Lecture-Recordings: A solution for students of psychology as a minor subject?

Tatjana Spaeth-Hilbert, Tina Seufert, Stefan Wesner

Ulm University, Germany

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Students of psychology as a minor subject often face the problem that they cannot attend psychology lectures as they coincide with courses in their major field of studies. A solution for these students might be lecture-recordings. In two field experiments, students' learning outcome in live-lectures and low-effort lecture-recordings did not differ. In experiment 1 students were able to choose whether they attended the live-lecture or watched the lecture-recording. Though fewer students than usually attended the live-lecture, the results show that also students who do not attend class regularly could be reached by the lecture-recording. In experiment 2 students were randomly assigned to the groups. As a result, many students did not behave cooperatively. Taking the comparable learning outcome in a low-effort lecture-recording and the result concerning students' participation into account, we encourage teachers to use lecture-recordings and, therefore, give their students the chance to choose between live-lecture and recording.

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1 Introduction

As university teachers of psychology, we are faced with two groups of students. Those with a major in psychology usually are highly motivated. They are seldomly hindered by organizational problems in attending class. The second group of students university teachers of psychology are faced with consists of students whose major lies in another field of studies, for example, in teaching, media and computing, or computer sciences. These students are required to earn course credits in psychology, however, their main interests typically lie in their major field of studies. Thus, many of them may not be very motivated to attend live-lectures in psychology. Additionally, some students cannot regularly attend the live-lecture as required courses in their major subject overlap with the psychology lecture due to misaligned curricula. These students depend on alternatives. One such alternative might be to offer lecture-recordings.

More and more university teachers are recording their lectures live or are producing e-lectures in their office or even in a studio. Recorded lectures are distributed via learning management systems, websites or iTunes U (O'Bannon *et al.*, 2011). Reasons for this development surely are the generally increasing use of technology in education but also that many students demand for lecture-recordings from their university teachers.

Lecture-recordings allow students to study independently of time and space (Dewhurst & Williams, 1998). This offers chances especially for students who cannot attend courses because of illness, family commitments, or organisational reasons (O'Bannon *et al.*, 2011). As Griffin, Mitchell, and Thompson (2009) state, positive aspects of e-learning material like lecture-recordings are that students can choose where they learn, when they learn, how much time they invest in learning, and which resources they use for learning. Therefore, lecture-recordings support self-regulated learning (Rosen *et al.*, 2010). Students might follow the recorded lecture in their own pace, are able to stop the recording to take notes or read up on a topic, or to discuss with fellow students. Also, lecture-recordings offer a level of freedom to students, which is a pre-condition for intrinsic motivation (Deci & Ryan, 1985; Sha *et al.*, 2012).

Though many students demand for lecture-recordings, it is less clear whether learning outcome is not compromised. As lecture-recordings and live-lectures have important differences, it is difficult to research this question (Dewhurst & Williams, 1998). For example, lecture-recordings enable students to stop and replay and allow a rather individual learning experience. While this is not possible for live-lectures, in live-lectures students can ask questions and discuss with co-learners and their university teacher. Furthermore, the teacher can react on the questions by changing priorities and focus of the lecture ad-hoc. While these differences between lecture-recordings and live-lectures cannot

be compared or controlled in experimental studies, they are at the same time the characteristic traits of both lecture types that make studies on this question particularly interesting for practitioners.

Studies on learning differences between lecture-recordings and live-lectures show that students are convinced that the electronic delivery of learning materials facilitates their learning outcome (e.g., Glowalla, 2008; Holt *et al.*, 2001). Studies that measured learning outcome with tests show varied results. Dewhurst and Williams (1998) and O'Bannon *et al.* (2011), for example, found comparable learning outcomes in live-lectures and lecture-recordings. Stephenson *et al.* (2008) confirmed students' impression of better learning results with lecture-recordings compared to live-lectures. Interestingly, the advantages of lecture-recordings for learning outcome in this study were stronger for those learning goals that – according to Bloom's (1956) taxonomy of educational objectives – are more complex. Maki and Maki (2002) found out exactly the contrary that lecture-recordings were only advantageous for learning goals on the knowledge level but not for more complex learning goals. Other researchers point out that learning outcome depends substantially on the technical and didactical preparation of the lecture-recording (e.g., Baeßler *et al.*, 2003) and the way students learn with a lecture-recording (Fernández *et al.*, 2009).

