

THE ROLE OF EXPERIENCE IN THE SOCIAL CONSTRUCTION OF KNOWLEDGE

James Slear

Air University

Ellen H. Reames

Auburn University

This mixed-methods study explored the extent to which parity of professional experience between pairs of adult learners modulates the sophistication of co-constructed knowledge. The study was conducted during a semester-length online, graduate-level, educational leadership course in a large southern university. Student assignments were designed to foster engagement and scaffolded to focus on application of prior professional experience. The interaction analysis model (Gunawardena et al., 1997) was used to measure levels of knowledge construction, while self-report surveys were used to measure experience levels. Results suggest a relatively minor relationship between these variables, but the student learning activities yielded consistently high levels of knowledge construction.

Meaningful social interactions and the processes through which they are internalized provide the context developing higher reasoning skills (Vygotsky, 1987). While the classroom is an obvious setting for such interaction, the on-line learning environment presents challenges to creating meaningful interactions (Palloff & Pratt, 1999; Simonson et al., 2015). A line of inquiry informed and inspired by the constructivist concepts in the works of Papert and Har-el (1991), Piaget (1967), and Vygotsky (1987) seeks to promote meaningful interactions and student engagement oriented towards social learning. Within this broad line of inquiry, a subset of researchers developed social knowledge co-construction as a valuable framework for collaborative learning among adult pro-

fessionals (Gunawardena et al., 1997; Henri, 1992; Veerman & Veldhius-Diermanse, 2001).

Studies in this area generally explore the product and processes of social knowledge co-construction and investigate appropriate measures to describe and stratify the quality of co-constructed knowledge (Buraphadeja, 2010; Heo et al., 2010; Hou et al., 2009; Gunawardena et al., 1997, 2016; Gomez & del Rosario, 2018; Lucas & Moreira, 2010; Sing & Khine, 2006; Tan et al., 2008; Veerman & Veldhius-Diermanse, 2001). Other studies propose educational methods to promote and improve knowledge co-construction (Aviv et al., 2003; De Wever et al., 2010; Hull & Saxon, 2009; Xie et al., 2014).

• Correspondence concerning this article should be addressed to: JamesNSlear@gmail.com

The Quarterly Review of Distance Education, Volume 25(3), 2024, pp. 27–44
Copyright © 2024 Emerald Publishing Limited

ISSN 1528-3518
All rights of reproduction in any form reserved.

One element largely absent from this line of inquiry has been the consideration of differences in knowledge and experience among students. Theorists suggest that the give and take required for meaningful knowledge co-construction requires equality among discussants (Baker, 1994; Conrad & Donaldson, 2004; Gunawardena et al., 1997; Piaget, 1970; Stahl, 2003). Despite this assertion, empirical studies have not accounted for knowledge or experiential inequality among discussants.

In the field of educational leadership, graduate students begin programs of study having had several years of professional experience. Constructivist pedagogy leverages this experience as students interpret new information using their existing conceptions and beliefs (Tynjala, 1999). In addition, graduate cohorts consist of members whose experiences are drawn from a diverse set of educational contexts. Given an appropriate context for student-to-student engagement, students can use their differing experiences to co-construct new knowledge. While qualitative differences in student experience provide the fuel for social knowledge co-construction, inequalities may be found in quantitative differences in the level of student experience with respect to the topics of discussion. This inequality or power imbalance could potentially inhibit the give and take required for knowledge co-construction. The present study contributes to the constructivist literature by examining the relationship between experiential power parity between pairs of students and social knowledge co-construction among interacting pairs of students engaged in a structured, online dialogue. In addition, the study's research context contributes to the distance education literature by demonstrating methods of engagement which produce high levels of knowledge co-construction as measured by the interaction analysis model.

RESEARCH QUESTION

What is the relationship between experiential power parity and the level of social knowledge

co-construction/negotiated meaning among paired-student threaded discussions in an on-line educational leadership course?

Literature Review

Knowledge Co-Construction

Gunawardena et al.'s (1997) interaction analysis model (IAM) seeks to capture the evolution of knowledge construction, differences in the quality of interaction, and the resulting knowledge constructed. Together these three elements represent "the entire gestalt of the interaction" (Gunawardena et al., 1997, p. 411). The model was developed using transcripts from a virtual education conference of recognized leaders in distance education. The participants' expertise, coupled with the rich theoretical nature of the subject matter, provided optimal conditions to observe the processes of knowledge co-construction and negotiation of meaning. The model's five phases trace the participant's knowledge construction as they transition from lower to higher level demonstrations of mental function through the process of negotiation (Gunawardena et al., 1997). In the model's first phase, discussants share and compare information. Statements of opinion or agreement are exchanged. Participants uncover dissonance in the second phase where disagreements surface. In the third phase, discussants work through dissonance and negotiate meaning. Example statements here include weighted arguments, clarifications of terms and proposals of new definitions. In the fourth phase, negotiated meanings are tested against potentially contradictory evidence. Finally, the fifth phase sees newly constructed meaning put to use in the form of summaries of agreement or proposals for subsequent use.

Negotiation of Meaning

The Role of Power in Negotiated Meaning

Social learning is achieved when meaning is negotiated among participants (Smith &

Regan, 1999). Baker (1994) contrasts social learning from teacher-led Socratic methods in part by the power differential between parties. In teacher-led learning, power asymmetry is manifested by both the teacher's authority over the student and relative difference in subject knowledge. By contrast, in social learning contexts, peer learners have no authority over one another or to put it another way, peer relationships lack positional power (Northouse, 2019).

As part of his constructivism, Piaget held that learner development was more effectively advanced through peer interaction than teacher to student interaction (1967). The power symmetry among peers favors give-and-take over submission to authority (Conrad & Donaldson, 2004). In developing the interaction analysis model, Gunawardena et al. (1997) specifically targeted participants who "brought to [an asynchronous online discussion] roughly equal levels of knowledge and roughly equal cognitive and metacognitive skills" (p. 406).

Despite this apparent desirability for power parity in social knowledge co-construction and negotiated meaning, power parity among participants has not been formally operationalized and studied in social knowledge co-construction studies. Recent research has touched on power relationships in various knowledge construction contexts, such as student-teacher negotiation (Owusu-Agyeman & Fourie-Malherbe, 2019), in peer tutoring (Howard et al., 2017), in game-theoretic learning (Jean et al., 2018) and between environmental researchers and policy makers (Twalo, 2019) but not until now in the peer-to-peer discussions commonly found in graduate-level distance education courses.

