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Preparing to Learn: Structuring the Basic Course to Increase Student Preparation and Learning

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INTRODUCTION

In a recent nationwide study, Arum and Roksa (2011) found that students spend remarkably little time on coursework outside of class and often make no significant academic gains during college, which suggests that limited learning and poor preparation have become the norm on many campuses. At academic conferences and in the hallways of our own institutions, we have often heard faculty lament that getting students to do the assigned reading before coming to class is an immense challenge, and it is not uncommon for students to forgo buying the textbook for a course altogether. However, it is possible that students come to class unprepared because they are given little incentive to prepare well for class. When students typically come to class unprepared and believe that their classmates will do the same, it is possible that instructors tend to lecture more and make sure that they talk about everything that was in the textbook, believing that it is the only way they can teach if students do not come to class with a foundational

knowledge of the material, thereby giving students even less incentive to read the textbook, and this becomes a vicious cycle.

Public speaking or oral communication courses, which serve as the Basic Course on many campuses, present unique challenges that make it especially important for students to use the time between classes to prepare for class. Public speaking classes usually have two complementary goals: to develop students' understanding of communication theories about effective speaking and to build students' public speaking skills. While building speaking skills includes applying communication theory in practice, it has been our experience that students see reading the textbook and preparing speeches as separate assignments that compete for their time in between classes.

However, providing a clear structure for work done before class and an incentive for completing readings and other preparatory work has the potential to increase student learning in public speaking courses and allow instructors to develop more engaging classroom activities that help students learn at the higher levels of Bloom et al.'s (1956) taxonomy of learning. For the purposes of these studies, learning will be conceptualized primarily within the cognitive domain and includes knowledge, comprehension, application, analysis, synthesis, and evaluation. There has been significant controversy in instructional communication research about the measurement of learning, and since many of the perception-based measures of learning are often associated with affective learning, performance-based measures that include multiple levels of Bloom's cognitive domain will be relied upon most heavily in this series of

studies (King & Witt, 2009). Previous research has documented the academic benefits of frequent quizzing, particularly as a learning tool that can facilitate increased preparation and learning (e.g., Azerloza and Renner, 2006; Bangert-Drowns et al, 1991; Chan, 2010; Glenn, 2007). The goal of this paper is to investigate whether frequent quizzing might facilitate greater preparation and learning in the Basic Course and to test variations of frequent quizzing through a series of three separate studies in order to identify best practices for using such quizzes.

LITERATURE REVIEW

While little research in instructional communication and communication education has examined the impact of frequent quizzes in communication classes, research in other disciplines has well documented the effects of frequent testing. In this literature review, we will summarize the existing research on the effects of frequent testing and variables within the public speaking classroom before introducing our research hypotheses.

Effects of Frequent Testing

Most existing research suggests that giving students frequent quizzes increases learning. Many studies have found that students who take frequent quizzes over the course of an academic term retain more information (Carpenter, 2009; Chan, 2009; McDaniel, Anderson, Derbish, and Morrisette, 2007), perform better on subsequent in-class exams (Gretes and Green, 2000; Had-

sell, 2009; Johnson and Kiviniemi, 2009; Johnson and Mrowka, 2010; McDaniel et al., 2007; Narloch et al., 2006; Nevid and Mahon, 2009), and produce better results than when practicing the skill for an equal amount of time (Kromann, Morten, and Ringsted, 2009). Bangert-Drowns, Kulik, and Kulik (1991) conducted a meta-analysis of 35 studies; of those studies, 13 found statistically significant positive effects, 16 found statistically insignificant positive effects, and only one found a statistically significant negative effect on overall learning in the course. They sum up their findings by saying, “The average student who was frequently tested outperformed 59% of the students who were not frequently tested” (p. 94).

In addition to research that suggests that quizzes increase student learning, there is also literature that indicates that using frequent quizzes impacts the way that instructors teach and the ways that students engage in and perceive their classes. Instructors who use frequent quizzing can identify student weaknesses more quickly and easily than when they only offer a midterm and final exam (Haigh, 2007; Waite, 2007) and point out that regular class quizzes can enhance and sustain student engagement, attendance, and learning in courses that build progressively (Haigh, 2007). Haigh also argued that when students come to class prepared for a quiz, they already have a useful foundation of knowledge upon which to construct deeper learning. This in turn allows instructors to prepare for a different kind of class, one that allows for more in-depth learning since less time needs to be spent reviewing foundational knowledge. Quizzes allow instructors to spend less time

lecturing and more class time on activities (Fernald, 2004).

Furthermore, Waite (2007) found that students prefer taking frequent quizzes to having only a final exam or midterm and final exam. Students believe that frequent quizzes help them to understand the material (Cooper, Tyser, & Sandheinrich, 2007; Feldhusen, 1964), motivate students to study more than usual (Feldhusen, 1964; Haigh, 2002), and better prepare students for the final exam (Johnson, 2007). Others have found that frequent quizzes increase student attendance and preparation for class (Azerlosa and Renner, 2006), though it appears in other studies that quizzes increase attendance on days that quizzes are given but might actually contribute to a decrease in attendance on non-quiz days compared to classes in which quizzes are not given (Hovell, Williams, and Semb, 1979). Students who take frequent quizzes participate more in classroom discussion (Haigh, 2002) and have a more favorable opinion of their instructor and the course (Bangert-Drowns et al, 1991). Based on this research, it is reasonable to expect that frequent quizzes over the reading in a public speaking class will also increase students' understanding of communication theories about public speaking so that they will be better able to apply those theories when developing their speeches.

The Testing Effect

There are several theories that help to explain why frequent quizzing impacts student learning, a phenomenon often referred to as the "testing effect" (Glenn, 2007). Three of the most frequently used explanations

include retrieval-induced facilitation, retrieval-induced forgetting, and generative learning.

