jeffery & Wilcox, 2014). Generally, self-efficacy links to

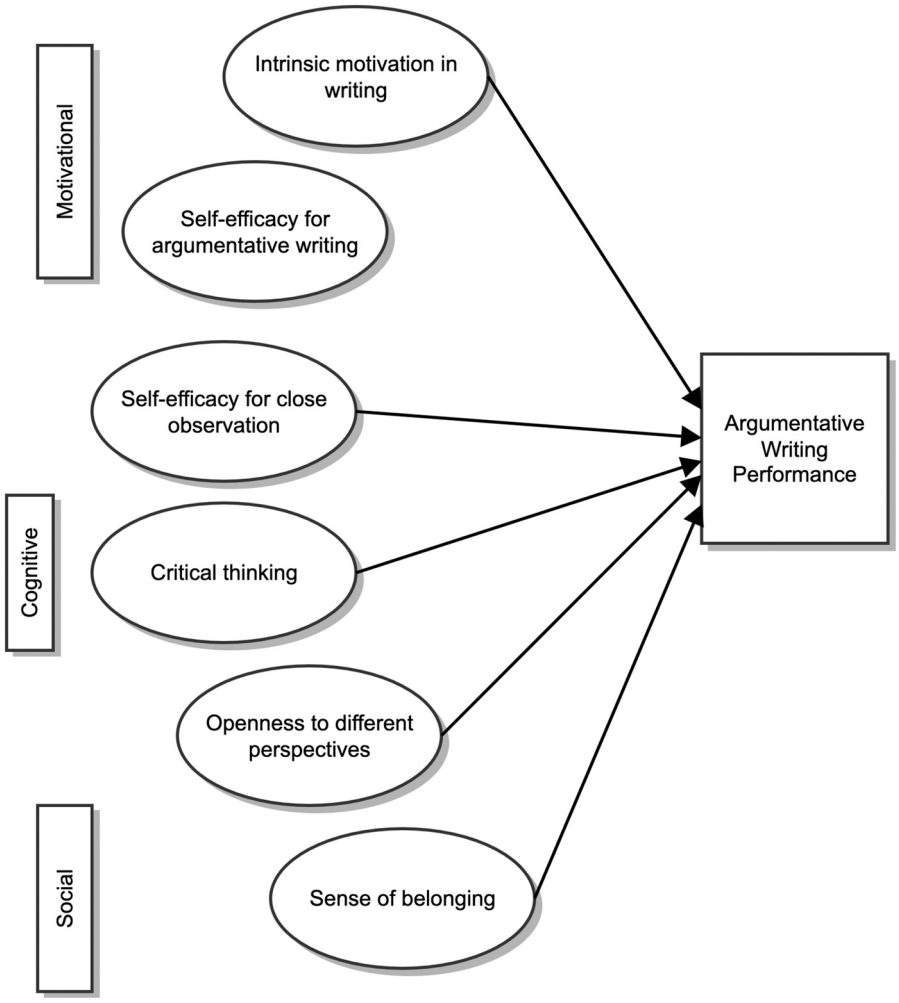


**Fig. 1.** Hypothesized Predictors of Argumentative Writing Performance from a Social-Cognitive Perspective.

students' sense of control and persistence in learning and can serve as a protective factor against disengaging from learning and school during middle school and high school (Anderson et al., 2019; Madison et al., 2019). Self-efficacy is considered task-specific, so it is possible that a student could feel strong self-efficacy to observe visual sources closely but less self-efficacy to communicate those observations and claims through argumentative writing (Bandura, 2005)—both aspects of self-efficacy in the writing task studied were measured. Self-efficacy in a skill such as observing closely or writing an argument links to the intrinsic enjoyment and drive a student feels for that kind of academic challenge, which may determine to an extent how much effort and persistence a student puts into a task.

Self-efficacy is a key belief and long-term memory resource within the WWC model of writing (Graham, 2018). Self-efficacy in writing has been found to relate to student writing performance across several reviews (see Camacho et al., 2021). One study found that this relationship was mediated by students' strategy knowledge and use, indicating the importance of connecting self-efficacy to specific cognitive challenges and skills in writing, such as argumentation (De Smedt et al., 2017). This current study builds on that prior application of social-cognitive theory in writing development by proposing that self-efficacy as prospective self-belief in writing will be a more powerful motivator than intrinsic enjoyment (Bandura, 2018) and that argumentative writing incorporates specific cognitive and social dimensions as well. We hypothesize that both self-efficacy for close observation and argumentative writing and intrinsic motivation should be related to students' actual demonstrated writing in the visual arts-based argumentative writing exercise and rubric-based scoring. This study tests that assumption to observe which plays a stronger role.