Power and the Student-to-Student Relationship

The asynchronous, online learning environment provides visibility into how students negotiate meaning and the political power dynamics through which this is done. As students engage one another in online discussion and debate, they bring their experiences and

opinions with them. In their postings, students give course terms and definitions proposed shape and context. As their peers engage these postings through their own experiential lenses, they may experience dissonance as they uncover views incongruent with their own. Thus the stage becomes set for negotiation of meaning and potentially, new knowledge co-construction (Gunawardena et al., 1997).

In any negotiation, power is a prominent factor (Fisher et al., 1993). Before considering how power differences may shape negotiation, we ought to characterize the relevant types of power which might be in play in the context of peer-to-peer discussion. French and Raven (1962) defined six bases of social power: legitimate, reward, coercive, informational, referent, and expert, which have been widely adopted to study power relationships in different social contexts (Northouse, 2019). Kotter (1990) later divided these into two categories, positional, consisting of these first four power bases, and personal, which embody the last two. As peer-to-peer discussion has no positional power base, only personal power, referent or expert, are operative. Referent power is a measure of one's likability; it stems from the affinity of others. One's expert power is derived from the perceived credibility of his or her opinion on a given subject. In peer-to-peer learning, these two forms of power could interact in ways making predictions about social knowledge co-construction more difficult. By anonymizing participation in discussion, however, the effects of referent power can be limited leaving expert power as the sole power base. Further, anonymizing participation removes biases based on previous perceptions of expertise. The credibility of an opinion expressed in an anonymous post rests on the perceived quality of argumentation.

When entering a negotiation, Eisen (2011) offers five strategies: evade, comply, insist, cooperate and settle, which are distinguished by the power differential of the engaged parties. Each of these strategies can be applied to negotiation of meaning in an anonymous online discussion by considering perceived ex-

expertise as the power base. Evasion is manifest when students avoid engagement with a more knowledgeable peer. Compliance is observed when a peer concedes a point to a peer with greater expertise. Opposite the compliance strategy, one with greater expertise might assert or insist upon his or her position as authoritative. Students who are equally matched but hold different perspectives may collaborate and negotiate new meaning, or they may settle, maintaining the core of their respective positions but embracing certain caveats in recognition of the perceived validity of their partner's counterpoints. As insisting, evading, and complying strategies do not reflect an internalized changed perspective, knowledge co-construction and negotiated meaning are to be found in the collaborate or settle behaviors, both of which assume power parity. This study attempts to explore the relationship between expert power parity or the extent to which a pair of discussants are equally matched in terms of subject matter expertise and the level of knowl-

edge co-construction they produce as found in the written record of their engagement.

CONCEPTUAL FRAMEWORK

Social knowledge co-construction results from the dialectic interaction among two or more individuals (Hull & Saxon, 2009). In learning environments where the students' previous experiences combine with highly contextual subject matter, such as in the study of educational leadership, social knowledge co-construction pedagogy presents a unique opportunity for students to contribute to one another's learning.

Centered around the interaction analysis model (Gunawardena et al., 1997), the conceptual framework guiding the current study is depicted graphically in Figure 1.

This framework illustrates key elements of social knowledge co-construction. Graduate students enter the learning environment

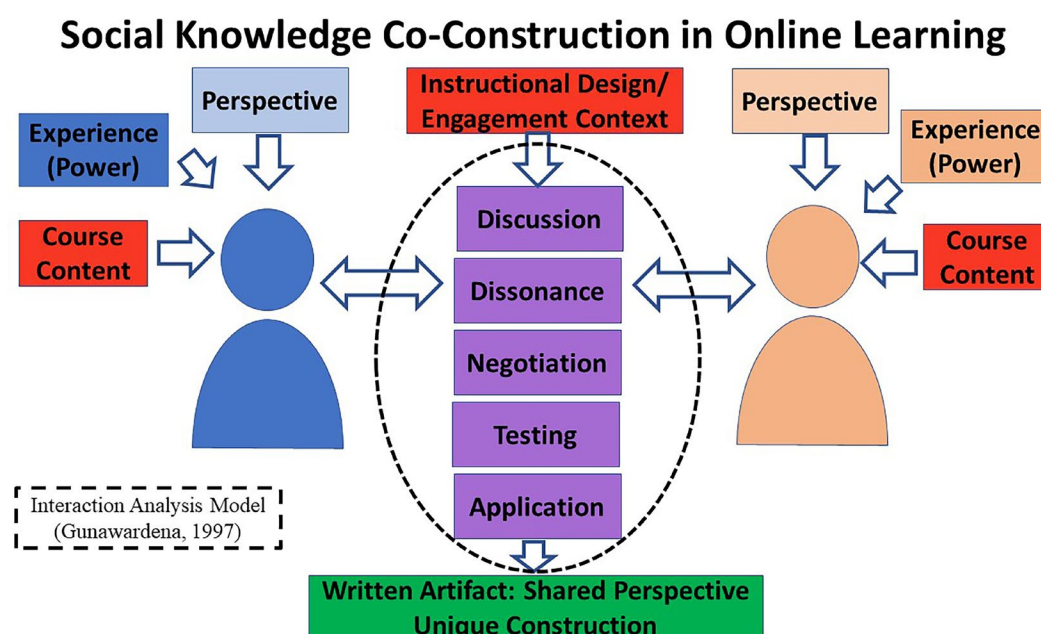


FIGURE 1

Conceptual framework—Social Knowledge Co-Construction in Online Learning. Note. The conceptual framework incorporates Gunawardena et al.'s [1997] Interaction Analysis Model.

informed by personal and professional experience. As they engage course content, the concepts presented interact with their lived experience to shape their perspective. Then, through a thoughtfully designed instructional exercise, they discuss professional implications of the course content. If properly designed to promote reflexivity and critical discussion, the students will begin the process of co-constructing new knowledge, which takes place through the five phases of the interaction analysis model (Gunawardena et al., 1997). Cognitive dissonance, if encountered, can be reconciled through negotiation. As with any negotiation, relative power between the parties can shape the negotiating process. Ideas emerging from this negotiation phase take the form of new or nuanced interpretations or meaning, which can be validated and applied. The result is an artifact, a unique co-construction reflecting a shared perspective.

