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Instructor Clarity and Student Motivation: Academic Performance as A Product of Students' Ability and Motivation to Process Instructional Material

San Bolkan, Alan K. Goodboy & Dawn M. Kelsey

This study tested the notion that the effect of instructor clarity on learning is conditioned upon students' motivation. We randomly assigned 128 participants to a video of a clear or an unclear lecture and asked them to report their motivation to deeply process lecture material. Results indicated that even with clear instruction, test scores were not increased when students' motivation to process was low. However, when students' motivation to process was high, motivation interacted with instructor clarity to increase test scores. Under conditions of high clarity, participants who were highly motivated to think deeply about the lecture scored 71% compared with their less motivated counterparts who scored 49%—the academic difference between a passing and a failing grade.

Keywords: Clarity; Motivation; CATLM; Learning

In the classroom, instructors and students must work together to create optimal learning conditions. Teachers can facilitate the creation of these conditions by enacting behaviors that have been shown to associate with student learning such as being humorous (Bolkan & Goodboy, 2015), providing clear lectures (Chesebro, 2003; Seidel, Rimmele, & Prenzel, 2005), and making information relevant to students' lives (Frymier & Shulman, 1995; Kember, Ho, & Hong, 2008). Students, of

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course, also have a responsibility in promoting positive educational outcomes. To facilitate an optimal learning environment, researchers have claimed that students should focus their attention on lectures and avoid distractions such as texting (Wei, Wang, & Klausner, 2012), take detailed and organized notes (Titsworth & Kiewra, 2004), and take an active role in learning by relating new information to that which has previously been learned (Bransford et al., 1982).

Despite instructors doing their best to provide students with effective instruction, some may be surprised to learn that their teaching does not result in the outcomes they had imagined. However, considering that students' experiences with their instructors and their own proclivities in the classroom may differ among the variables mentioned above (and, indeed, others), it is reasonable that student outcomes will differ even when exposed to similar educational curriculum. For this reason, it is crucial for instructors to remember that simply providing information is not enough to ensure that students have engaged with the material in ways that promote deep learning and a lasting memory.

As it pertains to student outcomes, scholars examining differences in learning often emphasize the importance of individual differences in thinking about course material. According to the levels of processing framework, information that is processed in a deep manner (i.e., information that is elaborated) is more meaningful and is associated with longer-lasting memories compared with information that is processed in a shallow manner (e.g., Craik & Lockhart, 1972). Specifically, compared with students who do not, students who spend more time thinking about the material by adding details to what is being learned, clarifying ideas in a lesson, highlighting relationships between concepts, or connecting new information to material already learned are more likely to experience higher message comprehension and recall (King, 1992) and are likely to do better on performance-based tests (Dornisch, Sperling, & Zeruth, 2011).

Although it could be argued that students should do their best to elaborately process instructional messages without regard to the people who communicate them, scholars note that students may not have the ability or motivation to think deeply about course concepts on their own (Dornisch et al., 2011; King, 1992). That said, instructors play a significant role in promoting students' ability and motivation to think deeply about course concepts (King, 1992) and it is essential that instructors help their students engage in deep-processing and higher-order thinking by promoting learning strategies that encourage elaboration (Dornisch et al., 2011).

One instructor behavior that may help increase students' ability to process course information is instructor clarity. In fact, research has shown that the use of clarity may function by reducing students' cognitive loads thereby making learning easier to do (Bolkan, 2015). However, promoting clarity in the classroom may not be enough. According to several scholars (e.g., Chaiken, Liberman, & Eagly, 1989; Eagly & Chaiken, 1993; Petty & Cacioppo, 1986), individuals need to have both the ability and motivation to process information in elaborate ways because each "antecedent condition serves only as a necessary, but not sufficient condition for message elaboration" (Andrews, 1988, p. 220). That said, in the current study, we examined instructor clarity in conjunction with students' motivation to process course material in a deep and elaborate manner to determine how the interaction between the two variables operates to influence student learning in the context of higher education.

Cognitive and affective antecedents of student elaboration

Though students may spend the same amount of time studying information from the same class, success in terms of recall, understanding, and mastery of the material may be different for each individual. There are a variety of reasons students may differ in their learning outcomes; one explanation may stem from the way students think about their lessons. According to Bransford et al. (1982), students who are successful seem to "take a much more active role in the learning process" (p. 392). Specifically, the authors note that students who do well tend to spend time relating new information to previously learned information whereas less successful students simply study information without attempting to integrate it into their knowledge base. As a result, students who elaborate on information in their classes are likely to enjoy better retention and understanding compared with students who do not (Craik & Lockhart, 1972; Dornisch et al., 2011; Ekuni, Vaz, & Bueno, 2011).