The retrieval-induced facilitation hypothesis posits that the process of recalling information when taking a quiz enhances students' ability to remember that information later, such as when taking a final exam. Carpenter (2009) theorizes that this benefit likely results from the elaborative retrieval process. Hadsell (2009) found that the closer to when the material is covered in class that students take quizzes, the greater the impact on final exam scores, suggesting that when students connect with material in multiple ways in a short period of time, they are more likely to succeed in future retrieval-induced remembering. Kang, McDermott, & Roediger (2007) discovered that students who completed short-answer quizzes and then received instructor feedback rather than standard multiple-choice quizzes without feedback performed better on the final exam, suggesting that a more demanding the retrieval process facilitates greater long-term learning.

The retrieval-induced forgetting hypothesis suggests that quizzing increases students' ability to remember information over which they were quizzed, but decreases their ability to remember information over which they were not quizzed (Anderson, Bjork, and Bjork, 1994). However, Chan (2009) found that retrieval-induced forgetting fades over time and is further reduced when items are integrated. Despite an initial forgetting, students who are frequently quizzed are more likely than students who are not quizzed to remember the tested and untested material later in the term (Chan, 2010).

The generative learning model is the third explanation for why frequent quizzing might increase student cognitive learning. Wittrock (1989) argues that deeper understanding is achieved through active constructive meaning that activates four learning components: generation, motivation, attention, and memory. Johnson and Mrowka (2010) found that the relationship between quizzing and exam performance is due to quiz structure—not just the act of quizzing alone. They argue that generative learning “results from structuring quizzes to require linking concepts to one’s own experiences, comparing and contrasting and justifying conclusions” (Johnson and Mrowka, 2010, p. 118).

Online quizzes

Less research has been conducted on the impact of online quizzes on student learning, but early research suggests that online quizzes might have the same benefits for cognitive learning as in-class quizzes. Some studies show no differences on course performance between online and in-class quiz groups (Harter and Harter, 2004; Peng, 2007; Pont, 2009), though one study shows that online quizzes improve course performance more than in-class quizzes (Kibble, 2007), a difference that disappears when time limits are set for online quiz groups (Daniel, 2004). Online quizzes make it possible for students to see their scores (Peng, 2007) and receive immediate feedback. Online quizzes also allow instructors to see how many students answered each question correctly (Harter and Harter, 2004) so that they can tailor their lesson plans to focus more on material with which students are having the most difficulty, skip de-

tailed explanations of concepts students already comprehend (Cooper, Tyser, & Sandheinrich, 2007), and spend more time in class doing activities that help students develop their ability to use course concepts at the highest levels of Bloom's taxonomy. In a public speaking class, using online quizzes could potentially allow instructors to use more class time for informal and formal speaking assignments, giving students more opportunities to apply theory and practice speaking skills.

Notetaking

Kiewra (2002) reminds college educators that, despite having been in school for twelve years, most college students are not expert learners and must be taught how to learn. He argues that helping students learn to take better notes is an important aspect of this since students have a 50% chance of remembering information that was included in their notes versus only a 15% chance of remembering information that was not in their notes (Aiken, Thomas, & Shennum, 1975), and since students are usually take incomplete notes, recording only 20-40% of the important details (Kiewra, 1985a).

The way that an instructor presents information in class can influence student notetaking. The use of prominent spoken organizational cues during a lecture can increase the amount of important information recorded in students' notes and improve test performance (Titsworth, 2004; Titsworth & Kiewra, 2004), but using too much immediacy can distract students from recording details (Titsworth, 2004). Giving students the opportunity to rewatch a lecture also allows students to add

to their notes, first filling in the most important information and then adding lower-level ideas in subsequent viewings (Kiewra, Mayer, Christensen, Kim, & Risch, 1991). However, even when the instructor utilizes these techniques, student notes are usually incomplete.

In attempt to remedy this, some instructors prepare skeletal notes (also called guided notes or partial notes) that provide the lecture's structure and key terms or main ideas before the lecture, but leave room for the students to fill in the notes with additional main ideas and details. Several studies have shown that students record more details and perform better on later exams when they are given skeletal notes instead of taking traditional unguided notes (e.g. Austin, Lee, & Car, 2004), and these benefits are greater when students are trained to use the guided notes (Konrad, Joseph, & Eveleigh, 2009). Kiewra (1985b, 2002) recommends providing students with partial or skeletal notes before a lecture and a full set of instructor notes afterward, while others have found that students actually learn more retain the information longer when they are given skeletal notes instead of a full lecture transcript or a full set of instructor's notes (Katayama, 1997; Russell, Caris, Harris, & Hendricson, 1983). While Neef, McCord, & Ferreri (2006) found no difference in mean quiz scores between students who had been provided with guided and completed notes, they did find that students who were only given guided notes performed better on more complex analysis-level questions.

Since college students spend approximately 80% of the class time listening to lectures (Armbruster, 2000), it is not surprising that all of these studies have tested student note-taking in a lecture-based scenario. How-

ever, as more and more instructors consider “flipping” their classrooms, and as we seek to identify ways to help students better prepare for class, we should investigate whether asking students to fill in skeletal notes as they prepare for class and then add to those notes during class might facilitate greater learning.

CONTEXT

This series of studies was conducted at an urban public university in the Pacific region of the United State with a total enrollment of 21,755, including 18,074 undergraduates (Office of Institutional Research, 2012). In this Basic Course, master’s level Graduate Teaching Assistants (GTAs) teach standalone sections of the course, but are supervised by a faculty Basic Course Director who oversees the course. Although each GTA has considerable freedom in how they develop their lesson plans and are given a small number of “discretion points” that can be used for section-specific assignments and activities, all sections of the course are taught using the same textbook, workbook, syllabus, speeches, major assignments, and exams, so there is a high degree of consistency among sections of the course, allowing comparisons across sections for assessment and research purposes. All three of the studies described below were approved by the university’s Institutional Review Board, and each was designed with the purpose of answering questions that lingered from the preceding study in order to help refine our Basic Course pedagogy and curriculum.

