Expansively Framing Social Annotations for Generative Collaborative Learning in Online Courses

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Abstract: This study extends the use of *expansive framing*, a discursive pedagogical practice for supporting generative (i.e., transferable) collaborative learning, to a fully online undergraduate Educational Psychology course. This study examined how students expansively framed their engagement in a social annotation activity across the semester. Quantitative analysis confirmed the extent to which interactions in the annotation activity were expansively framed and found a significant correlation between expansive framing and open-ended exam performance. Qualitative analyses confirmed that expansively framed interactions made numerous connections between disciplinary course knowledge and nascent disciplinary teaching practices. More generally, the study showed that expansive framing can be easily and successfully used to support generative collaborative learning in online courses.

Introduction

Expansive framing (Engle, 2006; Engle, Lam, Meyer, & Nix, 2012) is a recent framework for explaining and encouraging generative learning—learning that is more likely to transfer to subsequent contexts. The research on transfer is plentiful and has traditionally focused on learners' abilities to create abstract mental representations of the content to be transferred (Day & Goldstone, 2012). Engle (2006) argued that, from a situative perspective, "transfer is more likely to occur to the extent that learning and transfer contexts have been framed to create what is called *intercontextuality* between them" (p. 456).

Intercontextuality is created when learners make enough connections back and forth between a learning context and a transfer or imagined future context (Engle et al., 2012). This intercontextuality indicates that the social context—the who, when, where, how, and why—expands to encompass both the learning context and the transfer context. According to Engle (2006), "When this [intercontextuality] occurs . . . the content established during learning is considered relevant to the transfer context" (p. 456). If learners perceive the learning context and the transfer context to be relevant to each other, it is more likely that transfer will occur. Engle suggested that this intercontextuality can be created through what she referred to as *expansive framing*.

Expansive framing uses prompts or cues (usually from the instructor) that position learners as authors of their own ideas and encourage learners to frame their immediate learning context across time (relevance of prior learning to current learning context and relevance of current learning to potential future contexts), places, topics, and participants. These "meta-communicative signals" (Engle, 2006, p. 456) create intercontextuality by helping learners see prior learning as relevant to immediate learning contexts and the potential for current learning to be useful in other contexts and situations. Expansive framing pushes learners to (a) be publicly recognized as authors of the connections they are making to other learning contexts, (b) be held accountable for their contributions, and (c) feel encouraged to adapt and generate new connections. Expansive framing contrasts with *bounded* framing which (a) focuses on the contexts defined and/or provided by the instructor, (b) discourages learners from making connections or considering other contexts of use, and (c) expects learners to explain the ideas of a text or the teacher (Engle et al., 2012).

This study aims to extend the work of expansive framing in three innovative ways. First, studies of expansive framing have primarily focused on the instructors' use of expansive framing in classrooms such as an elementary classroom (Engle, 2006), tutoring sessions (Engle et al., 2011), a secondary science classroom (Engle et al., 2012), and a hybrid second language undergraduate course (Mendelson, 2010). More recent research has acknowledged the role of the learner and examined whether learners' perceptions and beliefs aligned with expansive framing (Lam, Mendelson, Meyer, & Goldwasser, 2014); however, few studies examined whether students took up expansive framing in their own discourse within a course (e.g., Fasso & Knight, 2015). While expansive framing was originally conceived as a *pedagogical* tool used by teachers to encourage learning, we reconceptualized expansive framing as a *learning* tool used by students to promote their own generative learning. This view also prioritizes students' agency in taking up expansive framing for learning. One aim of this study is to examine how and to what extent *students* took up expansive framing.