Elaboration has proven to be an important concept in education. Scholars studying the idea in academic contexts define elaboration as the degree of cognitive analysis that occurs when students create associations between new information and stored information in a meaningful manner (Craik & Lockhart, 1972; Dornisch et al., 2011). As previously reported, elaboration can occur when students add details to what is being learned, clarify ideas in a lesson, highlight relationships between concepts, or connect new information to past experiences (King, 1992). According to several scholars, the fundamental process of elaboration in each of these activities is the making of information more meaningful which, in turn, makes it easier to remember (King, 1992; Levin, 1988; Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987). Craik and Lockhart (1972) note that elaboration is crucial in education because, in the end, it is the effort spent deeply analyzing information that leads to better retention, not simply the time spent studying. Importantly, students who engage in elaborate processing tend to have better academic results beyond simple retention including increased comprehension as well (e.g., King, 1992).

As mentioned previously, scholars claim that elaboration or deep processing is a function of individuals' ability and motivation to engage in this type of behavior (see Eagly & Chaiken, 1993 for a review). Though research on cognitive elaboration has traditionally occurred in the context of social influence, scholars in educational disciplines have recently adopted this framework as well. The foundation for this research comes from studies of cognitive load (see Plass, Moreno, & Brunken, 2010; Sweller, Ayres, & Kalyuga, 2011 for reviews) and has evolved into a more comprehensive theory including student affect and motivation (Moreno, 2005, 2006; Park, Flowerday, & Brunken, 2015; Um, Plass, Hayward, & Homer, 2012).

Cognitive load

Researchers have studied the notion of cognitive load for several decades and have used it to explain student learning as a function of individuals' mental strain in educational contexts. According to Sweller et al. (2011), mental strain takes its toll on learning insofar as humans' cognitive capabilities and learning potential function highest under conditions of limited workloads. That said, researchers typically categorize cognitive workload as being present in three forms: germane load, intrinsic load, and extraneous load. Specifically, cognitive load theorists predict that learning will occur to the extent that students have the mental resources (i.e., germane load) to organize new information into schemas and argue that this process is constrained by the demand created by the difficulty of the material to be learned (i.e., intrinsic load) and the cognitive load imposed through poor instructional design (i.e., extraneous load; Sweller et al., 2011). Cognitive load theorists suggest that for instruction to be effective, "intrinsic and extraneous loads together should not exceed limited working memory capacity" (Kalyuga, 2010, p. 55).

Because the difficulty of the material to be learned (i.e., intrinsic load) is considered to be largely fixed (Sweller et al., 2011), proponents of cognitive load theory suggest that instructors can facilitate learning by changing the design of their instructional materials and reducing students' extraneous cognitive loads (Mayer & Moreno, 2003). To achieve this goal, Mayer and Moreno (2003, 2010) note that there are several methods instructors can employ in their teaching including segmenting information (e.g., pacing it appropriately), signaling (e.g., adding organizational components and stressing key words), providing concise and uncluttered information to students, and getting rid of unnecessary or redundant course material. In addition to these tactics, researchers also note that extraneous load can be reduced through the provision of examples and by relating newly learned concepts to information that is already known (Kalyuga, 2010).

As should be evident to scholars of instructional communication, several of these techniques mirror instructional behaviors that have been shown to enhance instructor clarity. For example, scholars note that clear teachers enact a variety of behaviors that help students learn course material better including pacing instruction appropriately, teaching in steps, using examples that students can relate to, and using advanced organizers, transitions, previews, and reviews (Chesebro, 2003; Chesebro & McCroskey, 1998; Kennedy, Cruickshank, Bush, & Myers, 1978; for a review see Titsworth & Mazer, 2010). Because of its connection to instructional design and its ability to decrease extraneous load (Bolkan, 2015), we focus this project on instructor clarity as a method of increasing students' ability to learn course information.

Instructor clarity refers to the "process by which an instructor is able to effectively stimulate the desired meaning of course content … through the use of appropriately-structured" class material (Chesebro & McCroskey, 1998, p. 262) and is beneficial in the classroom for a variety of reasons. As it pertains to the current study, one of these reasons includes the fact that clear instruction is a necessary condition for students to "cognitively engage in learning tasks" (Seidel et al., 2005, p. 542). The reason Seidel et al. report that clarity is essential for cognitively engaging in learning tasks is likely due to clarity's ability to reduce the cognitive load associated with student learning activities. Specifically, an increased extraneous cognitive load from unclear lectures may reduce individuals' processing capacity by taking away mental resources that could otherwise be devoted to creating and modifying schemas that aid in learning and recall (Sweller, 1988). Recent research (Bolkan, 2015) has born this relationship out and has supported the argument that clear instructors decrease students' extraneous cognitive loads and, in turn, increase their deep processing of course information and subsequently their engagement in behavioral indicators of learning.

