Effects of Lecture Fluency and Instructor Experience on Students’ Judgments of Learning, Test Scores, and Evaluations of Instructors

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Students’ judgments of learning (JOLs) are often driven by cues that are not diagnostic of actual learning. One powerful cue that can mislead JOLs is lecture fluency—the degree to which an instructor delivers a smooth, confident, and well-polished lecture. Lecture fluency often inflates JOLs, but has no effect on actual learning. The limited research so far, however, has not systematically explored the role of instructor experience, which may moderate the effects of lecture fluency. In two experiments, students viewed a video-recorded lecture of a fluent or disfluent lecture, and beforehand were informed that the instructor was experienced or inexperienced. Afterward, students made a JOL estimating how much they had learned, answered several evaluation questions, and took a test. Significant effects of lecture fluency, but not instructor experience, occurred whereby lecture fluency inflated JOLs but not test scores. As well, students more often based their JOLs on lecture fluency than instructor experience. The fluent lecture received more favorable evaluations than the disfluent lecture, including students’ increased interest in the material and willingness to attend class, suggesting that fluent instruction might benefit learning in indirect ways that are not reflected in test scores.

Public Significance Statement

Students’ evaluations of their own learning can be misled by cues that are highly intuitive but unreliable. The fluency with which an instructor delivers a lecture (i.e., in a smooth and well-polished manner), but not the perceived experience of the instructor, coincides positively with students’ impressions of the instructor and how much they feel they have learned, but does not reliably enhance learning, raising questions about the influence of certain instructor characteristics that have long been considered qualities of effective teaching.

Keywords: instructor experience, learning, lecture fluency, memory, metacognition

Every day, people make decisions that are influenced by a number of factors. As real-world decisions are typically made under conditions of uncertainty, people commonly rely on subjective heuristics to guide these decisions. One popular heuristic is fluency, or the subjective impression of how easy something is to look at, listen to, or pronounce. Things that are more fluent are often perceived as more favorable and are preferred over things that are less fluent.

For example, written statements that are presented in clearer, easier-to-read font are judged as more truthful (Reber & Schwarz, 1999), pharmaceutical drugs with more fluent names are judged as safer and consumed in higher dosages (Dohle & Montoya, 2017), people with easier-to-pronounce names are deemed more likable (Laham, Koval, & Alter, 2012), and candidates participating in online job interviews under conditions of good audiovisual quality (compared with poor quality) are deemed more hirable (Fiechter, Fealing, Gerrard, & Kornell, 2018). These examples demonstrate that people’s judgments can be positively influenced by the external attributes of a stimulus that give the impression of fluency.

The same is true in educational contexts. When students make judgments about how much they have learned, those judgments are often influenced by fluency (see Finn & Tauber, 2015, for a recent review). Information is perceived by students as better learned when it is organized, supplemented, or altered in a way that makes
it appear more fluent. For example, students’ judgments of their own learning are enhanced by increasing the organization and coherence of text passages (Rawson & Dunlosky, 2002), supplementing text with pictures and diagrams (Carpenter & Olson, 2012; Serra & Dunlosky, 2010; Wiley, Sarmento, Griffin, & Hinze, 2017) or multimedia (Paik & Schraw, 2013), increasing the size or clarity of printed information (Geller, Still, Dark, & Carpenter, 2018; Magreehan, Serra, Schwartz, & Narciss, 2016; Mueller, Dunlosky, Tauber, & Rhodes, 2014; Rhodes & Castel, 2008; Yue, Castel, & Bjork, 2013), and increasing the volume of auditory information (Rhodes & Castel, 2009). Whether such external attributes directly influence the processing of information, or instead trigger people’s preexisting beliefs associated with these attributes, has been the topic of recent research. In some cases, metacognitive judgments may reflect preexisting beliefs about learning (e.g., Jia et al., 2016; Mueller & Dunlosky, 2017; for a review, see Dunlosky, Mueller, & Tauber, 2015), though processing experiences also contribute to them (e.g., Frank & Kuhlmann, 2017; Undorf, Zimdahl, & Bernstein, 2017).

Students’ evaluations of instructor quality may be based on a similar heuristic. For decades, students have evaluated the quality of teaching by assessing instructor attributes such as organization, clarity of communication, preparedness for class, and enthusiasm (Feldman, 1976; Marsh, 1987, 2007b). Such attributes are commonly encouraged in handbooks on teaching preparation (Brown & Atkins, 1990; Brown & Race, 2002; Davis, 1993; Ekeler, 1994; Hogan, 1999; Lowman, 1995; Morton, 2009) and have been routinely interpreted as qualities of effective teaching (Feldman, 1976, 1988; Marsh, 1977, 1983). Although intuition suggests that these qualities would positively influence learning, there has been surprisingly little research on the relationship between these instructor qualities and student learning outcomes.

In fact, experimental research actually suggests that such qualities do not influence learning. In a series of recent studies, instructor attributes related to fluency were experimentally manipulated while holding constant all other aspects of the learning situation. Carpenter, Wilford, Kornell, and Mullaney (2013) prepared two short (i.e., 1-min) video-recorded lectures in which the same instructor delivered identical content (i.e., about the genetics of calico cats) in the same classroom setting, and the same essay-style test was used afterward to assess students’ knowledge of what they had learned. The only way the two lectures differed was in the behavior of the instructor. In one version—the fluent lecture—the instructor exhibited confidence, made eye contact with the camera, stood upright, and used voice inflections and relevant gestures. In the other version—the disfluent lecture—the same instructor spoke the same content, but this time hunched over a desk reading from notes, failing to make eye contact, and limiting voice inflections. Undergraduate students who viewed the fluent lecture rated the instructor high on traditional teaching evaluation questions such as knowledge, preparedness, and organization—the measures of “effective teaching.” Students who viewed the fluent lecture also estimated that they learned significantly more than students who viewed the disfluent lecture. An actual memory test over the lecture contents, however, revealed no significant performance differences between students who viewed the fluent versus disfluent lecture. Thus, lecture fluency had the effect of increasing students’ positive impressions of the instructor, along with the amount that students believed they had learned, but had no effect on students’ actual learning.

The null effects of lecture fluency on student learning have since been replicated in other studies involving undergraduate students as participants, and using longer lecture videos (e.g., 20–30 min) over topics such as signal detection theory (Carpenter, Mickes, Rahman, & Fernandez, 2016) and information theory (Toftness et al., 2018). In these studies, when the instructor gave a fluent lecture, students routinely rated him/her as significantly more effective at teaching than when s/he delivered a disfluent lecture. However, students’ impressions of effective teaching did not appear to coincide with evidence of effective learning as reflected by their performance on a multiple-choice test over the content from the videos. Along similar lines, a recent study found that an instructor’s increased enthusiasm while explaining to students how to perform an upcoming task enhanced students’ memory of the instructor, but had no effect on students’ actual performance of the task (Motz, de Leeuw, Carvalho, Liang, & Goldstone, 2017, Experiment 2).

These results run counter to the intuitive notion that an instructor’s delivery style would affect student learning. Fluent lectures, compared with disfluent lectures, would seem more likely to maintain students’ attention and engagement throughout the lecture. A disfluent lecture, particularly if it is lengthy and contains a lot of information, would seem more likely to place students at risk for boredom or disengagement, resulting in less effective encoding of the information and ultimately inferior learning. Although this reasoning seems highly intuitive, the existing research on lecture fluency—holding other factors constant—has yet to show evidence of any effects on student learning.

