Attention During Lectures: Beyond Ten Minutes

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Many authors claim that students' attention declines approximately 10 to 15 min into lectures. To evaluate this claim, we reviewed several types of studies including studies of student note taking, observations of students during lectures, and self-reports of student attention, as well as studies using physiological measures of attention. We found that the research on which this estimate is based provides little support for the belief that students' attention declines after 10 to 15 min. Most studies failed to account for individual differences in attention. Our findings indicate that instructors should take into account individual differences in student attention when lecturing and determine whether students are recording the relevant content of the lecture in their notes.

Many articles and book on teaching indicate that students' attention declines in the first 10 to 15 min of a lecture. For example, Benjamin (2002) wrote "When the lecture begins, most students are paying close attention . . . [and] for most students that attention lasts for about 10 minutes" (p. 63). That estimate has been around for some time, having appeared in the eighth edition of McKeachie's *Teaching Tips* (1986) and in the current edition (McKeachie & Svinicki, 2006). Other authors have written that student attention during lectures tends to wane after approximately 10 to 15 min (e.g., Davis, 1993, p. 113; Goss Lucas & Bernstein, 2005, p. 63; Wankat, 2002, p. 68). Benjamin (2002) wrote that estimates of student attention are supported by research and cited the 10th edition of *Teaching Tips* (McKeachie, 1999), which stated, "Hartley and Davies' (1978) review of research on attention of students during lecture reports that attention typically increases from the beginning of the lecture to ten minutes into the lecture and decreases after that point" (p. 62).

In research on teaching there are few, if any, similarly precise parameter estimates, so the psychological scientist who teaches should be pleased to have this one. We were impressed by this finding and by the creativity of the research that must have produced it. Given authors' repeated use of the estimate (e.g., Benjamin, 2002; Davis, 1993; McKeachie, 1986, 1999) it seemed appropriate to examine its origins. What was the dependent measure, and how did researchers measure attention during a lecture without influencing the lecture itself as well as students' attention?

We searched for answers to these questions by pursuing the references to the research cited in support of the attention estimates and then examining references cited in those articles. We review the research beginning with *Teaching Tips* to discover the various methods used to obtain estimates of changes in students' attention during lectures. Finally, we offer conclusions about what researchers know regarding student attention during class and how this information might benefit faculty.

Note Taking

The evidence in McKeachie (1986, 1999) came from a review of the literature by Hartley and Davies (1978) that examined patterns in note taking during lectures, presumably an indicator of attention. Their review showed that the amount of notes written over the course of a lecture declined, but Hartley and Davies stated that although there may be decrements in attention and arousal during lectures these "decrements are unlikely to be apparent from students' notes" (p. 215).

Hartley and Davies (1978) cited two studies (Hartley & Cameron, 1967; Maddox & Hoole, 1975) showing that note taking is not necessarily indicative of student attention. Both studies examined how many notes students recorded during a standard lecture. The researchers divided the class period into time intervals (10-min intervals in Hartley & Cameron; 5-min intervals in Maddox & Hoole) and compared the amount of notes students recorded in each interval to the amount of information from the lecture. Both studies found that the amount of notes taken was fairly consistent throughout the lecture. Hartley and Cameron (1967) noted that, on average, students' notes reflected the points in the lecture that the instructor believed were most important and that differences between the lecturer and student notes depended on the context of

the lecture and students' attitudes toward note taking, rather than student fatigue. This conclusion implies that student attention did not decline. Hartley and Cameron found a decline in notetaking in the last 10 min of the lecture, but the decline was due to a reduction in content in the lecture itself. Maddox and Hoole (1975) also found a decline in note taking during the 30- to 35-min interval of the lecture and a wide range of individual variability in the amount of notes taken.

A PsycINFO search yielded a more recent study by Scerbo, Warm, Dember, and Grasha (1992), who examined the influence of time and cuing on note taking and retention of lecture material on an unfamiliar topic. Scerbo et al. kept the amount of information presented over time constant by dividing the lecture into information units, which also provided an effective means for scoring students' notes. The researchers randomly assigned students to receive written and verbal cues highlighting important information at various points in the lecture or to receive no cues. During the lecture, the amount of notes that students took declined, but retention of material did not. Students recorded written cues more than verbal cues and retained the information from written cues better than from verbal cues. Scerbo et al. concluded that when examining notes, student attention appeared to decline, but when measuring retention of material, attention during lectures seemed to be relatively stable.