Second, we argue that expansive framing is relatively easy to implement in asynchronous online settings and would likely support generative learning in those settings. A search of the literature returned few

instances of expansive framing in fully online settings. Fasso and Knight (2015) incorporated expansive framing into a study of adult learning in a hybrid a/synchronous professional development course for teachers from various contexts (e.g., P-12 education, vocational training, and higher education). Their study found that "expansive framing of the discussions led to broadened perspectives, enhanced collaboration and sharing, and evidence of the transfer of ideas across contexts that served to enrich the ideas of others" (p. 279). Hickey and Rehak (2013) and Jaber, Dini, Hammer, and Danahy (2018) successfully implemented elements of expansive framing in asynchronous online settings by encouraging learners to connect disciplinary knowledge to their relevant disciplinary practices; however, their studies were based off Engle's prior work of productive disciplinary engagement (Engle & Conant, 2002). Therefore, a second aim of this study is to examine expansive framing in a completely asynchronous online setting.

Finally, this study extends expansive framing by combining it with the use of a social annotation tool. Annotation tools are well known in the CSCL community for supporting anchored discussions, or discussions anchored to an artifact such as a course reading (van der Pol, Admiraal, & Simons, 2006). Novak, Razzouk and Johnson's (2012) literature review found mixed results from using social annotation tools for learning. Most of those studies, however, focused on attitudes rather than learning outcomes. Social annotation has been shown to foster elaborated discussions (Eryilmaz, van der Pol, Ryan, Clark, & Mary, 2013; Gao, 2013). Social annotation aligns with expansive framing because it allows learners to layer their own expansively framed contexts directly on top of content discussions and readings. The third aim of this study examines whether social annotation tools can support the use of expansive framing.

Research questions and methods

This study asked (1) to what extent were students' interactions expansively framed, (2) how was expansive framing related to individual learning outcomes, and (3) what was it about expansively framed interactions that appeared generative.

Context and participants

This study took place in an online undergraduate Educational Psychology course for pre-service teachers which took place in the Spring 2018 semester at a large Midwestern university. The first author was the lead instructor for this course. There were 17 student participants from four different majors (visual arts education, n=10; world language education, n=4; physical education, n=2; dietetics, n=1). During the 16-week course, students annotated 23 course readings using the online social annotation tool *Hypothesis* (https://web.hypothes.is/). Hypothesis allows students to select portions of text and directly annotate it by adding their own comments. Hypothesis allows users to engage in further conversation via threaded comments on the direct annotations. The course readings consisted of academic articles that discussed key theoretical principles from several major learning theories. The students were asked to engage in the annotation activity but were not graded on their participation in the annotations. Students were, however, asked to reflect on peers' and their own annotations on a weekly reflection which was graded. The prompt for engaging in the annotation activity was deliberately worded to encourage students to expansively frame their engagement and their annotations (see Table 1).

Table 1: Annotation activity prompt

Before you start reading, you should think about a specific context for your engagement in the reading and annotations. To do this, you should: 1. Pick a developmental level (e.g., Elementary, Middle, Secondary, etc.) you are interested in teaching. 2. Pick a content standard(s) from the State Standards that you are interested in focusing on. As you read and make web annotations, consider the relevance of the reading and annotations as applied to your context. At the end of most units, you will be designing a lesson plan that you could actually use in a current or future classroom as part of our Theory/Practice Workshops. Picking a developmental level and content-area standard(s) should help you think about how what you are learning applies to the Theory/Practice Workshops as well as other potential future contexts (e.g., classroom, student teaching, other classes, etc.). In this class we will be using web annotations using a web tool called Hypothes.is to participate in a larger discussion of articles that we will read as well as facilitate making connections to other content such as other articles we are reading in the class or content you may read or interact with outside of class. The web annotations can also help us make connections to prior experiences you may have had, current experiences you are having, or potential future experiences you may have (e.g., your field experience, future classroom, or work-related experiences).

At the end of the course, students took a written exam that included two different prompts relating to learning theory. One prompt provided students with an op-ed article written in the New York Times arguing for the pedagogical practice of lecturing. Students were asked to analyze that article from two different theoretical perspectives of their choice. For each theory, students needed to (1) describe what learning looks like in that theory, (2) describe a specific concept or aspect of that theory, (3) explain how that theory and concept would disagree with the article, and (4) provide an appropriate link to the course readings to back up their argument. The second prompt asked students to (1) design an assessment and two activities for a specific academic standard in their content area provided for them by the instructor, (2) describe how a particular learning theory informed their design, and (3) provide an appropriate link to the course readings. The exam was designed to assess students' understanding of the major learning theories discussed in the course and their ability to apply it to classroom design. Within the constraints of a typical teacher education course, this exam was a reasonable proxy for a transfer measure that was indicative of generative learning and was likely to transfer to subsequent educational and professional contexts.