However, the small number of studies on this topic calls for further investigation. Though lecture fluency manipulated under highly controlled conditions is a good starting point, investigation of additional factors is needed, as real-world instructors vary along a multitude of other attributes that could combine or interact with the effects of fluency. One attribute in particular—ubiquitous in educational settings—is the experience level of the instructor. Instructors vary widely in their level of experience, with some teaching a course for the first time and others having taught the course for decades. As experience affords the opportunity to refine and improve teaching practices over time, an experienced instructor might be expected to be more effective than an inexperienced instructor. Data from real courses on the relationship between instructor experience and student learning, however, are unclear. Some studies show that students earn higher grades when taught by more experienced instructors (Zabaleta, 2007), whereas others show no relationship between instructor experience and student grades (Hoffmann & Oreopoulos, 2010). The relationship between instructor experience and student evaluations of teaching effectiveness is equally mixed (Feldman, 1983; Marsh, 2007a). Part of these inconsistencies could be that in real courses, the experience level of the instructor is confounded with other factors such as the course itself and the content taught. The direct effects of instructor experience, therefore, are difficult to gauge from the complex data available from real courses.

Thus, currently it is unknown what effect, if any, an instructor’s level of experience has on student learning, and whether it moderates the effects of lecture fluency. In the recent studies on lecture fluency, no information about instructor experience was given to
The purpose of the current study was to experimentally investigate the roles of instructor experience and lecture fluency on students' perceived and actual learning. Prior to viewing an instructional video delivered fluently or disfluently, students were either informed that the instructor was experienced or inexperienced. Immediately after viewing the video, students then made a judgment of learning about how well they expected to perform on a test over the video content. They then answered several evaluation questions about the instructor and the information presented, followed by a multiple-choice test over the video content.

Consistent with previous research, we expected the fluent lecture to garner higher judgments of learning and higher instructor evaluation ratings, but not better test performance, than the disfluent lecture. We tentatively predicted that the experienced instructor would garner higher ratings of instructor quality and higher judgments of learning than the inexperienced instructor. Whether these judgments coincide with actual learning, however, is less clear. To the extent that perceived inexperience of the instructor creates greater sensitivity to the effects of lecture fluency (e.g., Leventhal et al., 1977), students who believe the instructor is inexperienced may insufficiently process the material in the disfluent lecture, leading to an interaction in test performance whereby disfluent instruction impairs learning, but only when students believe the instructor is inexperienced.

A final goal of the current study was to assess the effects of these factors on indirect measures of learning. Previous studies of lecture fluency have included items to assess students' evaluations of instructor quality—namely, how organized, prepared, knowledgeable, and effective the instructor was—and have found that such qualities do not relate to student learning as reflected by test performance (Carpenter et al., 2013, 2016; Toftness et al., 2018). However, the relationship between these instructor qualities and indirect forms of learning—such as a student's interest in learning more about the material, willingness to attend class, or motivation to take more classes on the topic—has not been explored. Even if they do not directly affect test scores, lecture fluency and other instructor attributes might enhance learning through these indirect means. Thus, in addition to the evaluation items included in past studies, a number of new items were included in the current study to measure the degree to which lecture fluency and instructor experience might inspire student behaviors that could indirectly enhance their learning.

**Experiment 1**

In Experiment 1, participants viewed either a fluent or a disfluent lecture on information theory. Half of the participants in each condition were informed prior to viewing the video that the instructor was experienced at teaching the content, and half were informed that the instructor was inexperienced. After viewing the video, participants gave a judgment of learning (JOL) predicting how well they would perform on an upcoming test. Participants then answered several evaluation questions about the instructor and the information they learned. Finally, all participants took a multiple-choice test over the content covered in the video.

**Method**

**Design and participants.** A 2 (lecture fluency: fluent vs. disfluent) × 2 (instructor experience: experienced vs. inexperi-
A power analysis with an alpha level at 0.05 and power at 0.95 was performed using an effect size of $d = 0.75$ for the effect of lecture fluency on JOLs (from Toftness et al., 2018). Results from the power analysis revealed a target sample size of 48 per group (i.e., total $N = 192$). Thus, 194 undergraduate students were recruited from the psychology department subject pool at Texas Christian University (TCU). This subject pool includes students enrolled in introductory-level psychology courses and students enrolled in upper-level courses. Thus, participants were enrolled in a variety of psychology courses, but it is noteworthy that no participants were enrolled in a course on information theory. All participants spoke English as a first language. Participants received course credit in exchange for their participation. The study was approved by the Institutional Review Board (IRB) of TCU.

Participants were randomly assigned to one of four groups: the fluent experienced group ($n = 50$), the fluent inexperienced group ($n = 48$), the disfluent experienced group ($n = 49$), and the disfluent inexperienced group ($n = 47$). Data from three participants were removed because of technological errors, and data from one participant were removed because the participant did not make any judgments or ratings. Thus, the final sample size for all analyses was 190 participants.

**Materials and procedure.** Materials included two versions of a lecture video on information theory (from Toftness et al., 2018). The lecture videos were created for the purposes of experimentation, and thus, to maintain experimental control did not consist of videotaped footage of lectures delivered to actual students. Even so, the lectures were videotaped in a college classroom with a chalkboard visible behind the instructor. The instructor was a male graduate student, approximately 24 years old, who wore a gray suit, blue shirt, and tie in both videos (see Figure 1 for screenshots of each video). For the fluent video, the instructor’s body was visible from his head to his knees, and he did not stand behind a podium. For the disfluent video, the upper-half of the instructor’s body was visible and his lower-half was obscured from view because he was standing behind a podium. The videos displayed the same instructor who was positioned in the bottom right corner of the screen. The rest of the screen displayed PowerPoint slides presenting the information discussed by the instructor. Most PowerPoint slides contained a few bullet points of the information being discussed by the instructor and an associated image.

The content of the lecture was on information exchange, methods of measuring information, and the application of information theory to multiple domains, with applied examples such as secret codes and DNA. Both lecture videos were 31-min long, and both consisted of approximately 4,000 words and 42 slides. The videos contained identical spoken and graphical content. Only the fluency of the lecture was manipulated. In the fluent lecture video, the instructor stood upright, exhibited confidence, made eye-contact, gestured to emphasize main points, and used prosody effectively in his speech. In the disfluent lecture video, the instructor hunched over a podium, exhibited less confidence, did not make eye-contact, read from notes, and spoke in a monotonous tone with some awkward pauses (e.g., yawning, saying “um”, etc.). Although voice inflection and intonation varied between the videos, the instructor spoke loudly and clearly enough in both to be heard by participants. No participants reported difficulty understanding or hearing the lecture, which was true of both lecture videos.

Participants were seated at individual computers and were told that the focus of the research was on how participants rate instructors. Participants then received instructions regarding the experience of the instructor, which were modeled after Leventhal et al. (1977, see p. 364). Participants randomly assigned to the experienced instructor condition received the following instructions:

> Today, you will be shown a video of a lecture delivered by an experienced instructor. This instructor has been teaching this material for a number of years in an Introduction to Information Theory course. In addition to teaching Introduction to Information Theory, this instructor has contributed publications and teaching materials to several undergraduate courses in this area. Experienced instructors vary greatly in quality and we will ask you to evaluate the quality of this instructor on a special rating form we are developing for rating experienced lecturers.

Participants randomly assigned to the inexperienced instructor condition were presented with instructions that were designed to be highly similar, except for the fact that they emphasized the inexperience of the instructor:

> Today, you will be shown a video of a lecture delivered by an inexperienced instructor. This instructor is now teaching this material for the first time in an Introduction to Information Theory course. Except for Introduction to Information Theory, this instructor has never taught any other undergraduate or graduate courses. Inexperienced instructors vary greatly in quality and we will ask you to evaluate the quality of this instructor on a special rating form we are developing for rating inexperienced lecturers.

Next, all participants received instructions that they would be watching a video-recorded lecture that was about 30 min long. Participants were instructed that they would be asked to give impressions of the instructor immediately following the video, and that they would have a quiz immediately following. Participants then placed headphones on and watched the video.

