International Journal of Learning, Teaching and Educational Research
Vol. 16, No. 8, pp. 1-17, August 2017

Learning from each other: Dialogical Argumentation in an Online Environment

Anita Chadha
University of Houston
Downtown, Houston, Texas, U.S.

Renée B. Van Vechten
University of Redlands
Redlands, California, U.S.

Abstract. This research builds upon past work exploring how an online academic website can provide a learning environment in which students engage in dialogic argumentation by voicing their diverse perspectives, challenging their peers through counterarguments, and articulating their positional differences. Drawing from two semesters of data from an academic website populated by three classes, we analyze 375 peer-to-peer responses for their argumentative interactions. Using a mixed methods approach, we find statistically significant evidence that argumentative interactions lead to deeper engagement across the classes. This study concludes that online discussions—a form of computer mediated communication (CMC)—are an innovative means to advance e-learning, a concern for educators across disciplines.

Keywords: Argumentation; Online deliberation; Online teaching; Dialogic argumentation; Computer-mediated communication

Introduction: Learning from each other: Dialogical Argumentation in an Online Environment

Online learning environments now proliferate in our digital age and researchers have observed that in online, networked environments, learning can occur through an egalitarian process in which participants generate, challenge, reflect upon, and defend ideas, thereby constructing meaning through a social process (Rowntree, 1995; see also Chu et al., 2017; Cooper, 2001; Gordon & Connor, 2001; Wilson 2001). Also known as computer-mediated communication (CMC), web-based, interactive technologies are particularly well-suited to creative collaboration among active participants (Lee & McLoughlin, 2007). The CMC environment influences interaction due in part to visual anonymity and the absence of nonverbal cues. As Herring (1993) argues "they provide for the possibility that individuals can participate on the same terms as others, that is, more or less anonymously, with the emphasis being on the content, rather than on the form of the message or the identity of the sender" (p. 1). With greater focus on the written message produced through asynchronous means, students

can participate in discussions on the same terms as others, without respect to geographic distances (Lane, 1994) or due to personal disabilities (Collins, 2014; Lane, 1994). Relative anonymity can also encourage users to be more expressive and form relationships with others rapidly (Schouten et al., 2009).

Researchers have demonstrated that learning through CMC transpires through an individual process of critical reflection, a process of testing one's ideas while being challenged, reconsidering one's experiences and ideas in light of new information, and then reconciling differences. The argumentative process also involves synthesizing information and anticipating and responding to opposition, all of which are particularly conducive to learning (Jacoby, 2009; Blount, 2006; Bloom et al., 1956). In short, communicators learn through arguing with each other (Dehler & Porras-Hernandez, 1998), and dialoguing in ways that contains elements of argumentation also represents an opportunity to learn actively (Bender, 2003). As Socrates might have asserted, active argumentation channels learning.

In this paper, we investigate online discussion forums created for and by undergraduate students enrolled in American Politics courses from three campuses, assessing their interactions for patterns of dialogical argumentation. In the experiment, students were given a weekly prompt about a contemporary issue in American politics, and participants created individual statements that, inevitably, reflected various levels of intellectual engagement with the material. From generalizations to fairly thoughtful and well-constructed essay-like answers that evidence deep, critical reflection, the content of those discussion posts provided the data for our study. First we identify various forms of interaction, and present a model for analyzing the content of those website discussion posts, testing whether students engage the learning process when they argue with each other in online discussion forums.

Literature Review

Argumentation, according to Toulmin (1958), is a process whereby an individual or group, wanting to be taken seriously, tries to convince the others that the assertions being made are acceptable, meritorious, or valid, and there is abundant evidence that this argumentative process has great worth as a learning tool (Clark & Sampson 2008; Schwarz & DeGroot, 2007; Clark & Sampson 2007). Through it, students' understanding of challenging concepts can increase (Andriessen et al., 2013) and their ability to reason productively also can improve (Kuhn et al., 1997; Kuhn & Udell, 2003; Bell, 2004).

Argumentation sets the scene for changes in people's views because of the knowledge building and transformation of ideas that can occur through this process, leading to learning. This is a process of critical reasoning, and at its core is the idea of change in thinking. Change occurs because the arguer *convinces,* or a respondent critically *reflects* upon an idea and updates or refines an existing concept or belief. In any case, argumentation involves opposition, a process that some have characterized as occurring within a dialectic, whereby a *position statement* is made and justification is given, a *counterargument* is made and claims are questioned or examined, and a *reply* or rebuttal to the counterargument is supplied the dispute may ultimately be resolved into a *conclusion* (Toulmin 1958; Clark & Sampson 2007; 2008).

Arguments include supports such as warrants, backing, and qualifiers. In an online setting where students confront a discussion question and puzzle through its implications, the process generally parallels basic argumentative phases described by Toulmin (1958): online, they might might raise questions, challenge a premise, add new information, and/or anticipate responses. In essence, through dialoguing with each other via e-collaboration, students have the opportunity to engage in a *process of argumentation* that enables learning.