STUDY 1: FREQUENT QUIZZING

The purpose of our first study was to find out whether giving students frequent, announced reading quizzes would increase their learning in the Basic Course. Even though a great deal of previous research attested to the benefits of frequent quizzing for student learning, only two of those studies were done in communication (Johnson, 2007; Johnson & Mrowka, 2010), and those studies either used unannounced quizzes that were given after the material had been previously discussed in class or were student-generated quizzes in other types of communication courses. Prior to completing this study, our Oral Communication course utilized a midterm and final exam, similar to many other Basic Course programs, and our goal was to find out whether our students would learn more if the midterm was replaced with frequent, announced reading quizzes. With these issues in mind, this study was designed to test the following hypothesis:

H₁: There will be a significant difference in the student learning in public speaking classes when frequent pre-lecture quizzes are given compared to when a midterm examination is given.

Procedures and Instrumentation

This study used a quasi-experimental field research design with one independent variable, assessment type, and one dependent variable, learning. This is a quasi-experimental design because we did not randomly assign students to groups; instead, students self-selected into their group when they chose to enroll in a section of

the class in a particular quarter. However, choosing this kind of design allowed us to collect data in the most realistic natural setting possible: Basic Course classrooms. Students did not know about the study until they were invited to sign a consent forms on the day of the final exam, so it is highly improbable that student self-selection into groups could have caused differences due to unequal groups. Both groups of students were given a list of chapter learning objectives for every chapter of the textbook at the beginning of the year as part of the course workbook.

Assessment type was a nominal variable with two levels: midterm or quizzes. All students who were enrolled in the course in the winter quarter were given the same midterm exam halfway through the quarter; the midterm was a comprehensive exam of all material that had been covered prior to the exam. All students who were enrolled in the course in the spring quarter were given a quiz at the beginning of each class for which they were supposed to have read part of the textbook (i.e., most days except speech days, for a total of nine quizzes throughout the quarter) instead of a midterm exam. These quizzes were based on the chapter learning objectives that were provided in the course workbook and included a blend of short answer and multiple-choice questions. Because the quizzes were given after students had read the textbook chapter but before the material had been covered in class, GTAs were instructed to keep all questions at the knowledge and comprehension levels of Bloom's cognitive learning taxonomy (Bloom et al, 1956), and then use class time in ways that would help students learn at the higher levels of the taxonomy. During both quarters, students were

given the same comprehensive final exam that assessed students' understanding of material covered throughout the entire quarter at all six levels of Bloom's Taxonomy. Though choosing to select groups by quarter increased the risk of maturation threat, assessments in previous years had indicated that there was no difference in student learning between the winter and spring quarters, so we decided this risk was minimal compared to the risk of threats from compensatory rivalry, resentful demoralization, or the Hawthorne effect that might have resulted from utilizing both treatments in different sections at the same time.

Learning was operationalized as the student's grade on the comprehensive final examination, which included equal coverage of all chapters in the textbook and included questions that tested learning at all six levels of Bloom's cognitive learning domain. The final exam was identical for both groups of students.

Participants

All students who were enrolled in Oral Communication during the winter and spring quarter when this study was conducted were invited to participate in this study. A total of 1194 undergraduate students participated in this study.

Results

An independent-samples *t*-test was conducted to find out whether the final exam scores were significantly different. For the group that was given the midterm exam, $N = 616$, $M = 54.33$, $SD = 9.66$. For the group that was

given frequent quizzes, $N = 578$, $M = 57.31$, $SD = 8.23$. Levene's Test for the Equality of Variance was significant ($F = 12.757$, $p < .001$), so values for equal variances not assumed were used. The t -test indicated that the final exam scores were significantly different, $t(1191.235) = -5.743$, $p < .001$. Students who were given frequent quizzes scored an average of 3 points higher on the 75-point final exam than students who were given a midterm exam, which was an increase of 4%.

Summary and Discussion

This study shows that students benefit from frequent quizzes in public speaking classes. While a 4% increase in final exam scores might not sound like a large change, this is a fairly substantial finding when we consider that this is the average change for all students, even including those who might have been less than diligent about attendance and preparation, and suggests that this is a strategy well worth incorporating into public speaking classes.

There are several explanations for our findings. First, it is possible that the quizzes simply provided an additional incentive for students to engage in other activities that are facilitating learning. GTAs were encouraged to talk about the quizzes as a means of rewarding students for the preparatory work that they should already be doing, so it is highly likely that the quizzes were seen by many students as an incentive. Other studies report that the use of quizzes can increase attendance (e.g., Hovell, Williams, & Semb, 1979), motivate students to keep up with the course readings (e.g., Feldhusen, 1964), and give students an opportunity to

practice retrieving knowledge (e.g., Chan, 2010), and it is likely that these factors play an important role in our findings as well. Second, it is also probable that actual process of taking the frequent quizzes is helping students learn. Karpicke & Zaromb (2009) argue that the process of effortful retrieval helps students remember more later than they would if they had not been quizzed. Third, the quizzes provided frequent opportunities for low-stakes assessment so that students could check their own understanding of the material and adjust their preparation throughout the term. In this way, the quizzes provided students with near-constant feedback so that they had a good idea of how they were progressing before any of the higher-stakes assessments (eg: the final exam) took place.