VALUE AND IMPLICATIONS FOR PRACTICE

Success in co-constructing knowledge through negotiation of meaning has three potential benefits. First, by attending to, rather than avoiding, differences in interpretations, professionals demonstrate both critical thinking, when identifying and communicating dissonance (Schellens & Valcke, 2007) and creative thinking, through the proposal and negotiation of new constructions. Next, the knowledge co-construction itself represents a higher level of quality than the original conceptions of either party. Why? Because the original conceptions have evolved to address valid challenges posed by one or more peer professionals. Finally, changed perspectives are evidence of a willingness to think differently. Engaging in patterns of discourse that promote thinking differently may develop dispositions to embrace, rather than resist change.

This study offers two contributions to furthering understanding of knowledge co-construction. First, by illuminating the interplay

between power and negotiation of meaning in peer-to-peer discussions, teachers and instructional systems designers can be more intentional in their design of peer engagement activities. Second, the study data presented here provides an example of a peer engagement context that yielded consistently high levels of social knowledge co-construction.

RESEARCH DESIGN/METHODS

This mixed methods inquiry explored the relationship between differential experience in pairs of adult students in an online discussion and the level of social knowledge co-construction they achieve. The study was conducted during a semester-length online, graduate-level, educational leadership course in a large southern university.

PARTICIPANTS

The study's participants ($n = 19$) were recruited from the pool of graduate students at a large southern university enrolled in a PhD-level course in educational leadership theory and practice, delivered using a combination of face-to-face and online methods. A total of nineteen students were enrolled in the course and all nineteen students agreed to participate in the study. This group was chosen using purposive and convenience sampling (Teddlie & Yu, 2007). It was purposive because the course's learning objectives require the students to draw on their professional experiences—a favorable context for studying social knowledge co-construction. In addition, this hybrid course was recently re-designed to promote higher-quality student-to-student interaction during the online portion of the course. The participants represent a convenience sample as the researcher had access to course, the students' enrollment in the selected course, and because their participation was voluntary. The researcher used a concurrent, mixed methods

sampling strategy, relying on a “single sample of participants where qualitative and quantitative data are collected simultaneously but not necessarily at a single point in time” (Creamer, 2018, p. 121). Other than the initial survey instrument, which was administered at the start of term, participation was passive. Consent was obtained to access student writing, and study recruitment followed an institutional review board-approved script.

RESEARCH CONTEXT

Data for the study were collected over a 15-week semester of a graduate level educational leadership theory course. The instructor taught the class using a combination of face-to-face and online approaches. The face-to-face component consisted of three full-day sessions while the online component consisted of weekly reading and writing assignments.

Each week, students read a chapter of the course text, which described a leadership theory or model, and a case study describing a challenging situation set in an educational leadership context. Students answered a writing prompt addressing one or more elements of the case, framed in terms of the leadership theory discusses in that week’s reading. Once submitted, the student was randomly paired with an anonymous classmate and tasked to read that student’s post from the same prompt. Next, students were asked to re-write their responses, acknowledging any insights gained from reading their anonymous partner’s perspective. Once both partners submitted their re-written responses, the partners’ identities

were revealed, and the pair exchanged posts and crafted a final statement which attempt to reconcile differences and present a shared perspective while acknowledging remaining differences. The design of this assignment was inspired by Nash (2011) who successfully applied similar methods to improve interaction quality among online students.

DATA COLLECTION INSTRUMENTS

The survey’s purpose was to inventory the experience level of each student concerning various topics in educational leadership. The course’s educational leadership case studies (Northouse & Lee, 2019) provided the set of topics included in the survey. Experience with each topic was used as a measure of expert power (Northouse, 2019) held by each student at the start of each paired discussion. The survey asked participants to rate their knowledge and experience with each topic in the set. Examples of topics from the survey included managing after school programs, program oversight across multiple schools, and school budgeting. A six-point Likert-type scale was used for students to report their knowledge and experience such that a value of “1” indicated *none*, while a value of “6” indicated *extensive* knowledge and/or experience. To enhance construct validity, the course instructor reviewed the proposed list of topics for each case study and confirmed the primacy of each topic within each case study.

The Interaction Analysis Model (IAM). In this study, the IAM is used both as an instru-

TABLE 1
Research Questions, Data Sources, and Instruments

<i>Research Question</i>	<i>Data Sources and Instruments</i>
What is the relationship between power parity and the level of social knowledge co-construction/negotiated meaning among paired-student threaded discussions in an online educational leadership course?	Data Sources: (1) Weekly paired discussion transcripts (Canvas); (2) Experience survey (Qualtrics) Instruments: (1) Interaction Analysis Model

ment to evaluate individual statements and as a measure of the overall quality of a co-construction artifact, which in this study, is the transcript of a threaded discussion. The model's scale has five levels and each level is marked by 3–5 sublevels. Although the scale is ordinal, researchers have used the scales sublevels to treat it as continuous (Aviv et al., 2003; Bu-

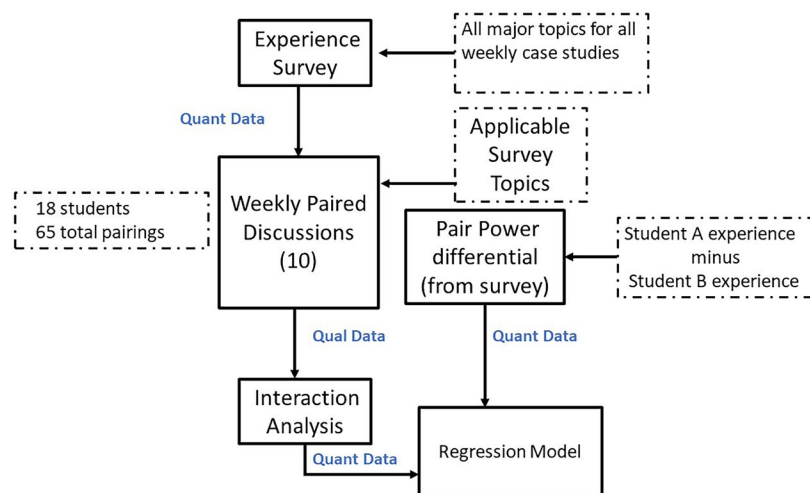
raphadeja, 2010; De Wever et al., 2010; Heo et al., 2010; Hull & Saxon, 2009). The present study, follows the example of these researchers, spacing sublevel scale values at equal intervals. Table 2 defines the model's levels and sublevels and depicts the scale score used to transform the IAM level from an ordinal to a continuous value.