In practise, students do not only use lecture-recordings as an alternative to attending the live-lecture. In a study by Glowalla (2008), for example, 60% of the students used the lecture-recording additionally to attending the live-lecture. Only 13% used lecture-recordings as an alternative to the live-lecture. Similar results have been attained by Brotherton and Abowd (2004) who found that most students planned to use lecture-recordings in addition and not as an alternative for live-lectures. Such a combination of lecture-recordings and live-lectures could mean that students use the recorded lecture for follow-up course work. Should a record be available before the live-lecture, students might also use the recording to prepare for the live-lecture (O'Bannon *et al.*, 2011). In a study by Glowalla (2008), learners attained better results in an exam when they had used lecture-recordings additionally to attending the live-lecture compared to those who did not use the lecture-recordings.

Though studies show that lecture-recordings might be at least as beneficial for learning as live-lectures (Dewhurst & Williams, 1998; O'Bannon *et al.*, 2011) or even more effective (Maki & Maki, 2002; Stephenson *et al.*, 2008), often, university teachers do fear potential disadvantages of lecture-recordings. The advantages of lecture-recordings for students' self-regulated learning – that is, being able to learn where, when, how long and with which resources they choose (Griffin *et al.*, 2009) – do also make great demands on students' self-regulation competencies. Many students, for example, might avoid attending classes (Moss *et al.*, 2010). This will be especially detrimental for students

who are not skilled enough in cognitive and metacognitive strategies that are necessary for self-regulated learning with the lecture-recordings. On the other hand, students might experience more intrinsic motivation when learning with a lecture-recording (Deci & Ryan, 1985; Sha *et al.*, 2012).

Another fear of university teachers is, that recording their lectures will cost them much time and effort for the recording itself as well as for the editing. In this paper, therefore, we focused on a common, but very simple form of lecture-recordings: the recording of a live-lecture that is distributed without or very little editing.

The aim of the two field studies we present in the following was to research whether such low-effort lecture-recordings are recommendable according to students' learning outcome, motivation and participation. Both field studies had been conducted in psychology lectures. The audience consisted of students whose major field of study was not psychology but who are required to take psychology classes as a minor field of study, e.g., teacher students or students of media and computing.

2 Experiment 1

Based on the aforementioned considerations, the main aim of experiment 1 was to analyse whether students with psychology as a minor subject make use of lecture-recordings. We also compared students' learning outcomes after learning with the lecture-recording, a live-lecture or a combination of both. In experiment 1, students were given the choice of using the lecture-recording and/or attending the live-lecture. Additionally, we assessed students' attitudes towards lecture-recordings in psychology and generally.

In detail, we examined the following research questions:

1. How many students use the possibility to watch a lecture-recording in addition or instead of the live-lecture?
2. Are there differences in learning outcome between students who merely watch the recording, attend class, do both or none of these?
3. What are students attitudes toward lecture-recordings?

2.1 Methods

In Experiment 1, we recorded a live-lecture on the topic of motivation in a psychology lecture for teacher students using the software Camtasia Studio 7. About 400 students were enrolled in this lecture, with 150 students usually attending the live-lecture.

The laptop with the recording software was provided from the university's computer centre. University teachers who want to record their lectures are

able to make a reservation for this laptop. A student assistant will then bring the laptop together with a microphone for the audio recording and oversees that the record is successful. Subsequently, he or she will edit and render the recording before distributing it over the learning management system. Thus, this recording scenario clearly comprises very low effort for the university teachers. The lecture-recording (slides + audio) was distributed via the learning management system Ilias.