If unclear lectures inhibit mental processing because they overload students' cognitive capacity, it should be the case that students experience a reduction in their ability to process information under these conditions. Conversely, if instructors are clear, students should be more able to think deeply about course concepts. Results of several research projects support this contention insofar as instructor clarity has been associated negatively with receiver apprehension (Chesebro & McCroskey, 2001) and has been associated positively with students' emotional and cognitive interest (Mazer, 2013), detailed and organized note taking (Titsworth, 2004; Titsworth & Kiewra, 2004), and their reports of affective and cognitive learning (Titsworth & Mazer, 2010).

The research reviewed above lends credence to the argument that clear instruction may be beneficial to student learning because of its ability to reduce the extraneous cognitive load associated with lecture content. However, if this is the case, we might expect that instructor clarity should interact with students' motivation to process course content to create optimal conditions for learning. In fact, recent theoretical extensions of cognitive load theory support this contention.

Cognitive-affective theory of learning with media

In addition to reducing the extraneous load associated with learning, proponents of cognitive load theory suggest that students will learn more to the extent that they increase their germane load. In other words, in addition to needing instructional environments that make it easy to learn, researchers claim that learning occurs insofar as students actually spend time engaged in the deep processing of instructional material. Scholars assert that this behavior can be promoted to the extent that students are motivated to learn and have proposed the cognitive-affective theory of learning with media to detail this process (CATLM; Moreno, 2005, 2006).

According to CATLM, motivation to think deeply about course concepts is crucial to student learning because despite reducing extraneous load and increasing students' ability to process information deeply, ultimately, "motivation and affect determine how much of the available cognitive resources will be assigned to the learning task" (Moreno & Mayer, 2010, p. 160). Mayer and Estrella (2014) support this position and note that while the reduction of poor instructional practices may give students the ability to learn course content, enhanced motivation should lead to better learning outcomes because it helps students select appropriate material to attend to, while also helping them organize and integrate it into their existing knowledge bases. Other researchers agree. According to Park, Moreno, Seufert, and Brunken (2011), "freeing working memory capacity by designing low load learning environments" does "not necessarily lead to spending the available resources in productive way" (p. 9). Instead, those authors argue that "students need to become motivated to make full use of their cognitive resources during learning" (p. 9).

In essence, researchers argue that the optimal learning environment is one where motivated students are exposed to educational materials that foster their ability to deeply process course lessons. That said, promoting a reduced cognitive load through clear teaching may be a necessary, but not sufficient, condition for increasing students' deep processing of course material. Instead, students' ability to deeply process course material and their subsequent learning may be conditioned upon their motivation to think elaborately about course concepts. Theories of message elaboration support this contention (e.g., Eagly & Chaiken, 1993; Petty & Cacioppo, 1986). We created the current project to test this notion in the context of student learning. Specifically, because theory predicts that students' ability and motivation to elaborate should interact to foster elaboration, and because students who elaborate on course material should learn it better, we propose that students who are exposed to clear teachers and who are motivated to think deeply about course concepts will experience an increase in cognitive learning. To test whether or not ability and motivation interact to increase student learning, we proposed the following hypothesis:

> H: Instructor clarity and students' motivation to deeply process course material interact to influence students' test scores.

Method

Participants and procedures

After gaining institutional review board approval, we recruited 181 students from upper and lower level communication studies courses to take part in the study in return for minimal extra credit. To avoid confounding influences on students' learning experiences, we removed 53 students from the study because they reported that they had been in a class with the professor delivering the videotaped lecture. The remaining 128 participants were 31 men and 97 women whose ages ranged from 19 to 36 (M = 22.3, SD = 3.0). Four students were in their first year, 24 students were in their second year, 46 students were in their third year, 33 students were in their fourth year, and 20 students were in their fifth year or beyond (one response was missing). We notified students of the opportunity to take part in the study in class and emailed them a link to an online survey to complete on their own time. Once students consented to participate in the survey, we told them that they would (a) watch a five minute lecture, (b) answer some questions pertaining to the lecture, and (c) take a short test regarding what they learned in the lecture. After participants saw these instructions, they were randomly assigned to one of two lecture conditions (described below) on the topic of social cognitive theory (Bandura, 1997, 1998, 2004). Participants were forced to stay on the page until the video was complete and were allowed to take notes on the lecture, though they were not explicitly told to do so. After watching one of the lecture videos, participants answered a series of questions regarding the perceived clarity of the lecture, their motivation to think deeply about the lecture material, their familiarity with the lecture content, and the perceived difficulty of the content. After responding to these measures, participants took a test on the material. The measures used in this study are reported below.

