Live Lecture Versus Video-Recorded Lecture: Are Students Voting With Their Feet?

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Abstract

Purpose
In light of educators' concerns that lecture attendance in medical school has declined, the authors sought to assess students' perceptions, evaluations, and motivations concerning live lectures compared with accelerated, video-recorded lectures viewed online.

Method
The authors performed a cross-sectional survey study of all first- and second-year students at Harvard Medical School. Respondents answered questions regarding their lecture attendance; use of class and personal time; use of accelerated, video-recorded lectures; and reasons for viewing video-recorded and live lectures. Other questions asked students to compare how well live and video-recorded lectures satisfied learning goals.

Results
Of the 353 students who received questionnaires, 204 (58%) returned responses. Collectively, students indicated watching 57.2% of lectures live, 29.4% recorded, and 3.8% using both methods. All students have watched recorded lectures, and most (88.5%) have used video-accelerating technologies. When using accelerated, video-recorded lecture as opposed to attending lecture, students felt they were more likely to increase their speed of knowledge acquisition (79.3% of students), look up additional information (67.7%), stay focused (64.8%), and learn more (63.7%).

Conclusions
Live attendance remains the predominant method for viewing lectures. However, students find accelerated, video-recorded lectures equally or more valuable. Although educators may be uncomfortable with the fundamental change in the learning process represented by video-recorded lecture use, students' responses indicate that their decisions to attend lectures or view recorded lectures are motivated primarily by a desire to satisfy their professional goals. A challenge remains for educators to incorporate technologies students find useful while creating an interactive learning culture.

Acad Med. 2008; 83:1174–1178.

Traditionally, educators have assumed lecture attendance during the preclinical years of medical school to be the norm. Students attend class at appointed times and take copious notes as professors lecture in vast auditoriums. Indeed, despite trends toward small-group and problem-based learning,[1,2] a review of the Association of American Medical Colleges' Curriculum Management and Information Tool indicates that virtually all medical schools continue to use lecture as an important pedagogical component of their preclinical curricula.[3]

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Many medical schools also provide video recordings of lectures, allowing students the option of attending a live lecture or watching recorded lecture material online at the students' convenience.[4] In addition, video-acceleration technology has become available in recent years, and now some schools offer access to video-accelerating software.[4–6] These tools allow students with varying knowledge levels[7] and learning styles[8] to watch recorded lectures at their own speeds, from a fraction of the normal speed to two and a half times the original rate, without distorting the pitch of the lecturer's voice. In institutions where lecture attendance is not mandatory, these technologies create a free-market environment enabling students to vote with their feet to attend lectures live, to watch lectures online, or to skip lectures entirely.

Limited research exists on students' experiences with, preferences for, and reactions to lecture[9,10] and technological innovations[11–14] and only cursory studies of accelerated video exist.[5,6] Much of the research concerning the use of technology in education has focused on introducing methods such as video conferencing,[15] Web-based learning,[11–13] and audience response systems.[16] Although some of these technologies substitute for lecture,[14,15] they typically serve to supplement live lectures.[11–13] However, the academic medicine community has conducted very little systematic research on (1) how offering alternative lecture-viewing options affects students' attendance at traditional live lectures or (2) students' perceptions of the relative utility of live versus recorded lecture.

In light of educators' speculations about declining lecture attendance and its impact on various student outcomes,[9,17] we sought to provide evidence about the beliefs of medical students concerning live and accelerated, video-based lectures. In particular, we report students' responses to a survey directed at understanding the following:

- the impact of accelerated, video-recorded lectures on live lecture attendance,

- the reasons for students' attendance decisions,

- the ways in which students use their time, and

- students' perceptions of the value of accelerated, video-based lectures.