Students had been informed one week prior about the planned lecture-recording via email and during the live-lecture. They were informed that they were free to decide whether they wanted to attend class or watch the lecture-recording. The lecture-recording was available for one week after the live-lecture. One week after the lecture-recording, a multiple choice posttest with nine items was used to examine students learning outcome. The test was distributed in a paper-pencil-format during the live-lecture. Also, an electronic version of this test was offered via the learning management system Ilias. The electronic test was available for a time period of one week after the paper-pencil-test had been distributed during the live-lecture. Students were asked not to use any help resources but their memory and understanding when filling in either the electronic or the paper-pencil version of the posttest.

2.2 Results

2.2.1 Utilization of the lecture-recording

All in all, $n = 23$ students filled in the online-version of the posttest, $n = 119$ filled in the paper-pencil version. Of the 142 students who filled in the posttest, $n = 44$ (31%) neither attended the lecture nor watched the lecture-recording; $n = 35$ (25%) only watched the lecture-recording; $n = 58$ (41%) only attended the live-lecture. A small sample of $n = 5$ (4%) students had attended the live-lecture and watched the lecture-recording. These numbers have been determined with the posttest, therefore, conclusions have to be drawn cautiously. The live-lecture we recorded had been attended by 98 students – about 2/3 of those who usually attend. We cannot conclude that those students who did not attend the live-lecture necessarily used the lecture-recording as an alternative.

We asked students how often they had attended the live-lecture prior to the recorded lecture. About one third ($n = 11$) of those who watched the lecture-recording usually did not attend the live-lecture. Therefore, we conclude that the lecture-recording has the potential to reach students who otherwise would not attend class. The low amount of students who attended the live-lecture and watched the lecture-recording ($n = 5$) indicates that students did not use the potentials for self-regulated learning and follow-up course-work.

2.2.2 Learning outcome

Learning outcome differed significantly between groups, $F(3, 128) = 9.67$, $p < .001$, $\eta^2 = .17$ (see Figure 1). Learners who attended the live-lecture and watched the recording performed best while learners who did neither performed worst. Post-hoc comparisons using the Tukey HSD test indicated that differences between students who only watched the lecture-recording or who only attended the live-lecture were not significant. All in all, students performed quite well in the posttest, thus, all students had learned the lecture's content. However, even students who neither attended the live-lecture nor used the lecture-recording, on average, achieved half the maximum points ($M = 4.57$, $SD = 2.46$). Thus, the posttest had a rather low difficulty.

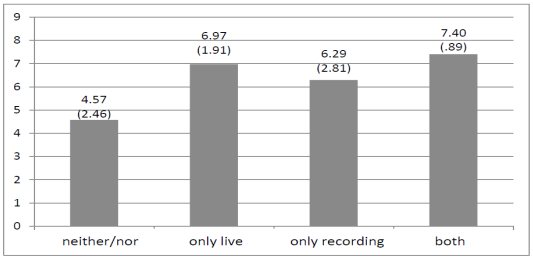

Figure 1. Mean (standard deviation in parentheses) of the learning outcome in the groups.

Fig. 1 - Learning outcome in the groups (means and standard deviations). A maximum of nine points could be reached in the posttest.

2.2.3 Students' attitudes towards lecture-recordings

We also asked for students attitudes towards lecture-recordings (see Table 1). Most students did not believe that lecture-recordings could substitute live-lectures. A combination of lecture-recording and live-lectures appeared to be the most supported solution – although, only very few students in this sample used both possibilities. All groups wished that more lectures would be recorded. Especially the group of those who neither attended the live-lecture nor watched the lecture-recording expressed that wish.