Table 2: Coding scheme for aspects of expansive framing

Code	Description	Example
Time Past	Refers to a past time that what was learned then can, should be, or has been used.	"I had an English teacher senior year…" "This reminded me of last semester…"
Time Future	Refers to a future time in which what is learned can, should be, or would be used.	"In my future classroom I'd like to…" "Teachers need to…"
Place	Refers to another place outside of the course in which what is learned can, should be, or has been used.	"In my field experience…" "At the high school…" "At home…"
Topic	Refers to a non-course topic in which what is learned can, should be, or has been used.	"In my content area of visual arts…" "My Pluralism in Education course talked about this…"
Participants	Refers to person(s) other than the teacher that one can, should be, or has communicated what one has learned.	"Pre-service teachers could use this to…" "This really applies to students…"
Accountability	Holds others accountable for sharing knowledge by directly engaging others with questions to encourage threaded discussion and/or responding directly to a peer's statement by answering and/or referring to a specific question/comment.	"How would you…?" "Leslie's comment helped me think about…" "I agree with your claim that…"
Authorship	Presents themselves as authoring knowledge.	"I think this is important…" "We also should consider…"

Data collection and analysis

All of the annotations during the course of the semester were exported from Hypothesis. This data included the text of students' annotations, the annotated text from the article (if applicable), the level of the annotation (for threaded comments), and other metadata.

To address the first research question, these annotations were first coded for enlistment of expansive framing using the coding scheme in Table 2 following from Engle et al. (2012). This coding revealed the proportion of annotations that were expansively framed with each aspect. To determine how expansive those annotations were, we developed a second coding scheme (Table 3). For this degree of expansiveness coding scheme, the first two authors coded 20% of the annotations separately and achieved an inter-rater reliability of 0.70 using Cohen's Kappa. The first author then coded the remaining annotations alone.

To address the second research question and determine whether students' engagement in expansive framing appeared to be generative to a transfer task, we ran a Pearson correlation between students' mean expansive framing score (i.e., degree of expansiveness) and student scores on the written final exam. Two students dropped the course before the final exam and thus were not included in this analysis. To address the third research question, we drew upon discourse analysis (Wooffitt, 2005) to identify what students were actually doing in their annotations that might lead to generative learning. Looking across the dataset, we were

interested in patterns that emerged around how students used framing in their annotations and how that framing shaped the subsequent discourse in the threaded annotations.

Table 3: Coding scheme for degrees of expansiveness

Code	Description	Example
U Unframed	The annotation makes no reference to any aspect of expansive framing.	"I'm not sure I fully understand the difference between the two."
0 Bounded	The annotation references at least one aspect of expansive framing, but the annotation is confined to the course and content from the current reading.	"Further analysis and application of what is learned can occur when knowledge of subject matter exists. How the subject matter is organized and connects to itself matters."
1 Slightly Expansive	Uses *at least 1 aspect* of expansive framing; Uses *vague descriptions or connections* to aspects of expansive framing; AND/OR *Does not go beyond* the framing established by the original document or annotation it responded to.	"I think the things that they learn in school will have an effect on their lives outside of school, it just depends on the student and how much of the information they retain. I do agree though that the teachers should try to have an understanding of the students' lives outside of school."
2 Moderately Expansive	Uses *more than 1 aspect* of expansive framing; Uses *specific examples* when connecting to aspects of expansive framing; OR *Explicitly orients towards others* in a future setting.	"In high school, I had a Spanish teacher that taught English in Spain for about 7 years. She was fluent in Spanish so I thought I would learn a lot during my time in her class. It was the complete opposite, which is interesting to me because of this highlighted portion. Just because she was an expert on the topic, she could not teach it well."
3 Very Expansive	Uses *more than 2 aspects* of expansive framing; Uses *specific examples* when connecting to aspects of expansive framing; *AND Explicitly orients towards others* in a future setting.	"This is a great way to engage students in their learning and understanding of art history. When analyzing a painting, students must first understand how to use contextual clues to describe and explain what the painter might have been communicating through his/her work. Taking a step further, to help students improve their flexibility in transferring knowledge, a teacher might ask, 'What if the figure on the right was looking toward the viewer, rather than away. What might we say about the painting then?'"