STUDY 2: ONLINE VS. IN-CLASS QUIZZES

While our first study found that students retained more knowledge over time and performed better on their final exam when they were given frequent quizzes, giving those quizzes took up valuable class time and substantially increased instructors' grading loads. For this second study, conducted a little over a year later, we wanted to find out whether there might be alternatives that would allow us to garner the benefits of frequent quizzing while minimizing the time spent in class or grading. Additionally, we wanted to learn more about the impact of quizzes on several variables and course outcomes, including psychomotor learning (through speech performance), Public Speaking Anxiety, and cognitive learning on course concepts (including perception-

based measures and performance-based measures). Since most Learning Management Systems (LMS) allow instructors to create online quizzes that can be taken out of class and automatically graded, we developed a study to test the following hypotheses:

- H₂: There is a significant difference in the change in speech grade across the academic term for students who have been given in-class quizzes and those who have been given online quizzes.
- H₃: There is a significant difference in the change in public speaking anxiety across the academic term for students who have been given in-class quizzes and those who have been given online quizzes.
- H₄: There is a significant difference in the change in cognitive learning across the academic term for students who have been given in-class quizzes and those who have been given online quizzes.
- H₅: There is a significant difference in final exam score for students who have been given in-class quizzes and those who have been given online quizzes.
- H₆: There is a significant difference in the final course grade for students who have been given in-class quizzes and those who have been given online quizzes.

Procedures

This study used a split-plot design with one independent variable (between-subjects factor), quiz type, and three dependent variables that were measured repeatedly (within-subjects factors), speech grade, public

speaking anxiety, and cognitive learning. Additionally, several measures were taken once: demographic characteristics, final exam grade, and final course grade. The repeated measures design reduces the number of subjects needed by removing variability due to individual differences from the error term, which is statistically “much more powerful than completely randomized designs” (Stevens, 2002, p. 492).

Students were assigned to one of two groups based on the sections of public speaking in which they were enrolled, again making this a quasi-experimental design that allowed us to use real Basic Course classes as our research setting. Both groups had quizzes about the reading each day that reading was due in the class (a total of 10 quizzes); however, Group 1 took paper-and-pencil quizzes in class at the beginning of the class period, whereas Group 2 was asked to take the quizzes online before coming to class. Both groups were given a list of chapter learning outcomes on which the quizzes were based.

Table 1
Research Design and Timeline

	O ₁ Week 3	O ₂ Week 6	O ₃ Week 10
Group 1 In-Class Quizzes	PSA ₁ , CL ₁ , Narrative Speech	Informative Speech	PSA ₂ , CL ₂ , Persuasive Speech, Final Exam, Final Course Grade
Group 2 Online Quizzes	PSA ₁ , CL ₁ , Narrative Speech	Informative Speech	PSA ₂ , CL ₂ , Persuasive Speech, Final Exam, Final Course Grade

Note: SG = Speech Grade, PSA= Public Speaking Anxiety,
CL= Cognitive Learning

Except for grades, all data was collected using an online survey. Students received extra credit for completing the surveys (5 points per survey; the maximum 10 survey points was 2% of the course total). A survey link was sent to students in the second week of the class and again in the final week of the class, allowing the surveys to serve as pre-tests and post-tests. Speech grades were collected from the instructors' grade books at the end of the quarter. Table 1 shows the timeline for all measurements and treatments for both groups.

Instrumentation

The first variable included in this study was speech grade, which serves as a proxy for speech quality and is a performance-based measure of learning. All speeches were graded by the course instructors using standardized grading rubrics, and all speech grades were converted into a 100-point scale for the purposes of this analysis. The three speeches that students gave included a narrative speech, an informative speech, and a persuasive speech.

Public Speaking Anxiety was measured using Booth-Butterfield and Gould's (1986) State Communication Anxiety Inventory, which includes twenty items measured with a four-point Likert-type scale in which 1 = Not at all, 2 = Somewhat, 3 = Moderately so, and 4 = Very much so. The authors report an overall reliability of $\alpha = .912$ for this scale and include items such as, "I felt tense and nervous," and "My words became confused and jumbled when I was speaking" (p. 199). In our study, the scale reliability was $\alpha = .878$.

Perceived Cognitive Learning was measured using Frymier and Houser's (1999) Revised Learning Indicators scale, which includes nine items measured with a 5-point scale ranging from Never (1) to Very Often (5). This scale is an improved measure based on Learning Empowerment Indicator Scale created by Frymier, Shulman, and Houser (1996). The authors report an overall reliability of $\alpha = .83$ for this scale and include items such as "I actively participate in class discussion" and "I think about the course content outside of class" (p. 8). In our study, the scale reliability was $\alpha = .860$.

Final exam grade and final course grade were included as additional performance-based measures of cognitive learning. Students were also asked which type of quiz they would prefer if given a choice between in-class and online quizzes and were asked to provide a rationale for their choice.

Participants

A total of 101 students enrolled in four sections of Oral Communication were selected to participate in this study. Students did not know about the study prior to enrolling in these sections of the course, so the sections should have been equivalent groups similar to the groups that would have resulted from random assignment. These sections were taught by two instructors, and each instructor was asked to teach one section using each of our two treatment conditions to equalize any instructor effects between the two conditions. We have grade data for all 101 students who participated in this study, but only 64 students completed the first survey and 34 students completed the second survey, so we

only have partial participation in the measures that were taken via the two online surveys (demographic information, Public Speaking Anxiety, and Cognitive Learning).

Of the 64 students who completed the first online survey, which is the survey that included demographic items, 37 (57.8%) were female and 27 (42.2%) were male, and the mean age was 19.2 years ($SD = 2.16$). For ethnicity, 3 (4.7%) of the students reported that they are African-American, 9 (14.1%) are Asian, 42 (65.6%) are Hispanic, 4 (6.3%) are white, 4 (6.3%) are of other ethnicities, and 2 (3.1%) prefer not to respond.

Table 2
Means for Dependent Variables by Group

	Group 1 (In-Class Quizzes)			Group 2 (Online Quizzes)		
	O1	O2	O3	O1	O2	O3
Speech Grade	88.80 (7.09)	88.16 (7.09)	90.72 (7.06)	85.49 (9.93)	87.71 (7.02)	89.24 (6.40)
Public Speaking Anxiety	42.83 (10.57)	--	41.00 (6.20)	43.10 (8.20)	--	39.79 (9.21)
Cognitive Learning	29.40 (5.32)	--	31.70 (4.67)	31.69 (5.80)	--	35.21 (6.97)
Final Exam Grade	--	--	79.28 (11.42)	--	--	77.76 (11.84)
Final Course Grade	--	--	86.84 (7.57)	--	--	85.76 (6.39)

Note: Means are shown on top in each cell; standard deviations are shown in parentheses in the bottom of each cell. All grades are expressed as percentages.