TABLE 2
The Interaction Analysis Model and Scale

<i>Description</i>	<i>Phase</i>	<i>Scale Score</i>
Level 1: Sharing and comparing of information		
A statement of observation or opinion	1a.	1.1
A statement of agreement from one or more other participants	1b.	1.3
Corroborating examples provided by one or more participants	1c.	1.5
Asking and answering questions to clarify details of statements	1d.	1.7
Definition, description, or identification of a problem	1e.	1.9
Level 2: Discovery and exploration of dissonance or inconsistency		
Identifying and stating areas of disagreement	2a.	2.2
Asking and answering questions to clarify the source and extent of disagreement	2b.	2.5
Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view	2c.	2.8
Level 3: Negotiation of meaning/co-construction of knowledge		
Negotiation or clarification of the meaning of terms	3a.	3.1
Negotiation of the relative weight to be assigned to types of argument	3b.	3.3
Identification of areas of agreement or overlap among conflicting concepts	3c.	3.5
Proposal and negotiation of new statements embodying compromise and co-construction	3d.	3.7
Proposal of integrating or accommodating metaphors or analogies	3e.	3.9
Level 4: Testing and modification of proposed synthesis or co-construction		
Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture	4a.	4.1
Testing against existing cognitive schema	4b.	4.3
Testing against personal experience	4c.	4.5
Testing against formal data collected	4d.	4.7
Testing against contradictory testimony in the literature	4e.	4.9
Level 5: Agreement statements/applications of newly constructed meaning		
Summarization of agreement(s)	5a.	5.2
Applications of new knowledge	5b.	5.5
Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the interaction	5c.	5.8

DATA ANALYSIS STEPS

1. After students submitted their initial responses to the weekly discussion prompt, the researcher paired the discussants using random sampling without replacement. That is, pairings were drawn from the set of all possible student pairings, but no pair was matched more than once.
2. Based on the major educational leadership topics associated with the weekly case study, the researcher calculated the difference between the means of each paired participant's experience scores. To illustrate, the first weekly case study contained the following main topics: management of afterschool programs; overseeing programs in more than one school at a time; budget creation and management; and hiring personnel. These four topics corresponded to four survey items from the experience survey. If the mean experience scores of two paired participants were 4.2 and 2.7 respectively, their power differential was calculated as $P_D = 4.2 - 2.7 = 1.5$.
3. Two secondary power measures were derived from the survey. Survey participants indicated their number of years' experience as educators and as educational leaders. Subtracting the two experience values between pair members produced two experience differentials.
4. Five artifacts were considered in determining the IAM level of paired discussions. The two original student posts were used to establish initial student perspectives. Then the two revised posts, and the shared statement were used to measure the level of knowledge co-construction achieved by the pair.
5. The cumulative set of paired scores were collected such that each data element took the form of a quadruple $(P_{D(i,j)}, E_{D(i,j)}, L_{D(i,j)}, I_{(i,j)})$ with the pair's power differential described in the first three elements and the IAM level achieved in their discussion in the fourth element.
6. Through the course of data collection, two additional potential sources of variance were considered. First, the mean scores of the class could vary considerably from week to week. Second, students who consistently

**FIGURE 2***Data Collection and Analysis Method*

achieved high scores could potentially score higher when paired with similar students, regardless of the level of parity. A multiple regression model was built to test the significance of the power measures in predicting IAM level, while controlling for the two additional sources of variation. Figure 2 provides a graphical representation of the data collection and analysis procedure.

Applying the IAM to Calculate Scores

Original posts are the primary source of student opinion and lines of argumentation, but the ideas put forth in the original post are not considered co-constructions until the partner reacts to them. The researcher read each sentence in the revised submission identifying statements of agreement, disagreement, negotiation, etc. as described in the interaction analysis model. The co-construction score was recorded based on the highest IAM-level utterance by either student in either the revised post or the shared statement. It is important to note that the researcher's subject matter expertise informs the interpretation of the student discourse. The following excerpts from a scored data sample illustrate the process used to assess the IAM level of each post. The researcher offers subject matter references to justify assigned scores.

Excerpts from Case 5.1, posts 919 and 922:

Post 919: *I hadn't thought of Principal Hernandez quick reaction to the superintendent's dissatisfaction by putting two leadership chairs in charge was somewhat of an indication that he wasn't sure how to approach the situation. I just assumed that maybe he felt this was something he could delegate to the leaders in the building, however, after reading this post I do believe that he was unsure how to achieve this goal.*

The segment was evaluated as Level 3a, "negotiation of the meaning and use of terms", because after considering the partner's input, the participant broadens the application of the

situational leadership model to tie together the antecedents and consequences of the case.

Post 922: *After reading my colleagues response, I would definitely take a different approach. For example, I did not consider scheduling a planning and coaching session with both department leaders. Although they teach different subjects, reviewing the data collectively would provide more insight which would lead to more comprehensive planning.*

These statements from a student's post were evaluated as level 3b negotiation of argument weight. This is seen in the way the author puts greater weight on the value of the two teachers working together than on the fact that they teach different subjects and are concerned with different areas of standardized tests. Higher levels of co-construction were found in the student's dialogue as they crafted their shared statement.

Post 922: *Your plan of action provoked me to reflect on our (my school) current practices when in regard to how we utilize department and/or grade level teams.*

This is an example of Level 4c as it tests the proposed construction against the conditions found in the author's professional environment. Evidence of the highest level of co-construction was seen the partner's subsequent statement.

Post 919: *Reading your response certainly forced me to come out of teacher-mode and tackle my inside "leader". I hadn't considered that Principal Hernandez didn't really understand how to achieve this goal, because with my current position, as a classroom teacher, we seem to think administration has all the answers. Seeing this from the leadership point of view gave me insight on how true transformational leadership is modeled.*

This final segment achieved Level 4c by considering the solution in terms of the author's professional experience, and then Level 5c, as seen in the expression of changed per-

spective as a result of co-constructing the solution with the partner.

Excerpts from Case 8.1, posts 075 and 632:

Post 075: *This leads to success within the school because she can express expectations, demonstrate tasks and behaviors, execute, and lead through development changes.*

Central to this case was the identification of the leader's dominant behavior from among the behaviors of the transformational leadership model (Bass, 1985). Post 075 made the case for a behavior called *individual consideration*, while post 632 argued that a behavior called *idealized influence* was dominant. This statement from the revised post was an attempt to convince the other that the case study's leader favored individual consideration. In this context, the statement is Level 2c "advancement of argument".