#### *1.2.2. Critical thinking and openness to different perspectives*

The process of argumentative writing overlaps well with students' critical thinking development. An existing framework to integrate critical thinking into any content area suggests a focus on consistent practice questioning and analyzing (Duron et al., 2006). A developmental framework for critical thinking suggests a balance between remaining open to different perspectives while also learning to evaluate the evidence of statements shared by others and in one's own claims (Fukuda et al., 2015). Assessing the quality and evidence of one's own claims and the claims of others should be related to argumentative writing skill (Pintrich & De Groot, 1990). Similarly, remaining open to different perspectives, multiple possible claims within a source such as a work of art, and recognizing that different perspectives can co-exist should add to the quality and elaboration of students' argumentative writing. The proposed arts-based writing prompt and task provides all students access to knowledge about the topic—the visual content of the image—alongside an opportunity to integrate diverse funds of knowledge from their personal lived experience. This generative aspect toward critical thinking and openness reflects some of the knowledge resources proposed by the WWC model (Graham, 2018).

#### *1.2.3. A sense of belonging*

A sense of belonging and relatedness has been considered a fundamental need for student engagement in school based on self-determination theory (Fredricks et al., 2004; Ryan & Deci, 2000) and fits within the sociocultural community dimension of the WWC model (Graham, 2018). Most recently, belonging has been considered essential for diverse students from the BIPOC community. To establish a sense of belonging for racially, ethnically, linguistically, and culturally diverse students (Gray et al., 2018), culturally responsive and sustaining teaching must provide students opportunities to share their lived experience, construct and express knowledge from their past learning and experiences, and deepen relationships with peers and teachers through the validation of their perspective (Hammond, 2015). Students' willingness and capacity to share their unique perspective on the meaning of a piece of art could have a reciprocal relationship to how strongly they feel a sense of belonging in class. Because the format studied does not require student sharing, this relationship may not be strong. This study provides an initial test of that relationship, but one that is exploratory given the cross-sectional nature and narrow scope of this study.

### *1.3. Context of study*

This sequential mixed method study (Creswell & Plano-Clark, 2018) is one part of a larger study. The STELLAR project includes teachers' whole classroom implementation of visual thinking strategies (VTS) with works of art in core non-arts classes. Within a social-cognitive approach, the theory of change proposes a relationship between the intrapersonal and interpersonal factors described above and skill in argumentative writing for late elementary to middle school age students. The present investigation aims to test those theoretical relationships, with cross-sectional data collected prior to VTS implementation, to support future research and practice in this interdisciplinary instructional practice. To begin, we developed a rubric and method to evaluate argumentative writing skill through a scored writing task using a work of art for the writing stimulus. Second, we adapted a variety of measures to fit the context and framework of this study and evaluated their internal consistency. Third, we evaluated the correlations across the included social-cognitive and motivational factors and argumentative writing scores to identify the strongest predictor of argumentative writing skill within this cross-sectional research design. Fourth, we analyzed a sample of student responses to provide additional understanding about the rubric and student responses.

#### *1.3.1. Research Questions*

1. To what extent does the proposed rubric for argumentative writing demonstrate evidence of reliability for scoring students' written responses to visual works of art? What can the scores tell us about students' argumentative writing?
2. To what extent do the adapted surveys demonstrate acceptable evidence of reliability for students from Grades 4–7?
3. Do the hypothesized relationships between argumentative writing skills and the different social, cognitive, and motivational factors exist, and, if so, what factors demonstrate the strongest relationship with argumentative writing performance?

4. Based on qualitative analysis of a random sample of student responses across the distribution of scores, what are the distinguishing features of the top-scoring student responses and what are potential areas of improvement in the scoring rubric?

## 2. Method

### 2.1. Sample

A sample of 270 Grade 4–7 students participated from 12 schools (19 students completed the writing but not the survey so were not included in the analytic sample). According to National Center for Education Statistics data, one school was classified as "City: Small," one school was classified as "Suburb: Midsize," two were classified as "Town: Remote," six schools were classified as "Rural: Fringe," and one was classified as "Rural: Distant." Five schools qualified for Title 1 services. Free and reduced-price meals eligibility ranged from 15 % to 71 %, and the number of students served by the schools ranged from 75 to 184. Table 1 provides additional descriptive data about the participating schools.