After the video ended, participants made a JOL by responding to the following prompt: “In about 2 minutes from now, we will give you a multiple-choice test over the information from the video. How well do you think you will score?” Participants were instructed to type their JOL in a text box located at the bottom of the screen using a scale of 0% to 100%. Immediately following the JOL, participants evaluated the instructor on how organized, prepared, knowledgeable, and effective the instructor was on a scale of 1–5 (1 for *Not at all* and 5 for *Very*). Additionally, based upon prior work, participants evaluated (on the same 1–5 scale) how

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**Figure 1.** Screenshots of the lecture videos used in Experiments 1 and 2. The screenshot on the left shows the fluent lecture video, and the screenshot on the right shows the disfluent lecture video. See the online article for the color version of this figure.
much they felt they had learned about the information presented in
the video, their level of interest in the information, and their
motivation to learn the information (Carpenter et al., 2013; Car-
penter et al., 2016; Toftness et al., 2018).

We were also interested in how lecture fluency and instructor
experience might influence other perceptions of the instructor and
course, including those that could indirectly benefit students' learn-
ing. As such, participants responded to eight novel evaluation
items on the same 1–5 scale. Specifically, participants evaluated
how likely they would be to recommend the instructor to other
students, how likely they would be to recommend the course to
other students, how interested they were in learning more about
the topic, the extent to which the information applied to their own life,
how likely they would attend class if taking a course with this
instructor, how likely they would participate in class discussions,
the extent to which they felt they related to the instructor, and how
regularly they would study if taking the course. Table 1 contains
a complete list of all 15 evaluation items.

Next, participants were given a 30-question multiple-choice test
on the content covered in the video. Each question included four
alternatives, only one of which was correct (e.g., "Which of these
is NOT a unit of information measurement? (a) Boolean, (b) Shannon,
(c) Binary Unit, (d) Bit; correct answer is Boolean). All test
questions probed factual content that was covered in the video,
including main ideas (10 questions), supporting details (7 ques-
tions), and applied examples (13 questions). In previous research
using the same videos and test (Toftness et al., 2018), a pilot group
of participants who took the test without first viewing the videos
scored low (26.89% accurate) and not significantly above chance,
π(14) = 1.09, p = .30, whereas participants who viewed either the
fluent or disfluent lecture scored substantially higher on the same
test (greater than 50% accuracy). The test therefore appears to
serve as a reliable measure of learning of the video contents. All
test questions and alternatives can be found at https://osf.io/hkar7.

On the final test, the questions appeared in a fixed order corre-
sponding to the order in which the content appeared in the video.
The order of the alternatives for each question was randomized
anew for each participant. The final test was self-paced, and
participants answered one question at a time.

After the test, participants indicated how much prior knowledge
they had about information theory. Participants were given the fol-
lowing options to choose from: No, I did not have any detailed prior
knowledge of this information, I have heard of it before, but I did not
know the details until today, I may have learned this information
before, but I did not remember the details, I learned this information
before, and I remembered the details before coming to today’s ex-
periment. Finishing this question marked the end of the experiment.

Results

We report analyses of participants’ prior knowledge first to
establish whether participants had existing knowledge of informa-
tion theory. Analyses of JOLs are then reported, followed by
analyses of test performance, evaluations of the instructor, and
other evaluation items.

Prior knowledge. Many participants reported having no prior
knowledge of the information presented in the videos (n = 115,
60.5%). Fewer participants (n = 49, 25.8%) reported having heard of
the information before but having not known details about it. An
additional 23 participants (12.1%) reported having learned the infor-
mation before but having forgotten the details, and only three par-
cipants (1.6%) reported having learned the information before and still
remembering the details prior to the experiment. Thus, most partici-
pants (i.e., 86.3%) self-reported having little or no knowledge of
information theory prior to participating in the experiment. Even so,
all analyses were conducted excluding participants who reported
either having prior knowledge and remembering details or having
prior knowledge but forgotten details (26 participants, 13.7% of
sample). In all cases, the same pattern of results was found, and all
conclusions maintained when these participants were excluded; thus,
data from all participants were included in the reported analyses.

Judgments of learning. Lecture fluency had a significant
impact on the magnitude of JOLs, whereas instructor experience
did not (see Figure 2). These observations were supported by a 2
(lecture fluency: fluent vs. disfluent) × 2 (instructor experience:
experienced vs. inexperienced) between-participants analysis of
variance (ANOVA). The main effect of lecture fluency on JOLs
was significant, F(1, 186) = 24.05, p < .001, η² = 0.11, as the

Table 1
Evaluation Questions Used in the Current Experiments

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How organized was the instructor in the video?</td>
<td>(1 = not at all organized, 5 = very organized)</td>
</tr>
<tr>
<td>2. How prepared was the instructor in the video?</td>
<td>(1 = not at all prepared, 5 = very prepared)</td>
</tr>
<tr>
<td>3. How knowledgeable was the instructor in the video?</td>
<td>(1 = not at all knowledgeable, 5 = very knowledgeable)</td>
</tr>
<tr>
<td>4. Please rate the overall effectiveness of the instructor in the video.</td>
<td>(1 = not at all effective, 5 = very effective)</td>
</tr>
<tr>
<td>5. How well do you feel that you have learned the information that was</td>
<td>(1 = not at all, 5 = very well)</td>
</tr>
<tr>
<td>presented in the video?</td>
<td></td>
</tr>
<tr>
<td>6. Please rate your overall level of interest in the information that</td>
<td>(1 = not at all interested, 5 = very interested)</td>
</tr>
<tr>
<td>was presented in the video.</td>
<td></td>
</tr>
<tr>
<td>7. Please rate your overall level of motivation to learn the information</td>
<td>(1 = not at all motivated, 5 = very motivated)</td>
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<td>that was presented in the video.</td>
<td></td>
</tr>
<tr>
<td>8. How likely would you be to recommend this instructor to other</td>
<td>(1 = I would not at all recommend, 5 = I would highly</td>
</tr>
<tr>
<td>students?</td>
<td>recommend)</td>
</tr>
<tr>
<td>9. How likely would you be to recommend this course to other students?</td>
<td>(1 = I would not at all recommend, 5 = I would highly</td>
</tr>
<tr>
<td></td>
<td>recommend)</td>
</tr>
<tr>
<td>10. Please rate how interested you are in learning more about this topic.</td>
<td>(1 = not at all interested, 5 = very interested)</td>
</tr>
<tr>
<td>11. While watching the video, to what extent did you think about how</td>
<td>(1 = I did not think about it at all,</td>
</tr>
<tr>
<td>the information applied to your own life?</td>
<td>5 = I thought about it often)</td>
</tr>
<tr>
<td>12. If you were taking this course with this instructor, please rate</td>
<td>(1 = I would not, 5 = I would regularly)</td>
</tr>
<tr>
<td>your likelihood of attending class.</td>
<td></td>
</tr>
<tr>
<td>13. If you were taking this course with this instructor, how likely</td>
<td>(1 = I would not, 5 = I would regularly)</td>
</tr>
<tr>
<td>would you be to participate in class discussions?</td>
<td></td>
</tr>
<tr>
<td>14. To what extent did you feel that you related well to this instructor?</td>
<td>(1 = I did not relate at all, 5 = I very much related)</td>
</tr>
<tr>
<td>15. How regularly would you study if you were taking this course?</td>
<td>(1 = I would not study at all, 5 = I would study on a</td>
</tr>
<tr>
<td></td>
<td>regular basis)</td>
</tr>
</tbody>
</table>

Note. Questions are listed in the order that they were presented to participants.
Experiment 1. Error bars reflect standard errors of the mean.

Figure 2. Mean Judgments of Learning (JOLs) for each group in Experiment 1. Error bars reflect standard errors of the mean.

disfluent group gave lower JOLs than did the fluent group, \( t(188) = 4.93, p < .001, d = 0.72 \). However, instructor experience did not impact JOLs, and it did not significantly interact with lecture fluency, \( Fs < 0.12, ps \geq 0.731, \eta^2_p < 0.01 \).

