

Effect of the Lecture Handouts on the Quality of Students' Learning (QSL) in University of Guilan, Iran (case study, research methodology course)

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Abstract: The aim of present research was to investigate the effect of lecture handout on the Quality of Teaching and Learning (QSL). Two features of the layout were distinguished- headings and text. Both were varied: the headings were present or absent, and the text was full, key points only, or absent. Five conditions were compared: (a) heading and full text; (b) headings and key points; (c) headings but no text; (d) no headings and no text (equivalent to an 'own-notes') and (E) lecturer reading-student writing. A randomized groups design, analyzed by t- test comparisons between all pairs of conditions, was adopted in preference to a factorial design and ANOVA. This was because the assumption of additivity could not be made for conditions constructed out of different combinations of semantically meaningful material. To ensure the ecological validity, the experiment was conducted during a normal course of instruction in research methodology.

Keywords: handout, quality, learning

Introduction

Teaching and learning methods apply by the teacher and the students to achieve the desired learning quality in themselves. The strategies of learning quality are partially developed according to the learner. Increase in the number of students and wide areas to be covered in less time and more focused sessions made an inevitable reappraisal of how teaching can be delivered sustainably using systems such as tutorials, visual or video aids and discussions together with white board and ordinary lectures. According to Marsh, and Sink (2010) studies point out that, cognitive load theory has effects on the different options mentioned above.

Habeshaw et al. (1992) and Kiewra (1985) emphasized on Several studies that have shown how effective note-taking techniques can improve quality student learning. Noto & Numazawa (2018), and Rummer and et.al. (2017) believed that during the lecture, students attempt to create notes they can easily use and understand. Therefore, note taking needs a teaching system that helps students to redesign the contents the teacher provides.

The present study investigates whether the amount of detail in the handout is a critical factor for this matter. A randomized groups experiment was conducted in the context of two course on Research Methodology in Faculty of Humanities in the University of Guilan, Iran. Four lecture handout conditions (headings and full text; headings and key points; headings only; no supplementary materials on the first test; and 'headings and full text' better than 'no supplementary materials' on the second test. The results indicate that the amount of detail is a critical factor in handout effectiveness.

Teachers always keep thinking of modifying their teaching and learning skills. It requires a lot of effort and talent to modify the method effectively and to communicate the ideas more easily and artistically. Changes in teaching practice, student's expectations, technology and demographics have resulted in the development of various new methods of QSL from traditional approaches. Van Der Meer, J. (2012) found that, most of the students face challenges in taking complete notes and in many cases, they prefer to be provided with complete and comprehensive ones. Teachers apply different skills and arts in their teaching session for effective teaching and learning. Many teachers use the method of distributing the printed notes (handouts) to students in advance, as a part of teaching program. Selection of learning materials is an integral part of curriculum planning.

The learning and the teaching resources provide a source of learning experience to the students. Rous and Rashbass (2002) mentioned that despite its limitations, lecturing is the most commonly used method of teaching in higher education. As a result of advanced technology, cost-containment pressures, and a desire to make innovative improvements in medical education, dramatic changes have occurred in planning and delivery of lecture and its handouts. Assessment of students learning at each time, known as clicker method, would improve the effectiveness of teaching method further (Mohammed Nazrul Islam and et.al, 2005). It is important to understand the target group's various levels (ability of learning, interest) in advance. Also, for various groups and different topics, effective mode may differ. It is important to design tutorials and lectures according to audience perspective.

However, any benefit gained from reviewing notes will depend on their QSL as a record of the lecture. To investigate this, a number of researchers have 'marked' student's lecture notes for accuracy and completeness, and then correlated these scores with the students' examination performance after they have used the notes for private study (Locke,1977, Tara and et al 2008). All these studies report significant positive correlations between the QSL related to the student's notes and their examination performance, and a poor QSL related to note-taking overall. Research on the quality of lecture notes is reviewed by Kiewra (1985b).

Kroenke K. (1991) found that lecture handouts are widely used as instructional tools. Handouts make the lectures "portable and enduring" and lead to improved recall of information and improved test performance. The handouts are expected to be clear, brief, well-structured in simple language and compilation of summary from standard textbooks. Although handouts are widely used as instructional tools, little research has been done on conventional paper-based, and on computer-based and web-based handouts (Brown & Tomlinson 1980).

It is likely, therefore, that students would learn more from lectures if they obtained a better record of the lecture content. One way of attempting to ensure this is to better record of the lecture content. One way of attempting to ensure this is to issue handouts containing some or all of the lecture content to be retained for private study afterwards. However, previous research suggests that if the handout is full one, such as a transcript, this might not improve QSL. Some studies have found that reviewing full handouts produced worse recall than reviewing student's own notes (Kiewra, 1985b). In these cases, the review and the test took place immediately following the lecture. Other studies, in which the recall test was delayed, found no significant difference (Thomas, 1978).