### 2.2. Procedure

Students completed the full assessment protocol in a 45-minute normal class period on their own using pencil and paper. A member of the research team administered both the student surveys and the written task. All instructions were read aloud by the research staff to ensure that students were prompted in a consistent way across classrooms. Students were allowed to ask clarifying questions before beginning the task and after the instructions were read aloud. Instructions asked students to respond to the survey questions and then complete the written task. The written task protocol asked students to look at the image (see Fig. 2) and think about what is happening in the image and what makes them think that (e.g., questions 1 and 2 of the visual thinking strategies protocol). Students were told to write a short essay about their idea and to provide as much detail as they want to connect the ideas to the image. The directions told them there were no wrong answers and they should have fun with it. Students had half a page below the image to write notes and a full lined page to write their short essay. Students had approximately 25 min to observe the image, take notes, and compose their response. This assessment length had been piloted with a similar age group and demographic to determine if it provided sufficient time and intensity to result in quality responses for this age group (see Smolkowski et al., 2020). The results from that pilot indicated this assessment format could provide an informative distribution of quality of written arguments. Although students were not allowed to revise or rewrite their short essay, there is some evidence that first drafts are sufficient for writing assessment (Crawford & Smolkowski, 2008).

### 2.3. Measures

#### 2.3.1. Survey assessment

This study relied mostly on using or adapting existing scales from past research in education (see Appendix for all scales and items). The 6-item scale developed for self-efficacy was developed based on recommendations from Bandura (2005) and adapted for two subscales that related closely to the proximal skills students used in the assessment—(a) Close Observation and (b) Argument Writing. A sample item was "I am confident I can look for important information in an image" and "I can write an argument and back up my claims with evidence." Critical Thinking for Close Observation and Argumentation included five items adapted from the *Motivation and Self-Regulated Learning Questionnaire* (MSLQ; Pintrich & De Groot, 1990). A sample item was "I form an argument carefully considering different points of view." The 4-item scale for Intrinsic Enjoyment to Write also came from the MSLQ; a sample item was "I try writing tasks that challenge me so I improve." Sense of Belonging was assessed using the 5-item scale created by Anderson-Butcher and Conroy (2002). A sample item was "I am supported in this class." The 5-item scale for Openness to Different Perspectives was adapted for the context of this study from a subscale for Creative Ideational Flexibility in the Runco Ideational Behavior scale for students (Anderson

**Table 1**
Descriptive data for participating schools.

| School | Grade Range | Locale | Charter | Title 1 School | Title 1 School Wide | Students | Teachers FTE | Free/Reduced Lunch |
|---|---|---|---|---|---|---|---|---|
| 1 | K-8 | Rural: Distant | No | Yes | Yes | 319 | 17.64 | 47.96 % |
| 2 | K-8 | Rural: Fringe | No | No | † | 184 | 8.55 | – |
| 3 | K-5 | City: Small | No | Yes | Yes | 553 | 29.40 | 48.82 % |
| 4 | 6–8 | Rural: Fringe | No | No | † | 759 | 33.79 | 45.85 % |
| 5 | K-5 | Town: Remote | No | Yes | Yes | 739 | 36.80 | 59.81 % |
| 6 | K-8 | Rural: Fringe | Yes | No | † | 341 | 13.46 | 30.50 % |
| 7 | K-5 | Suburb: Midsize | No | Yes | Yes | 530 | 26.46 | 67.74 % |
| 8 | K-8 | Rural: Remote | No | Yes | Yes | 219 | 12.20 | 57.53 % |
| 9 | K-8 | Rural: Fringe | Yes | No | † | 213 | 11.18 | 22.07 % |
| 10 | 6–8 | Town: Remote | No | No | † | 311 | 17.38 | 71.06 % |
| 11 | K-8 | Rural: Fringe | Yes | No | † | 199 | 10 | – |
| 12 | K-5 | Rural: Fringe | No | No | † | 611 | 29.25 | 15.38 % |

† Indicates that the data are not applicable.
– Indicates that the data are missing.

**Fig. 2.** The Visual Artwork Students Responded to for Argumentative Writing.

et al., 2017; Runco et al., 2001). A sample item was "If you think about different ideas, you will probably find some really good ones." All items used a 6-point Likert scale response option: 1, *strongly disagree*; 2, *disagree*; 3, *somewhat disagree*; 4, *somewhat agree*; 5, *agree*; & 6, *strongly agree*.

*2.3.2. Writing assessment*

We built a writing assessment prompt using a visual arts prompt for several reasons. First, universal design for learning suggests that variability in learners' skills, needs, and perspectives should be considered not only as an inherent part of the classroom but also as an opportunity to deepen understanding and appreciation for different ways of learning, knowing, and expression (Hashey et al., 2020). As this study proposes (see Appendix for protocol), using the visual arts as a stimulus for argumentative writing can provide an additional way for students to access content and ideas taught in class, thus reducing the potential barrier for some students, especially those who struggle with reading skills, of having to process and analyze only written sources (Meyer et al., 2014). If students are developing a written argument based on their analysis of an image, teachers can primarily focus their feedback on students' evidence-based argumentation and writing as well as their visual literacy. This process can isolate students' writing skills and deemphasize the role of students' reading skills to their argumentative writing.