Method

We performed this study at Harvard Medical School (HMS) in May and June 2007. At HMS, all preclinical lectures are recorded and posted online, and, since the fall of 2006, HMS has provided students with the video-accelerating technology, 2xAV. This technology provides students the ability to vary the speed of a recorded lecture from one-third to two-and-a-half times the original rate, while still keeping voices intelligible, and to pause, fast forward, and rewind videos as needed. The 2006–2007 HMS Student Handbook indicates that attendance at tutorials and other small-group activities is "required," whereas attendance at "lecture and other large group experiences" is "expected." Given the availability of recorded lectures and video-accelerating technology and the absence of attendance-taking measures, HMS students generally feel that they have the option of choosing between attending live lectures and watching lectures online.[4]

We surveyed first- and second-year students at HMS, which includes both medical and dental students, all of whom take the same preclinical curriculum at Harvard. We conducted the survey at the end of the academic year, when all students had experienced at least one full year of the curriculum. We contacted students three times via e-mail with a link to an online server (SurveyMonkey®). The e-mail cover letter identified one of us (S.C.) and explained the purposes of the survey (outlined above). In addition, one of us (S.C.) announced the project at the beginning of both a first- and a second-year lecture. The HMS/Harvard School of Dental Medicine Committee on Human Subjects Institutional Review Board approved the instrument and its distribution. The participants provided their consent when they accessed and completed the online questionnaire; they received no compensation.

The questionnaire contained 35 Likert-style and multiple-choice items, some of which were previously validated by Williams and Deci,[18] and several free-response questions. In particular, it

included the Perceived Competence Scale, which asks about students' confidence comparing two learning methods.[18] In our survey, we used this scale to assess students' confidence in their own knowledge after attending a live lecture compared with after viewing a recorded lecture. In addition to demographic information (Table 1), the survey addressed the frequency of live lecture attendance and video-recorded lecture use, students' behaviors regarding recorded lecture technologies, and perceived advantages of both live lecture attendance and video-recorded lecture. Questions that asked students to provide reasons for their behaviors and attitudes presented students with a set of comprehensive choices (Table 2), asking them to choose as many as apply as well as their most important reason for

Table 1

Self-Reported Demographic Information of First- and Second-Year Students From Harvard Medical School and Harvard School of Dental Medicine Who Responded to a Survey Collected in May–June 2007[*]

Demographics	No. (%)
Gender	
Female	117 (60.0)
Male	78 (40.0)
Total	195 (100)
Student class year	
First year	119 (61.3)
Second year	75 (38.7)
Total	194 (100)
Degree seeking	
MD	159 (81.5)
DMD	36 (18.5)
Total	195 (100)
Undergraduate major	
Life sciences	100 (51.3)
Social sciences	38 (19.5)
Humanities	25 (12.8)
Physical and mathematical sciences	16 (8.2)
Engineering and technology	13 (6.7)
Fine arts and communications	2 (1.0)
Health and human performance	1 (0.5)
Total	195 (100)

[*] Of the 353 students contacted, 204 returned valid questionnaires for a response rate of 58%. Not all respondents answered all questions; only 195 students provided demographic information. Of those, one student did not indicate class year.

attending live lecture, for replacing class time with personal learning time, and for using video-accelerating technologies. Students also indicated the most important ways they utilize the time saved by watching accelerated, video-recorded lectures. Other questions asked students to indicate whether they were more successful in accomplishing various personal goals and learning objectives using accelerated, video-recorded lecture or live lecture (Table 3). The survey required approximately 6 to 10 minutes to complete.

We calculated frequencies, mean values, and, where appropriate, chi-square comparisons, F tests, and t tests using SAS software (version 9.1). To account for multiple comparisons, we calculated a Bonferroni-adjusted significance level of 0.0012. For this reason, we considered P values less than .0012 to be significant.

Results

Of the 353 students contacted, 204 students (58%) returned valid questionnaires. Table 1 presents demographic data for the respondents. In our sample, females and social science majors are somewhat overrepresented; however, this is not a serious threat to the validity of our findings because gender and major show little association with students' responses. In addition, we also found no clear or consistent differences between the responses of first- and second-year students, and therefore we analyzed the data of all students together.