In dialogical argumentation, these being arguments carried out through written or verbal dialogue, participants negotiate their divergences and reconstruct their perspectives in a social context. In other words, arguments by participants are sensitive, as Leitão (2000) argues, "to specific demands of argumentative situations" (p. 336). In this way, "macro" meets "micro," as macro-level factors influence what is essentially a micro-level process of decision making. Hakkinen (2013) points out this interactive relationship: "these processes are intertwined…in a way that is not reducible to one level only" (p. 550). For example, a person might respond in a certain way because of how s/he has internalized shared norms about proper conduct, or the collective understanding about the purposes of an argument (Resnick et al., 1993). Likewise, personal attitudes such as openness to change or expectations about compromise (Coirier & Golder, 1993), as well as personal characteristics such as race, can influence how arguments unfold. Measurable change, therefore, takes place at the individual level as well as the social or group level. These changes might be of any magnitude; wholesale change is not required for an argument to be successful. As Leitão (2000) points out, in a discussion in which opposing views are justified and recognized, shifts in perspective occur across a continuum, ranging from subtle (qualifying a position) to complete reversal in stance.

Much research on online argumentation draws on Toulmin's initial work on argumentation (1958). For example, Clark & Sampson (2007) note that "analytic frameworks focus on many different aspects of argumentation including argument structure, epistemic types of reasoning, conceptual normativity, quality of warrants, number of warrants, logical coherence of claims with warrants, argumentation sequences, patterns of participation, conceptual trajectories, and the process of consensus building which can be applied across disciplines." (p. 275).[1] They examine how students engage six major components of arguments: claims (assertions about what exists or what values people hold); data (facts or statements used as evidence to support the claim); warrants (statements that explain the relationship of the data to the claim); qualifiers (special conditions under which the claim holds true); backings (underlying assumptions); and rebuttals (exceptional conditions capable of defeating or rebutting the warranted conclusion. The context, combined with the type of project, often determine which components are necessary for a successful argument.

---

[1] As Clark et al. point out that the pedagogical goal of an online project, class, or environment determine it use "for students to learn *from* argumentation (e.g., develop a more in-depth understanding of the content that is being discussed)," whereas the hierarchical analytic framework is better suited for analyzing online environments where students are learning "*how* to engage in argumentation (e.g., proposing, justifying, challenging ideas)" (2007: 352).

Several scholars argue that these components can be combined into more parsimonious models with fewer categories (Stegmann et al., 2012; Kollar et al., 2007; Means & Voss, 1996; Stegmann et al, 2007). Thus, the *quality* of each component depends on the validity and content of the argumentative claims, but how they are ultimately judged is discipline- or domain-specific. In order to test how students are in fact engaging in academic argumentation for the purposes of learning in online discussion forums, we turn to Clark & Sampson (2007) and (Erduran et al., 2004), who incorporate Toulmin's framework to evaluate the *presence, type,* and *quality* of each element within online group dialogue.

As Clark and Sampson (2007) explain, "argumentative phrases are categorized based on their operational purpose: (a) opposing a claim, (b) elaborating on a claim, (c) reinforcing a claim with additional data and/or warrants, (d) advancing claims, and (e) adding qualifications" (p. 255). In our study, we combine and then organize these categories into progressively complex combinations in order to create a rubric by which to the judge the quality of an argument, whereby "quality" refers to the *structure* rather than the normative content of the argument. This approach allows coded phrases to be aggregated and evaluated for their argumentative strength, and we adapt this method in the first part of our analysis.

We also turn to scholars who have developed a variety of analytical approaches, tools, and frameworks for evaluating qualitative argumentative dialogues generated in pursuit of different educational goals in different subjects (physics, mathematics, linguistics, social sciences), and through various modalities (face-to-face, online chatting). These methods for analyzing online dialogues include qualitative, quantitative, and mixed methods approaches. Likewise, we use a mixed methods approach for our analysis, first by coding the discussion forums and then testing the content analysis quantitatively. These methods have been used successfully in past research (Chadha, 2017a; Chadha, 2017b; Chadha, 2017c; Van Vechten and Chadha 2013). Before we elaborate upon this model, however, we first describe the nature and source of our data: a website designed around discussion threads.

The Collaborative Website Overview

Data are drawn from a collaborative, cross-campus website project that involved students enrolled during the two spring semesters of 2012 and 2013 as shown in Table 1. In spring 2012, students from two campuses participated in the website, for a total of 79 students. In spring 2013, a total of 81 students from three campuses participated, including 21 from an upper level class, and 60 from two introductory American Politics courses on other campuses. Except for the upper level course, courses contained mostly freshmen and sophomores, and virtually all were unfamiliar with the use of online courses requiring argumentation.

Table 1
Courses and Participants

	Spring 2012		Spring 2013			Total # of peer-to-peer responses
Campus	**A**	**B**	**C**	**D**	**E**	
Course Title	American Politics	American Politics	Political Science Capstone	American Politics	American Politics	N=375 entries
Number of Students	48	31	21	34	26	
% of Course Grade	15%	13%	15%	13%	10%	

Methods

The collaborative website was organized around asynchronous discussion forums that students developed through their online participation. Our research focused on the discussion forum entries recorded by the 160 students during the two spring semesters, and also questions that our students answered on pre- and post- surveys. Our approach included both qualitative and quantitative elements. First, we performed a content analysis of the 375 postings produced by the students, and then tested the data through linear regression.