Similarly, culturally responsive approaches to teaching and learning support teachers to provide learning stimuli that is culturally accessible and representative to a diverse classroom of learners (Hammond, 2015). Teachers can use art works that represent broad historical and cultural perspectives for the proposed integrative assessment. Not only does this process offer students the opportunities for personal meaning-making, but it can also help teachers build relationships with students and learn more about their personal and cultural perspectives (Smolkowski et al., 2020). The proposed argumentative writing protocol may provide teachers a new way to combine a universal design and culturally responsive approach to supporting students' writing skill development.

To assess student's argumentative writing skill, we built a writing protocol that needed to be accessible and engaging for students in Grades 4–8 and would most closely match the kind of critical thinking and exploration of art that VTS cultivates. We developed a rubric (see Appendix) that built from past work by the research team with a previous project (Abia-Smith et al., 2020; Anderson et al., 2020; Smolkowski et al., 2020) and ensured that the rubric criteria aligned to Common Core State Standards for argumentative writing (Council of Chief State School Officers, 2010). Additionally, the rubric followed examples from the National Writing Project's Analytic Writing Continuum Assessment (Bang, 2013) and provided anchors alongside detailed criteria for each aspect of argumentative writing included. The rubric included four levels: 4, *proficient*; 3, *sufficient*; 2, *emergent*; and 1, *ineffective*. Five criteria were included, and raters were instructed to score each criterion separately on a 1–4 scale (see supplementary material for complete scoring rubric). The criteria included (a) Presents Claim; (b) Connects Source Material to Claim; (c) Cohesion of Words, Phrases, and Sentence Fluency;

(d) Elaborates with More Evidence or Claims; and (e) Concluding Statement. Fig. 3 illustrates the *proficient* level of the rubric for each criterion.

Each scoring level included an authentic student example from a previous project with a similar sample but different visual prompt to anchor the scoring. Each criterion included specific material from that anchor example to illustrate the rationale for the score given. An additional statement was provided to clarify the rationale and suggest what more might be needed for the response to become proficient if it was scored lower than a "4" for that criterion. To assess the feasibility and reliability of the rubric, three research assistants underwent a 2-hour long virtual training with an initial orientation. Two of the three raters were familiar with scoring student writing samples on previous projects or as part of their earlier profession as a teacher. The third rater was new to scoring using writing rubrics. After the training the raters were assigned to rate 17 of the 270 student writing responses to allow for review of each rater's reliability. Once the 17 responses were scored, the lead assessment researcher tallied the intraclass correlation coefficient (ICC) across the raters and found the reliability for each criterion to reach an adequate level of evidence, reported in the results below. Each rater was assigned batches to be scored independently, which were used in the additional analyses reported in the results.

In a sequential mixed method framework (Creswell & Plano-Clark, 2018), we conducted qualitative analyses after the quantitative analyses using 10 sample responses randomly pulled from different levels of the distribution of scores. We sought to understand what appeared to be the most commonly accessible aspects of the writing task versus those that distinguished the top scoring writing products from the others. We also sought to identify potential improvements to the scoring rubric for future research.

| *The things going on in this picture seem very unclear to me, but I can tell that it definitely has a background meaning. It makes me feel like it is based on how our society works. You see there are several older aged men, on what seems to be a billboard, these men could be the ones who are running the country. Then you have all of the people going into the door to give their lives away and work for these men. Though, you also have the two main men in the picture who are in a way rebelling. Or maybe they aren't [aloud] with the others? To this I do not know. This picture definitely has an incredibly deep meaning. It represents how our society works and/or functions. I also notice the woman at the bottom with her child because her husband, the child's father, maybe, has gone to work for the men. This is overall a powerful image and should definitely be shown more to give others perspective on what goes on in our world.* (Grade 8 student) | | | | | |
|---|---|---|---|---|---|
| **Level 4: Proficient** | **Presents Claim** | **Connects Source Material to Claim** | **Words, Phrases, and Sentence Fluency for Cohesion** | **Elaborates with More Evidence or Claims** | **Concluding Statement** |
| **Data-based rationale for score** | Score 4 Anchor: *It makes me feel like it is based on how our society works.* | Score 4 Anchor: *You see there are several older aged men, on what seems to be a billboard, these men could be the ones who are running the country…you also have the two main men in the picture who are in a way rebelling. Or maybe they aren't allowed with the others.* | Score 4 Anchor: *Background meaning… It makes me feel like… Or maybe they aren't allowed…* (speculation) *This is overall a powerful image and should definitely be shown more to give others perspective…* | Score 4 Anchor: *I also notice the woman at the bottom with her child because her husband, the child's father, maybe, has gone to work for the men.* | Score 4 Anchor: *It represents how our society works and/or functions…should definitely be shown more to give others perspective on what goes on in our world.* |
| **What makes it proficient? What more is needed?** | Presents a broad but relevant claim about the meaning of the work. | Provides clear and detailed evidence from work that draws out claim further into a cohesive narrative. | Uses multiple types of connecting, speculating, or explanatory words. Includes variation and stylistic choices in sentence structure, or flow between sentences. Could use more words (e.g., because) to explicitly connect claim and evidence. | Uses "also" to indicate a new idea and extension. Connects another detail from the work to support the claim and develop narrative further. | Provides a summative statement that revisits original claim and expresses opinion about the work. |