There are two possible reasons for these dissatisfying results. Both relate to the hypothesis that the process of taking notes while listening to a lecture facilitates assimilation and subsequent recall by stimulating highly personal encodings of the lecturer's oration. First, the handout material, still in the original form when review takes place, might interfere with the student's recall of the transformed version. Second, being given a full handout might displace the allegedly beneficial process of Hartley (1976) which mentioned that the more details available in a lecture handout, the fewer notes' students take for themselves. Teachers expect that lecture handouts should supplement rather than substitute student's regular reading (Vaz,1999).

The students who do not have handouts have to do a bit more work to achieve the same grade as those who were given handouts. The decision to issue lecture notes is related to a number of factors: the teaching style of the lecturer, the nature of the subject matter, and the availability of written and other resources in the subject area (Gibbs, and et.al 1992)

Having handout in hand, students can make a link between what they see on the board and what they have in written text format. With this approach simultaneous audio-verbal, visual and written text communication modalities are involved to clarify the educational context and to promote QSL. Another important aspect of handouts is that distributing handouts may cause a positive relationship between the instructor and the students and creates a more interesting and attractive educational atmosphere (Zahedi Avval1 and et.al 2013).

Research on whether memory for material given in lectures is facilitated by the process of note-taking presents an equivocal picture. Kiewra (1985a) reviews 56 studies on this, of which 33 reports a facilitating effect, 21 reports no effect and two report that note-taking worsened recall. A further study by Knight and McElvie (1986) found no facilitation. Thus, although the evidence for the beneficial effect of note-taking is far from everwhelming, it cannot be discounted altogether.

In view of these findings, a promising approach would be to issue skeletal handouts for students with their own notes during the lecture itself. Previous research supports this proposal. Some studies have shown that note-taking on skeletal handouts produces better test performance after review than if students take all the notes themselves (Collingwood and Hughes, 1978).

It appears that the amount of detail in a handout is a factor affecting QSL from a lecture. The optimal amount is likely to be less than the full transcript, but how much less remains unclear. One previous study has compared handouts with different degrees of detail (North craft and Jernstedt,1975) but found no significant differences. More research is needed to clarify this question.

According to Babu Raj & Belgin (2017) the preparation of good lecture notes is time-consuming, and their reproduction is probably costly. Handouts for lectures have always been a much-debated subject between teachers and students. It is also important to validate our sessions to identify the effectiveness of mode of our teaching and QSL according to the nature of students and type of subject we handle.

Methodology

1. Design of experiment

The aim of this experiment was to investigate the effect of lecture handout on QSL. Two features of the layout were distinguished- headings and text. Both of these were varied: the headings were present or absent, and the text was full, key points only, or absent. Four conditions were compared: (a) heading and full text; (b) headings and key points; (c) headings but no text; (d) no headings and no text (equivalent to an 'own-notes' condition) and lecturer reading-student writing. A randomized groups design, analyzed by t-test comparisons between all pairs of conditions, was adopted in preference to a factorial design and ANOVA. This was because the assumption of additivity could not be made for conditions constructed out of different combinations of semantically meaningful material. To ensure ecological validity the experiment was conducted during a normal course of instruction.

(1) In the previous experiments on lecture handouts, students in the full and skeletal handout conditions were not given equal opportunity for incorporating their own notes into the handout- the full handouts were solid walls of text, whereas the skeletal handouts provided spaces for adding notes. However, there is no reason why a full handout should not provide as many of these spaces as a skeletal one. That the absence of this control might have biased the results against the full handout conditions in the Hartley (1976), the Collingwood Hughes (1978) the Piolat, A., T. Olive. 2005 and Bohay and et.al 2011 studies are suggested by an experiment by Fisher and Harris (1973), where student's own notes taken prior to receiving a full lecture handout showed signs of having produced pro-active interference when both were used for the review. In the present study, therefore, all the handouts provided space for students' notes.

(2) in the North Craft and Jenstedt (1975), the Collingwood and Hughes (1978), the Farnaz Z (2013) and the Seery (2013) studies there may have been a placebo effect benefiting those who were given a handout against those in the 'own-notes' groups, who were not given one. While it is impossible under normal educational circumstances to prevent students realizing this difference, it should be possible to minimize its effect by ensuring that those in the 'own-notes' group are treated in a way similar to the others. Every effort was taken to ensure this in the present experiment.

2. The context

The experiment was conducted during the second year of a university course in department of Humanities. University lectures may be given for a variety of purposes other than the transmission of information. Nevertheless, there are many courses where this is a principal aim, and where a necessary condition of effective lecturing is maximum recall of the information given-such is the case in the teaching of operative techniques to dental students.