Comparability across classes. To minimize differences among courses, the professors agreed to three syllabi requirements that were distributed to all students. First, the students were required to respond to a minimum of eight instructor-posed questions and respond to their peers a minimum of eight times, for a total of 16 posted responses over the course of the semester. Second, they were required to use a minimum of 75 words in each response. Third, each professor assigned a grade for these activities that represented between 10 to 15 percent of the course grade for this collaborative activity. Participation was voluntary, and students could opt for an alternative assignment.

During each semester a total of 14 weekly discussion questions were posed, covering variety of contemporary and enduring issues in American Politics. The number of responses varied with the type of question, whereby "hot button," controversial issues received the most attention. For this analysis, we selected discussion questions to represent a cross-section of the type of questions asked, as shown in Table 2. With the exception of laying the ground rules for civil discourse in the general guidelines that were distributed by each professor at the start of the semester, it should be noted that the professors did not intervene in the forums. Typically the students had one week to think about and post their replies.

Data collection. Our data collection began with the selection of discussion question forums for analysis. In the past nine years of work in this area we have found that controversial civil rights subjects with a moral dimension often elicit the strongest responses and provoke the liveliest arguments; whether to site a Muslim mosque near Ground Zero in Manhattan or to allow a fundamentalist Christian group to protest against gay rights at a soldier's funeral were two that

elicited heavy back-and-forth dialogue, for example. Questions that contain links to articles also seem to draw more thoughtful responses. Alternatively, when students are asked to consider slightly more abstract or theoretical issues, or are asked to supply a personal judgment to questions such as, "What is presidential greatness?" they offer assertions but rarely engage in vigorous debate or challenge each other. Students seem more unwilling to challenge each other when opinions prevail over argumentative elements (most seem to assume a "judge-not-lest-ye-be-judged" position). Peer-to-peer interaction is also biased in favor of agreement (Chadha, 2017b; Chadha, 2017c; Van Vechten & Chadha 2013; Van Vechten, 2013).

We chose discussion question forums (DQs) from two semesters that would represent different types of queries, both controversial and theoretical, and include high numbers of posts. For the sake of comparison, we also included one question that was nearly identical in both semesters (gay marriage). The selected topics are included in Table 2 where the "Responses" constitute peer-to-peer responses and the "Posts" refers to responses to the discussion question.

Table 2: Discussion Question Forums Selected for Analysis
Spring 2012 and Spring 2013

Semester	**Week Posted**	**Discussion Questions**	**Peer Responses / Posts***
Spring 2012, n=79	2	Relevance of a presidential candidate's personal life	44/ 100
	3	Federal government support for colleges & universities	30/ 76
	4	Free speech and right to privacy	34/ 79
	5	Gay marriage	58/ 119
	7	Right to lie	39/ 91
Spring 2013, n=81	2	Gun control	26/ 76
	4	Government's role	34/ 72
	10	Regulating food	37/ 88
	11	Political representation	32/ 69
	12	Gay marriage	41/ 91
TOTAL:			375/ 861

As Table 2 shows, there were a total of 375 responses and 861 posts during the spring semesters of 2012 and 2013. It is important to note that not every student is represented in a given forum; because students are required to respond to a question *plus* post a reply to another student, the total number of replies reflects about two posts per student. A typical discussion forum includes responses from roughly two-thirds of the website's student population. To ensure consistency and reliability of interpretation, only one author coded the data.

Operationalizing the variables with the framework. The analytic framework that Clark and Sampson (2007, 2008) developed to evaluate dialogic interactions in the hard sciences forms the basis for our analysis of argumentative quality, as shown in Table 3. We focus on the type of interaction, not content, to determine

"quality." Clark and Sampson's model depicts six levels that represent progressively more sophisticated forms of argumentation typically presented in the "hard" sciences. In their model, each higher step represents higher-level reasoning that involves more intellectually demanding components of the process, such as providing backing for claims in rebuttals. At bottom is an absence of argumentation, and at the highest level are extended arguments that include at least one rebuttal.

Our analysis focuses on interactive argumentative dialogue in the social sciences rather than on factual claim/counterclaim exchanges that typify hard sciences discourse. In our adaptation, we propose that the quality of the dialogue should be judged on the range, type, nature, and frequency of argumentative elements contained in peer-to-peer responses, as shown in Table 3. For our model we created a more parsimonious hierarchy of four types (instead of six), whereby each type represents progressively more sophisticated levels of argumentation as shown alongside the Clark & Sampson model. Coding each phrase within a posting for argumentative elements, or variables, within each online response allowed us to distinguish four levels of dialogical argumentation. It should be noted that a complete statement or posting could contain any number of these different elements.