**Fig. 3.** Proficient level of the argumentative writing rubric.

## 3. Results

In general, the results supported some hypotheses and not others, and provided initial evidence that the proposed assessment protocol and rubric approach has promise. Additionally, results emphasized the important role of students' self-efficacy in argumentative writing as opposed to self-efficacy in close observation of a visual image.

### 3.1. Research Question 1. Reliability and usefulness of argumentative writing assessment scoring

In general, the criteria demonstrated reliability across three raters for the sample of 17 responses used in the test run. The criteria for Presents Claim reached an ICC = 0.75; the criteria for Connects Source Material to Claim reached an ICC = 0.89; the criteria of Cohesion of Words, Phrases, and Sentence Fluency reached an ICC = 0.80; the criteria of Elaborates with More Evidence or Claims reached an ICC = 0.82; the criteria for the Concluding Statement reached an ICC = 0.67. The ICC of the *summative mean score* of the five criteria across the three raters reached ICC = 0.89. Landis and Koch (1977) provide useful guidelines for ICC (and kappa) reliability coefficients: moderate, 0.41–0.60; substantial, 0.61–0.80; and nearly perfect, 0.81–1.00 (see also Donner & Eliasziw, 1987). Though the evidence of reliability ranged considerably across the sub score criteria from ICC = 0.67–0.89, they were generally substantial to nearly perfect on their own. When computed as a mean for each rater, the ICC across raters for the summative mean score was strong. The score reliability of the five criteria was high at α = 0.94. In sum, the rubric demonstrated strong evidence as a reliable scoring method to research and assess students' argumentative writing skill using visual art works as a source.

As Table 1 illustrates, the range of mean scores for criteria ranged from a low of $M = 1.42$ ($SD = 0.67$) for skill in concluding the argument to a high of $M = 2.48$ ($SD = 0.87$) for presenting claims. Overall, the mean summative score for students argumentative writing was $M = 2.04$ ($SD = 0.78$), which represents the *emergent* level for students' skill development in argumentative writing. Student development appears to be most needed in concluding the argument and using words, phrases, and sentence fluency for cohesion.

### 3.2. Research Question 2. Social, cognitive, and motivational survey factors

As Table 2 details, survey factors generally met the threshold for adequate reliability across a broad age range of students from Grades 4–7. Reliabilities ranged from a low of α = 0.68 in Self-Efficacy for Close Observation and a high of α = 0.86 for sense of belonging. Factor means ranged from a low of $M = 3.99$ ($SD = 1.18$) for Intrinsic Enjoyment to Write, which reflects a response of *somewhat agree*, to a high of $M = 4.97$ ($SD = 1.00$) for Sense of Belonging, which reflects a response of *agree*.

### 3.3. Research Question 3. Correlations across factors and predictive strength for writing score

As hypothesized, the summative mean argumentative writing scores demonstrated small effect size correlations with Critical Thinking ($r = 0.18$), Self-Efficacy for Argumentation ($r = 0.24$), and Openness to Different Perspectives ($r = 0.20$). However, our hypotheses that other factors, including Self-Efficacy for Close Observation, Intrinsic Motivation to Write, and Sense of Belonging would relate to argumentative writing scores for this type of task, were not supported based on statistically non-significant correlations. (Table 3,4).