Test performance. Responses to each question on the test were coded as either correct or incorrect. Thus, performance on the memory test was operationalized as the mean percent correct for all items and averaged for participants in each group. As evident from Figure 3, the percent correct did not differ between the four groups. Indeed, these observations were supported by a 2 (lecture fluency: fluent vs. disfluent) \( \times 2 \) (instructor experience: experienced vs. inexperienced) between-participants ANOVA. There was no significant main effect of lecture fluency, \( F(1, 186) = 2.13, p = .15, \eta^2_p = 0.01 \), no significant main effect of instructor experience, \( F(1, 186) = .02, p = .90, \eta^2_p < 0.01 \), and no significant interaction between lecture fluency and instructor experience, \( F(1, 186) = .06, p = .81, \eta^2_p < 0.01 \).

Evaluations of the instructor. We next examined students’ responses to the evaluation items. Overall, students answered 15 evaluation items—six items designed to evaluate the instructor, and nine items designed to evaluate other aspects of the course portrayed in the video. Responses to each item were thus analyzed using separate 2 \( \times \) 2 between-participants ANOVAs (lecture fluency \( \times \) instructor experience), with a Bonferroni correction applied to adjust the significance threshold to 0.003 across the 15 analyses.

The means, standard errors, and follow-up inferential statistics for the six instructor evaluation items are provided in the top portion of Table 2. Instructor experience had no meaningful impact on instructor evaluations, whereas lecture fluency had a significant and substantial impact on them. Six 2 (lecture fluency: fluent vs. disfluent) \( \times 2 \) (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were performed to evaluate the impact of these variables on participants’ evaluations of the course. The main effect of lecture fluency was significant for all items, \( Fs \geq 10.26, ps \geq 0.002, \eta^2_p \geq 0.05 \). Participants who watched a fluent lecture gave higher evaluations than did participants who watched a disfluent lecture on (a) the material applying to their lives, (b) likelihood of class attendance, (c) likelihood of participation in class discussions, (d) likelihood of studying regularly, and (e) wanting to learn more about the topic. Additionally, participants who watched a fluent lecture were more likely to recommend the course to other students than were participants who watched a disfluent lecture. The main effect of instructor experience was not significant for any item, and it did not significantly impact lecture fluency for any item, \( Fs \leq 3.53, ps \geq 0.062, \eta^2_p \leq 0.02 \).

Finally, three 2 (lecture fluency: fluent vs. disfluent) \( \times 2 \) (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were performed to evaluate the impact of these variables on participants’ self-reported motivation to learn the material, interest in the material, and how much they felt they had learned from the video. The main effect of lecture fluency was significant for all measures, \( Fs \geq 18.52, ps < 0.001, \eta^2_p \geq 0.09 \). Participants who watched a fluent lecture gave higher evaluations than did participants who watched a disfluent lecture on (a) motivation, (b) interest, and (c) learning. The main effect of experience was not significant for any item, and instructor experience did not interact with lecture fluency for any item, \( Fs \leq 3.11, ps \geq 0.080, \eta^2_p \leq 0.02 \).

Figure 3. Mean percent correct on the final test for each group in Experiment 1. Error bars reflect standard errors of the mean.

Evaluations of the course. The means, standard errors, and follow-up inferential statistics for the nine course evaluation items are provided in the top portion of Table 3. Lecture fluency significantly impacted every evaluation, but instructor experience did not impact any. Six 2 (lecture fluency: fluent vs. disfluent) \( \times 2 \) (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were performed to evaluate the impact of these variables on participants’ evaluations of the course. The main effect of lecture fluency was significant for all items, \( Fs \geq 5.89, ps \geq 0.016, \eta^2_p \leq 0.03 \). Participants who watched a fluent lecture were also more likely to recommend the instructor to other students than were participants who watched a disfluent lecture. The main effect of instructor experience was not significant for any item, and instructor experience did not significantly interact with lecture fluency for any item, \( Fs \leq 0.72, ps \geq 0.12, \eta^2_p < 0.01 \).
In Experiment 1, participants who watched a fluent lecture gave higher JOLs than did participants who watched a disfluent lecture. Even so, performance on the final test did not differ between the groups, which is consistent with prior research examining the effects of lecture fluency (Carpenter et al., 2013; Carpenter et al., 2016; Toftness et al., 2018). Additionally, participants who watched a fluent lecture gave higher evaluations of the instructor and the course, along with higher evaluations indicating willingness to engage in behaviors that could indirectly enhance learning (such as attending class), than did those who watched a disfluent lecture.

Interestingly, instructor experience did not influence participants’ JOLs, test performance, or evaluations of the instructor or course. This is inconsistent with previous work showing interactive effects on learning between lecture fluency and experience (Leventhal et al., 1977), and inconsistent with our

### Table 2

**Evaluations of the Instructor for All Groups in Experiments 1 and 2**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Experienced</th>
<th>Inexperienced</th>
<th>Disfluent</th>
<th>Inexperienced</th>
<th>t value</th>
<th>d value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fluent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized</td>
<td>4.38 (0.11)</td>
<td>4.02 (0.13)</td>
<td>1.63 (0.13)</td>
<td>1.78 (0.16)</td>
<td>19.07</td>
<td>2.77</td>
</tr>
<tr>
<td>Prepared</td>
<td>4.79 (0.07)</td>
<td>4.43 (0.13)</td>
<td>1.56 (0.09)</td>
<td>1.46 (0.09)</td>
<td>31.41</td>
<td>4.58</td>
</tr>
<tr>
<td>Knowledge</td>
<td>4.71 (0.10)</td>
<td>4.50 (0.12)</td>
<td>2.08 (0.17)</td>
<td>1.84 (0.13)</td>
<td>19.98</td>
<td>2.89</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>3.56 (0.15)</td>
<td>3.29 (0.18)</td>
<td>1.29 (0.08)</td>
<td>1.37 (0.11)</td>
<td>15.56</td>
<td>2.26</td>
</tr>
<tr>
<td>Relate</td>
<td>2.35 (0.15)</td>
<td>2.10 (0.14)</td>
<td>1.08 (0.04)</td>
<td>1.22 (0.09)</td>
<td>9.52</td>
<td>1.39</td>
</tr>
<tr>
<td>Rec. instructor</td>
<td>3.15 (0.18)</td>
<td>2.69 (0.19)</td>
<td>1.00 (0.00)</td>
<td>1.15 (0.08)</td>
<td>13.36</td>
<td>1.95</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organized</td>
<td>4.41 (0.13)</td>
<td>4.28 (0.13)</td>
<td>1.39 (0.13)</td>
<td>1.51 (0.15)</td>
<td>21.63</td>
<td>3.29</td>
</tr>
<tr>
<td>Prepared</td>
<td>4.66 (0.09)</td>
<td>4.46 (0.12)</td>
<td>1.47 (0.14)</td>
<td>1.58 (0.13)</td>
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<tr>
<td>Knowledge</td>
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<td>4.46 (0.12)</td>
<td>2.11 (0.17)</td>
<td>2.09 (0.16)</td>
<td>17.63</td>
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<tr>
<td>Effectiveness</td>
<td>3.64 (0.13)</td>
<td>3.74 (0.15)</td>
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<td>Relate</td>
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<td>2.07 (0.18)</td>
<td>1.11 (0.06)</td>
<td>1.19 (0.07)</td>
<td>8.47</td>
<td>1.28</td>
</tr>
<tr>
<td>Rec. instructor</td>
<td>2.91 (0.16)</td>
<td>3.10 (0.21)</td>
<td>1.02 (0.02)</td>
<td>1.07 (0.04)</td>
<td>14.98</td>
<td>2.26</td>
</tr>
</tbody>
</table>

**Note.** Standard errors are shown in parentheses. “Rec.” is abbreviated for “recommend.” All items are on a scale of 1 to 5. Inferential statistics reflect follow-up test comparisons between the fluent and disfluent groups. All t statistics are significant at p < .003. Inferential statistics are not provided contrasting the experienced and inexperienced groups because the main effects were not significant for any item (see text).