Table 3
Dialogical Argumentation Typology

Clark & Sampson (2007)		→	**Our (2013) Model**
Levels	**Characteristics of Argumentation**	**Type**	**Characteristics/elements of dialogical argumentation**
5	Rebuttals and at least one rebuttal that challenges the grounds used to support a claim	3	Rebuttals that *Challenge* and *Dispute* peers' claims on the grounds used to support those claims, using warrants, claims and counterclaims
4	Rebuttals that challenge the thesis of a claim but does not include a rebuttal that challenges the grounds used to support a claim	2	Rebuttals that *Correct* and *Clarify a Position* with peers on the grounds used to support a claim, using qualifiers, claims, or counterclaims
3	Claims or counter-claims with grounds but only a single rebuttal that challenges the claim		
2	Claims or counter-claims with grounds but no rebuttals	1	*Agreement/Disagreement With* and/or *Repetition* of peer's argument, but *Adds to Argument* by providing more information, such as facts or backing of claims; no grounds or rebuttals
1	Simple claim versus counter-claim with no grounds or rebuttals		
0	Non-oppositional	0	Contains *unsupported generalizations*

In our model, Type 0 would include a response consisting mainly of *unsupported generalizations:* sweeping statements or opinions offered without any

supporting logic. Virtually no substantive or meaningful information was offered. Type 1 responses mostly contained echoes or repetition of a peer's claims, but the argument was advanced minimally through the inclusion of a new perspective, angle, or information. We coded for whether they *added* new, non-normative information that expanded the discussion (as opposed to providing emotionally-charged, normative, "should" directives or claims), entries that also might have taken the form of "teaching" a new angle or offering a new perspective. We also looked at whether a student simply *agreed* with a peer, *disagreed* (a more challenging position), or did both in their responses. Type 2 responses encompassed *clarifications*, meaning that positions were clarified through qualifiers and/or counterclaims are rebutted. The arguer may have offered an analogy, considered new angles, sharpened the position, and so forth; in essence, the aim was to rebut a counterclaim by adding new information or adding qualifiers. In Type 2 responses the author might also have *corrected* a peer by adding new information, or pressed a peer to reconsider a claim. However, no direct challenges to opposing claims were offered. At the highest level of argumentation, Type 3, the arguer offered direct rebuttals or *challenges* to peers that included warrants or qualifiers intended to push deeper thinking about a point that was made. There was also an attempt to *dispute* or argue, by disputing a claim and questioning its validity or veracity. Each of these levels evidences progression of thought that promotes learning. Descriptive measures for these interactive components are presented in Table 4.

Table 4
Elements of Dialogic Argumentation (Spring 2012 and Spring 2013) N= 375

Combin -ations	AGREED and/or DISAGREE D	CORRECT	ADD INFO	CLARIFY	CHAL- LENGE	DISPUTE
No	39.5%	22.4%	47.7%	52.3%	23.5%	25.6%
Yes	60.5%	77.6%	52.3 %	47.7 %	76.5 %	74.4 %

Table 4 shows that over half (60.5%) of peer-to-peer responses contained direct engagement with a peer, which took the form of agreement and/or disagreement. Well over half of the posts (77.6%) included corrections, meaning that they provided factual information in an attempt to clear up a misconception. Another 52.3% added or provided additional information to support their responses, and 47.7% clarified their responses with specific information or by articulating a different perspective. A similarly high percentage (76.5%) challenged each other, and another 74.4% disputed (or directly argued) by supplying supporting evidence or reasoning for their claims.

We were also interested in measuring whether students could use these different elements in combination, which would be a sign that students were more deeply engaged and on the path to actually learning through their interactions. In our view, generalized replies that required little thought, expressed emotional reactions, contained unsupported generalizations, and contributed nothing new to the discussion could be distinguished from those in which students were pushing themselves to consider new angles and reconsider their own issue stances.

To measure *depth of academic engagement,* we created an index based on five elements. First, we scored student entries for assertions that were reflective, deliberative or critical (*reflective*), the functional equivalent of claims, and/or qualifiers, and/or rebuttals. Second, we coded for whether the post included an *honest question* that created further deliberation among students (rather than a rhetorical one), such as when a student asked a peer to think about another aspect of an issue (*honestq*). Third, we looked "backings to claims" that took shape in two forms: in references to authorities, such as an assigned text or the professor's teachings (*classtext*); or in links or references to outside media or sources such as an article, video clip, or other online materials supporting any assertions the student is making (*media*). Fifth, we coded for *length* (short, medium, or long based on the number of words), as a proxy for effort to articulate an argument. Students who wrote virtual essays, for example, clearly achieved a different level of critical thought than those who merely offered an opinion that was expressed in a few lines.

Our composite variable, "depth of academic engagement" (or more simply, depth of engagement) represents a sum of the scores for these five elements. Therefore, a post that evidences deep engagement would incorporate all five elements: reflective + honestq + class text + media materials + length. These results are presented below.

Research Questions and Hypotheses. We were interested in how seriously students engage with each other in online discussions, and whether they argued with each other and wrestled with the material in gently provocative ways that could change a person's mind or produce a new position. More specifically, we wanted to know whether the computer-mediated communication process of dialogical argumentation could foster academic learning. Building on Clark and Sampson's work (2007; 2008), we hypothesized (H1) that the most sophisticated levels of argumentation would be least common, in that students would *challenge* and *dispute* each other (Type 3 responses) less often than they would *correct* and *clarify* their positions to each other (Type 2), and that the majority of students would reach a basic level of engagement by *agreeing and/or disagreeing* with each other (Type 1). We also hypothesized (H2) that Type 0 responses would be less prevalent than Type 1 responses, given our clear guidelines about length of posts and our expectations that they would reflect on their answers before recording their thoughts. Thus, we expected the greatest number of posts to be Type 1, representing "entry-level" engagement with the learning process. Furthermore, we hypothesized that students who "dove deeply" into the process by incorporating links to other materials or producing lengthy posts would also be more likely to argue at higher levels of sophistication.