When respondents' live and recorded lecture viewing patterns were averaged, the 189 students responding to this question collectively indicated watching 57.2% of lectures only live, 29.4% only recorded, and 3.8% using both methods. Additionally, students did not view 9.6% of lectures in either form. On average, this indicates that the students view recordings of 75.4% of the lectures they have not attended. When asked to generalize their attendance habits, of the 203 students who answered this question, 97 (47.8%) said they regularly attend live lectures, 69 (34.0%) stated their attendance varies, and 37 (18.2%) reported that they rarely attend live lectures. All students (100%) stated they have viewed a recorded lecture, and 88.5% (169/191 students) reported they

Table 2

Self-Reported Reasons for Behavior Regarding Live Lectures Versus Accelerated, Video-Recorded Lectures Viewed Online Among First- and Second-Year Students at Harvard Medical School and Harvard School of Dental Medicine[*]

Behavior or reason for behavior	No. (%) of students
Most important reason for attending live lecture[†]	
Not motivated to watch the recorded lectures on my own	55 (27.8)
To show professionalism and respect for the instructor	35 (17.7)
To talk with classmates	23 (11.6)
So I feel like I am getting more out of my tuition	21 (10.6)
I learn better live	15 (7.6)
Not applicable; I rarely attend live lecture	13 (6.6)
To ask questions and hear those of my classmates	9 (4.5)
More fun/leisurely way to learn	8 (4.0)
Good lecturer	5 (2.5)
To actively participate and/or feel involved	4 (2.0)
Other (to keep a schedule; harder to see/technical issues when online; guilt; electure is immediately useful)	10 (5.1)
Total	198 (100)
Most important reason for replacing class time with personal learning time[‡]	
So I can use learning methods that work better for me	44 (21.7)
Because it allows me to watch the lectures at any time of day/structure my day to improve my productivity/sleep	41 (20.2)
To watch lectures at my own pace	41 (20.2)
So I can set my own learning priorities	28 (13.8)
Not applicable; I attend nearly all live lectures	24 (11.8)
To allow me time to develop into a more balanced person	19 (9.3)
To set my own priorities	6 (3.0)
Total	203 (100)
Most important reason for using the speed-changing feature when viewing video-recorded lectures[§]	
To save time (more efficient)	101 (63.1)
To watch lecture segments I didn't understand or missed	21 (13.1)
To focus better	16 (10.0)
To pause to look up information	11 (6.9)
To increase how much I learn	6 (3.8)
To improve retention	5 (3.1)
Total	160 (100)
Most important activity that occupies time saved from viewing accelerated, video-recorded lectures[¶]	
Study other material	37 (24.2)
Sleep in, rest, or relax	37 (24.2)
Periodically stop 2xAV to take notes	30 (19.6)
Get involved in service, leadership, and research	18 (11.8)
Look up information on something from lecture	9 (5.9)
Spend it with friends or family	9 (5.9)
Exercise	7 (4.6)
Periodically stop 2xAV to ponder hard concepts	6 (3.9)
Total	153 (100)

[*] Of the 353 students contacted, 204 returned valid questionnaires for a response rate of 58%. Not all respondents answered all questions.
[†] Only 198 students answered this question.
[‡] Only 203 students answered this question.
[§] Only 160 students answered this question.
[¶] Only 153 students answered this question.

have used the video-accelerating 2xAV technology at least once. They rated the utility of video-accelerating technology a mean of 6.02 on a 7-point scale (1 = not useful, 7 = very useful).

As indicated in Table 2, 198 students provided their most important reason for attending live lectures: 55 (27.8%) reported that the most important reason they attend live lectures is because they lack motivation to watch video-recorded lectures on their own; 35 students (17.7%) said they attend live lectures primarily to show professionalism and respect for the lecturer; and 23 (11.6%) stated that their main motivation for attendance is a desire to converse with fellow classmates. Only 9 (4.5%) indicated that asking questions is the most important reason for their attendance at live lectures.

Of the 203 students who answered the question concerning their most important reason for not attending live lectures, 44 students (21.7%) said they prefer to use learning methods they feel work better; 41 (20.2%) reported that their primary reason for nonattendance at live lectures is scheduling flexibility (e.g., an ability to watch lectures at any time of day, to structure their day to improve productivity, or to sleep). In addition, 41 students (20.2%) reported that they value the ability to watch lectures at their own pace, and 28 (13.8%) reported that they prefer setting their own learning priorities.