Instrumentation

Clarity

We manipulated clarity by producing two videotaped lectures that were embedded into the online survey. Each video was five minutes and 18 seconds long, and was delivered by an associate professor of communication studies. Similar to previous clarity experiments (e.g., Chesebro, 2003), we manipulated clarity by using clusters of behaviors including both verbal and structural clarity components. Specifically, the clear lecture had advanced organizers, transition statements, summaries, and concrete examples. The unclear lecture did not contain the aforementioned components (see Titsworth & Mazer, 2010), but did contain vagueness terms (i.e., unclear sets of words that indicate a recovery point during a lecture), mazes (i.e., false starts and redundant language), and utterances (i.e., vocalized pausing during the lecture; see Table 1 for examples). Sixty seven participants were exposed to the unclear lecture, and 61 participants were exposed to the clear lecture.

Manipulation check

Five items were created for this study to determine if the clarity manipulation was successful. These items were based on previous research examining clarity (Chesebro & McCroskey, 1998) and included the following statements: "This lesson was clear," "This lesson was straightforward," "This lesson made sense," "This lesson was easy to understand," and "This lesson was easy to follow." Responses could range from (1) *strongly disagree* to (5) *strongly agree* ($\alpha = .95$, $M = 3.60$, $SD = 1.03$).

Motivation to deeply process course information

Because motivation is multidimensional (Deci & Ryan, 2000), researchers should consider examining specific types of this variable to produce explicit insights regarding the impact of motivation on student outcomes. In the current study, we operationalized the construct as motivation to engage in deep thought regarding course concepts. We hypothesized that this type of motivation would be important insofar as it should lead to the systematic processing of information presented in class. We created the measure of motivation to deeply process course information for this study using the definition of message-relevant thinking (Eagly & Chaiken, 1993) and a measure of message elaboration as a guide (i.e., Reynolds, 1997). This measure contained four items with responses ranging from (1) *not at all true of me* to (7) *very true of me*. Items assessing motivation included, "I was motivated to think deeply about what is being taught in this lesson," "I was motivated to thoroughly

Table 1 Examples from Clear and Unclear Lectures

Clear lecture: (698 words, five minutes 18 seconds)	Unclear lecture: (766 words, five minutes 18 seconds)
Advanced organizers: "Social cognitive theory predicts behavior change through three key components. These components include first, self-efficacy; second, people's perceived outcomes; and third, the perceived facilitators and impediments of healthy behavior."	*Lack of advanced organizers*: "Social cognitive theory models behavior change through several key components … "
Transition statements: "In addition to self-efficacy and outcome expectations, Social cognitive theorists believe that behavior can also be influenced by the third aspect we already spoke about. This third aspect is perceived facilitators and perceived impediments."	*Lack of transitions*: "In addition, behavior will also be influenced by perceived facilitators and impediments."
Summaries: "We talked about self-efficacy, the second idea was outcomes, and the third idea was impediments and facilitators."	NA
Concrete examples: "The third form of outcomes includes perceptions that a behavior will lead to social approval or disapproval. So, for example, will people who are close to you approve of or disapprove of your dieting?"	*Lack of concrete examples*: "Outcomes also represent perceptions that a behavior will lead to social approval or social disapproval."
Lack of mazes: "Self-efficacy is defined as … "	*Mazes*: "Self-efficacy is ummm, self-efficacy is considered to be, or self-efficacy is defined as … "
Lack of utterances: "Social cognitive theory was created by a man named Albert Bandura … "	*Utterances*: "Social cognitive theory was ummm, social cognitive theory was created by Albert Bandura … "
Lack of vagueness terms: "Facilitators and impediments represent features of the environment that may make performing a behavior either easy to do or hard to do."	*Vagueness terms*: "Facilitators and impediments represent features of the environment that can either enable a behavior or that can also serve as, that can serve like as obstacles to a behavior."

study the ideas being delivered in this lecture," "I was interested in concentrating meaningfully on the lesson presented in this lecture," and "I cared about really learning the material in this lecture" ($M = 3.81$, $SD = 1.58$, $\alpha = .94$).

Familiarity with the lecture material

Similar to previous studies (e.g., Chesebro, 2003), we attempted to control for individuals' previous knowledge of the lecture content on learning. We assessed participants' familiarity with the lecture material with three items created for this study. These items asked students "How familiar were you with this topic before today?," "How much did you already know about the subject being discussed?," and "To what extent had you been exposed to the material in this lesson in the past?" Responses could range from (1) *not at all* to (5) *very much* ($\alpha = .94$, $M = 2.66$, $SD = 1.16$).