Findings and Discussion

Type of Arguments. Noting first that a student's post could contain different argumentative elements of argument, we mined the responses for progressively more sophisticated combinations that would allow us to categorize them by type. We found that almost one-third (30.1%) of posts included the most advanced "Type 3" combination of arguments: these incorporated challenges and disputations, and pushed ahead the discussion with new, engaging points or questions. A larger percentage (56.5%) included Type 2 combinations, which

encompassed corrections and clarifications. The largest percentage (68.5%) included Type 1 interactions where the students agreed and/or disagreed with each other, or added a new point or information. A much larger portion, 77.4%, contained unsupported generalizations, as reported in Table 5.

Table 5
Dialogical Argumentation Types: Spring 2012 & Spring 2013 (N=375)

	Percent of Interactive Posts	**Combined Elements of Argumentation**
Type 3	30.1%	Challenge + Dispute
Type 2	56.5%	Correct + Clarify
Type 1	68.5%	Agreement/Disagreement + Offer Info
Type 0	77.4%	Information + Unsupported generalizations

The results in Table 5 support our main hypothesis (H1), such that fewer than a third of all peer-to-peer responses contained the most sophisticated arguments, while non-oppositional statements of opinion were among the most common types found among the responses. More difficult arguments were indeed less common. Contrary to our expectations (H2), however, Type 0 responses were more common than Type 1, which provides some evidence that students were contributing to the discussions without investing much thought.

At the lowest level of engagement, Type 0, students typically made sweeping claims or generalizations lodged in "common wisdom," yet remained civil. This example of a Type 0 response comes from a spring 2013 dialogue about the utility of banning sugary drinks and taxing fatty foods:

> *"I do think it's a nice thought however ultimately I just feel that people should just do a better job of taking care of themselves and be better role models for the youth. If you set good examples kids will look up to you and what you do."*

In this example, the student backs her opinion by a broad generalization. This exmplifies Type 0 responses in which information relevant to the thread might be included, but *unsupported generalizations* render it unhelpful for advancing an argument from which students can learn, either through practice or the act of considering their peers' arguments.

In Type 1 interactions, students disagree at least mildly with their peers (often they combine disagreement with agreement), and they continue to advance an argument by offering a new perspective, angle, or information, even if only briefly. No direct challenges are made. In the following excerpt from a discussion forum about government regulation of food from the Spring 2013 semester, Student Y responds to Student X by not only repeating X's claim, but also by supplying his own reasoning, which effectively adds a new point (childhood diseases) to the dialogue:

> *<u>Student X initial post:</u> Bloomberg's attempt to ban the large sugary drink is a good idea because most of America is unhealthy and obese. Banning the large sugary drink is a good health decision. Now the question, Is it really a debate? No, this should not be a debate and the large sugary drink should not be banned. Banning the large drink will not stop people from drinking large amount of soda, it will only have them purchase two drinks instead of one which will equal to or*

> *more to the size of one large drink. People should be allowed to purchase their own size of drink. If customers are interested in their health, restaurants have posters up on the wall which has the amount of calories on items sold*
> *Student Y's response to Student X: I agree because these days we now have children with diabetes and obesity. The educational system has already attempted to help the obesity problem by offering healthier food options. Maybe allowing the government to help with the obesity problem will aid the obesity and diabetes issue that we have present.*

Here, Student Y adds to the discussion with this concise point about government's responses to childhood obesity, but does so without challenging his peer directly and without providing data or qualifiers for the assertion about obesity. Type 1 responses thus contribute in some small way to the general argument, and over two-thirds, 68.5%, did so.

Over half the interactions (56.5%) were of Type 2: a student would *clarify* his or her position, and/or rebut a counterclaim, sometimes *correcting* a peer by adding new information. Warrants and backings in the form of reasoning and examples were common, indicating that the author was engaging the learning process in a more rigorous way. Type 2 is exemplified by this thoughtful reply to another student's post, which the author does not question:

> *Even though i am proud of Bloomberg for trying to help make New York's citizen's healthier, i do not think potentially banning soda size is the main health problem. There are many reason why. For example, just banning the soda size alone will not stop people from drinking more soda. In fact, this will have the complete opposite reaction. Once people hear their soda size is being cut down, it will only make them want to buy more soda to make up for the loss in size, meaning they will buy more cans or bottles of sodas until they are satisfied. I agree with [Margo] that restaurants should make the public more aware of the ingredients rather than the calorie count of food items. If people know about what is in their food, then they will have a better idea of how to control what they eat, making healthier food choices. Let us take the fast food chain "Subway" for example. They give healthy food choices and make their customers aware of the calorie and sugar content which helps us all to make better food choices. When it comes to decisions about food, at the end of the day each person is responsible for their own choices and will have to bear the consequences or gain the benefits according to how they choose.*

Type 2 posts, therefore, include a *correction* or counterclaim (information that corrects a peer's claim) and a *clarification* of one's own position, usually through additional data, warrants, or qualifiers. We interpret this type of post as moderate engagement of the learning process.