By far, the most popular self-reported reason students use accelerated video technologies is to save time. One hundred one of the 160 students (63.1%) responding to this question cited saving time as their most important reason for viewing video-recorded lectures. The next most common reasons are to watch lecture segments they missed (21 students; 13.1%), to improve focus (16; 10%), and to stop a lecture to look up information (11; 6.9%). Students reinvest time saved from watching accelerated, video-recorded lectures in a variety of ways. The two most common time uses, according to the 153 students who answered this question, are (1) to study other material (37 students; 24.2%) and (2) to sleep in, rest, and relax (37; 24.2%). Other important uses of saved time are to stop the lecture to take notes (30; 19.6%) and to get involved in

Table 3

Comparison of Satisfaction of Learning Goals From Live Versus Accelerated, Video-Recorded Lecture (2xAV™) Among First- and Second-Year Students at Harvard Medical School and Harvard School of Dental Medicine*

Variable	Better with 2xAV™ than live lecture, no. (%)	As well with 2xAV™ as live lecture, no. (%)	Better live than with 2xAV, no. (%)	P value
Speed of knowledge acquisition	127 (79.4)	10 (10.0)	17 (10.6)	<.001
Ability to find time for other activities	115 (73.7)	28 (18.0)	13 (8.3)	<.001
Propensity to look up additional information	107 (67.7)	37 (23.4)	14 (8.9)	<.001
Ability to manage stress	103 (66.0)	38 (24.4)	15 (9.6)	<.001
Ability to stay focused	103 (64.8)	14 (8.8)	42 (26.4)	<.001
Quantity learned	102 (63.8)	27 (16.9)	31 (19.4)	<.001
Ability to retain information	78 (49.4)	41 (26.0)	39 (24.7)	<.001
Motivation to study	71 (45.2)	48 (30.6)	38 (24.2)	.004
Interest in the subject	61 (38.9)	47 (29.9)	49 (31.2)	.334

* Of the 353 students contacted, 204 returned valid questionnaires for a response rate of 58%. Not all respondents answered all questions. Different numbers of students, ranging from 154 to 160, answered this set of questions.

service, leadership, and research (18; 11.8%).

Students using the 2xAV technology view lectures at an average speed of 1.67 times the original rate, which potentially allows students to watch a 60-minute lecture in 36 minutes. Students reported watching lectures faster when they find lecture material to be familiar (1.91 times regular speed, N = 156 respondents) versus unfamiliar (1.50, N = 157), simple (1.95, N = 156) rather than difficult (1.33, N = 156), or not relevant (2.12, N = 146) versus relevant (1.61, N = 150). The differences between familiar and unfamiliar, simple and difficult, and relevant and not relevant were all significant ($P < .0001$).

When asked why they like using accelerated, video-recorded lectures, students reported an increased ability to watch lectures before becoming tired. Students (N = 164) reported they can watch a mean of 2.6 recorded one-hour lectures per day before tiring versus 1.9 live one-hour lectures (N = 160, $P < .0001$). Furthermore, students reported feeling confident that they are able to learn the necessary material watching accelerated, video-recorded lectures instead of live lecture. Students (N = 159) rated their ability to learn the necessary material at 5.8 on a 7-point scale (1 = not confident; 7 = very confident).

When asked to directly compare the utility of accelerated, video-recorded lecture and live lecture, students rated accelerated, video-recorded lectures as equal or superior in all qualities. Table 3 provides the number of students who indicated that recorded lectures help them to perform better than, as well as, or not as well as live lectures for each of nine academic and personal variables. In particular, 79.4% of students reported feeling that accelerated, video-recorded lectures are superior in terms of speed of knowledge acquisition, 73.7% said video-recorded lectures provide them with more time for other activities, and 67.7% indicated that they are more likely to look up additional information when using video-recorded lectures (all $P < .0001$). Further, 66.0%, 64.8%, and 49.4% of students felt video-recorded lectures help them, respectively, manage stress, stay focused, and retain information (all $P < .0001$) better than live lectures.