Observation

A number of authors have cited several observational studies as evidence of a decline in attention. Although not an empirical study, many authors cite a paper by Lloyd (1968) as evidence of a decrement in attention (e.g., Bligh, 2000; Hartley & Davies, 1978; Penner, 1984; Scerbo et al., 1992; Stuart & Rutherford, 1978). Lloyd hypothesized that the amount of information assimilated by students depends on two factors: the teacher's transmittal performance and the receptivity of the student. Lloyd based his conclusions on a compilation of his personal observations of students' behavior in class (i.e., restlessness), his evaluation of his performance as a lecturer, and comments from his colleagues regarding their experiences. Based on these observations and discussions, Lloyd plotted a hypothetical curve of students' receptivity over time, showing that receptivity is greatest in the first 5 min of a lecture, begins to decline after 10 min, and increases again about 45 min into a 50-min lecture. Lloyd hypothesized that the increase at the end of the lecture occurs because students know that the lecture is about to end.

To determine the pattern of inattentiveness during lectures and its relation to lecture style, Johnstone and Percival (1976) analyzed observations from two independent observers who each attended 12 lectures. Johnstone and Percival broadly defined a break in attention as "a period of general lack of concentration involving the majority of the class, and not merely isolated individuals" (p. 49). Results indicated a period of low attention at the start of the lecture with the next lapse in attention occurring 10 to 18 min later. However, the rate of decline in attention varied quite a bit across classes and instructors. Johnstone and Percival's study has the advantage of greater reliability and objectivity as compared to Lloyd's (1968) work given that two independent judges observed students. However, Johnstone and Percival did not provide reliability correlations for the judges nor did they report data on individual variation in student attention.

Frost (1965) reported a firsthand account of his responses and those of others at the presidential address of the British Association for the Advancement of Sciences. Frost noted that about 10 min into the address his attention had wandered and some people in the audience had closed their eyes. Approximately 15 min into the lecture, 10% of the audience was showing signs of inattention, and after 35 min everyone was inattentive. Frost based his observations of inattention on the fact that many members of the audience were fidgeting and whispering during the lecture. Frost certainly seems to have witnessed signs of inattention in himself as well as the rest of the audience, but his observations were not based on valid and reliable measurement.

Retention

McLeish (1968) discussed the work of Trenaman, who found that as the length of a lecture increased, the proportion of material remembered by students decreased. In Trenaman's studies, students listened to a 45-min recorded talk and then took a recall test on the material in the lecture. The recall test, given immediately after the lecture, consisted of recognition items, free recall, and true–false items. Trenaman found that students listening to only the first 15 min of a lecture retained approximately 41% of the material, students listening to 30 min retained 25%, and those listening

to 40 min retained only 20% of the material (McLeish, 1968).

In what he labeled the Norwich experiment, McLeish (1968) attempted to replicate Trenaman's results with a live lecture. McLeish had participants attend a live lecture for 25, 40, or 50 min. Participants completed a test of retention immediately after the lecture that consisted of multiple-choice, true–false, matching, and paragraph completion items. There were no differences in retention between the groups. Across the groups, individuals retained between 40% and 46% of the material in the lecture. McLeish's results were consistent with Scerbo et al.'s (1992) findings regarding stability of retention.

Self-Report

Stuart and Rutherford (1978) collected reports of concentration levels at 5-min intervals from 1,353 students attending 12 50-min lectures given by four different lecturers. Calculations of the mean level of concentration for each 5-min interval indicated that the maximum level of concentration was achieved between 10 and 15 min from the start of the lecture. Stuart and Rutherford did not measure retention and learning of the lecture material, so it is unclear from their results whether the observed decrease in concentration may have adversely affected retention and learning of the material. They observed the same general pattern of concentration across the 12 lectures but with considerable variability across instructors. There were greater differences in concentration between lecturers than between lectures given by the same person. The authors did not provide information regarding individual variability among the students.

Physiological Measures

Bligh measured heart rate in 4 students during a lecture as an indicator of arousal, which is one component of attention (Bligh, 2000, p. 49; personal communication, March 15, 2005). He observed a decline in heart rate during the 40-min lecture. However, he noted that, like others (e.g., Scerbo et al., 1992), he was unable to confirm a decrement in student attention as indicated by objective measures of learning. In fact "using an immediate test, learning in the last twenty minutes seemed superior" (Bligh, 2000, p. 51).

Discussion

Many of the sources we cited presented the estimate of attention span during lectures in the context of a critique of the teacher-centered lecture and described ways in which to vary class presentations to maintain student interest. The 10-min span seems to be a straw parameter to be knocked down by visual aids and active learning techniques. We became interested in this topic when we wondered how researchers could have discovered when students were paying attention during lectures. It turns out that the research concerned attention only indirectly or not at all and that several frequently cited sources were not empirical studies, but secondary sources or personal observations. The six empirical studies that we did find concerned either students' note taking or observations of students' behavior during lecture classes.

There was no consistent pattern across studies in note taking during lectures. There probably is a reduction in the amount of notes recorded, but retention of lecture material was not related to note-taking patterns (e.g., Scerbo et al., 1992). Although some higher education research indicates that the completeness of students' notes is indicative of learning (Armbruster, 2000), the studies we reviewed did not show a relation between retention and the amount of notes taken. More important, the note-taking studies reviewed here do not appear to support the assertion that attention declines in the first 10 to 15 min of a lecture. It is possible, too, that the relevant content of the information coming from the lecturer may be declining over the course of the lecture, which would lead to a decline in note taking (Lloyd, 1968).