The lecture chosen for administering the experimental handouts was an integral part of the course and dealt with the techniques for preparing a tooth cavity for a root filling. The lecture described the sequence of steps in

research methods, which involves the use of experimental, descriptive and correlation. During the lecture, which lasted 50 minutes and took place in the class, there was extensive use of slides and overhead transparencies to illustrate the procedure. Two days after the lecture the students attended a practical class where they practiced the experimental methods. During this class, teaching assistants evaluated the students' attempts and gave individualized instruction (but without knowing which experimental group they belonged to). Questions on these procedures were liable to appear in the final examination, and the students had access to further information from textbooks.

3. Subjects

The subjects were 120 undergraduate Humanities students (70 females, 50 male) aged approximately between 19-30 years in different disciplines.

4. Procedures

Prior to the experiment, each of the students was randomly allocated to one of the four handout conditions. On entry to the lecture class, each of them collected an envelope with his / her name on it which contained the lecture handout material. Students in condition A received the headings and full text; in condition B they received the headings from the above plus the key points; in condition C they received the headings only, while in condition D they received blank sheets of paper. The handouts given to students in condition A, B and C all had spaces for them to incorporate their own notes. These conditions were also given diagrams corresponding to the slides which were projected during the lecture.

When the students had taken their seats, they were asked to make all their notes on the paper in their envelopes. although the students in condition D received no supplementary materials, they did experience being given an envelope and being given an instruction about their note – taking, as did the other three conditions. The following extracts from conditions a, b and c shows the differences between them.

Condition A
Objectives

1. Elimination – removal of research methods including experimental, descriptive and correlative. Space was provided for student notes.
2. Writing proposal - shaping the proposal designs so that it can be readily and completely filled. Space was provided for student notes.

Condition B
Objectives

1. Elimination- removal of the type of research instruments including Questionnaire, interview, observation and library. Space was provided for student notes.
- 2 Using triangulation. - shaping the triangulation instruments. Space was provided for student notes.

Condition C
Objectives

1. Elimination. Space was provided for student note
- 2 Writing proposal. Space was provided for student notes

Following the lecture, the students were asked without warning to replace their notes in the original envelopes and to hand them in as they left the class. Over the next few hours all the notes were photocopied, and the originals were handed back to the students later in the day.

Measurement of recall

Recall was assessed by two tests. The first was held without warning 2 days after the lecture, at the beginning of the practical class. It comprised six questions requiring freely constructed descriptions of aspects of the operative procedure. The second test was held 2 weeks later; students this time being given a week's warning. This comprised six further questions also requiring freely constructed descriptions of aspects of the operative procedure. Both tests were scored blind as to the origin of the scripts, using a detailed marking scheme.

RESULTS

Effect of handouts on amount of student note- taking

Table 1 shows the number of notes taken by students in the four conditions (measured by the number of words). Consistent with previous studies there was an inverse relationship between the amount of material in the handout and the amount of own note-taking by students. Thus, despite all having blank spaces in their handouts, students in condition A took only about one-third the notes taken by the students in condition B, who in turn took less than half those taken by the students in condition C. These differences were both significant at the $p < 0.05$ level. However, the difference between conditions C and D was very small and not statistically significant. Because there were often large differences in standard deviations, variance ratio tests were carried out on all pairs of conditions. Where the ratio was significant, t-tests were carried out using Welch's correction for unequal variances as described in Winer (1971).

Where the ratio was not significant, the standard form of t-test was used.

Recall of lecture material after 2 days

Part of the purpose of the lecture was to teach students the sequence and purpose of the steps in the operative procedure before they practiced them in the practical class 2 days Later. Consequently, it is a valid criterion for evaluating the different handout conditions to test how much students could recall about the procedure before they began the practical class.

Table 1. Test performance and number of notes taken under four handout conditions

Conditions	A Headings and full points (n=30)	B Headings and key materials (n=30)	C Headings only (n=30)	D Supplementary test (n=30)
Unannounced test administered 2 days after the lecture				
Mean	9.43	7.13	13.46	9.38
SD	5.91	4.31	8.39	4.90
Forewarned test administered 2 weeks after the lecture				
Mean	21.27	16.67	20.54	14.38
SD	5.99	7.97	4.54	8.78
Number of words in notes taken during the lecture				
Mean	65.33	220.60	524.15	532.08
SD	73.24	101.75	144.07	197.48

Table 1 shows that the best performance was by students in condition C, followed by A, D and B in that order. The difference between conditions C (headings) and B (headings and key points) was statistically significant ($p < .05$), variance ratios and t-tests being computed as described above.

Recall of lecture material after 2 weeks

Table 1 shows that the best performance in the forewarned test taken 2 weeks after the lecture was by students in condition A. However, they were only marginally better than condition C, followed by conditions B and D in that order. Both the condition A and C means were significantly different from the condition D mean ($p < .05$).