### 3.4. Research Question 4. Distinguishing Features and Improvements to the Rubric

Student writing samples pulled randomly across different rating levels are included in the Appendix along with the mean score each received across criteria. As can be seen from those examples, students were generally able to make an observation and form it into a claim with some evidence backing up that claim, even in the bottom quartile—the beginning steps of argumentation. For instance, Sample #1 wrote "it looks like [they are] taking flowers across a river in a boat, but they all look sad." If that student had elaborated on a potential source of that look of sadness (e.g., a funeral procession) the argument would have developed further. Defining features of student responses in the top quartile included: offering numerous pieces of evidence for claims, exploring multiple claims, and building coherence for their argument through sentence structure and vocabulary—all learnable skills. For instance, Sample #9 proposed three viable claims with details backing those claims up. One claim was "…a family with a family member who just perished. In some cultures or religions, a family brings the dead body in a boat with flowers…".

**Table 2**
Reliability and descriptive statistics of scored argumentative writing components.

| Argumentative writing skill | α | *N* | Min | Max | Mean | SD |
|---|---|---|---|---|---|---|
| Presenting claims | – | 270 | 1.0 | 4.0 | 2.48 | 0.87 |
| Connecting source material to claims | – | 270 | 1.0 | 4.0 | 2.18 | 0.98 |
| Using words, phrases, and sentence fluency for cohesion | – | 270 | 1.0 | 4.0 | 1.91 | 0.76 |
| Elaborating with more evidence or claims | – | 270 | 1.0 | 4.0 | 2.22 | 1.01 |
| Concluding statement | – | 270 | 1.0 | 4.0 | 1.42 | 0.67 |
| Mean argumentative writing score | 0.94 | 270 | 1.0 | 4.0 | 2.04 | 0.78 |

**Table 3**
*Reliability and Descriptive Statistics of Survey Factors.*

| Survey Factors | α | *N* | Min | Max | Mean | SD |
|---|---|---|---|---|---|---|
| Self-Efficacy for Close Observation | 0.68 | 270 | 1.33 | 6.0 | 4.35 | 0.89 |
| Self-Efficacy for Argument Writing | 0.82 | 270 | 1.0 | 6.0 | 4.41 | 1.03 |
| Intrinsic Enjoyment to Write | 0.85 | 270 | 1.0 | 6.0 | 3.99 | 1.18 |
| Sense of Belonging | 0.86 | 270 | 1.0 | 6.0 | 4.97 | 1.00 |
| Openness to Different Perspectives factor mean | 0.72 | 270 | 1.8 | 6.0 | 4.83 | 0.82 |
| Critical Thinking factor mean | 0.74 | 270 | 1.4 | 6.0 | 4.53 | 0.79 |

**Table 4**
Bivariate Correlations Between Argumentative Writing Skill and Other Relevant Factors.

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Argumentative writing score | – | | | | | | |
| 2. Critical thinking | 0.18* | – | | | | | |
| 3. Self-efficacy for close observation | 0.02 | 0.45* | – | | | | |
| 4. Self-efficacy for argumentation | 0.24* | .61* | .44* | – | | | |
| 5. Sense of belonging | 0.09 | 0.41* | .28* | .28* | – | | |
| 6. Intrinsic enjoyment to write | 0.12 | 0.54* | .51* | .51* | .45* | – | |
| 7. Openness to different perspectives | 0.20* | .43* | .30* | .46* | .38* | .39* | – |
| Mean | 2.04 | 4.53 | 4.35 | 4.41 | 4.97 | 3.99 | 4.83 |
| Standard deviation | 0.78 | 0.79 | 0.89 | 1.03 | 1.00 | 1.18 | 0.82 |

* $p < .05$.

Students' conclusions were the weakest part of their written arguments, which could be a result of the prompt lacking any suggestions or reminders to conclude their writing. This point may be one of the areas of weakest alignment between the arts-based visual thinking prompt and argumentative writing. As can be seen in the range of student writing samples included in the Appendix, even the high-scoring examples did not include a formal concluding statement but instead chose to write about multiple possible claims they could build about the image. In this way, the elaboration criteria of the rubric may conflict with the conclusion criteria and should be reconsidered for this open-ended arts-based writing prompt. This finding could also point at insufficient practice for students in class to develop all parts of an oral or written argument. One other potential issue using this approach as a formative development process and assessment for argumentative writing is how Sample #7 built a fictional narrative to explore the meaning behind the image. It is possible that student interpreted the open-ended prompt as a creative writing exercise.