Difficulty of the material

Because it may be reasonable to assume that the perceived difficulty of the material (i. e., intrinsic load) may affect participants' test scores (Kalyuga, 2010), we attempted to control for the influence of this variable. To assess the perceived difficulty of the material, participants were asked to respond to a 1-item measure based on Paas' (1992) mental effort rating scale. This measure asked participants to report "How difficult would the material have been to understand if it was taught in an ideal manner (e.g., by an ideal teacher, in a way that was simple to comprehend, etc.)?" Response options ranged from (1) *very very low* to (9) *very very high* ($M = 3.29$, $SD = 2.26$).

Exam

The exam was 10 questions and tested participants' knowledge of the material covered in the lecture. The exam consisted of three multiple choice questions and seven true/ false questions. Each question was coded as (1) for a correct answer and as (0) for an incorrect answer ($KR\text{-}20 = .62$, $M = 5.16$, $SD = 2.20$).

Results

To determine if the manipulation of instructor clarity was successful, we conducted an independent samples t-test to examine the means of the perceived clarity scores comparing participants from the clear and the unclear lectures. Results revealed that participants exposed to the clear lecture perceived the material to be clearer ($M = 4.15$, $SD = .87$) than participants exposed to the unclear lecture ($M = 3.10$, $SD = .90$; $t(126) = 6.71$, $p < .01$, $d = 1.19$). Moreover, to assess the appropriateness of our exam, we performed validity tests on the questions (i.e., item difficulty, item discrimination); in each case, the questions were found to be valid.

Recall that our hypothesis predicted that instructor clarity would interact with students' motivation to deeply process lecture content. To test this notion we conducted a moderation analysis using hierarchical ordinary least squares regression controlling for students' level of familiarity with the lecture content and their perceptions of the difficulty of the content (see Table 2). Results from the second block of the

Table 2 Hierarchical Regression Analysis Predicting Test Scores

Model	*F*	*df*	*p*	Adj R^2	*B*	*SE*	*t*	*p*
Block 1	3.91	2/125	<.05	.04				
Constant					6.48	.57	11.35	<.01
Familiar					−.23	.17	−1.41	.16
Difficulty					−.21	.09	−2.51	<.05
Block 2	15.50	4/123	<.01	.31				
Constant					5.11	.58	8.80	<.01
Familiar					−.33	.14	−2.31	<.05
Difficulty					−.23	.07	−3.18	<.01
Clarity					2.10	.34	6.19	<.01
Motivation					.18	.11	1.61	.11
Block 3	15.80	5/122	<.01	.37				
Constant					6.24	.65	9.63	<.01
Familiar					−.28	.14	−2.07	<.05
Difficulty					−.26	.07	−3.66	<.01
Clarity					−.65	.87	−.75	.45
Motivation					−.17	.15	−1.15	.25
Clarity*Motivation					.71	.21	3.41	<.01

Note. *B*: unstandardized coefficient.

regression indicated that the main effect for clarity (dummy coded 0 for the unclear and 1 for the clear lecture) was significant while controlling for students' perceptions of the difficulty of, and their familiarity with, the lecture content ($B = 2.10$, $SE = .34$, $p < .01$). Furthermore, students' perceptions of the difficulty of the lecture content and their reported familiarity with the content were also significantly and negatively associated with their test scores, serving as important covariates.

The results of the third block supported our hypothesis and revealed that the interaction between instructor clarity and student motivation to process course information was significant. An examination of the effect of instructor clarity on students' test scores at varying levels of motivation revealed that under low motivation (i.e., 10th percentile) the conditional effect of instructor clarity on students' test scores was not significant ($\theta_{X\rightarrow Y} = .60$, $t = 1.09$, $p = .28$). However, the conditional effect of instructor clarity on students' test scores was significant at the 25th percentile of students' motivation to process course content deeply ($\theta_{X\rightarrow Y} = 1.31$, $t = 3.28$, $p < .01$), the 50th percentile ($\theta_{X\rightarrow Y} = 2.02$, $t = 6.21$, $p < .01$), the 75th percentile ($\theta_{X\rightarrow Y} = 2.91$, $t = 7.22$, $p < .01$), and the 90th percentile ($\theta_{X\rightarrow Y} = 3.45$, $t = 6.73$, $p < .01$). More specifically, an examination of the conditional effects of instructor clarity on student learning using the Johnson-Neyman technique revealed that instructional clarity was not significantly related to learning when students' motivation was below a raw score of 2.22 (the 16.41% least motivated students). Beyond this point, students who listened to clear lectures and who were more motivated to think deeply about the content of the lecture were more likely to earn higher scores compared with students who were less motivated (see Figure 1).