Discussion

Although recorded lectures were provided by educators and readily accessible, those preclinical students who responded estimated that they still attend 61% of the lectures offered (a mean of 57.2% viewed live only plus 3.8% viewed both live and recorded). The most important reasons students cited for attending live lectures (those indicated by more than 10% of the sample) are a lack

of motivation to watch recorded lectures, to show professionalism and respect for the instructor, to talk with classmates, and to feel as if they are getting more for their tuition money. Although sometimes cited as benefits of live lectures, relatively few students selected talking with the lecturer, asking questions, and hearing questions of classmates as most important in their attendance decisions.

Although students indicated that they attended the majority of the lectures live, we did find that responding students viewed a substantial proportion of their lectures (29.4%) only on video. The fact that students viewed only 3.8% of their lectures using both methods indicates that, generally, they are not using video-recorded lectures as a supplement to live lecture attendance, even though some schools may supply the technology on the basis of this assumption. When students directly compared live lectures and accelerated, video-recorded lectures, they indicated consistently that their needs were better satisfied using accelerated video technology, as denoted by their feelings that they were more likely to improve their speed of knowledge acquisition, find time for other activities, look up additional information, manage stress, stay focused, watch longer, learn more, and retain more using accelerated, video-recorded lectures compared with live lectures.

When students chose not to attend live lectures, they instead used personalized learning methods, reorganized their time to improve productivity, watched lectures at their own pace, or set individualized learning priorities. Consistent with prior findings[9] that students make deliberate decisions on why and when to attend lectures on a case-by-case basis, the students in this sample seemed to be making conscious decisions on how to use technology (i.e., they watch faster when the subject is familiar, simple, or less relevant to them).

Clearly, students use accelerated, video-recorded lectures to save time, as suggested by an average video-recorded lecture viewing speed of 1.67 times the lecturer's original speed. Although students reported that they use some of the extra time created for personal activities (e.g., sleeping in, spending time with friends, exercising), the majority of respondents (65.4%) reinvest this time in

school-related pursuits: studying other material, stopping the recording to take notes, looking up information, pondering difficult concepts, or getting involved in service, leadership, or research.

Limitations

A principal weakness of relying on student ratings is that their perception of value may not reflect actual value. Although students may believe they learn and retain information better when using accelerated, video-recorded technologies, only further research directed toward testing learning outcomes can establish whether these benefits are real and significant or merely perceived. A concern that students may be overestimating the value of educational technologies, however, must be weighed against the findings of studies that found that students typically tended to underestimate the value of technology.[12,13] Second, this is a study of a single school that may not accurately represent all medical schools. Future studies, multiinstitutional as well as longitudinal, are needed both to further elucidate students' attitudes and behaviors and to provide a systematic understanding of faculty perspectives on these issues. Finally, the participants' reported responses of their actual behaviors may be subject to recall and social desirability biases.

Implications

Despite these limitations, our findings present a strong and consistent pattern that the survey respondents find accelerated, video-recorded lectures both useful and effective and that they prefer recorded to live lectures for a variety of reasons. In light of these findings, medical educators looking to an increasingly technological future must ponder several questions: What functions can or should live lecture play, not only in imparting knowledge, but also in the culture of medical school? Should lecture attendance be optional or required, and what would be lost if live lecture became

the dinosaur of medical education? Rather than thinking of the issue in terms of either–or, those who find value in the classroom lecture need to ask how they can refine the traditional lecture to make it more beneficial for all students, perhaps by providing students more live, interactive learning opportunities. Instead of fighting technology, it is possible to incorporate it into lectures— for instance, using audience response systems.

Notwithstanding these concerns, our data suggest that students find value in accelerated, video-recorded lecture technologies and that the reasons behind their decisions to forego lecture attendance hardly suggest a lack of commitment to learning or a lack of concern for professionalism. By giving students the opportunity to watch accelerated, video-recorded lectures, medical educators provide students with flexibility to maintain academic and personal priorities and may more effectively teach students with varying knowledge levels, learning styles, or learning disabilities. A discussion of how to design lectures that satisfy goals for student learning and professionalism, as well as how to satisfy the desire for community in medical education, is beyond the scope of this study. However, technology will only expand, and students will continue to take advantage of that technology; therefore, there is a definite need to grapple with these matters, because our data suggest that, when given the option of attending lectures versus watching video-recorded lectures, students are likely to continue to vote with their feet.

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