Results

Split-plot within-subjects repeated measures analyses were conducted to find out whether there was a difference between the two treatment groups in Speech Grade, Public Speaking Anxiety, and Cognitive Learning across the quarter. Additionally, independent samples *t*-tests were used to find out whether there was a difference between the groups on the final exam and final course grade. Means for these variables are included in Table 2. Alpha was set at .05 for all tests.

Speech Grade. A within-subjects split plot analysis was conducted to determine whether speech grades changed differently across the quarter between the two groups. Wilks' Lambda was significant for speech grades, $\lambda = .897$, $F(2, 98) = 5.651$, $p = .005$, $\eta_p^2 = .103$, but not for speech grades by group, $\lambda = .964$, $F(2, 98) = 1.822$, $p = .167$, $\eta_p^2 = .036$. Between-subjects effects were not significant, $F(1, 99) = 2.037$, $p = .157$, $\eta_p^2 = .020$. Tests of within-subjects effects were significant for speech grade, $F(2, 198) = 6.700$, $p = .002$, $\eta_p^2 = .063$. Within-subjects contrasts for speech grades showed a significant linear trend, $F(1, 99) = 10.465$, $p = .002$, $\eta_p^2 = .096$, but did not show a significant quadratic trend, $F(1, 99) = .989$, $p = .323$, $\eta_p^2 = .010$. However, pairwise comparisons and tests of simple main effects show that in-class and online quizzes have a slightly different impact on student changes in speech grade throughout the term. Students taking in-class quizzes did not have significant differences between their first and second speech ($p = .551$) or between their first and third speech ($p = .126$), but did have significant differences between their second and third speech ($p = .019$). However, students taking online quizzes showed significant growth

in their speech grades between their first and second speeches ($p = .036$) and between their first and third speech ($p = .003$), but not between their second and third speech ($p = .163$). This means that, while there were no statistically significant differences between groups on any of the speech grades at any one point in time, students who took online quizzes improved their speeches more from the beginning to the end of the quarter, while students taking in-class quizzes only improved between the second and the third speech. However, these results do not provide any kind of conclusive evidence about which type of quiz is more effective for improving speech quality.

Public Speaking Anxiety

A within-subjects split plot analysis was conducted to determine whether state public speaking anxiety changed differently across the quarter between the two groups. Wilks' Lambda was not significant for PSA, $\lambda = .852$, $F(1, 22) = 3.808$, $p = .064$, $\eta_p^2 = .148$, nor for PSA by group, $\lambda = .972$, $F(1, 22) = .628$, $p = .436$, $\eta_p^2 = .028$. Tests of within-subjects effects, within-subjects contrasts, and between-subjects effects were not significant. However, tests for simple main effects showed a significant change in public speaking anxiety for students who took online quizzes, $F(1, 22) = 9.036$, $p = .007$, $\eta_p^2 = .291$, but not for students who took in-class quizzes, $F(1, 22) = .424$, $p = .522$, $\eta_p^2 = .019$. This indicates that students who took online quizzes significantly reduced their state PSA through the quarter, while students who took in-class quizzes saw no significant change in state PSA. However, students who took the online quizzes also

started with slightly (but not statistically significantly) higher levels of state PSA when giving their speech at the beginning of the quarter, so these results do not provide compelling evidence that either type of quiz is preferable for reducing Public Speaking Anxiety.

Perceived Cognitive Learning. A within-subjects split plot analysis was conducted to determine whether Cognitive Learning changed differently across the quarter between the two groups, as measured by the Revised Learning Indicators Scale. Wilks' Lambda was not significant for CL, $\lambda = .962$, $F(1, 22) = .864$, $p = .363$, $\eta_p^2 = .038$, nor for CL by group, $\lambda = .920$, $F(1, 22) = .1917$, $p = .180$, $\eta_p^2 = .080$. Tests of within-subjects effects, within-subjects contrasts, and between-subjects effects were not significant. However, pairwise comparisons and tests for simple main effects showed a significant change in cognitive learning for students who took online quizzes, $F(1, 22) = 6.426$, $p = .019$, $\eta_p^2 = .226$, but not for students who took in-class quizzes, $F(1, 22) = .065$, $p = .801$, $\eta_p^2 = .003$. This indicates that students who took online quizzes significantly increased their cognitive learning throughout the quarter, while students who took in-class quizzes reported no significant change in cognitive learning.

Performance-Based Measures of Cognitive Learning. Independent samples *t*-tests were conducted to find out whether there was a difference in the final exam grade and final course grade between students who took in-class quizzes and those who took online quizzes throughout the quarter. There was not a significant difference between groups in final exam grade, $t(99) = .654$, $p = .514$, nor for final course grade, $t(99) = .771$, $p = .443$.

Student Preferences. At the end of the quarter, students were asked to indicate whether they would prefer to take quizzes in-class or online before class and explain why they chose their preference. Of the students who took online quizzes before coming to class, 97.1% indicated that they prefer taking online quizzes, while only 2.9% indicated that they would prefer to take in-class quizzes. However, for students who took in-class quizzes, 79.3% indicated that they prefer to take in-class quizzes, and only 20.7% indicated that they would prefer to take online quizzes online before coming to class. In short, students indicated a strong preference for whichever type of quiz they were given throughout the quarter. Students who preferred online quizzes gave reasons such as, “I feel less pressured at home” and “It is more convenient and allows you to refer to the book if need be,” whereas students who preferred in-class quizzes gave reasons such as, “I feel more focused when I am in the classroom taking the quizzes. I would get more distracted if they were online,” and “It motivates me to come to class on time.” Even though students did not get to choose their quiz type, they appear to be engaging in effort justification by arguing for the benefits of the type of quiz that they were given.