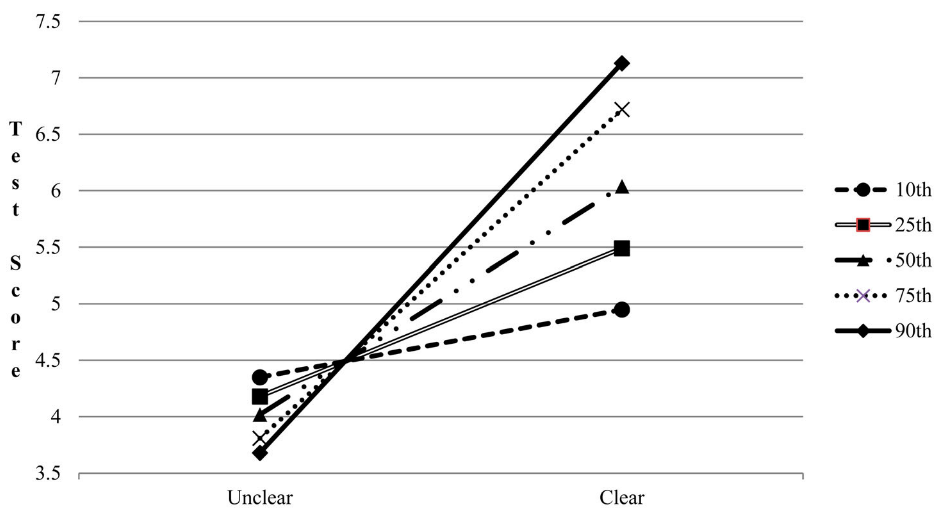

Figure 1 Instructor clarity conditioned on students' motivation to deeply process lecture content. Numbers in the legend refer to percentiles of motivation. The test was out of a possible 10 points.

Discussion

Because students are likely to interact with course material differently, instructors may expect to observe differences in student learning despite exposure to similar educational material. In this study, we argued that one of the reasons explaining the differences between student outcomes may be their level of processing with regard to course information. Considering the importance of student elaboration, we conducted this study to investigate two antecedents to this process. Specifically, using cognitive load theory (Plass et al., 2010; Sweller et al., 2011) and CATLM (Moreno, 2005, 2006) as a guide, we conducted this study to examine how instructor clarity and student motivation to think deeply about course content work together to influence student learning outcomes. In support of our hypothesis, we found that instructor clarity and students' motivation to deeply process lecture material interacted to produce significant differences on a test of students' knowledge of social cognitive theory (Bandura, 1997, 1998, 2004). In line with CATLM, our results revealed that student learning was maximized under conditions of high clarity and high motivation to process course material. Specifically, under conditions of high clarity, participants who were highly motivated to think deeply about the lecture scored 71% compared with their less motivated counterparts who scored 49%—the academic difference between a passing and a failing grade.

The results of this study may be explained by clarity's influence on students' ability to process course information in elaborate ways. Recall that the rationale for this explanation rests with cognitive load theory (Sweller, van Merrienboer, & Paas, 1998) which assumes that humans have a limited mental capacity in terms of working memory. Thus, because humans cannot process highly complex material, instructors who ask students to do so may overload students by increasing "the effort required to process poorly designed instruction" (Sweller et al., 1998, p. 259). Called extraneous load, the cognitive burden imposed through poorly designed instructional materials may ultimately take resources away from students' ability to elaborately process course information. Several studies of message comprehensibility and message elaboration support this conclusion (e.g., Bradley & Meeds, 2004; Hafer, Reynolds, & Obertynski, 1996; Lowery, 1998).

In addition to reducing students' extraneous loads, clarity may help students elaborate by directly facilitating their deep processing of course material. This is because instructors who provide clear lectures also likely aid in students' ability to link new incoming information to older, more established information. Evidence for this connection lies in the conceptualization of the clarity which is, to some extent, operationalized as providing examples to help illustrate course concepts (e.g., Chesebro, 2003; Chesebro & McCroskey, 1998; Civikly, 1992; Kennedy et al., 1978; Sidelinger, 2010; Sidelinger & McCroskey, 1997; Simonds, 1997). Considering the levels of processing framework defines elaborate processing as making connections between new information and old information less arbitrary (e.g., Bransford et al., 1982; Craik & Lockhart, 1972), instructors who provide clear lectures may create opportunities for elaboration for students who would not otherwise engage in this type of thinking.