Type 3 responses include a direct *challenge* to a peer's statement or premise, and key parts of a *dispute* are present as real dialogical argumentation unfolds. Again, 30.1% fell into this category, as they combined elements of argumentation (warrants, claims, counterclaims) that enabled the author to clarify, challenge, and argue thoughtfully. This kind of argument is demonstrated here:

> *I don't think that you managed to capture the entirety of my argument. All you managed to do was call me bigoted; and you support your argument by saying that the beliefs of many don't mean anything (as in your case for Religion) when your opinion on gay marriage is at its foundation just a belief. The phrase of separate but equal was meant to be in respect to the Church and State. I'll admit*

that it was a poor choice of words given the civil rights history of the U.S. I respect your point of view here, but you completely overlooked mine.

We regard this type of response as paving the way for others to reconsider their views, including the target of the post, as well as other students who might read the exchange. Students at this level are fully engaged in argument, trying to convince others that his claims are meritorious and valid.

Depth of Engagement. We also assessed depth of academic engagement quantitatively. First we created an index for depth of engagement by scoring the responses for the presence of five various elements (as described in the methods section): overall reflectiveness, asking honest questions, including references to the class or textbook, inserting links to outside media or materials, and length (scored one to three)[2]. A response containing none of these elements would be scored zero; a response reflecting deep engagement would incorporate all five elements. Actual scores ranged from zero to five, and most of the 375 responses clustered around the mid-range—what we might call "moderately engaged," as Table 6 shows.

Table 6
Frequency and Percent of Academic Engagement Scores

Score	Frequency	Percent	Cumulative Percent
0	<1	.03%	.03%
1	43	11.47%	11.5%
2	145	38.7%	50.2%
3	98	26.1%	76.3%
4	66	17.6%	93.9%
5	23	6.1%	100%
N	**375**	**100%**	

According to Table 6, about one out of ten responses demonstrated engagement at the lowest level; it's unlikely that the author learned anything new or that peers gleaned meaningful information from these posts. Over two-thirds (64.8%) were moderately engaged, having scored at least a two or a three on our scale. At levels four and five, students are now invested in the learning process, sharing materials and new ideas, prodding each other to question further, or providing links to interesting articles that could shed further light on the issue at hand. Almost a quarter (23.7%) appeared to be deeply engaged.

Finally, we wanted to know if a student's use of argumentative elements could predict how "reflective" his or her response was. We scored each response for overall reflectiveness: did the student generally seem to be thoughtful, or was the response a knee-jerk, "let's-get-this-over-with" response? Using a dummy

[2] Considered as a single variable (it is otherwise included in the "depth" score), *length* is another indicator of students' engagement through discussions with each other leading to in dialogical argumentation. Students were required to post at least 75 words, and found that posts on average exceeded the minimum at a mean of 96 words, but with a rather large standard deviation (56 words). Viewed another way, in both semesters most students (73%) posted what we coded as "medium" length posts, meaning 50-150 words. At the lower end, 15% of all students posted far less than the required minimum (0-50 words), and the remainder (11.5%) far exceeded the minimum by posting at least double what was required (151+ words).

variable for "reflective," we analyzed the data through a series of simple linear regressions to estimate the relative weight of each element of argumentation. Interestingly, each term was found to be statistically significant ($p<.001$). A summary of results is displayed in Table 7.

Table 7
Summary of Regression Analyses

Model	Unstandardized Coefficients	Standardized Coefficients	
	B	Std. Error	Beta
(Constant)	1.603	.108	
Correct	-.226	.130	-.085*
Clarify my position	.819	.098	.367*
Challenge views	.214	.159	.082*
Dispute	.002	.157	.001*
Adding information	.716	.108	.321*
Agreeing and disagreeing	.194	.067	.154*
*p< .001.			

This finding tells us that students who employ argumentative elements also tend to be more reflective in their answers; they invest more in their learning when they argue. Overall, the regression analysis confirms what we found through our content analysis, providing further evidence that dialogical argumentation occurs across three different types of argument—that is, Types 1 to 3. This is the strongest evidence that websites designed for academic purposes can produce virtual learning environments.

Related Variables

While we found statistically significant evidence that students engage each other in the process of argumentation, we continued to explore other questions that formed during this process. Would a question about gay marriage that was posed a year apart produce noticeable differences in argumentation? We found this not to be the case. The student populations from two semesters took similar approaches to answering questions, a conclusion confirmed by the "depth of engagement" patterns, which were roughly parallel across two semesters as shown in Figure 1.