Post 632: *As my peer has stated, Joan set exclusive requirements for her staff.*

Here the author advances her argument using her partner's own evidence. This too represents a Level 2c "advancement of argument".

Post 632: *While individualized consideration is strongly evident with Joan's leadership style. I would still press her personal work ethic as the driving force for her success. If I had to choose a second most valuable attribute for Joan, it would be her use of her leadership team and strength of her coordinator.*

Here, the participant acknowledges the validity of her partner's argument but negotiates the position that the weight of his argument is not as strong as the evidence in support of her own. This is a Level 3b "negotiation of weight."

Post 075: *Idealized influence is a catalyst for individualized consideration because her tenacity allows her to commit to her staff in ways unquantifiable because she stays late, shows up early, and works on her days off.*

Here the participant integrates her position with the other's and proposes a relationship

between the two positions. This is a Level 3d statement—"proposal of new statements embodying co-construction or compromise."

The two dialogs illustrate how considering a peer's differing perspective can lead to exchanges promoting richer understanding of course content while adding nuance to one's own perspective. Not all dialogs in this study achieved this. In this final example, the participants converge quickly and without evidence of change. In the fifth weekly case study, students were asked to identify which of the four transformational leadership behaviors (Northouse, 2019) exhibited by the case's principal were most responsible for her success.

Excerpt from Case 8.1:

Post 434: *We both agree that Joan sets a great example for her staff by coming in early, staying late, and taking on extra duties. She leads, but delegates well. She is also willing to develop her staff. Joan recognizes the need to understand individual characteristics of her staff. Amy and I agree that Individualized Consideration is the main reason for Joan's success.*

Post 531: *Thank you for your post. I completely agree.*

This example illustrates that not all discussions result in knowledge co-construction. If the goal of successfully promoting co-construction is considered worthwhile, it is worth understanding the factors that do so.

DEFINITION OF VARIABLES

This section defines the variables used in the regression model, their source, and their purpose in addressing the research question.

- Score $I_{(i,j)}$. The text of revised statements and final discussions were analyzed using the Interaction Analysis Model (IAM). The highest-scoring utterance from their combined discourse was recorded as the pair's knowledge co-construction score.

- Parity $P_{D(i,j)}$. This is defined as the difference in topical power score between the pair members. It has a maximum value of zero. Parity is measured with respect to the case study of the week in which the students were paired.
- Years in Education E . The number of reported years the participant worked in the education field. This value was not used independently but was used to calculate to calculate differences between pair members.
- Difference of Years in Education $E_{D(i,j)}$. The difference in the Years in Education variable between paired participants.
- Years in Leadership L . The number of reported years the participant served as an educational leader. This value was not used independently but was used to calculate to calculate differences between pair members.
- Difference in Years of Leadership $L_{D(i,j)}$. The difference in the Years in Leadership variable between paired participants.
- Weekly Discussion Mean Score. Not all weekly discussions are created equal. There is significant variation in the mean score for the class from week to week. Therefore, this variable was identified to control for the effects of weekly variation.
- Paired Student Mean Score. Not all students have the same propensity to achieve knowledge co-construction in threaded discussions. The pair mean is

the mean co-construction score of each pair member over the duration of the course. It is used as a control variable.

ANALYSIS

Using SPSS, the researcher modeled co-construction of the set of paired discussions using multiple regression. As seen in Table 3, the mean co-construction score for the course was just over 3.0. According to Gunawardena et al. (1997), the attainment of Level 3 is what distinguishes posts considered to contain evidence of unique social knowledge co-construction, while Levels 1 and 2 are considered foundational but not indicative of new construction. On average then, students participating in this study achieved the construction benchmark.

In the regression model, variables were tested for inclusion under the stepwise method, where variables were added and removed until those with the weakest correlations were removed. Entry criteria was set at initial significance levels of $p \leq .05$ and model exit criteria was set at $p > .10$. Table 4 shows the Pearson correlations and significance levels of each variable tested for entry into the regression model. Significant bivariate correlations ($p < 0.5$, 1-tailed) with the dependent variable, *Score*, were found with parity and the two control variables, *WeeklyMean* and *PairMean*. Because the hypothesis explicitly proposed a positive relationship between co-construction score and parity, the use of a 1-tailed test is appropriate.

TABLE 3
Descriptive Statistics from Co-Construction Regression Model

	Mean	Std. Deviation	N
Score	3.005	1.0590	65
Parity	-1.0833	.86953	65
WkMean	2.977775	.5601454	65
PairMean	3.024345	.2571958	65
DifYrEd	6.31	3.897	65
DifYrLd	4.71	3.556	65

TABLE 4*Bivariate Correlations Among Power Measures, Control Variables, and Co-Construction Scores*

		<i>Score</i>	<i>Parity</i>	<i>WeeklyMean</i>	<i>Pair Mean</i>	<i>DifYrsEd</i>	<i>DifYrsLead</i>
Pearson Correlation	Score	1.000	.242	.504	.526	-.160	-.032
	Parity	.242	1.000	-.001	.131	-.088	-.299
	WkMean	.504	-.001	1.000	.148	.030	.011
	PairMean	.526	.131	.148	1.000	-.261	-.134
	DifYrEd	-.160	-.088	.030	-.261	1.000	-.066
	DifYrLd	-.032	-.299	.011	-.134	-.066	1.000
Sig. (1-tail)	Score	.	.026	.000	.000	.102	.400
	Parity	.026	.	.497	.148	.244	.008
	WkMean	.000	.497	.	.120	.405	.464
	PairMean	.000	.148	.120	.	.018	.144
	DifYrEd	.102	.244	.405	.018	.	.302
	DifYrLd	.400	.008	.464	.144	.302	.

Note. WkMean = weekly discussion mean score; DifYrsEd = difference of years in education; DifYrsLd = difference of years in leadership.

As seen in Table 5, the R-square value of the final model, $R^2 = .496$, indicates the regression model explains nearly half the variation in knowledge co-construction score. The research variable, parity, makes a small but statistically significant contribution to the model's total explanatory power.

The regression coefficients are presented in Table 6. Controlling for the effects of variation in weekly mean scores and mean student pair scores, the table of partial correlations in the final model indicate a small but statistically significant correlation between knowledge co-construction score and the research vari-

able parity of $r = .249$. The significance level of the final model is $p = .049$. Therefore, the null hypothesis can be rejected in favor of the research hypothesis.