Summary and Discussion

In terms of student speech performance, public speaking anxiety, cognitive learning, final exam performance, and overall course grade, there is not a significant difference between students who took in-class and online quizzes on any measure at any point in time. However, when looking at student growth at the indi-

vidual level across the entire term, these results show that there might be very slight advantages to using online quizzes in public speaking classes, which might be attributed to the increased face to face instructional time in the classes that use online quizzes. If in-class quizzes take an average of ten minutes per quiz, ten quizzes over the course of the quarter adds up to 100 minutes of class time that can be used to further clarify concepts, engage students in higher-level learning activities, and allow students to extend their time giving and receiving feedback in peer workshops. The TAs who taught these classes confirmed that they usually adapted their lesson plans for students who took online quizzes to give students more time on activities, in workshops, and preparing and giving informal group speeches as part of in-class activities. This study is one in which we believe that the non-significant findings have important practical implications because they show that online quizzes are a valid alternative that can facilitate learning just as well as in-class quizzes.

However, the success of online quizzes depends on having a reliable LMS infrastructure that is not frequently down for maintenance, on students remembering to take the quizzes, and on students having reliable access to a high-speed internet connection to take the quizzes, all of which proved problematic when we attempted to replace in-class quizzes with online quizzes across our entire Basic Course. Despite these findings, we chose to continue to use in-class quizzes, which led to the third study in this sequence.

STUDY 3: NOTES VS. NO NOTES

As we conducted the first two studies described in this paper, we heard complaints from many students who claimed that they read the textbook and studied for hours, but could not remember the information when it was time for the quiz. It soon became apparent that many of our students did not know how to read the textbook or identify key concepts, which was not particularly surprising since we were working with a student population that was underprepared for college. Drawing on previous research on student notetaking, we decided to provide skeletal notes that students could fill in as they read the textbook to help guide them through the reading, keep them focused on their learning task, and help them learn to identify key concepts throughout the text. However, this raised an important question. Should we allow students to use their notes on the pre-class quizzes, assuming that doing so would motivate students to spend more time developing their notes and ultimately learn more because they would likely be spending more time on task? Or should we ban the use of notes during quizzes, assuming that student would learn more if quizzes gave students an opportunity to engage in effortful retrieval? To find out which process would facilitate greater learning, the following hypotheses were developed:

- H7: There is a difference in class preparation for students who are allowed to use notes on quizzes and students who are not allowed to use notes on quizzes.
- H8: There is a difference in Student Intellectual Stimulation for Students who are allowed to use

notes on quizzes and students who are not allowed to use notes on quizzes.

H₉: There is a difference in Cognitive Learning for students who are allowed to use notes on quizzes and students who are not allowed to use notes on quizzes.

H₁₀: There is a difference in Affective Learning for students who are allowed to use notes on quizzes and students who are not allowed to use notes on quizzes.

Procedures

Like the previous studies, this study used a quasi-experimental design in which students self-selected into groups when they enrolled in their Oral Communication course. However, students did not know that they were enrolling in sections that would be included in this study, so groups should be equal and approximate random assignment, and this again allowed us to collect data in a natural classroom setting. Six sections of Oral Communication taught by three instructors were selected to participate in this study. Each instructor was asked to allow students to use their skeletal notes on the reading quizzes in one section that they taught, but not in the other section. This was done to equalize any potential instructor effects between groups. Students were given seven quizzes throughout the quarter, and all of the sections included in this study gave the same quizzes.

Instrumentation

This study included one independent variable (Notes vs. No Notes) and four dependent variables (Student Intellectual Stimulation, Cognitive Learning, Affective Learning, and Class Preparation). Student Intellectual Stimulation and Affective Learning were included in this study so that we could capture additional dimensions of learning and engagement. Quiz, final exam, and final course grades were collected from instructors' final grade books, and all other measures were obtained using a voluntary in-class paper survey. Students who volunteered to participate received five extra credit points, which accounted for less than 1% of their total course grade.

Student Intellectual Stimulation Scale. This study used the short form Student Intellectual Stimulation Scale (SISS) which is a 10-item, self-report measure that uses a 7-point Likert format ranging from "never" to "always". Bolkan and Goodboy (2010) developed the SISS to measure intellectual stimulation in the college classroom. It is also an indicator of transformational leadership displayed by the instructor within the classroom. With regard to transformational leadership, this scale measures Teacher Confirmation, Nonverbal Immediacy and Teacher Accessibility. This scale includes items such as "My teacher uses unique activities to get the class involved with the course material," "My teacher stimulates students to help us get involved in the learning process in a variety of ways," and "My teacher wants me to think critically about what we are learning." The authors report a Cronbach's alpha scale reliability of $\alpha = .94$.

Cognitive Learning. Cognitive learning was measured in two ways. The first method was a self-report measure using Frymier and Houser's (1999) Revised Learning Indicators Scale, which was also used in Study 2. Cognitive learning was also measured using classroom performance-based measures of learning, including quiz scores, final exam grades, and final course grades.

Affective Learning Measure. The Affective Learning Measure (ALM) is a 7-point bipolar semantic differential scale (McCroskey, 1994). This measure includes four separate scales that ask students to rate their course or instructor on each of four items; for example, one of these scales asks students to rate the class content on the following bipolar semantic differential items: bad—good, valuable—worthless, unfair—fair, and positive—negative. There are two subscales included in this measure, affective learning and instructor evaluation, each of which includes eight items. For this study, we will use Affective Learning and Instructor Evaluation as separate measures. The authors report a Cronbach's alpha scale reliability of $\alpha = .90$.

Class Preparation Questionnaire. The Class Preparation Questionnaire was created by the researchers and asked students, "In a typical week, approximately how many minutes do you spend doing each of the following activities outside of class to prepare for your COMM 150 class?" for each of the items listed in Table 3.