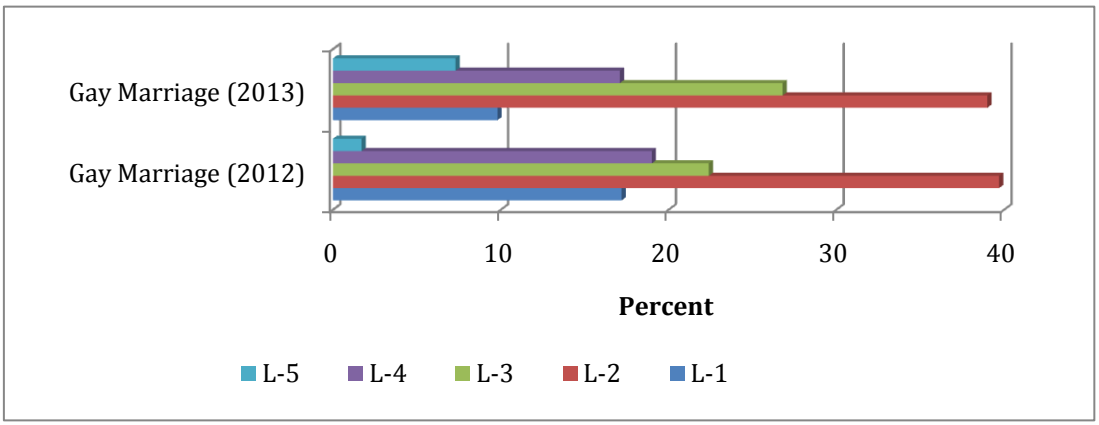

Figure 1: Depth of Engagement Scores for Discussion Questions about Gay Marriage In Spring 2012 and Spring 2013

We also explored whether the wording of the discussion question was correlated with the sophistication of argumentation. We found that question prompts that attract the most replies are current-events-oriented and contain links to outside materials such as news articles. Theoretical questions attract the fewest responses (even when they are required), as well as the most limited branching among students; there is plenty of room for students to think critically and post reflective statements, but they argue less with each other over definitions or applications of abstract concepts when these are the actual topic of discussion. In spring 2012 and spring 2013 the discussion questions that attracted the fewest replies were about government's role (n=72) and the nature of political representation (n=69), compared to 119 and 91 replies about gay marriage.

A final note concerns the way that students interacted asynchronously to create "back-and-forth" dialogues. Most of the peer-to-peer responses (84%) involved one single reply rather than a sustained series of responses; 11.5% extended to two responses; 4.5% involved three or more responses. However, some of those exchanges involved several persons, and branching was common. The spring 2012 forum on gay marriage provides good examples of this. Almost half (47%) of the posts in this forum were actual interchanges between or among students. Similarly, a spring 2012 forum that asked students to weigh privacy against the government's need to collect private information attracted 79 replies, 44% of which were "branches" that included three or more people. Clearly students are engaging each other through this format, though just under half are participating in actual "dialogues" involving more than two people.

Conclusions

The purpose of our shared academic website was to provide a space for undergraduate students from different campuses to interact and to promote thoughtful discussion and learning through asynchronous discussion-based forums. We hoped our students would learn about the issues and their own positions through dialogical argumentation. This inquiry into the nature of online student dialogue uncovered statistically significant evidence that students did just that: they engaged the learning process through arguing with each other, asynchronously through discussion forums, in the spring 2012 and 2013 semesters. Concrete elements of argumentation were visible in students'

responses to each other, namely in the way that they countered each other's claims, clarified their own positions, offered new perspectives and information, questioned each other, and challenged one other to account for their views. It should be noted that the process does not encompass all students equally; not everyone argued, and not every student was invested in the site. However, based on the totality of evidence, we conclude that the process was a valuable learning tool for those who did engage.

Students are more likely to engage in activities when they feel their contribution is valued by others. As students reported in open-ended survey responses at the end of the semester, the iterative nature of the online exchanges tended to foster an online community (59% in spring 2012 agreed that the website made them "feel as if they were part of a larger political community"), which begins with following basic rules for civil discourse. The overwhelming majority (84%) also felt that the discussion on the site increased their interest in political issues and prompted them (84%) to find more information about these issues. Specifically designed educational portals such as ours can simultaneously promote engaged e-learning and a sense of community. Definitively, CMC is an effective means to engage students in meaningful academic exchanges, regardless of discipline.

In using a digital portal designed to support interactive e-learning and by concentrating on students' interaction, we have shown that argumentation involving students across geographic boundaries can lead to productive "conversations" that prod students into thinking reflectively in an environment conditioned by academic instruction. It's clear that online educational portals possess great potential to encourage critical thinking and learning. The ingredients for knowledge construction and cognitive development are threaded into discussion forums, and when enlivened through argumentation, learning can take place.

References

Andriessen, J., Baker, M., & Suthers, D. (Eds.). (2013). *Arguing to learn: Confronting cognitions in computer-supported collaborative learning environments*. Springer Science & Business Media 1. 33-56.

Bell, P. (2004). Promoting students' argument construction and collaborative debate in the science classroom. *Internet environments for science education*, 3. 115-143.

Bender, T. (2012). *Discussion-based online teaching to enhance student learning: Theory, practice and assessment*. Stylus Publishing, LLC.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives, handbook I: The cognitive domain.

Blount, A. G. (2006). Critical reflection for public life: How reflective practice helps students become politically engaged. *Journal of Political Science Education*, *2*(3), 271-283.

Chadha, A. (2017a). Learning to Learn: Lessons from a Collaboration. *Journal of the Scholarship of Teaching and Learning*, *17*(3), 34-47.

Chadha, A. (2017b). E-Learning Opens Doors to the Online Community: Lessons from a Longitudinal Study. *National social science association*, 45.

Chadha, A. (2017c). Comparing Student Reflectiveness in Online Discussion Forums across Modes of Instruction and Levels of Courses. *Journal of educators online* 14 (2), 1-19.