LIMITATIONS

In this study, the three measures of expert power used in the calculation of the power parity variable were limited to self-reports. The topical experience measure of power concerned a variety of educational leadership topics, each of which were relevant to one or more of the

TABLE 5*Model Summary*

<i>Model</i>	<i>R</i>	<i>R Square</i>	<i>Change Statistics</i>						
			<i>Adjusted R Square</i>	<i>Std. Error of the Estimate</i>	<i>R Square Change</i>	<i>F Change</i>	<i>df1</i>	<i>df2</i>	<i>Sig. F Change</i>
1	.526 ^a	.276	.265	.9080	.276	24.058	1	63	.000
2	.680 ^b	.463	.445	.7887	.186	21.484	1	62	.000
3	.704 ^c	.496	.471	.7700	.033	4.048	1	61	.049

a. Predictors: (Constant), PairMean

b. Predictors: (Constant), PairMean, WkMean

c. Predictors: (Constant), PairMean, WkMean, Parity

TABLE 6
Regression Model Coefficients^a, Partial Correlations, and Collinearity Metrics

Model	Unstandardized Coeff		Std Coeff	t	Sig.	Correlations			Collinearity	
	B	Std. Error	Beta			Zero	Partial	Part	Tol	VIF
1 Constant	-3.541	1.339		-2.644	.010					
PairMean	2.164	.441	.526	4.905	.000	.526	.526	.526	1.000	1.000
2 Constant	-5.195	1.217		-4.269	.000					
PairMean	1.899	.388	.461	4.900	.000	.526	.528	.456	.978	1.022
WkMean	.825	.178	.436	4.635	.000	.504	.507	.432	.978	1.022
3 Constant	-4.664	1.217		-3.832	.000					
PairMean	1.797	.382	.436	4.707	.000	.526	.516	.428	.961	1.041
WkMean	.832	.174	.440	4.788	.000	.504	.523	.435	.978	1.023
Parity	.225	.112	.185	2.012	.049	.242	.249	.183	.982	1.018

a. Dependent Variable: Score

weekly case studies. The case studies related to these topics however, discussed both the topics and a specified leadership theory selected from the coursework. The very logic of this study would suggest that understanding of the theoretical component would be just as much a source of power as the topical knowledge from the students' experience; however, since the introduction of a new leadership model or theory was introduced just prior to the discussion period, students were assumed to have been starting on common ground with respect to knowledge of each theory.

While expert power can be demonstrated through writing, referent power, which is derived from a person's likeability, could not be accounted for, and is not guaranteed to be symmetric between discussants. However, discussions were kept anonymous until the final stage as a deliberate means to prevent bias, which might arise from pairings in which the partners share an affinity or lack of one. Despite this precaution, it is conceivable that impressions of likability could be made simply from reading the work of another and the researcher saw no remedy for this potential condition.

RESULTS

Power Parity

A few recent studies have looked at the role of power in contexts, such as public resource management, in shaping knowledge construction and meaning (Jean et al., 2018; Owusu-Agyeman & Fourie-Malherbe, 2019; Twalo, 2019). No studies, however, have examined knowledge co-construction in the online learning environment through lens of power parity. As a consequence, there is no baseline in the literature with which to compare the results of the present study. Still, an acknowledgement that socially dynamic and complex activities, such as learning, are influenced by a multitude of factors, is helpful in explaining the modest results found here. Evidence from this study suggests that once controlling for structural causes of variation, there may be a small but statistically significant relationship between power parity and the level of social knowledge co-construction achieved. Given the complexities of learning and social interaction, it should not be too surprising for a single factor to have limited explanatory power, even when controlling for other factors. However, a crit-

ical look at the study's control variables, the class's weekly mean co-construction score and the paired mean score, point logically towards subfactors that may have been influential in the level of observed knowledge co-construction.

Variation in Weekly Mean Co-Construction Score

In each of the 10 weeks in which students participated in paired case study discussions, significant variation was observed in the average co-construction score with an observed mean of just over 3.0 out of 5, and an observed standard deviation of 0.524. Score means ranged from a low of 2.325 in week 9 to a high of 3.743 in week 6. According to Gunawardena et al. (1997), discourse reaching IAM level 3 and above is considered evidence of knowledge co-construction while discussions at IAM Levels 1 and 2 are foundational but not indicative of new construction. On average then, students participating in this study achieved the construction benchmark each week. Potential sources of variation are discussed next.

Program Workload and Flow

The study's assignment structure was rigid. A strict pattern of participation was required each week. This rigidity and the resulting fatigue may have inhibited engagement (Freedman et al., 2003). Recall that the study participants are fulltime educators, following a demanding cohort model, which together place competing demands on students' time. Most cohort members were enrolled together in the same three graduate-level classes. The cohort's face to face meetings generally took place over three weekends, during which students spent more than twelve hours in class and were asked to attend other program meetings and presentations as well. The combination of these demanding weekends and the ebb and flow of assignments from the participants' other classes, could easily produce competing demands for students' time, and result in reduced levels of effort during some discussion periods. If the instructional methods employed in this study are repeated, flexibility should be increased to

the extent possible and the demands of meaningful participation carefully balanced against underlying educational objectives (Manning & Smith, 2018).

Instructional Design

As students engage in case studies, they naturally bring with them their relevant experiences and opinions. As they draw from their experience, they apply course concepts in ways reflective of this experience. The extent to which each case study successful in promoting knowledge co-construction may have been influenced by several factors. First, as Ko and Rossen (2010) note, diversity among students result in different interests. Because students were not given a choice of case studies to read, it follows that some topics were more or less interesting to students than others. The case studies were drawn from *Leadership Case Studies in Education* (Northouse & Lee, 2019) and were designed to align with the chapters in the primary course text, *Leadership, 8th ed* (Northouse, 2019). Although the cases were designed to frame contemporary issues in educational leadership, in some cases, students showed little variation in their responses and subsequently exchanged statements of agreement without the need for negotiation.