Participants

A total of 142 students participated in this study. Of all of our participants, 37.3% (N = 53) were male and 62.7% (N = 89) were female. For ethnicity, 80.3% (N = 114) were Hispanic, 8.5% (N = 12) were Asian, 4.2% (N = 6) were African American, .7% (N = 1) were Caucasian, 2.1% (N = 3) were More Than One, 2.8% (N = 4) were Other, and 1.4% (N = 2) Preferred Not to Respond. The mean age was 18.61 years (N = 139, SD = .90), the mean G.P.A. was 3.12 (N = 139, SD = .59), and the mean for the number of terms enrolled in college was 2.76 terms (N = 132, SD = 1.50)

Results

The primary goal of this study was to find out whether there were differences on a variety of measures between students who were allowed to use their notes while taking quizzes and those who were not allowed to use their notes while taking quizzes. First, we wanted to find out how students prepared for class. T-tests were conducted to find out whether there were differences between the students who used notes and who did not use notes for each measure of preparation for class. Means and standard deviations for each measure are shown in Table 3. However, significant differences were found only for “Read the textbook while taking notes,” $t(135) = 2.21, p < .05$, and for “Review, organize, or revise my notes,” $t(93.27) = .94, p < .05$. For both of these variables, students who were allowed to use their notes on their quizzes spent more time engaging in those preparation activities.

Table 3
Time Spent Preparing for Class in Minutes per Week by Group

	Use notes			No notes		
	N	M	SD	N	M	SD
Read the textbook without taking notes	65	31.29	37.881	71	26.14	31.55
Read the textbook while taking notes*	65	49.85	37.52	72	34.53	42.99
Review, organize, or revise my notes*	66	36.35	41.44	73	19.75	20.67
Prepare, revise, and practice speeches	65	80.62	78.09	73	75.25	79.38
Work on other homework assignments	65	128.77	162.08	72	122.40	151.94
Take practice quizzes	61	6.61	14.29	72	3.82	8.20
Talk about the course material with others	65	23.94	33.77	72	18.68	33.00
Other	2	37.5	31.82	1	30	
Total Preparation	68	342.90	298.29	73	297.81	269.58

* Significant differences exist between groups

A chi-square was conducted to assess whether the use of skeletal notes or no skeletal notes on a quiz affects how students complete the given skeletal notes. The result of this test was significant, $\chi^2 (4, N = 100) = 11.016, p < .05$. Table 4 shows the valid percentages for each way students used their skeletal notes. In sum, both groups used the skeletal outlines heavily when preparing for class, but students who were allowed to use their notes on the quizzes were a little bit more consistent than those who were not allowed to use their notes in filling out their skeletal notes all or most of the time.

Independent-samples *t*-tests were conducted to find out whether there were differences in a variety of self-report outcome measures between students who were allowed to use their notes while taking quizzes and those who were not allowed to use their notes while taking quizzes. Table 5 shows the means and standard deviations for each group with respect to the four scale variables. There were no significant differences between groups on any of these variables; for the Student Intellectual Stimulation Scale, $t (133.15) = 1.65, p > .05$; for the Revised Learning Indicators Scale (cognitive learning), $t (136) = .879, p > .05$; for Affective Learning, $t (117) = .311, p > .05$; and for Instructor Evaluation, $t (117) = -.386, p > .05$. These results indicate that there is no difference in the ways that students perceive their learning and experiences in their class based on whether or not they are allowed to use their notes on quizzes.

Table 4
Skeletal Notes Used by Group

	Use Notes	No Notes	Total
I completely filled out the skeletal outlines every time there was reading assigned.	N = 38 57.6%	N = 29 42%	N = 67 49.6%
I usually filled out the skeletal outlines, but I left them incomplete or didn't fill them out at all a couple of times.	N= 23 34.8%	N=21 30.4%	N=44 32.6%
I completed about half of the skeletal outlines.	N=2 3.0%	N=7 10.1%	N=9 6.7%
I completed the skeletal outlines a couple of times, but left more incomplete or undone than I actually completed.	N=3 4.5%	N=6 8.7%	N=9 6.7%
I never filled out the skeletal outlines.	N=0 0%	N=6 8.7%	N=6 4.4%

Table 5
Outcome Scores by Group

	Use Notes			No Notes		
	N	M	SD	N	M	SD
Student Intellectual Stimulation Scale	67	59.40	10.12	72	56.17	12.94
Revised Learning Indicators Scale	67	31.43	6.70	71	30.44	6.62
Affective Learning	56	42.63	7.99	63	42.14	8.84
Instructor Evaluation	56	48.89	7.45	63	49.46	8.48
Quiz Grade	77	41.35	8.38	78	29.20	8.97
Final Exam Grade	77	74.58	8.84	78	78.26	8.41
Course Grade	77	423.51	33.07	78	414.40	36.16

Table 6
Correlations between Preparation and Student Self-Reported Outcome Variables

	Preparation	SISS	Cognitive Learning	Affective Learning	Instructor Evaluation
Preparation	$r = 1$	$r = .053$	$r = .279^*$	$r = -.032$	$r = .065$
SISS		$r = 1$	$r = .476^*$	$r = .438^*$	$r = .494^*$
Cognitive Learning			$r = 1$	$r = .413^*$	$r = .369^*$
Affective Learning				$r = 1$	$r = .585^*$
Instructor Evaluation					$r = 1$

* $p < .001$.

Next, independent samples *t*-tests were conducted to find out whether there was a difference in student performance on quizzes, the final exam, and the overall course grade. Students who were allowed to use their notes performed significantly better on the quizzes than students who were not allowed to use their notes, $t(153) = .107, p < .05$. However, students who were not allowed to use their notes on quizzes performed significantly better on the final exam than students who were allowed to use their notes on the final exam, $t(153) = -2.65, p < .05$. There was no significant difference between groups on final course grade, $t(153) = 1.64, p > .05$.