## 4. Discussion

Using a social-cognitive framework within the Writers-Within-Community model (Graham, 2018) and a visual arts-based argumentative writing prompt we hypothesized that several individual-level factors would be positively related to students' actual demonstrated writing. The relationship between argumentative writing performance was tested using a student survey that measured the following factors (a) Self-Efficacy for Close Observation, (b) Self-Efficacy for Argumentation, (c) Intrinsic Enjoyment to Write, (d) Critical Thinking, (e) Openness to Different Perspectives, and (f) Sense of Belonging in class. This study also sought to establish initial technical adequacy of a writing assessment rubric specific to argumentative writing that integrates a visual prompt in the assessment format. Overall, findings supported the use of visual arts sources as the stimuli for argumentative writing to determine individual differences that might link to some components of a social-cognitive framework aligned to the WWC model (Graham, 2018). Strong evidence of reliability across raters provides some confidence in the use of the rubric for objective assessment of students' responses to detect individual differences that relate to students' openness to different perspectives, self-efficacy for argumentation, and critical thinking.

Bivariate correlations indicated that students' writing scores were not related to their self-reported intrinsic motivation to write, self-efficacy for close observation, or sense of belonging in class. Additional research is needed to learn how those factors may be at work in students' further development of argumentative writing skill, for instance, in the more social, peer-to-peer aspects of writing. As can be seen in the writing examples in the Appendix, even the responses scoring lower contained some degree of personal observation and opinion from the students. How willing students would be to share their claims and evidence orally in class may draw on how much belonging they feel, which could be studied in future research with this protocol. This formative writing assessment activity could be complimentary to the WWC model (Graham, 2018), offering students the opportunity to privately write down their observations and arguments, then share them in peer-to-peer collaboration to revise and refine.

### *4.1. New approaches to argumentative writing skill*

The use of visual artworks to prompt student's argumentative writing appears to provide an open and accessible opportunity for students to demonstrate skills in argumentative writing. In our sample of 270 students from Grades 4–7 their skill development in

argument writing was generally emergent. This finding reflects past trends identified in research of a general lack of proficiency in writing (SalahuDin et al., 2008) and less time dedicated to writing instruction as students' progress through grade levels (Applebee & Langer, 2011). In addition to using visual artworks as source material for argumentative writing, teachers could also experiment with a variety of other types of sources to develop students' skill and self-efficacy within a social-cognitive theory framework. For instance, teachers could use video and social media sources on different topics relevant to student's lives outside of school. Teachers could integrate journalistic techniques and ask students to listen to interviews or read transcripts about a story or person's life and build a balanced story from what they hear (Madison et al., 2019). Students could listen to a musical piece and interpret the choices the artist makes, identifying a claim and building an argument. A greater variety in media form and cultural representations enhances the possibility for universal accessibility (Meyer et al., 2014) and cultural responsiveness and relevance (Hammond, 2015). The rubric developed and tested in this study can serve as a foundational template for those other types of assessment formats, where educators and researchers could generate new anchors and examples for rubric level and aspect of argumentation from authentic examples.

### 4.2. Self-efficacy as foundational to motivation

Self-efficacy for argumentation was one of the statistically significant predictors of argumentative writing score. While self-efficacy for the most proximal skill to the task—argumentation—was a statistically significant factor, self-efficacy for close observation was not, which highlights the task-specific nature of self-efficacy and the primary focus of writing versus visual literacy in this task. Interestingly, intrinsic motivation appeared to be unrelated. After conducting decades of research, Bandura pronounced that one's self-efficacy is the "foundation of human aspiration, motivation, and accomplishment" (2018). According to the agentic perspective of social-cognitive theory (Bandura, 1986), the self-reflection that goes into this judgment of oneself plays a major metacognitive role in a person's action and performance. If a student doesn't hold a strong belief that they can produce the desired outcome of a solid claim backed up with robust evidence, for example, they are likely to feel little incentive to act or to persist when they hit a challenge or setback. For this reason it makes sense that self-efficacy undergirds students' resilience (Amitay & Gumpel, 2015; Abia-Smith et al., 2020; Anderson et al., 2020; Smolkowski et al., 2020) and serves as a protective factor for continued engagement in school (Anderson et al., 2019).

Sources of students' judgment of their self-efficacy in argumentative writing is likely not just based on mastery experience in the skill but also based on their social comparison, feedback and help availability from teachers, and their comfort with specific skills included in the task (Butz & Usher, 2015). Students also develop domain-specific self-efficacy through vicarious experience, modeling, and messaging of others (Kim et al., 2021). To this end, consistent practice using different kinds of prompts to developing argumentative writing skill (Smolkowski et al., 2020; Yenawine, 2013), such as visual art work, could be a major support to students' self-efficacy development in argument writing. As a core belief in the WWC model (Graham, 2018), the social nature of self-efficacy development for students in a school setting is key and could be fostered by integrating the assessment and rubric tool investigated in this study as a form of class discussion and peer-to-peer feedback.