The observational research shows that there are changes in other behaviors that occur during lectures that might be related to a decline in attention. Researchers use behaviors such as fidgeting, doodling, yawning, and looking around as indicators of inattentiveness (e.g., Frost, 1965; Johnstone & Percival, 1976). However, it is possible that these behaviors could also be indicative of attempts to maintain attention. Students looking around the classroom or looking away from their notes could be thinking about the material that the instructor is presenting, and fidgeting could be an attempt to increase arousal. Perhaps the observed behavior is simply a physical reaction to the discomfort of most lecture hall seating.

The self-report and physiological studies also failed to support the decrement in attention. Stuart and Rutherford (1978) found a decline in self-reports of

concentration; however, there was more variability across instructors than within, suggesting that the delivery of the lectures may be contributing more to the decline than an overall lack of attention on the part of students. Bligh's (2000) heart rate study showed a decline in arousal, but this change was not related to learning. Physiological arousal may naturally decrease as students adapt to the classroom environment but this change may not be enough to affect retention.

Many of these studies also suffer from methodological problems. They relied on subjective observations of students' behavior, but did not give reliability estimates. Additionally, they failed to take into account individual differences, relying solely on group differences and ignoring within-group and within-student variance.

The research reviewed here does raise interesting questions about students' cognitive processing during class. What are they thinking? The answer to that question depends on a multitude of situational and dispositional variables, some of which are under the control of the teacher.

In relation to dispositional variables, Kahneman's (1973) unitary-resource model of attention argued that there is a limit to how much mental effort an individual can devote to a task. The capacity of one's attention varies with the level of arousal of the individual, with capacity being best at moderately high levels of arousal and with how one evaluates the demands of a particular situation. In the classroom, students who are motivated by the demands of the classroom situation to pay attention and who are sufficiently aroused can sustain prolonged attention during lectures.

The ability to maintain prolonged attention is closely tied to working memory. Nairne (1996) defined working memory as the mechanism that maintains short-term memories in an active state and underlies much of an individual's task-related cognitive processing, including maintenance of attention. The information processing that occurs during classroom tasks resembles a large working memory task (D. J. LaVoie, personal communication, March 21, 2005). Students receive information from the instructor and must hold the information long enough to record it in their notes or do whatever else they need to do with it. Whether students will be able to maintain their attention in class depends on their working memory capacity as well as their motivation and arousal (Pashler, 1998).

Attention probably also is affected by the presentation of the lecture material, something under the control of the teacher. Differences in student attention exist across instructors (see Johnstone & Percival, 1976) in part because instructors vary in their style of lecturing. More students will maintain interest for a longer time when the topic is interesting and delivered with clarity, enthusiasm, and drama, with a cognitive break every now and then (Bligh, 2000).

Classroom cognition involves much more than attention, however researchers choose to define it. We recognize that it is difficult to impose experimental control in actual classroom situations. For this reason it is surprising that there are so few laboratory studies of attention during a lecture. Bligh's (Bligh, 2000, p. 49) work measuring heart rate responses during lectures seems to be the closest measure of attention during class, although his work was carried out with a small sample (D. A. Bligh, personal communication, March 15, 2005). Extending Bligh's work in a laboratory setting seems the logical next step in understanding students' attentional processes during lectures. For example, future studies could examine students' physiological arousal in terms of indicators such as heart rate and EEG during lectures to see if there is a general pattern of decreased arousal. Such work could look for general patterns of physiological arousal as a function of attention-maintaining methods and examine individual variability in physiological responses during lectures.

When teachers evaluate the effectiveness of their lectures, they should find out what students put in their notes. Are they recording relevant content or misinformation with an organized structure? A good teacher who lectures would help students develop efficient note-taking skills that promote transfer to long-term memory. In addition, teachers should consider the purpose of the lecture. If the purpose is solely to transmit information, then lecturing can be an effective method (Bligh, 2000), and it would behoove instructors to follow the suggestions of the many books on teaching (e.g., Forsyth, 2003; McKeachie & Svinicki, 2006). However, if the objective is critical thinking, then teachers probably should be doing more than just lecturing.

Conclusion

It is clear that students' attention does vary during lectures, but the literature does not support the perpetuation of the 10- to 15-min attention estimate. Perhaps the only valid use of this parameter is as a rhetorical device to encourage teachers to develop ways to maintain student interest in the classroom. If psychologists and

other educators continue to promote such a parameter as an empirically based estimate, they need to support it with more controlled research. Beyond that, teachers must do as much as possible to increase students' motivation to "pay attention" as well as try to understand what students are really thinking about during class.

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Notes

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