Results

The first major finding was that students did indeed reference aspects of expansive framing in their discourse (see Table 4). Across the course, students generated a total of 459 annotations. Students referenced Participants most often (76% of student annotations), followed by Authorship (71%) and Topics (61%). The types of Participants referenced most often were teachers and students. The types of Topics referenced varied but were generally related to three different categories: their own content area, other courses they were enrolled in, or general education topics and activities. Students did not reference all aspects of expansive framing equally, however. Students did not reference Places (28%) or Accountability (39%) as often. This shows that students have expansively framed their discourse, favoring some aspects over others.

The coding results of degree of expansiveness provides further evidence that students used expansive framing in their discourse. Only nine (2%) of the 459 annotations were unframed and 12 (3%) were bounded to the course and course reading. This means that more than 95% of the annotations were at least slightly expansive and 62% of the annotations were coded as moderately or very expansive.

The Pearson correlation between students average score on expansive framing (degrees of expansiveness) and their written final exam score was 0.56 ($p<.05$). In other words, students who performed better on the final written exam also, on average, were more expansive in their annotations. The final exam assessed students' ability to analyze educational practices from a theoretical perspective as well as design

towards educational practices grounded in theory. These results were promising but warranted a qualitative exploration to examine how students used expansive framing for generative learning.

Table 4: Coding results of students' use of expansive framing in their annotations

Code	#	%
Aspects of expansive framing		
Time Past	179	39%
Time Future	227	50%
Place	129	28%
Topic	279	61%
Participants	349	76%
Accountability	179	39%
Authorship	324	71%
Degree of expansiveness		
U (Unframed)	9	2%
0 (Bounded)	12	3%
1 (Slightly expansive)	152	33%
2 (Moderately expansive)	203	44%
3 (Very expansive)	83	18%
Total	459	100%

Discourse analysis of the annotations revealed several patterns that appeared both productive (Engle & Conant, 2002) and generative. One such pattern was that students were connecting disciplinary practices in their own content areas to the disciplinary knowledge in the course. Students made connections to their own content areas in all but four of the course readings (19 of 23) and in 92 annotations (20% of all annotations). The example below (see Table 5) shows a threaded conversation between students on an article about assessment.

Table 5: Threaded annotations connecting content-area disciplinary practices to course content (Excerpt 1)

Anchor text from Shepard (2000):
Students also reported that they had to be more honest about their own work as well as being fair with other students, and they had to be prepared to defend their opinions in terms of the evidence. (p. 12)

1. *Leslie, direct annotation (coded as moderately expansive)*
This is directly applicable to art critiques where students must analyze and evaluate the work of their classmates, and give them feedback. They must also receive feedback on their own work and be prepared to respond to this feedback (which requires self-assessment).

2. *Bethany (coded as moderately expansive)*
I feel like this can also apply to students studying a foreign language, if they are speaking to another student that is more skilled at the language than they are, then they can learn more and get assistance if they are struggling on vocabulary.

In this example, the original article was discussing implications of self-assessment practices and Leslie, a visual arts education student, points out a "direct" connection to her own content area and provides an example of a disciplinary practice in her content area. Likewise, Bethany, in her reply to Leslie, sees an application to students in her content area of foreign language learning. Both students expansively framed their learning by recognizing the relevance of prior knowledge from their own content area and made productive generalizations from the content to disciplinary practices in their own content area. Additionally, Bethany's response suggests she read Leslie's connection to art ("this can *also* apply", emphasis added). Connecting to one's own relevant contexts and being exposed to other relevant contexts likely promotes productive and generative collaborative learning.