Variation in Student Mean Scores

In addition to variation in class mean scores from week to week, there was considerable variation at the individual level, where some students were more often part of a high-scoring pair than others. Three possible explanations for this variation are found in the literature: effort, level of comfort engaging in co-construction activities, and personal challenges. Knowledge construction requires effort and students not all students are accustomed to doing heavy mental lifting (Palloff & Pratt, 1999). They argue further that the instructor should play an active role in promoting critical thinking and other co-constructive behaviors (Palloff & Pratt, 1999). This point of view is shared by Ringler et al. (2015) who say, "the role of the instructor is critical to keeping stu-

dents motivated to participate in ongoing discussions” (5p. 17), and Hull and Saxon (2009), who prod students with mid-week “intercedent questions” to spur students in stalled discussions (p. 631). To preserve integrity of the research design, however, the instructor did not attempt to mediate the paired discussions. In addition to a lack of instructor prompting, Simonson et al. (2015) note that students’ resistance to collaboration can be daunting. Many students lack cooperative learning experience and may need a push to help them break out of the “competitive learning mode” to which they are accustomed (Conrad & Donaldson, 2004, p. 8). Wake and Bunn (2015) add that “learners who were raised in the high stakes testing environments resulting from NCLB may have become accustomed to more didactic methods and can encounter difficulty in adapting to new teaching and learning methods” (p. 42). Finally, the ebb and flow of demands and stressors in students’ lives could create instances where in a given week they could find themselves optimally paired for social knowledge co-construction but unable to devote the time necessary to fully engage the required critical thought and reflection.

Implications for Research

This study revealed two potentially significant implications for the future of social knowledge co-construction research. First, it attempted to operationalize power parity so that its effects on social knowledge co-construction could be studied. While the results were minimal, perhaps the methods used in this study could inform the design of future studies that isolate the sources of variance more effectively. Second, analysis of the transcripts revealed an insight not previously discussed in prior research involving the interaction analysis model. It has been observed here that a given discussion may reach a very high phase of knowledge co-construction but along a very narrow line of inquiry representing only a minor facet of the topic of discussion. An example of this is found in the shared statements

of paired posts 199 and 282 where a participant made a clear Level 5 statement of changed perspective and directly attributed this change to the discourse with his partner. The change, though explicitly stated, concerned a relatively minor element of the case study. This raises an important question concerning how co-construction within a post is scored relative to other posts. Is it more desirable, for example, that student pairs reach the highest level possible on a single idea than for them to demonstrate multiple, substantive instances of new construction at lower levels? As it has been applied here and in previous research, the IAM favors the latter over the former. Future IAM studies should consider this question and propose methods to capture both the breadth and depth of knowledge co-construction.

IMPLICATIONS FOR PRACTICE

The discussion thread is a pedagogical staple of online courses. Course design that seeks to promote student-to-student engagement on these threads is laudable, but designers need to consider a variety of engagement modalities to meet the diverse needs of all types of learners (Simonson et al., 2015). The course associated with this study was a particularly good fit for the dialectic activities designed to promote and measure social knowledge co-construction. The highly contextual nature of the subject matter coupled with the students’ extensive set of diverse and relevant experiences, provided fertile ground for nuanced discussion at the intersection of theory and practice. However, requiring this type of interaction at the exclusion of other forms of collaboration and engagement may produce diminishing returns, lead to learner fatigue, and fail to meet the needs of all students.

This study presented evidence that student differences in experience levels, with respect to a topic of discussion, may factor into the degree of co-construction a pair of students will achieve when discussing or debating highly

contextual subject matter. Depending on the instructor's purpose, it may be prudent for instructors to consider this fact when building prompts for online discussions. While this study randomized pairings to measure specific relationships, in practice, an instructor might consider giving students a choice among discussion topics for a given assignment. This way, students can self-organize based on interest and experience, which will set the stage for co-constructive dialogue. Additionally, an instructor may wish to design an activity to create a common experience from which students will subsequently be asked to make meaning. Like all design decisions, these instances should be intentional rather than arbitrary.

REFERENCES

- Aviv, R., Erlich, Z., Ravid, G., & Geva, A. (2003). Network analysis of knowledge construction in asynchronous learning networks. *Journal of Asynchronous Learning Networks*, 7(3), 1–23.
- Baker, M. (1994). A model for negotiation in teaching-learning dialogues. *Journal of Artificial Intelligence in Education*, 5(2), 199–254.
- Bass, B. M. (1985). *Leadership and performance beyond expectations*. Free Press.
- Buraphadeja, V. (2010). *An assessment of knowledge construction in an online discussion forum: The relationship between content analysis and social network analysis*. Retrieved from ProQuest Dissertations & Theses Global. (AAT 3436323)
- Conrad, R. M., & Donaldson, J. A. (2004). *Engaging the online learner: Activities and resources for creative instruction*. Jossey-Bass.
- Creamer, E. G. (2018). *An introduction to fully integrated mixed methods research*. Sage.
- De Wever, B., Van Keer, H., Schellens, T., & Valcke, M. (2010). Roles as a structuring tool in online discussion groups: The differential impact of different roles on social knowledge construction. *Computers in Human Behavior*, 26(4), 516–523.
- Eisen, S. (2011). *Practical guide to negotiating in the military* (2nd ed., pp. 1–24). USAF Negotiation Center of Excellence.
- Fisher, R., Ury, W., & Patton, B. (1993). Negotiation power: Ingredients in an ability to influence the other side. In L. Hall, (Ed.) *Negotiation* (pp. 1–14). Sage.
- Freedman, S. C., Tello, S. F., & Lewis, D. (2003). Strategies for improving instructor-student communication in online education. In F. Albaloooshi (Ed.) *Virtual education: Cases in learning & teaching technologies* (pp. 157–168). IRM Press.
- French, J. R. P., Jr., & Raven, B. H. (1962). The bases of social power. In D. Cartwright (Ed.), *Group dynamics: Research and theory* (pp. 259–269). Harper & Rowe.
- Gomez, D. R., & del Rosario, M. (2018). Paths toward social construction of knowledge: Examining social networks in online discussion forums. In: Meiselwitz G. (Ed.), *Social computing and social media: User experience and behavior*. SCSM 2018. Lecture Notes in Computer Science, vol 10913. Springer.
- Gunawardena, C. N., Anderson, T., & Lowe, C. A. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research*, 17(4), 397–431.
- Gunawardena, C. N., Flor, N. V., Gomez, D., & Sanchez, D. (2016). Analyzing social construction of knowledge online by employing interaction analysis, learning analytics, and social network analysis. *Quarterly Review of Distance Education*, 17(3), 35–60.
- Heo, H., Lim, K. Y., & Kim, Y. (2010). Exploratory study on the patterns of online interaction and knowledge co-construction in project-based learning. *Computers & Education*, 55, 1383–1392. <http://dx.doi.org/10.1016/j.compedu.2010.06.012>
- Henri, F. (1992). Computer conferencing and content analysis. In Kaye, A. (Ed.), *Collaborative learning through computer conferencing: The Najaden papers* (pp. 117–136). Springer-Verlag.
- Hou, H.-T., Chang, K.-E., & Sung, Y.-T. (2009). Using blogs as a professional development tool for teachers: Analysis of interaction behavioral patterns. *Interactive Learning Environments*, 17(4), 325–340.
- Howard, C., Di Eugenio, B., Jordan, P., & Katz, S. (2017). Exploring initiative as a signal of knowledge co-construction during collabora-