### Table 3

**Evaluations of the Course for All Groups in Experiments 1 and 2**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Experienced</th>
<th>Inexperienced</th>
<th>Disfluent</th>
<th>Inexperienced</th>
<th>t value</th>
<th>d value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fluent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply life</td>
<td>2.85 (0.17)</td>
<td>2.40 (0.17)</td>
<td>1.90 (0.13)</td>
<td>1.85 (0.12)</td>
<td>4.99</td>
<td>.73</td>
</tr>
<tr>
<td>Attend</td>
<td>3.48 (0.18)</td>
<td>3.46 (0.20)</td>
<td>1.57 (0.15)</td>
<td>1.91 (0.19)</td>
<td>9.50</td>
<td>1.40</td>
</tr>
<tr>
<td>Participate</td>
<td>3.02 (0.19)</td>
<td>2.58 (0.18)</td>
<td>1.34 (0.10)</td>
<td>1.48 (0.12)</td>
<td>9.04</td>
<td>1.31</td>
</tr>
<tr>
<td>Study</td>
<td>3.38 (0.14)</td>
<td>3.69 (0.17)</td>
<td>2.71 (0.20)</td>
<td>2.67 (0.21)</td>
<td>4.66</td>
<td>.67</td>
</tr>
<tr>
<td>Learn more</td>
<td>2.13 (0.16)</td>
<td>2.06 (0.17)</td>
<td>1.54 (0.14)</td>
<td>1.65 (0.15)</td>
<td>3.23</td>
<td>.46</td>
</tr>
<tr>
<td>Rec. course</td>
<td>2.69 (0.17)</td>
<td>2.29 (0.17)</td>
<td>1.25 (0.09)</td>
<td>1.37 (0.12)</td>
<td>8.18</td>
<td>1.19</td>
</tr>
<tr>
<td>Motivated</td>
<td>2.27 (0.15)</td>
<td>2.10 (0.15)</td>
<td>1.40 (0.11)</td>
<td>1.37 (0.13)</td>
<td>6.00</td>
<td>.88</td>
</tr>
<tr>
<td>Interested</td>
<td>2.33 (0.16)</td>
<td>2.10 (0.17)</td>
<td>1.54 (0.12)</td>
<td>1.59 (0.15)</td>
<td>4.32</td>
<td>.63</td>
</tr>
<tr>
<td>Learned</td>
<td>3.15 (0.16)</td>
<td>2.83 (0.15)</td>
<td>1.67 (0.11)</td>
<td>1.85 (0.14)</td>
<td>8.78</td>
<td>1.27</td>
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<td></td>
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<td>Experiment 2</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply life</td>
<td>3.06 (0.16)</td>
<td>2.74 (0.16)</td>
<td>1.98 (0.13)</td>
<td>2.19 (0.16)</td>
<td>5.42</td>
<td>.82</td>
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<tr>
<td>Attend</td>
<td>3.89 (0.17)</td>
<td>3.69 (0.20)</td>
<td>1.89 (0.19)</td>
<td>2.05 (0.20)</td>
<td>9.69</td>
<td>1.46</td>
</tr>
<tr>
<td>Participate</td>
<td>2.89 (0.17)</td>
<td>2.88 (0.23)</td>
<td>1.33 (0.10)</td>
<td>1.56 (0.13)</td>
<td>8.92</td>
<td>1.34</td>
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<tr>
<td>Study</td>
<td>3.83 (0.14)</td>
<td>3.43 (0.14)</td>
<td>2.93 (0.21)</td>
<td>3.33 (0.21)</td>
<td>2.85</td>
<td>.43</td>
</tr>
<tr>
<td>Learn more</td>
<td>2.11 (0.16)</td>
<td>2.02 (0.17)</td>
<td>1.56 (0.12)</td>
<td>1.88 (0.15)</td>
<td>2.30</td>
<td>.35</td>
</tr>
<tr>
<td>Rec. course</td>
<td>2.51 (0.16)</td>
<td>2.57 (0.21)</td>
<td>1.33 (0.11)</td>
<td>1.49 (0.11)</td>
<td>7.47</td>
<td>1.12</td>
</tr>
<tr>
<td>Motivated</td>
<td>2.34 (0.15)</td>
<td>2.29 (0.18)</td>
<td>1.53 (0.11)</td>
<td>1.88 (0.13)</td>
<td>4.22</td>
<td>.64</td>
</tr>
<tr>
<td>Interested</td>
<td>2.40 (0.16)</td>
<td>2.29 (0.19)</td>
<td>1.64 (0.11)</td>
<td>2.00 (0.17)</td>
<td>3.31</td>
<td>.50</td>
</tr>
<tr>
<td>Learned</td>
<td>3.28 (0.13)</td>
<td>3.19 (0.12)</td>
<td>1.96 (0.13)</td>
<td>2.14 (0.16)</td>
<td>8.80</td>
<td>1.32</td>
</tr>
</tbody>
</table>

**Note.** Standard errors are shown in parentheses. “Rec.” is abbreviated for “recommend.” All items are on a scale of 1 to 5. Inferential statistics reflect follow-up test comparisons between the fluent and disfluent groups. All t statistics are significant at p < .003 except for the Study and Learn More items in Experiment 2 (see text). Inferential statistics are not provided contrasting the experienced and inexperienced groups because the main effects were not significant for any item (see text).
predictions that instructor experience might positively influence participants’ JOLs and instructor evaluations. In Experiment 2, we explored possibilities for why these effects may not have occurred.

Experiment 2

In Experiment 2, we further explored the roles of instructor experience and lecture fluency while investigating possible reasons for the lack of effects of instructor experience in Experiment 1. One possibility is that participants did not pay attention to the instructions at the beginning of the experiment informing them about the experience of the instructor. If so, procedures that draw participants’ attention to these instructions should increase the likelihood that they will impact JOLs and instructor evaluations. We explored this possibility in Experiment 2 by requiring participants to indicate the experience level of the instructor after reading the instructions but prior to viewing the video.

Another possibility is that experiences of fluency (or disfluency) during the video serve as a stronger cue for JOLs than do experiences associated with instructor experience. That is, the influence of instructor experience may have been overshadowed by lecture fluency. Further, participants may base their JOLs on other cues aside from lecture fluency. Indeed, Carpenter et al. (2016) found that multiple factors may impact participants’ JOLs. As examples, participants may base JOLs on perceptions of their own abilities to learn and remember information, or on things that are unrelated to the information and instructor, such as feeling tired or distracted during the experiment. To specifically evaluate the factors that impact participants’ JOLs, in Experiment 2 we measured participants’ self-reported bases for their JOLs.

In sum, there were three goals for Experiment 2. The first goal was to replicate the outcomes from Experiment 1. The second goal was to ensure that participants were attentive to the instructions informing them about the instructor’s experience. Finally, the third goal was to examine what factors participants report using as a basis for their JOLs.

Method

Design and participants. A 2 (lecture fluency: fluent vs. disfluent) × 2 (instructor experience: experienced vs. inexperienced) between-participants design was employed. Using the same power analysis as in Experiment 1, 191 undergraduate students were recruited from the psychology department subject pool at TCU. As in Experiment 1, all participants received course credit and spoke English as a first language. Participants were randomly assigned to one of four groups: the fluent experienced group (n = 48), the fluent inexperienced group (n = 48), the disfluent experienced group (n = 47), and the disfluent inexperienced group (n = 48).

Materials and procedure. The materials were identical to Experiment 1. As well, the procedure was nearly identical to Experiment 1. Specifically, participants were randomly assigned to watch the same videos as used in Experiment 1 (i.e., either a fluent or disfluent lecture). Additionally, participants were given instructions that they were either going to view an experienced instructor or an inexperienced instructor. In Experiment 2, following the information about the experience of the instructor, participants were asked the following question and provided with the following options:

Based on your interpretation of the information provided so far about the instructor, how would you describe the experience level of the instructor that will be teaching the material in the video you are about to view?