Another pattern was students making connections to general disciplinary contexts and practices of teachers. This pattern was found in all but one of the course readings (22 of 23) and in 156 annotations (34% of all annotations). Table 6 shows a threaded conversation about deficit approaches to education.

Table 6: Threaded annotations connecting general disciplinary practices to course content (Excerpt 2)

Anchor text from Paris (2012):
Simply put, the goal of deficit approaches was to eradicate the linguistic, literate, and cultural practices many students of color brought from their homes and communities and to replace them with what were viewed as superior practices. (p. 93)

1. *Rose, direct annotation (coded as moderately expansive)*
In one of my other classes, we are learning about Native American education. One thing that I have learned is that by eradicating student's culture, can make them feel unimportant and unvalued. I think this is a really important idea to keep in mind in a future classroom because students will not feel motivated or engage if they feel like their voice is not important.

2. *Jamie (coded as very expansive)*
I agree with you and in my own experiences, I have seen school trying to do special holidays related to China such as the (Chinese New Year), but after talking about it with my friends from China, they all say that the school got some of the major information incorrectly. For example, there is no such thing as fortune cookie and lion dance in mainland China on Chinese New Year. Although it is great to see that American schools are embracing different cultures from other countries, it is also important to keep in mind as future teachers that we get the facts correct before presenting to the students to avoid conflicts between teacher and student.

3. *Instructor (not coded)*
As I mentioned in the mini-lecture, this is very similar to the difference approaches to education where we try to incorporate other cultures but in a way that "fits into" the dominant culture (which is why there are so many inaccuracies as you mentioned). So how do we value our students ways of doing and knowing and being in our classrooms in more culturally sustaining ways?

4. *Brittney (coded as very expansive)*
In one of my other courses (pluralism in education), we discussed this and similar questions. One of the best solutions we thought of was to bring in people, that held a certain view point or background, to talk to students. Bringing in people who have first hand experience, in a culture for example, allows the students to feel valued if they are from that culture and the others to learn about them in an authentic way.

5. *Marrin (coded as moderately expansive)*
I am in class with Brittney and took a lot away from this topic in class. We also talked about how bringing in an outside resource can help bring a different learning experience than a daily teacher can lead. By simply having a new face leading sometimes allows students to be more engaged but also different methods of teaching is important in some instances. Another aspect we talked about is that a specific person teaching a subject can go a lot further than what the teacher may be. For example, if a white male were to be teaching a lesson about american indians students may not be as interested because he obviously would not be a direct source of their culture, though if an american indian were to come into class and teach a lesson students would value the information he shared much more.

In this annotation thread, Rose connects the content of the reading to another course she is taking and views her learning as relevant to the disciplinary practices of "a future classroom." Jamie responds by sharing an experience that validates Rose's prior learning. Jamie concludes her response by explicitly orienting towards herself and others in the class ("as future teachers . . . we") in sharing an example of how this applies to general disciplinary practices ("get the facts correct" about cultural activities). This type of comment was not uncommon throughout the annotations as students often used the phrase, "we need to" or "as future teachers we should" when writing about future applications of the content for students and teachers. The instructor of the course (the first author) responds to Jamie and connects back to the course content, followed by a question that asks students to imagine how they might apply the content of the article to their own future students. Brittney replies to the instructor's question by providing an example from another course she is enrolled in. Marrin states she is "in class with Brittney" suggesting that her response is not oriented toward Brittney, but rather towards others in the class. Marrin then reiterates Brittney's suggestion, validating her contribution, and connects to general disciplinary practices by briefly suggesting that "different methods of teaching" may be helpful. Finally,

Marrin shares an additional example of a disciplinary practice that connects to the previous responses. This set of threaded annotations showed students sharing examples of prior learning that was relevant to the content they were engaging in and generalizing the content to their future disciplinary practices.