Chu, H. C., Chen, J. M., & Tsai, C. L. (2017). Effects of an online formative peer-tutoring approach on students' learning behaviors, performance and cognitive load in mathematics. *Interactive Learning Environments*, *25*(2), 203–219. doi:10.1080/10494820.2016.1276085

Clark, D. B., & Sampson, V. D. (2007). Personally- seeded discussions to scaffold online argumentation. *International Journal of Science Education*, *29*(3), 253-277.

Clark, D. B., & Sampson, V. D. (2008). Assessing dialogic argumentation in online environments to relate structure, grounds, and conceptual quality. *Journal of Research in Science Teaching*, 45: 293-321.

Coirier, P., & Golder, C. (1993). Writing argumentative text: A developmental study of the acquisition of supporting structures. *European journal of psychology of education*, 8(2), 169-181.

Collins, L. (2014). *How online learning enables personalized learning.* Getting Smart. Retrieved fromhttp://gettingsmart.com/2014/03/online-learning-enables-personalized-learninginterview-dr-lisa-collins/

Cooper, J. (2001). Peer learning in law: using a group journal. In D. Boud., R. Cohen, & J. Sampson (Eds.), *Peer learning in higher education: Learning from & with each other* (pp. 115–127). London, UK: Stylus Publishing Inc.

Dehler, C., & Porras-Hernandez, L. H. (1998). Using Computer Mediated Communication (CMC) to Promote Experiential Learning in Graduate Studies. *Educational Technology*, *38*(3), 52-55.

Erduran, S., Simon, S., & Osborne, J. (2004). Tapping into argumentation: Developments in the application of Toulmin's argument pattern for studying science discourse. *Science education*, *88*(6), 915-933.

Gordon, R. & Connor, R. (2011). Team based learning in management education. In D. Boud, R. Cohen. R., J. & Sampson (Eds.), *Peer learning in higher education: Learning from & with each other* (pp. 85–98). London, UK: Stylus Publishing Inc.

Hakkinen, P. (2013). Multiphase method for analyzing online discussions. *Journal of Computer Assisted Learning*, *29*(6), 547-555.

Herring, Susan. (1993). Gender and democracy in computer-mediated communication. *Electronic Journal of Communication, 3*(2), 3–31. doi:10.1016/B978-0-12-415040-9.50121-4

Jacoby, B. (2009). Civic engagement in higher education. *Concepts and practices. Jossey-Bass, San Francisco*.

Kollar, I., Fischer, F., & Slotta, J. D. (2007). Internal and external scripts in computer-supported collaborative inquiry learning. *Learning and Instruction*, *17*(6), 708-721.

Kuhn, D., Shaw, V., & Felton, M. (1997). Effects of dyadic interaction on argumentative reasoning. *Cognition and instruction*, *15*(3), 287-315.

Kuhn, D., & Udell, W. (2003). The development of argument skills. *Child development*, *74*(5), 1245-1260.

Lane, D. R. (1994). Computer-mediated communication in the classroom: Asset or liability. In *Workshop presented*.

Lee, M. J., & McLoughlin, C. (2007). Teaching and learning in the Web 2.0 era: Empowering students through learner-generated content. *International journal of instructional technology and distance learning*, *4*(10), 21-34.

Leitão, S. (2000). The potential of argument in knowledge building. *Human development*, *43*(6), 332-360.

Means, M. L., & Voss, J. F. (1996). Who reasons well? Two studies of informal reasoning among children of different grade, ability, and knowledge levels. *Cognition and instruction*, *14*(2), 139-178.

Resnick, L. B., Salmon, M., Zeitz, C. M., Wathen, S. H., & Holowchak, M. (1993). Reasoning in conversation. *Cognition and instruction*, *11*(3-4), 347-364.

Rowntree, D. (1995). Teaching and learning online: a correspondence education for the 21st century? *British Journal of Educational Technology*, *26*(3), 205-215.

Schouten, A. P., Valkenburg, P. M., & Peter, J. (2009). An experimental test of processes underlying self-disclosure in computer-mediated communication. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *3*(2).

Schwarz, B. B., & De Groot, R. (2007). Argumentation in a changing world. *International Journal of Computer-Supported Collaborative Learning*, *2*(2), 297-313.

Stegmann, K., Weinberger, A., & Fischer, F. (2007). Facilitating argumentative knowledge construction with computer-supported collaboration scripts. *International journal of computer-supported collaborative learning*, *2*(4), 421-447

Stegmann, K., Wecker, C., Weinberger, A., & Fischer, F. (2012). Collaborative argumentation and cognitive elaboration in a computer-supported collaborative learning environment. *Instructional Science*, *40*(2), 297-323.

Toulmin, S. (1958). *The uses of argument.* Cambridge: Cambridge University Press.

Van Vechten, R. B. (2013). He Said/She Said: Tracking Gender Differences in Online Academic Discussions. Paper presented at the APSA teaching and learning conference.

Van Vechten, R. B. and Chadha, A. (2013). How students talk to each other: Findings from an academic social networking project. *Teaching civic engagement: From student to active citizen*, 167-188.

Wilson, J. T. (2001) Project management teams: A model of best practice in design. In D. Boud., R. Cohen, & J. Sampson (Eds.), *Peer learning in higher education: Learning from & with each other* (pp. 99–114). London, UK: Stylus Publishing Inc.