Importantly, this study helps make the case that students' motivation to deeply process course material is crucial to their learning as well. We argued that this is because the effect of students' ability to process information deeply on learning is conditioned upon their motivation to engage in message elaboration. Several scholars claim that this is due to motivation's ability to direct students' cognitive resources, such as attention, to the learning task (e.g., Mayer & Estrella, 2014; Moreno & Mayer, 2010). Moreover, students who are more motivated to study course material tend to devote more effort toward doing so (Mayer & Estrella, 2014). Thus, it makes sense that students who have the potential to learn course information are more likely to translate that potential into actual learning when they are more motivated to do so. The results of several studies linking student motivation to learning and academic achievement support this conclusion (e.g., Mayer & Estrella, 2014; Mega, Ronconi, & De Beni, 2014; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Um et al., 2012).

Finally, our results showed that students who perceived the lecture to be more difficult performed worse on the test compared with students who found it less difficult. The same pattern held true for students' reported familiarity with the lecture material; the more familiar they were, the worse they performed on the test. In regards to the perceived difficulty of the material, these results might have been expected; several scholars note that students' cognitive abilities are related to their experiences of cognitive load (see Plass et al., 2010). If students with lower cognitive abilities perceived the content of the lecture to be more difficult (i.e., to possess a higher intrinsic load), it may be reasonable to assume that these students did poorly on the exam due to their experiencing a higher cognitive load.

On the other hand, finding that students who were familiar with the material performed poorly seems at odds with what might be expected. Under most circumstances, researchers might assume that students with more experience in a specific content area should do better on a test designed to assess that experience. One explanation for these results may stem from the argument that less competent students are more likely to overestimate their abilities (e.g., Kennedy, Lawton, & Plumlee, 2002). If this is the case, students in our study who reported knowing more about the idea being taught may have simply been the students who were the least likely to be successful in the experiment. Alternatively, it could be the case that students who had prior knowledge were more complacent in their processing of information because they were overconfident in their ability to comprehend the familiar material (e.g., Wood & Lynch, 2002).

In summary, we argued that the effect of instructor clarity on students' test scores is likely due to clarity's influence on students' ability to deeply process information that is conditioned upon students' motivation to do so. Born out of CATLM, this claim is in line with arguments made in the realm of social influence where scholars note that deep or elaborate thinking is made possible to the extent that individuals have the ability and motivation to engage in this type of message processing (Chaiken et al., 1989; Eagly & Chaiken, 1993; Petty & Cacioppo, 1986). Thus, it is important for instructors to remember that although increasing students' ability to process information elaborately may be an important aspect of effective teaching, the most effective instruction is facilitated when students' are also motivated to think deeply about course constructs.

Practical applications

Based on the results of this study, reducing students' extraneous cognitive loads and increasing their motivation to elaborately process course material should be primary goals for instructors. As it pertains to reducing extraneous loads, most instructional communication researchers are probably already aware of the behaviors to enact to be clear (e.g., Chesebro, 2003; Chesebro & McCroskey, 1998; Kennedy et al., 1978). However, beyond some of the familiar behaviors linked to clarity, instructors may consider research in the area of cognitive load theory to help determine what methods they may employ to create opportunities for enhanced elaboration.

For example, Mayer and Moreno (2003, 2010) state that instructors can reduce the burden placed on students during lectures by off-loading information into different communication channels. By providing a lecture along with PowerPoint notes, for instance, instructors may be able to offload verbal information (e.g., lecture previews and signposts) into a visual format that should allow students to process more course content at once. The authors note, however, that if the information is dense, segmenting a presentation into "bite-size segments" (p. 47) with time in between may be helpful for students. In addition, Mayer and Moreno (2003, 2010) suggest that other tactics for reducing cognitive load may include pretraining students for information they are about to learn, reducing superfluous material, and presenting visual and aural information simultaneously as opposed to successively.

Additionally, instructors might also consider reducing students' cognitive loads by focusing on how students take notes in their classes. This is especially the case considering students' notes are associated with measures of their test achievement (e.g., Titsworth & Kiewra, 2004). First, instructors should consider providing notes to students before class because doing so has been shown to increase student success related to test scores (e.g., Raver & Maydosz, 2010). This may be the case because students who are given course notes are not overloaded by the pace of instruction. Instead of concentrating on getting all of the information recorded, students can concentrate on thinking deeply about course concepts by making connections between new and old information. If instructors do not want to give away notes for fear of students missing class, an alternative may be to provide students with guided as opposed to completed notes (Neef, McCord, & Ferreri, 2006). A second way to help students take notes may be through the management of their transcription. According to Mueller and Oppenheimer (2014), students who take notes on laptops are likely to be distracted by other applications of the computer that may reduce their motivation or ability to process course materials deeply. Moreover, students who use laptops are likely to try to write notes verbatim. The authors claim that writing notes verbatim detracts from students' ability to paraphrase course lessons and make the information personally meaningful which means they are less likely to elaborate on course content.