1. Experienced, the instructor has taught this class many times.
2. Inexperienced, the instructor is teaching this class for the first time.

Following the video, participants made a JOL as in Experiment 1. In Experiment 2, after participants made a JOL, they were asked five questions about it. Specifically, participants were asked to rate on a scale of 1–6 (1 for Strongly disagree and 6 for Strongly agree) how much their JOL was based upon (a) the material, (b) an unrelated factor, such as feeling tired or distracted, (c) their own ability to learn and retain information, (d) the instructor and his delivery of the material, and (e) the experience level of the instructor. These ratings were self-paced, and to respond to each question participants entered a number between 1 and 6 in a text box provided on the screen. The question order was randomized anew for each participant. Next, participants answered the same instructor evaluation questions, as well as evaluations of the instructor and course, and then took the same multiple-choice test as in Experiment 1.

Results

We first report analyses of participants’ knowledge of instructor experience. Next, analyses of participants’ prior knowledge of information theory are reported. We then report analyses of JOLs followed by factors influencing JOLs, analyses of test performance, evaluations of the instructor, and evaluations of the course.

Knowledge of instructor experience. Only 14 participants (i.e., 7% of total sample) incorrectly indicated the level of experience of the instructor. Five participants were in the disfluent inexperienced group, six participants were in the fluent inexperienced group, one participant was in the fluent experienced group, and two participants were in the disfluent experienced group. The number of participants who incorrectly reported the instructor’s experience did not significantly differ between groups, \(\chi^2(3) = 5.16, p = .16\). Data from the 14 participants who incorrectly reported instructor experience were not included in any of the following analyses. Thus, the final sample size was 177 participants.

Prior knowledge. One hundred nine participants (61.6%) reported having no prior knowledge of the information. A total of 37 participants (20.9%) reported having heard of the information before but having not known details about the information. Additionally, 29 participants (16.4%) reported having learned the information before but having forgotten the details. Finally, only two participants (1.1%) reported having learned the information before and still remembering the details of it. As in Experiment 1, most participants (i.e., 82.5%) reported having little or no knowledge of the topic prior to the experiment. Further, the same pattern of results was found when analyses were conducted excluding participants who reported having prior knowledge and forgotten details or having prior knowledge and remembering details (31
participants, 17.5%). Thus, data from all participants were included in the reported analyses.

**Judgments of learning.** Lecture fluency significantly impacted participants’ JOLs, but instructor experience did not (see Figure 4). These observations were supported by a 2 (lecture fluency: fluent vs. disfluent) × 2 (instructor experience: experienced vs. inexperienced) between-participants ANOVA. The main effect of lecture fluency on JOLs was significant, $F(1, 173) = 33.60, p < .001, \eta_p^2 = 0.16$, as the disfluent group gave lower JOLs than the fluent group, $t(175) = 5.82, p < .001, d = 0.87$. Instructor experience did not significantly influence JOLs, and it did not significantly interact with lecture fluency, $F < 0.56, ps \geq 0.457, \eta_p^2 < 0.004$.

**Factors influencing judgments of learning.** The proportion of participants who chose 1 (strongly disagree) through 6 (strongly agree) for each factor underlying their JOLs is shown in Table 4. Many participants endorsed instructor delivery as a strong basis for their JOLs, with 49.1% of participants giving this factor either a 5 or 6. Participants’ own ability to learn and retain information was the next highest endorsed basis for JOLs, with 43.5% of participants giving this factor either a 5 or 6. A total of 41.3% of participants endorsed the material itself as a strong basis for their JOLs. Fewer participants endorsed unrelated factors, such as feeling tired or distracted, with 39% of participants giving this factor either a 5 or 6. Finally, few participants (24.3%) endorsed the instructor’s experience as a strong basis for their JOLs.

To determine whether these ratings differed between groups, five 2 (lecture fluency: fluent vs. disfluent) × 2 (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were performed on participants’ ratings of how much their JOLs were based upon (a) the material, (b) an unrelated factor, (c) participants’ own ability to learn and retain information, (d) the instructor and his delivery of the material, and (e) the instructor’s experience. A Bonferroni correction was applied to adjust the significance threshold to 0.01 across the five analyses. The main effect of instructor experience was not significant for any item, $F < 2.27, ps \geq 0.134, \eta_p^2 \leq 0.013$, and instructor experience did not significantly interact with lecture fluency for any item, $F < 1.68, ps \geq 0.197, \eta_p^2 \leq 0.01$. However, the main effect of lecture fluency was significant for all items, $F \geq 7.90, ps \leq 0.006, \eta_p^2 \geq 0.04$, with only one exception: the main effect of lecture fluency was not significant for ratings based upon an unrelated factor, $F(1, 173) = 5.23, p = .023, \eta_p^2 = 0.03$. Specifically, the disfluent group gave higher ratings than the fluent group with respect to basing their JOLs on the instructor’s experience, $t(175) = 3.70, p < .001, d = 0.56$, and on the instructor and his delivery of the material, $t(175) = 3.45, p < .001, d = 0.52$, and the fluent group gave higher ratings based upon their own ability to learn and retain information, $t(175) = 2.79, p = .006, d = 0.42$, and on the material itself, $t(175) = 2.79, p = .006, d = 0.41$. In sum, lecture fluency consistently influenced participants’ self-reported bases for their JOLs, but instructor experience did not.

We conducted a secondary analysis to determine whether participants’ self-reported bases for their JOLs were consistent with the JOLs they gave in response to the experimental manipulation of lecture fluency. Specifically, we evaluated whether the influence of lecture fluency on participants’ JOLs was larger when participants reported relying on the instructor and his delivery of the lecture as a basis for their JOLs, compared with when they did not. To do so, we used an approach from a previous study (Carpenter et al., 2016) wherein participants who strongly agreed that their JOLs were based on the instructor (i.e., gave ratings of 5 or 6 on the 6-point scale) were categorized as using the instructor and his lecture delivery as a strong basis for their JOLs ($n = 87$) and participants who gave ratings of 4 or less were categorized as not using this cue as a strong basis for their JOLs ($n = 90$). A 2 (lecture fluency: fluent vs. disfluent) × 2 (use of instructor as a cue: yes or no) between-participants ANOVA was conducted on participants’ JOLs. A significant main effect of lecture fluency emerged, replicating the effect reported previously in the overall analysis, $F(1, 173) = 28.28, p < .001, \eta_p^2 = 0.14$. There was a nonsignificant main effect of instructor, $F(1, 173) = 2.38, p = .13$, indicated that JOLs did not differ significantly overall according to whether or not participants used the instructor as a strong basis for their JOLs. Finally, a significant interaction emerged between lecture fluency and use of instructor as a strong basis for JOLs, $F(1, 173) = 13.44, p < .001, \eta_p^2 = 0.07$. For participants who reported using the instructor as a strong basis for their JOLs, those in the fluent group gave significantly higher JOLs ($M = 72.83, SE = 2.83$) than did those in the disfluent group ($M = 46.53, SE = 2.85$), $t(85) = 5.93, p < .001, d = 1.34$. By contrast, for participants who did not report using the instructor as a strong basis for their JOLs, the magnitude of JOLs did not differ between the fluent

<table>
<thead>
<tr>
<th>Measure</th>
<th>1: Strongly disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6: Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor</td>
<td>9.0</td>
<td>14.1</td>
<td>10.2</td>
<td>17.5</td>
<td>28.2</td>
<td>20.9</td>
</tr>
<tr>
<td>Own ability</td>
<td>12.4</td>
<td>15.3</td>
<td>15.8</td>
<td>13.0</td>
<td>28.2</td>
<td>15.3</td>
</tr>
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<td>Material</td>
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<td>19.8</td>
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<td>18.6</td>
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<td>11.9</td>
<td>12.4</td>
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</table>

**Note.** Reported values are the percentage of participants who endorsed each rating. Ratings were on a scale of 1 (strongly disagree) to 6 (strongly agree).