### 4.3. Becoming more open

Openness to different perspectives held only a small bivariate correlation with argumentative writing skill and was correlated at a small-to-medium effect size with every other factor measured in this study. Developing an openness to multiple perspectives is one of the primary goals of classroom implementation of visual thinking strategies using works of art, which, by definition, often provide many possible interpretations (Smolkowski et al., 2020). Based on the findings from this study, development of openness to different perspectives may be reciprocal with other important factors, including self-efficacy, critical thinking, and sense of belonging. Framed as both an individual level factor and characteristic of a writing community, openness to other perspectives is a complementary extension within different parts of the WWC model (Graham, 2018), specifically in the conceptualization and reconceptualization aspects of the writing process. Regular opportunities to share out and listen to a variety of possible perspectives and interpretations from peers may grow this important factor for the community of students.

### 4.4. Implications for practice

Recent focus has called for greater integration of writing assessments with other instructional areas such as reading and language to increase measurement validity and authenticity (Uludag & McDonough, 2022). This study produced an assessment protocol integrating a piece of visual art as the stimuli for students' argumentative writing with results demonstrating evidence of reliability and validity for the rubric's use to score students' writing. More work is needed with this integrated approach and others like it to understand if it provides a more culturally responsive and accessible opportunity for diverse learners to engage in and develop writing skills. The validity of this formative assessment tool depends on the intended use and interpretations made. This rubric builds directly from the NWP Argumentative Writing Rubric (DiPardo et al., 2011), validated for a variety of uses. We propose that the visual arts-based prompt and rubric has demonstrated early evidence of validity as a formative tool to provide students' feedback on making claims with supportive evidence and effective language choices. The correlations identified with critical thinking, self-efficacy for argumentation, and openness to different perspectives provides initial convergent construct validity evidence that different levels of writing scores will reflect different levels in these other interrelated individual-level factors. More research will be needed to see how well improvements in these rubric-based scores will reflect increased levels of those other individual-level factors. Additionally, more supports will be needed to provide teachers guidance on giving students' meaningful feedback.

Students' self-efficacy was a strong factor predicting performance in the writing task. Given the variety of sources students incorporate to assess their self-efficacy in a context and task, teachers have multiple avenues to support students' efficacy growth. First, teachers can scaffold writing exercises to ensure students develop mastery in specific skills, such as making a claim, before trying to synthesize those skills holistically, such as writing an argument. Second, teachers can provide students' specific feedback and modeling on argument writing techniques. Teachers can reward effort and revision across drafts rather than focusing on initial quality in first drafts. Third, teachers can undermine the power of social comparison and competition in either building or diminishing self-efficacy through consistent messaging that mistakes are important and expected. Teachers can share stories from their life and from professional authors to help students see that most writing takes many drafts to get things right. Achievement goal theory (Dweck, 1986) emphasizes that a classroom climate that focuses on goals toward mastery of a specific skill, like writing, versus performance and competition between students will be more likely to develop students' self-efficacy (Madjar & Chohat, 2016).

### 4.5. Limitations and future directions in research

The design of the study as a cross-sectional descriptive study is an excellent exploration of related skills and concepts but future studies could include multiple time points to observe if relations change over time within a school year as students' skills change and as teachers provide meaningful feedback to support students' skill development. The study was limited to grades 4–7, so results at the high school level for relationships between writing skills and the social-cognitive constructs may function differently than for younger students. Now that an initial demonstration of reliability has been established for the argumentative writing rubric, future studies could extend construct validity by scoring student writing samples with both the NWP rubric and the Argumentative Writing Rubric alongside other convergent (e.g., self-efficacy) and discriminant (e.g., writing anxiety) factors. Social validity of the measure could be explored by training writing teachers and asking them to evaluate how they would use the rubric to provide feedback to students and how students could use the rubric to guide their writing process.

### 4.6. Conclusion

This study is an extension of previous instructional efforts (Abia-Smith et al., 2020; Smolkowski et al., 2020) to integrate visual arts to teach critical thinking and argumentative writing skills. The findings present two new areas of promise by assessing students in Grades 4 through 7 using adapted student surveys and a newly developed argumentative writing rubric. We were able to demonstrate that rubric-based scores of students' responses to the writing task, which uses visual artworks as the stimulus, is reliable and related to social-cognitive factors. It is possible that openness to different perspectives could be developed alongside argumentation skills in writing to enhance student development. The implications open new areas to engage all learners in the writing process using different kind of stimuli, such as artwork, which can increase teacher tools for universal engagement of diverse student populations.

## Data Availability

Data will be made available on request.

## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.asw.2023.100694.

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