As it pertains to influencing students' motivation to elaborately process course material, we suggest that instructors should strive to create relevant lessons for their students. This is because scholars note that promoting relevance increases motivation to participate in message-relevant thinking (Eagly & Chaiken, 1993), and argue that people who perceive important consequences related to incoming messages are likely to be highly motivated to process information deeply (Chaiken, 1980; Petty & Cacioppo, 1986). According to Frymier and Shulman (1995), promoting relevance in the classroom occurs through a variety of instructor behaviors including: using exercises or explanations that show how the content can be used in students' lives, communicating how the material might relate to professional opportunities, using student experiences to explain a concept, or using current events to help explicate course lessons, for example. These behaviors are similar to what other scholars have claimed promote relevance. For example, Kember et al. (2008) note that relevance can be established by "showing how theory can be applied in practice, establishing relevance to local cases, relating material to everyday applications, or finding applications in current newsworthy issues" (p. 249). Finally, streams of scholarship suggest that instructors can engage in various behaviors to increase student motivation to deeply engage with course material beyond relevance as well (Pintrich, 2003). Some of these behaviors may include fulfilling students' basic needs (Deci & Ryan, 2000, 2008) and being intellectually stimulating (Bolkan, Goodboy, & Griffin, 2011). Of course, students may also naturally differ in their self-regulated learning and thus it is likely the case that some are more likely than others to be motivated to process learning materials without the help of their instructors (Plass, Kalyuga, & Leutner, 2010).

Limitations and future directions

Like all studies, this one has its limitations. One limitation of this study has to do with the nature of motivation. Because students' motivation to process information deeply was not manipulated experimentally, it is difficult to determine its source. Future researchers may consider manipulating various instructor behaviors to determine the extent to which students' motivation to process lecture information deeply is a function of instructors' behaviors versus students' natural proclivities.

A second limitation of this study refers to the nature of clarity and its effect on student learning. As we mentioned in the discussion, clarity may enhance student processing by decreasing the extraneous load associated with learning new information. Additionally, clarity might function by increasing students' germane loads, or their willingness to think deeply about course concepts, through the provision of examples. Researchers have long known that clarity operates as clusters of behaviors (Titsworth & Mazer, 2010) and future researchers may wish to determine the importance of each as they relate differentially to students' various sources of cognitive load.

Third, in this study, we used cognitive load theory and CATLM to argue that students need both the ability and the motivation to process course content deeply if they are going to learn it well. This assumption was predicated on the levels of processing framework, which suggests that students who think deeply about course concepts are likely to better recall them. However, in this study, students' deep processing was never measured. Instead of relying on a theoretical connection, future researchers may wish to demonstrate that clarity and motivation to process information deeply influence students to process course information more deeply compared with their counterparts. Moreover, this deeper level of processing should then be linked to measures of actual student learning to more fully determine its mediating role in the classroom.

Finally, another limitation of this study concerns its potentially artificial context. That is, instead of listening to a lecture in class about a subject students were expected to learn for a grade that would impact their academic outcomes, students in the current study were simply asked to watch an online video and do their best. Because of the artificial nature of this procedure, it is difficult to determine how students' motivation in actual class settings might impact our results. Moreover, the procedures we used made it difficult to approximate the experience of a face-to-face lecture where students might ask their instructors questions when the lecture seems unclear. Having said that, it would be difficult to ethically justify manipulating clarity in actual classroom settings. Additionally, by creating a controlled experiment, we were able to determine how clarity and motivation interact to facilitate learning in a causal manner—this conclusion would be more difficult to draw using other methods of investigation more common in instructional communication research. Still, future researchers may consider examining the conclusions drawn from this study in a more naturalistic environment to determine if the results can be replicated using a different sample and different procedures.

Conclusion

In this project, we argued that students need to have both the ability and the motivation to think deeply about course concepts if they are going to do so. As a result, we predicted that clear instructors should benefit students only when they report having motivation to process course content in elaborate ways. Results from our investigation supported our hypothesis and revealed that even when an instructor was clear, if students' motivation to deeply process course content was low, they did not differ significantly in their test scores. On the other hand, students who scored highest on a test of knowledge after a short lecture were those exposed to a clear lecture and who were motivated to think deeply about the lecture content. Thus, results from this study support the major tenets of CATLM and reveal that being a clear instructor is not enough to foster learning in the classroom. Perhaps, then, in addition to providing clear instruction in the classroom, instructors should also consider helping students become motivated to process course information deeply as another pedagogical duty.

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