Table 1
MEANS (STANDARD DEVIATIONS IN PARENTHESES) OF STUDENTS' ATTITUDES TOWARDS LECTURE-RECORDINGS. ALL ITEMS COULD BE ANSWERED ON A LIKERT-SCALE FROM 0 (= TOTALLY DISAGREE) TO 5 (TOTALLY AGREE)

	neither/nor	only live	only recording	both
Lecture-recordings can substitute live-lectures	2.79 (1.54)	1.80 (1.47)	3.13 (2.38)	1.00 (1.00)
There is no substitute for a live-lecture	2.68 (1.74)	3.07 (1.57)	2.50 (1.81)	4.67 (.57)
A combination would be the best solution	3.75 (1.57)	3.60 (1.63)	3.77 (1.38)	3.33 (2.88)
This lecture should always be recorded	3.96 (1.52)	3.05 (1.88)	3.70 (1.62)	3.00 (2.88)
All lectures at the university should always be recorded	4.25 (1.99)	3.30 (1.95)	3.63 (1.47)	3.67 (1.52)

2.3 Discussion

Overall, the results of experiment 1 show that lecture-recordings, even though simply produced, have no disadvantage over attending the live-lecture in terms of learning outcome. Hence, the lecture-recording seems to be a suitable alternative to attending the live-lecture. The results of this study, therefore, corroborate the findings of other researchers that learning with lecture-recordings is at least as good as attending the live-lecture (e.g., Dewhurst & Williams, 1998; Maki & Maki, O'Bannon *et al.*, 2011; Stephenson *et al.*, 2008).

A promising result is that in experiment 1 some students who otherwise never attended the live-lecture used the lecture-recording for learning. Thus, lecture-recordings might be the solution for reaching students who are not able to attend the live-lecture out of organizational reasons. This is an important result for our focal group of students whose major field of study was not psychology and who, therefore, often cannot regularly attend the live-lecture as required courses in their major subject overlap with the psychology lecture.

On the other hand, the number of students who took part in this study and did not attend the live-lecture is rather small compared to the number of students enrolled in this course. Many students who were hindered in attending the live-lecture due to organizational reasons have most likely not been reached by the offer of a lecture-recording. The number of students who used both, the live-lecture and the lecture-recording, also is significantly smaller than expected. Due to Glowalla (2008) and Brotherton and Abowd (2004) up to 60% of students use lecture-recordings additionally to attending the live-lecture or

at least planned to do so. In experiment 1, only 4% of our participants used a combination of live-lecture and lecture-recording for learning. Reasons for this result could be a lack of motivation and self-regulation skills.

As we have seen, students who did neither attend the live-lecture nor learned with the lecture-recording agreed most with the statement that the psychology lecture and lectures generally should be recorded. However, given the opportunity to learn with a lecture-recording, they did not manage to use it for whatever reason. It seems plausible to assume that students in this group lacked the necessary self-regulation competencies to put their plans into practice. To test this assumption, we controlled for learning intensity and for motivation in experiment 2.

3 Experiment 2

The aim of experiment 2 was to analyse how motivation influences learning with lecture-recordings in a group of students whose major subject is not psychology. As Fernández *et al.* (2009) stated, learning outcome depends on the way how students learn with a lecture-recording – or with the live-lecture, respectively. How intensely students learn, on the other hand, depends on how motivated they are (Ormrod, 2006). Following the selfdetermination-theory of motivation (Deci & Ryan, 1985), lecture-recordings fulfill the requirements for motivation (Sha *et al.*, 2012): students are able to choose, when, where, how long and with which resources they learn (Griffin *et al.*, 2009).

As we explained in the Introduction, students whose major subject lies in another field of profession often are hindered in attending psychology lectures due to overlapping required courses in their major subject. Nevertheless, those students also have to take exams in their minor subject, that is, psychology. Thus, they require alternatives to attending the live-lecture. In experiment 2, we tested two such alternatives: (1) lecture-recordings and (2) a text on the lecture's contents. We compared the learning outcome with these alternatives to learning in the live-lecture. As students with psychology as a minor subject due to organizational reasons often do not have the choice whether they wanted to attend the live-lecture, in experiment 2, we randomly assigned students to the conditions in this study.