A final example (see Table 7) demonstrates a pattern that was less common—found in 18 of 23 course readings and 46 annotations (10%)—but was productive for student's engagement and likely to be generative. Most of the annotations that were coded for accountability were simply students responding to a peer's annotation. However, some of the most productive responses occurred when students requested ideas from their peers. These questions often led to students sharing potential disciplinary practices from their own content area or for general education practices.

Table 7: Threaded annotations stemming from a student question (Excerpt 3)

Anchor text from Ito et al. (2013): Further, when individual competence is assessed based on grades, test scores, and other standardized and summative metrics, one student's success highlights another student's failure. Environments like the HPA, Quest to Learn, or Clarissa's online writing group have a different dynamic (p. 48)
1. *Anna, direct annotation (coded as very expansive)* How can we create this in a classroom? What can we as teachers do to create an environment where one student's success does not highlight another's failure, because standardized tests and evaluative exams will be inevitable. How can we create a group of students that genuinely enjoys collaborating and wants to do well for the good of the class, and not themselves, when we will undeniably have tension between individual students because of personality difference and difference in interest? **Please respond w ideas: I'm genuinely interested in how we can do this!** (emphasis in original) 2. *Abby (coded as very expansive)* These are great questions that I'm wondering about myself also! For your first Q "What can we as teachers do to create an environment where one student's success does not highlight another's failure?" One example that popped into my head is how during many classes I took during high school (and even in college) the teacher/prof would state "the highest grade was a 98 and the lowest was a 32" or something like that. I feel like this isn't appropriate to do, especially in a high school classroom where it is VERY easy to find out which student it was that the highest or lowest score belonged to. I feel like announcing the scores out loud kind of pits the students against one another, and highlights failures. Instead of the teacher announcing the scores, they should talk to the struggling students privately and see what needs to be done to bring their grades up. There's no point in discouraging the students by stating how much better another student did compared to them. That's just one example for the first question, but I'd also like to hear more from others! (that goes for the rest of the questions, too) 3. *Brittney (coded as moderately expansive)* Personally I have found goal setting to be a great way to motivate students without creating a competitive environment. I'm currently in a 1 credit swimming class, and at the beginning of the semester the instructors asked us to write down several goals we wanted to accomplish. I thought this activity helped make the class more personal to all of us and helped us appreciate when we or others accomplished their goals. This task would obviously look very different in a school classroom, but I think there are always ways to apply goal setting to our individual content areas.

In this example, Anna asks a series of questions on how to implement the ideas from the original article to their own potential future educational practices. At the end of her questions Anna emphasizes her request by using bold font to catch the attention of her peers and elicit their responses. Anna is promoting the authorship of her peers and holding them accountable for their ideas by requesting them to share. In Abby's response, she recalls a bad example from a prior situation (highlighting students' failures) and suggests a general alternative practice (talking with struggling students privately). Abby ends her annotation with a request for more responses ("I'd also like to hear more from others!"). Brittney's response shares a prior experience that is relevant (setting goals) to the questions Anna asked and suggests that this practice could be applicable in anyone's content area. Holding students accountable for their own ideas by asking questions, although not used as often as other framing aspects, encouraged generative learning.

Discussion and implications

This study provided initial evidence that online course readings can be expansively framed, that students can collaboratively take up expansive framing in online annotations, and that expansive framing appears to result in more generative learning. While acknowledging that a course with pre-service teachers may have been particularly conducive, expansive framing via Hypothesis enabled these students to collaborate in productive threaded conversations by connecting content-specific and more general disciplinary practices to the disciplinary knowledge presented in course readings. As Engle and colleagues (2006; 2012) have argued, these connections encourage *generative* learning which will likely transfer to future educational, personal, and professional contexts. This study showed that expansive framing is possible in online settings. Additionally, the prompt (see Table 1) could easily be modified to function in other similar online courses, especially pre-professional courses where students are working towards specific future contexts.

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