Bivariate correlations were run to find out whether there were relationships between preparation and the four student self-reported outcome variables: student intellectual stimulation, cognitive learning, affective learning, and instruction evaluation. The correlations are reported in Table 6. As should be expected, all four of the student self-reported outcome variables had significant positive correlations. However, Preparation was only significantly correlated with Cognitive Learning, $r = .279, p < .05$, but not with the other variables.

Summary and Discussion

This study focused on the effects of using notes or not using notes on quizzes with regard to several learning outcome variables. Results showed that students who used their notes on quizzes spent more time reading and taking notes prior to class and scored higher on the quizzes, but scored lower on the final exam than students who were not allowed to use their

notes on the quizzes. These results support the retrieval-induced facilitation hypothesis (Chan, McDermott, & Roediger, 2006) and suggest that quizzes that require students to recall studied material without the aid of their notes is a more powerful learning tool than additional study time and note use. It appears that students who took the quizzes without notes studied more efficiently, the process of recalling information during the quizzes strengthened the learning process, or both. This suggests that giving frequent quizzes on which students are not allowed to use their notes helps to facilitate deep learning. However, it is also possible that students who were allowed to use their notes on quizzes developed a false sense of security about their understanding of the course material. These students had slightly higher course grades prior to the final exam and might have felt more confident about their performance in the class, which could have resulted in them spending less time studying prior to the final exam. While our data did not investigate confidence prior to the final exam, this is something that should be considered in future research.

This is not to say that the skeletal notes were not helpful to the students who were not allowed to use them when they took their quizzes. As Table 4 showed, most students who did not get to use their notes on the quizzes still relied heavily on the skeletal notes that were provided in their workbook to help them prepare for class, even if some were slightly less diligent about completely filling out the notes prior to every class. This suggests that the skeletal notes were perceived as being helpful for all students, and since previous research indicates that skeletal or guided notes are valuable tools

for helping students learn (Austin, Lee, & Carr, 2004), we would recommend integrating such notes into other courses.

This study also showed that there is no significant difference between the two groups on all four self-reported variables, including Student Intellectual Stimulation, Cognitive Learning, Affective Learning, and Instructor Evaluation. Since these are highly interactive courses and were taught by the same instructors using the same lesson plans, this is actually a positive finding because it suggests that being allowed to or forbidden from using their notes on the quizzes did not have a substantial impact on their overall experience in or perceptions of the course.

CONCLUSION

This paper shares the results of a sequence of three studies that were conducted to help develop a course framework that would encourage students to prepare well for class, ultimately allowing our program to maximize student learning both in and out of class. Results showed that there was a clear benefit to using frequent quizzes, both in terms of motivating students to come to class prepared and in terms of allowing instructors to use class time for higher-order learning activities that would promote deeper learning. While our second study showed that online quizzes can be just as effective as in-class quizzes, we caution that the reliability of your campus or publisher's LMS is critical to the successful implementation of frequent online quizzes. Moreover, the results of our final study on the use of

notes during quizzes suggest that the retrieval-induced facilitation of learning is a powerful learning tool, which is a reason to rethink the use of online quizzes.

Nonetheless, online quizzes can potentially eliminate the need for classroom time and drastically reduce or even eliminate the time needed to grade quizzes so that students and teachers can garner the benefits of frequent quizzes without the drawbacks. While online quizzes give instructors less control over the actual quiz situation, allow students to look up answers in the textbook, and increase the risk that students will use the quizzes as a substitute for, instead of a supplement to, reading to prepare for class (Beyeler, 1998), they also increase in-class instructional time and reduce the grading load for instructors, and these advantages might possibly outweigh the advantages of retrieval-induced learning.

Additionally, providing skeletal notes to students before class gave students an additional learning resource, and as the results of our third study show, most students used the skeletal notes whether or not they would be allowed to use them later. This is an example of a simple innovation that can be implemented in a class that will not interfere with any other normal classroom activities or assignments, but could have lasting impacts on student learning, both in this course and possibly in the way that students approach learning in future courses. Future research should further investigate the impacts of taking notes prior to attending class.

One of the limitations of this study was that we used exam grades and other assignment grades as a proxy for learning since these served as performance-based measures of learning. We did not have the resources

available to do the type of robust assessment that is generally done during program review with external reviewers, and final course grade could not be used as a proxy for overall student learning since it would be influenced by grades on the quizzes or midterm exam in the first study (and to some extent in the second and third study). Since the final exam was carefully crafted each year to include both breadth and depth across content and levels of learning using the guidelines provided by Stiggins (2004), this was the most comprehensive measurement of learning that was available to us and was practical to implement. A future study should utilize a more comprehensive assessment protocol that includes the evaluation of portfolios of student work, including performances, by subject matter experts who serve as external evaluators.

In sum, based on the combination of these three studies, we strongly recommend that basic course instructors give frequent in-class quizzes that will encourage students to prepare for class and provide an opportunity for effortful retrieval, which will help embed the foundational knowledge in students' long-term memory. These quizzes should be designed to be taken quickly so that the bulk of the class time is spent on other engaging learning activities, and instructors should be deliberate about utilizing class time for activities that provide opportunities for application, analysis, synthesis, and evaluation instead of giving lectures that simply repeat what students already read and were quizzed on. Online quizzes should be seen as a viable second option if course constraints and instructor workload make it too difficult to do in-class quizzes, but future research should evaluate whether clickers or other technology

might allow instructors to harness the benefits of in-class quizzes while avoiding heavy grading loads and class time involved with using paper and pencil quizzes. Additionally, we would encourage instructors to talk with students about effective preparation and study strategies and to provide skeletal notes and/or other resources that will help students focus on key concepts as they prepare for class. Future research should also examine whether other class preparation resources, such as video lectures, learning modules, and workshops, might help students achieve even higher levels of learning before coming to class. This combination of quizzes and preparation tools will not only increase learning in the basic communication course, but it might also lay a foundation for student success throughout their remaining college career.

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