In detail, we examined the following research questions:

1. Are there differences in learning outcome between students who watch the recording, attend class or read a text on the lecture's contents?
2. Is there a correlation between motivation and learning outcome? Does motivation differ between groups?
3. Does learning intensity differ between groups? Is there a correlation between learning intensity and learning outcome or motivation, respec-

tively?

3.1 Methods

In experiment 2, we recorded a live-lecture on the topic of "Design aspects of texts" in a psychology lecture for students of media and communication and computer sciences. The live-lecture was recorded using the software Camtasia Studio 7 (slides + audio). As the lecturer was experienced in working with this software, she recorded the lecture herself and also edited and rendered the recording before distributing it via the learning management system Moodle.

We randomly assigned the 60 students enrolled in this course to three conditions (20 each): (1) live-lecture, (2) lecture-recording, and (3) text on the lectures' contents. All in all, a total of $N = 43$ students took part in this study, that is, they filled in at least some of the tests we applied. Of these, $n = 13$ attended the live-lecture, $n = 20$ used the lecture-recording, and $n = 12$ used the text on the lecture's contents for learning.

All students were informed about the study and their condition per email one week prior to the recorded lecture. Students in the live-lecture condition were asked to attend the lecture as usually. Students in the lecture-recording condition were informed that they should not attend the live-lecture but will be able to learn with the lecture-recording. Students in the text condition also should not attend the live-lecture but were given a text on the lecture's content. The lecture-recording and the text, respectively, were distributed via the learning management system Moodle and was only available for students in the respective groups. The lecture-recording and the text were available for one week.

One week after the lecture-recording, a posttest with nine items (multiple choice and open questions) was used to examine students learning outcome (maximum points: 20). To assess students' motivation, we developed a questionnaire with four items (e.g., "I was very interested in working with this material"). All items had to be answered on a 5-point Likert-scale (1 = not true; 5 = true). Learning intensity was assessed by a questionnaire with 4 items (e.g., "I have the feeling that I worked with the material intensively"). The items also had to be answered on a 5-point Likert-scale ranging from 1 (= not true) to 5 (= true). All tests were distributed in a paper-pencil-format during the live-lecture.

3.2 Results

3.2.1 Learning outcome

Unfortunately, only 28 students filled in the posttest. Learning outcome did not differ between groups, $F(2, 25) = 1.06$, $p = .362$, $\eta^2 = .08$ (see Figure 2).

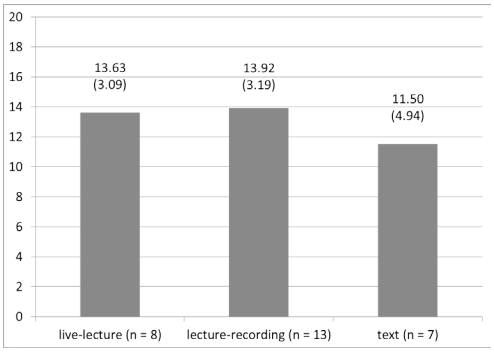

Fig. 2 - Learning outcome in the groups (means and standard deviations). A maximum of 20 points could be reached in the posttest.

3.2.2 Motivation

An ANOVA with students' motivation as dependent variable and the groups as independent variable revealed significant differences in motivation between groups, $F(2,42) = 5.26$, $p = .009$, $\eta^2 = .20$ (see Table 2). Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the lecture-recording condition ($M = 3.30$, $SD = .70$) was significantly higher than the live-lecture condition ($M = 2.61$, $SD = .67$). However, the text condition ($M = 2.54$, $SD = .90$) did not significantly differ from the live-lecture and lecture-recordings conditions. Students' motivation did not correlate with their learning outcome, $r = .21$, $p = .278$.

3.2.3 Learning intensity

Learning intensity did not differ between groups, $F < 1$, n.s. (see Table 2). However, learning intensity correlated positively with learning outcome, $r = .59$, $p = .001$. Thus, the more intensively students learned, the better was their learning outcome. Also, a correlation analysis shows that the more motivated students were, the more intensively they learned, $r = .49$, $p = .001$.