![Figure 4](image-url)
group ($M = 66.61, SE = 2.14$) and the disfluent group ($M = 61.77, SE = 3.39$), $t(88) = 1.26, p = .21$. Thus, students who reported relying more heavily on the instructor as a basis for their JOLs were indeed influenced more by the fluency manipulation than students who reported not relying as heavily on the instructor as a basis for their JOLs. These outcomes lend credibility to participants’ self-reported bases for their JOLs.

**Test performance.** Participants’ responses to test questions were scored and aggregated as in Experiment 1. Replicating Experiment 1, the percent correct did not differ between the four groups (see Figure 5). These observations were supported by a 2 (lecture fluency: fluent vs. disfluent) $\times$ 2 (instructor experience: experienced vs. inexperienced) between-participants ANOVA. There was no significant main effect of lecture fluency, $F(1, 173) = 1.14, p = .29, \eta^2_p = 0.01$, no significant main effect of instructor experience, $F(1, 173) = 0.01, p = .91, \eta^2_p < 0.01$, and no significant interaction between lecture fluency and instructor experience, $F(1, 173) = 0.17, p = .68, \eta^2_p < 0.01$.

**Evaluations of the instructor.** As in Experiment 1, we examined students’ responses to the evaluation items as a function of lecture fluency and instructor experience. We conducted $2 \times 2$ between-participants ANOVAs for each of the 15 items, with a Bonferroni correction applied to adjust the significance threshold to 0.003 across the 15 analyses. The means, standard errors, and follow-up inferential statistics for the six instructor evaluation items are provided in the bottom portion of Table 2. As in Experiment 1, lecture fluency had a significant impact on instructor evaluations, but instructor experience did not. Six 2 (lecture fluency: fluent vs. disfluent) $\times$ 2 (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were conducted to assess the impact of these variables on evaluations of instructor organization, preparedness, knowledge, and effectiveness, as well as relatability and likelihood of recommending the instructor. The main effect of lecture fluency was significant for all items, $F$s $\geq 6.69, p$s $\leq 0.01$, $\eta^2$s $\geq 0.29$. Participants who watched a fluent lecture gave significantly higher instructor evaluations than did participants who watched a disfluent lecture on instructor (a) organization, (b) preparedness, (c) knowledge, (d) effectiveness, and (e) relatability. Similarly, participants who watched a fluent lecture were more likely to recommend the instructor to other students than were participants who watched a disfluent lecture.

The main effect of instructor experience was not significant for any item, and instructor experience did not significantly interact with lecture fluency for any item, $F$s $\leq 3.83, p$s $\geq 0.068$, $\eta^2$s $\leq 0.02$.

**Evaluations of the course.** The means, standard errors, and follow-up inferential statistics for the nine other course evaluation items are provided in the bottom portion of Table 3. Six 2 (lecture fluency: fluent vs. disfluent) $\times$ 2 (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were performed to evaluate the impact of these variables on participants’ evaluations of the course. The main effect of lecture fluency was significant for all items, $F$s $\geq 28.73, p$s $\leq 0.001$, $\eta^2$s $\geq 0.14$, with two exceptions: there was no significant main effect of lecture fluency on participants’ evaluations of regularly studying, $F(1, 173) = 7.72, p = .006, \eta^2_p = 0.04$, or of wanting to learn more about the topic, $F(1, 173) = 5.10, p = .025, \eta^2_p = 0.03$. Participants who watched a fluent lecture gave higher evaluations than did participants who watched a disfluent lecture on (a) the material applying to their lives, (b) likelihood of attendance, and (c) likelihood of participation in class discussions. Participants who watched a fluent lecture were also more likely to recommend the course to other students than were participants who watched a disfluent lecture. The main effect of instructor experience was not significant for any item, and it did not significantly interact with lecture fluency for any item, $F$s $\leq 4.87, p$s $\geq 0.029$, $\eta^2$s $\leq 0.03$.

Likewise, three 2 (lecture fluency: fluent vs. disfluent) $\times$ 2 (instructor experience: experienced vs. inexperienced) between-participants ANOVAs were conducted to assess the impact of these variables on participants’ motivation to learn the material, interest in the material, and how much they felt they had learned. The main effect of lecture fluency was significant for all items, $F$s $\geq 10.65, p$s $\leq 0.001$, $\eta^2$s $\geq 0.06$. Participants who watched a fluent lecture gave higher evaluations than did participants who watched a disfluent lecture on motivation, interest, and learning. The main effect of instructor experience was not significant for any item, and instructor experience did not significantly interact with lecture fluency for any item, $F$s $\leq 2.10, p$s $\geq 0.149$, $\eta^2$s $\leq 0.013$.

**Discussion**

Experiment 2 confirmed the same findings from Experiment 1 under conditions in which participants were attentive to the instructions about instructor experience. Even when participants verified that they were aware of the experience level of the instructor prior to viewing the video, instructor experience still produced no effects on JOLs, evaluations, or test performance. A viable reason for this could simply be the fact that few participants appeared to base their JOLs on the experience of the instructor. Our analysis of the bases underlying participants’ JOLs suggests that lecture fluency was a more powerful cue for JOLs than instructor experience. As such, any effects of instructor experience were likely overshadowed by the more salient effects of lecture fluency.

**General Discussion**

The current results reveal new insights into the effects of instructor qualities on student learning. Replicating the results of
previous studies on lecture fluency (Carpenter et al., 2013; Carpenter et al., 2016; Tofness et al., 2018), we found that the fluency of a lecture had no significant effect on student learning as measured via a test following the video-recorded lecture. These results add to a growing number of studies demonstrating, somewhat counterintuitively, that instructor behaviors reflecting fluency do not influence learning.

Even so, it is clear that students expected lecture fluency to positively impact their learning. Students who viewed the fluent lecture gave significantly higher judgments of learning than did students who viewed the disfluent lecture. This finding is consistent with previous research showing that lecture fluency has a more powerful impact on students’ impressions of their learning than on their actual learning. (Carpenter et al., 2013; Tofness et al., 2018). In this way, lecture fluency appears to create an “illusion of knowing” that can mislead students’ judgments of learning.

Although much of the research on lecture fluency has been conducted in the laboratory, recent evidence suggests that lecture fluency might underlie students’ judgments in real educational contexts as well. Serra and Magreehan (2016) found that over multiple sections of an introductory psychology course, students’ judgments of their own learning correlated significantly with their ratings of instructor attributes that reflected fluency (e.g., the clarity of the instructor’s speaking, their use of visual aids, etc.), even after controlling for final grades in the course. Given the pervasive presence of fluency in real academic settings, these data encourage additional explorations of the effects of fluency in educational contexts, how it might influence students’ learning in real courses, and factors that might mitigate the potentially misleading effects of fluency on students’ learning.

According to metacognitive theory (e.g., Dunlosky et al., 2015; Kriat, 1997), lecture fluency may impact students’ judgments of learning via two mechanisms. Students may have beliefs about the impact of fluency on their learning, and they may use such beliefs as a basis for their judgments of learning (e.g., Mueller & Dunlosky, 2017). As well, experiences during learning (such as processing ease) may directly impact students’ judgments of learning. Recent research has begun to evaluate the separate contributions of these two mechanisms—for example, by directly measuring the ease with which information is processed during learning—and has revealed that preexisting beliefs, rather than fluency of processing, tend to account for the effects of many experimental manipulations that inflate judgments of learning, such as font size (Hu et al., 2015; Mueller et al., 2014), word concreteness (Witherby & Tauber, 2017), word frequency (Jia et al., 2016), and word pair relatedness (Mueller, Tauber, & Dunlosky, 2013; Mueller, Dunlosky, & Tauber, 2016). Other studies find that processing fluency does sometimes account for metacognitive judgments associated with word pair relatedness (Undorf & Erdfelder, 2015), font size (Undorf et al., 2017), and bolding of text material (Ball, Klein, & Brewer, 2014), and others find evidence that both beliefs and processing fluency can contribute to metacognitive judgments associated with the volume of auditory information (Frank & Kuhlmann, 2017). Future research might explore these mechanisms with lecture fluency by measuring the degree to which students’ judgments of learning are influenced by measures of online processing during a lecture (e.g., the speed with which students process or comprehend the information) versus their preexisting beliefs and ideas about fluency of lectures measured via their subjective reports in the absence of a direct experience with the lecture. Although it is not presently clear whether the effects of lecture fluency on metacognitive judgments are driven by beliefs, processing fluency, or some combination of both, it is clear that lecture fluency does not positively influence students’ learning in the way that students expect it to. As such, students should be cautious about relying on lecture fluency as a basis for assessing their own learning.