Discussion

The interpretation of experimental research on teaching methods presents many problems, not least that each experiment is only a snapshot and has limited generalizability. Nevertheless, the results of this experiment fill a gap in the research literature and thereby extend the database required for meta-analysis. Moreover, they suggest a way of improving the design of lecture handouts which could be developed and evaluated formatively by lecturers themselves.

Majority of students felt that distributing handouts was a better method which helped them to understand, score and kindled their interest. A study done by Farnaz Z (2013) also reported that students were in favor of distribution of lecture handouts for better understanding.

The present findings provide broad confirmation for the results of the Colling Wood and Hughes (1978) studies, that providing skeletal handouts can improve student performance on course examinations. However, by comparing handouts containing different amounts of detail the present study extended the earlier ones and partially replicated the inconclusive Hartly (1976) investigation. The results indicate that:

1. The amount of detail appears to be a critical feature of handout design, as shown by the significantly better performance in the test 2 days after the lecture by condition C (headings only) than by condition B (headings and key points).
2. The relationship between the amount of detail and the degree of facilitation of recall is non-monotonic, as shown by the reversals in the test performances of the different conditions.

The overall pattern of results is consistent with the following hypotheses about the cognitive processes involved in learning from lectures:

First, that information given in handouts may both facilitate subsequent recall (by providing review material) and inhibit it (by curtailing note-taking and thereby restricting encoding). These contrary effects may explain why the best performance overall was by condition C (headings only). Presumably because of the lack of detail in their handout, these students took almost as many notes as the students in condition D (no supplementary materials). Thus, they presumably obtained whatever stimulus note-taking gives to encoding. However, the headings in their handout, despite their brevity, also might have had a powerful facilitating effect during subsequent review. Hartley and True men (1983) provide evidence that text headings aid search and retrieval from both familiar and unfamiliar material and facilitate subsequent recall. It is possible that a comparable effect occurred in the present case, enabling the students to obtain the best of both worlds.

Second, the results suggest the hypothesis that consulting a handout while listening to a lecture may interfere with encoding. This may explain the poor performance of condition B (headings and key points) in the first test. With such a handout it would have been necessary to judge which details of the lecturer's delivery were already printed on it, and which were not, any needed to be noted. However, in both condition A and condition C it would presumably have been clear that the handout contained all the detail, or none of it, respectively. Thus, in condition B the students might have had to carry out an extra information-processing task which made it harder to timeshare the activities of listening and note-taking.

Third, the results are consistent with a further hypothesis which is complementary to the two already mentioned. This is that the effectiveness of a handout may depend on how soon after a lecture the students need to make use of the material- e.g., in a practical class or discussion group. As days elapse after a lecture, memory of the delivery itself will probably fade, while the opportunities to find time to review a handout probably increase. Thus, insofar as memory for lecture material depends on both encoding and external storage, the importance of the former

relative to the latter is likely to be greatest immediately after the lecture, but to decline as time passes. therefore, if there is a trade-off between encoding and storage when lecture handouts are used, the value of a full handout will probably be least the sooner after a lecture the material needs to be recalled. This is consistent with the improvement in condition A relative to condition D in between the test taken after 2 days and the test taken after 2 weeks. And if we accept the above interpretation of how condition B might have been disadvantaged during the lecture, this hypothesis is also consistent with that condition's poor performance in the first test and subsequent partial recovery.

This study replicated the finding of Seery (2013) that, giving handouts in lectures did not significantly enhance the students' performance. As we randomized the students in to three groups, the academic performance due to students' variability becomes equally distributed to the three groups. In addition, the teacher and the sessions were same to the three groups and the only difference was the teaching method (handout or no handout).

Previous studies have reported that taking class notes improve the focus in class which ultimately improve the outcome performance, deeper levels of content transmission and understanding (Piolat, A., T. Olive. 2005 and Bohay and et.al 2011).

Different studies have shown that students who had taken partial notes, performed better in examinations and in answering conceptual questions compared to students who received full notes (Katayama and Robinson 2000). Receiving full notes also has a negative effect on class attendance motivation (Tara and et al 2008). Taking lecture notes by students during class hours is a common practice, that helps them transferring the educational content very well (Zahedi Avval1 and et al. 2013).

Results of some studies indicated using slides with or without guided notes was superior to traditional lecture with regard to critical points and examples (Austin and et.al. 2002). Partial notes distributed to the students while listening to a lecture resulted in higher scores on the essay test (Annis, 1981).

In conclusion, lecture handouts can increase QSL, but they must facilitate the process of listening to the lecture as well as provide review material. This is critically dependent on the amount of detail they contain, and more research is needed on the complex cognitive interactions which are involved. Nevertheless, there is a clear indication in this research that handouts consisting of heading only deserve serious attention by lecturers who wish to maximize recall.

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