Table 2
MEANS (STANDARD DEVIATIONS IN PARENTHESES) OF STUDENTS' MOTIVATION AND LEARNING INTENSITY. ALL ITEMS COULD BE ANSWERED ON A LIKERT-SCALE FROM 0 (= NOT TRUE) TO 5 (TRUE).

	live-lecture	lecture-recording	text
Motivation	2.61 (.70)	3.30 (.67)	2.54 (.90)
Learning intensity	3.06 (.91)	3.25 (.74)	2.82 (1.13)

3.3 Discussion

In experiment 2, we also did not find differences between lecture-recordings and live-lectures. Therefore, again, we could corroborate the findings of other researchers that learning with lecture-recordings is at least as good as attending the live-lecture (Dewhurst & Williams, 1998; Maki & Maki, 2002; O'Bannon *et al.*, 2011; Stephenson *et al.*, 2008).

The aim of experiment 2 was to analyse the influence of learning intensity and intrinsic motivation on learning outcome when learning with lecture-recordings compared to live-lectures and text-learning. We assumed that lecture-recordings fulfilled the prerequisites for motivation (Deci & Ryan, 1985; Sha *et al.*, 2012). Indeed, we found that a motivation was higher in students who learned with a lecture-recording than in students who attended the live-lecture. Also, the fact that the lecture-recording group was the only one in which students in this study filled all questionnaires and in which most students filled in the posttest, hints on the motivating character of lecture-recordings. Interestingly, students in the text group, at least descriptively, were less motivated though their freedom in learning when, where and how long was as pronounced as in the lecture-recording group. This might be due to the Salomon-effect, that is, students' belief that "Television is easy and print is tough" (Salomon, 1984, p. 647). This holds the danger that students who belief learning with a lecture-recording was easy might not invest enough effort. Overall, though motivation was not directly correlated with learning outcome, motivation was correlated to a higher learning intensity. Learning intensity, on the other hand, was associated with a higher learning outcome.

Conclusion

The aim of the two field studies we presented in this paper was to research whether low-effort lecture-recordings were recommendable for students of psychology as a minor subject. On the one hand, this group of students often lacks motivation for psychology as a subject matter. On the other hand, orga-

nizational reasons might hinder them in attending the live-lecture. In the two field studies we presented, we used a low-effort solution for lecture-recordings. University teachers recorded their lectures during the live-lecture and, after very little editing, distributed the lecture-recording via a learning management system. Both studies corroborate the finding of other researchers that lecture-recordings can be at least as good as live-lectures in terms of learning outcome (e.g., Dewhurst & Williams, 1998; Maki & Maki, 2002; O'Bannon *et al.*, 2011; Stephenson *et al.*, 2008) – even with such a low-effort solution.

Experiment 1 also showed that lecture-recordings have the ability to reach students who otherwise would not attend the live-lecture. Experiment 2 showed that lecture-recordings were motivating for students of psychology as a minor field of studies. These are also promising results in favour of lecture-recordings. Further studies will have to examine whether the motivational effects are due to the one-time-experience of lecture-recordings or whether these effects are stable over the course of one semester (or more).

On the other hand, in experiment 1, many students did not use the possibility of learning with the lecture-recording. And as we had seen, many of those who neither attended the live-lecture nor used the lecture-recording wished for a higher quote of recorded lectures. We assumed, due to these students extensive wish for more lecture-recordings, that they planned to use the recording for learning. For some reason or other, however, they did not put their plans into action. This group of students needs special attention. For them, simply providing lecture-recordings might not be sufficient. Their self-regulation skills, especially those skills for self regulating motivation, will most likely not be sufficient to make use of the possibilities of lecture-recordings. Therefore, we advise university teachers to think about how to encourage students to make use of the lecture-recordings. For example, they might assign (obligatory) tasks that can only be solved after attending the live-lecture or using the lecture-recording.

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