Along similar lines, these results suggest that student evaluations of instructor effectiveness should be interpreted with caution as well. Consistent with previous research (Carpenter et al., 2013; Carpenter et al., 2016; Tofness et al., 2018), after viewing a fluent lecture, students rated the instructor significantly higher than did students who viewed a disfluent lecture on traditional instructor evaluation items such as organization and preparedness. These qualities, however, did not reliably coincide with better learning. These results parallel those of another recent study showing that instructor enthusiasm—a quality that would seem intuitively linked with student engagement and attention—does not reliably enhance student learning. Under carefully controlled conditions, Motz et al. (2017, Experiment 2) showed participants a video of the same male instructor either behaving in an enthusiastic manner (displaying excited facial expressions, gestures, and vocal dynamics), or in a nonenthusiastic manner (with subdued expressions, gestures, and vocal dynamics) when giving the same explanation about how to perform an upcoming word learning task. In each video the instructor stood in the same location within a classroom, wore the same clothing (button-up shirt, tie, and slacks), and was visible from his head to just below his waist (for screenshots of the videos, see Figure 1 of Motz et al., or http://osf.io/j2h8y for the full videos). Although participants who viewed the enthusiastic instructor (compared with the nonenthusiastic instructor) rated the instructor as more memorable and reported slightly higher levels of motivation to perform well at the task, memory accuracy on the task did not differ between the two groups. Together with the current results, these findings suggest that outward expressions of instructor preparedness, organization, and enthusiasm do not appear to coincide with more effective learning. Long viewed as measures of instructional effectiveness (Feldman, 1976, 1988; Marsh, 1977, 1983), such qualities should be carefully considered with respect to the influences they have, as they may not show straightforward direct connections to student learning.

Interestingly, however, new evidence from the current study suggests that lecture fluency might positively influence learning in indirect ways. Participants who viewed the fluent lecture, compared with the disfluent lecture, rated themselves significantly more likely to attend class, participate in class, and study the material (although this difference was not significant in Experiment 2), and also judged the information as significantly more applicable to their lives. These results suggest that although an instructor who delivers a fluent lecture may not directly affect the score a student receives on a test, that instructor may inspire the student to engage in behaviors that do positively affect their learning. Over time, therefore, instructors who deliver material more fluently may indeed lead to enhanced student learning. The potential indirect or mediated effects of lecture fluency on learning outcomes—such as through students’ decisions to engage in further study or pursue additional opportunities to learn more about the topic—are interesting and worthwhile areas for future research.
Though still a fairly new area of research, the effects of lecture fluency (on perceived learning, but not on actual learning) appear to be consistent across variations in the appearance of the instructor and the specific content taught. These effects have been shown to occur for a male instructor teaching information theory (Toftness et al., 2018), for a female instructor teaching genetics (Carpenter et al., 2013), and a different (unseen) female instructor teaching a voice-over lecture on signal detection theory (Carpenter et al., 2016). Research has not yet identified whether there are key ingredients of lecture fluency (e.g., eye contact, gestures, voice dynamics, enthusiasm, etc.) that drive these effects, but systematic investigations into different elements of fluency, and how they are utilized as cues by students to judge their own learning, could be a promising area for future research.

Unlike lecture fluency, instructor experience had no detectable effects on any outcomes measured here. Following these null effects in Experiment 1, Experiment 2 included a manipulation check to verify that participants understood the level of experience that the instructor was portrayed to have. Even then, instructor experience had no effect on students’ judgments of learning, test performance, or evaluations. Given the mixed results from actual courses with respect to the relationship between instructor experience and academic measures such as student evaluations (Feldman, 1983; Marsh, 2007a) and achievement (Hoffmann & Oropoulos, 2010; Zabala, 2007), the current results provide new information that helps clarify the role of instructor experience on these outcomes under controlled experimental conditions.

Results of the current study fail to replicate the findings of Leventhal et al. (1977), who showed that students who learned from an instructor they believed was inexperienced performed worse after viewing a disfluent lecture compared to a fluent lecture. Although this finding seems intuitive—on the basis that perceived inexperience of an instructor may negatively affect processing of the information in a disfluent lecture more than a fluent lecture—this finding did not occur in the current study. Instead, we found that lecture fluency had no significant effect on learning, nor did it interact with the effects of instructor experience.

Although there could be various reasons for these discrepant findings, the results of Experiment 2 provide important insights by demonstrating that participants rarely relied upon instructor experience in forming their judgments of their own learning. If instructor experience did not strongly influence participants’ impressions while learning, it seems unlikely to have affected their processing of information while viewing the video. The current results, therefore, are likely attributable to the fact that participants did not regard instructor experience as an important factor guiding their processing of the information. It is possible that in Leventhal et al.’s (1977) study, students relied upon instructor experience to a greater degree while viewing the videos, or the specific way in which lecture fluency was manipulated was more likely to interact with the effects of instructor experience. Although the nature of the test from Leventhal et al.’s study is not specified, it is possible that unlike the current study that focused on factual content, the lesson taught in the videos by Leventhal et al. (i.e., research design) and the associated test could have involved more conceptual understanding. To our knowledge, research on this topic has not directly explored different types of test questions to investigate whether lecture fluency or instructor experience might differentially affect learning outcomes that vary in complexity, but we consider this a worthwhile endeavor for future research. As the research on this topic has been largely conducted with undergraduate students as participants, another interesting avenue for future research is to explore the effects of fluency and other instructor attributes in diverse learning situations with students at different levels, as well as in vocational and occupational learning contexts.

In the current study, instructor experience was manipulated via the instructions provided to participants prior to watching the videos. In the interests of experimental control and consistency with prior work (e.g., Leventhal et al., 1977), the instructor himself and the content taught did not vary across the different conditions. It is possible, however, that a different way of manipulating instructor experience—perhaps by involving different instructors with noticeable variations in age or other experience-based external attributes, or by involving lessons that vary in content and strategies reflective of the instructor’s experience (Doğanay & Öztürk, 2011; Freitas, Jiménez, & Mellado, 2004; Housner & Griffee, 1985)—may increase the tendency for students to rely on instructor experience while processing the information. Other more subtle manipulations, such as providing the information about instructor experience before and after viewing the video, may also increase participants’ reliance on instructor experience as a cue for their judgments of learning. If instructor experience were a more salient factor influencing participants’ approaches to learning the material, effects of instructor experience on learning—and potential interactions with lecture fluency—may be more likely to emerge. Because there is currently a paucity of research exploring the direct effects of instructor experience on academic outcomes, future research is encouraged that explores the role of experience and other instructor attributes in a variety of learning situations.

In summary, students rely heavily on lecture fluency when evaluating their own learning and the quality of instructors. They rely much less on the experience level of the instructor in making these evaluations. Although neither lecture fluency nor experience had a significant direct effect on learning, lecture fluency may enhance learning in indirect ways by promoting effective academic practices such as class attendance and studying. These results encourage further investigations into the roles of student and instructor attributes in academic performance, and the various ways they may be utilized to encourage optimal learning practices.

References


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