- tive problem solving. *Cognitive Science*, 41, 1422–1449.
- Hull, D. M., & Saxon, T. F. (2009). Negotiation of meaning and co-construction of knowledge: An experimental analysis of asynchronous online instruction. *Computers in Education*, 52, 624–639.
- Jean, S., Medema, W., Amamowski, J., Chew, C., Delaney, P., & Wals, A. (2018). Serious games as a catalyst for boundary crossing, collaboration, and knowledge co-creation in a watershed governance context. *Journal of Environmental Management*, 223, 1010–1022.
- Ko, S., & Rosen, S. (2010). *Teaching online: A practical guide* (3rd ed.). Routledge.
- Kotter, J. P. (1990). *A force for change: How leadership differs from management*. Free Press.
- Lucas, M., & Moreira, A. (2010). Knowledge construction with social web tools. In M. D. Lytras, P. Ordonez-De Pablos, D. Avison, J. Sipiior, Q. Jin, W. Leal, L. Uden, M. Thomas, S. Cervel & D. Horner (Eds.), *1st International conference on reforming education and quality of teaching*, CCIS 73 (pp. 278–284). Springer Verlag. doi: 10.1007/978-3-642-13166-0_40
- Manning, R., & Smith, D. (2018). Creating spaces for learning: Online forums. In J. Baxter, G. Callaghan, & J. McAvoy (Eds.), *Creativity and critique in online learning* (pp. 31–57). Palgrave-MacMillan.
- Nash, J. (2011). A tale of two forums: One professor's path to improve learning through a common online teaching tool. *Journal of Research on Leadership Education*, 6(5), 181–194.
- Northouse, P. G. (2019). *Leadership theory and practice* (8th ed.). Sage.
- Northouse, P. G., & Lee, M. (2019). *Leadership case studies in education* (2nd ed.). Sage.
- Owusu-Agyeman, Y., & Fourie-Malherbe, M. (2019). Negotiating co-ownership of learning in higher education: An underexplored practice for adult learning. *Studies in Continuing Education*, 41(1), 17–35. <https://doi.org/10.1080/0158037X.2018.1497591d>.
- Palloff, R., & Pratt, K. (1999). *Building online communities in cyberspace*. Jossey-Bass.
- Papert, S., & Harel, I. (1991). Situating constructionism. *Constructionism*, 36(2), 1–11.
- Piaget, J. (1967). *Six psychological studies*. Vintage Books.
- Piaget, J. (1970). Piaget's theory (G. Gellerier & J. Langer, Trans.). In P. H. Mussen (Ed.), *Car-michael's manual of child psychology* (3rd ed., Vol. 1). Wiley.
- Ringler, I., Schubert, C., Deem, J., Flores, J., Friestad-Tate, J., & Lockwood, R. (2015). Improving the asynchronous online learning environment using discussion boards. *i-Manager's Journal of Educational Technology*, 12(1), 15–27.
- Schellens, T., & Valcke, M. (2007). Fostering knowledge construction in university students through asynchronous discussion groups. *Computers and Education*, 46(4), 349–370.
- Simonson, M., Smaldino, S., & Zvacek, S. (2014). *Teaching at a distance: Foundations of distance education*. (6th ed.). Information Age.
- Sing, C. C., & Khine, M. S. (2006). An analysis of interaction and participation patterns in online community. *Educational Technology & Society*, 9(1), 250–261.
- Smith, P. L., & Ragan, T. J. (1999). *Instructional design* (2nd ed.). John Wiley & Sons Inc.
- Stahl, G. (2003, January). *Knowledge negotiation in asynchronous learning networks*. Paper presented at 36th Hawaii International Conference on System Sciences (HICSS '03), Big Island, HI. IEEE.
- Tan, J., Chai, C. S., & Hong, H. Y. (2008). The analysis of small group knowledge building effort among teachers using an interaction analysis model. In S. C. Kong, H. Ogata, H. C. Arnseth, C. K. Chan, T. Hirashima, F. Klett, J. Lee, C. C. Liu, C. K. Looi, M. Milrad, A. Mitrovic, K. Nakabayashi, S. L. Wong & S. Yang (Eds.), *Proceedings of the 17th International Conference on Computers in Education* (pp. 801–808). Asia-Pacific Society for Computers in Education.
- Teddlie, C., & Yu, F. (2007). Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research*, 1(1), 77–100. DOI 10.1177/1558689806292430
- Twalo, T. (2019). Challenges of knowledge production and knowledge use among researchers and policymakers. *Educational Action Research*, 22(2), 269–285.
- Tynjala, P. (1999). Towards expert knowledge: A comparison between a constructivist and a traditional learning environment in the university. *International Journal of Educational Research*, 31(5), 357–442.

- Veerman, A. L., & Veldhuis-Diermanse, A. E. (2001). Collaborative learning through computer-mediated communication in academic education. In *Proceedings European Perspectives on Computer Supported Collaborative Learning : Euro-CSCL* (pp. 625–632). Maastricht McLuhan Institute.
- Vygotsky, L. S. (1987). Thinking and speech. In R. W. Rieber, & A. S. Carton (Eds., N. Minick, Trans.), *The collected works of L. S. Vygotsky. Volume 1: Problems of general psychology* (pp. 39–285). Plenum Press.
- Wake, D., & Bunn, G. (2015). Online learning for the left-behind generation. *Southeast Regional Association of Teacher Educators Journal*, 24(2), 40–50.
- Xie, K., Yu, C., & Bradshaw, A. C. (2014). Impacts of role assignment and participation in asynchronous discussions in college-level online classes. *The Internet and Higher Education*, 20, 10–19.