Distribution of Handouts in Undergraduate Class to Create More Effective Educational Environment

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Running title: More Effective Education by Handouts

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Abstract:

Introduction: Taking notes is a traditional task for students, although it is rather hard but it helps transferring the educational content. Some universities provide comprehensive notes. However, these full notes might have a negative effect on active attending the class and subsequent academic performance. In this study we evaluate the students' satisfaction with a partial handout which included some illustrations but required substantial annotation in comparison with comprehensive notes.

Methods: A total of 156 medical and pharmacy students who took biochemistry or microbiology courses participated in the study. Power point slides were used in all lectures. At the beginning of half of the classes students were provided with printed handouts, while the remained sessions were presented without handouts. Finally, students' attitude toward using handouts was evaluated with a questionnaire based on Likert rating scale.

Results: Most respondents (66.6%) were satisfied with having handouts which was not related to the course or topic (P =0.21). According to 78.3% of students having handouts facilitated taking desired notes. Moreover, they (73.7%) indicated that having handout increased their focus on the topic. Also 82.6% of the students stated that they obtained a general overview on the subject by provided handouts.

Conclusion: This study underlines the positive impact of handouts on medical and pharmacy students as an instructional aid. Preparation of handouts creates more effective learning environment hence, it should not be neglected by instructors for junior medical and pharmacy students.

Keywords: note-taking, handouts, power point, education

1. Introduction

Students at universities generally need to take notes for final examinations. Taking notes in the class will increase the focus of the student and ultimately more understanding of the concepts is achieved. Consequently it can improve students' learning outcomes (Piolat, Olive et al. 2005). Some studies have been also indicated that note taking involves deeper levels of data transmission and is linked with an improved learning performance (Trickett and Trafton 1999). Active engagement with educational material, for example through note taking has a beneficial for deeper levels of understanding (Bohay, Blakely et al. 2011).

This is not an easy task and in many cases some information is missed during note taking, also some times the educational content is not transferred perfectly. It is a complex activity which requires understanding, selection of information and writing down in a short time, while simultaneously new information comes. This requires high activity of memory and writing process which leads a relatively high mental and psychotic load that results in boredom during the class (Piolat, Olive et al. 2005). Furthermore, the students might miss the visual modality of the presentation by focusing all the time on writing. Besides students' note taking skills vary in terms of speed and accuracy. Most first year students face challenges in taking complete notes and in many cases they prefer to be provided with complete and comprehensive notes (van der Meer 2012).

The approach of some students is to record the lectures and prepare complete and full notes for other students, though, this has some drawbacks. These notes usually are prepared late at the end of semester and only a few students are involved in the process of transforming these records into booklet format, while it is ideal to involve all students in the educational activities. Moreover, such notes generally are not well-illustrated, while images play an important role in conveying information. In addition, providing complete notes may reduce the motivation to participate the class, and the learning benefits of note taking might be lost.

Today power point is the most frequent instructional medium used at universities. Note-taking in power point-based classes is more difficult than traditional chalk and talk classes, because it is usually higher conveying speed by power point presentations. Therefore partial note taking is recommended in these classes. Also visual presentation of educational material interferes with students' note taking procedures (Kobayashi 2005). Providing the students with the electronic version of slides is an alternative approach. However, in a routine undergraduate class this may not be an appropriate approach. Teachers are generally reluctant to give the electronic format of their slides to the students as they believe that this may have a

negative effect on students' attendance. In addition, students are not engaged in note taking and they miss this modality which has a positive role in educational process.

In an ordinary class, the students are not able to add favorite explanations to the images or text of the electronic slides along with teaching process. Also, these slides often include unintelligible and concise sentences which require the instructor's elucidations. Thus it seems that giving the electronic format of the power point slides to the students is not a perfect educational strategy. With provided slides students are not engaged in focusing to record notes, this in a darkened room will cause reduced eye contact, body language, gesture and other non-verbal communication means (Tarpley and Tarpley 2008) that may ultimately lead to what is called "death by power point", referring to the status of boredom and fatigue and attention lost (Taylor 2007; Harden 2008).

Instead of complete booklet or complete student's own note, in a power point-based class the instructor may provide handouts for the students. During a power point class supplemented with handouts, the students take note in a desirable format. Some studies indicate an strong students' support for handouts (Tavares and Silva 1999) while in some other studies a full comprehensive note is preferred (Russell, Caris et al. 1983). Thus students' points of views on handouts needs to be further investigated. In our medical university educators generally provide their students either with complete notes or electronic slides. To assess our students' points of views about handout as an educational support we performed the present study in Mashhad University of Medical sciences.

2. Method

This descriptive study was conducted at Medical and Pharmacy schools in Mashhad, north-east of Iran. A total of 156 (99 medical and 57 pharmacy) students who took microbiology or biochemistry courses, participated in this study. In order to expand the study and prevent any course or subject dependency, students were chosen from medical and pharmacy schools.

Power point slides were used in all lectures and printed handouts were prepared as an educational support. To prevent any bias due to the subject, we chose the students from two unrelated courses in two different faculties. At the beginning of half of the classes students were provided with handouts of the slides, while the remained half classes were presented traditionally without handouts. Finally at the end of the semester students'satisfaction was evaluated using an anonymous questionnaire prepared based on Likert rating scale. Questionnaire's validity was reviewed and confirmed by experts at the Educational Development Office of Medical School. The reliability of questionnaire was evaluated with calculation of Cronbach's Alpha.

The questions were designed to assess different aspects of students' views about application of handout in the classes (table1). The collected data was analyzed using SPSS version 11.5. Chi-square test was performed and two-tailed P-value was calculated in all the analyses. P value of < 0.05 was considered statistically significant.

3. Results

A total of 156 out of 165 students returned the questioner (response rate 94.5%). 61.7% of the participants were males and 38.3% were females with mean age of 20.75 ± 1.12 years. The results of the study are shown in Table 1. As indicated in the table, a satisfaction rate of 66.6% was obtained by having handouts which was not course or gender related (Chi square test $p=0.21$ and 0.46, respectively). Most of the students (73.7%)

believe that these partial handouts could help them to focus on the topic. And in this way students experienced a faster and easier note taking (0.73.7 and 78.3%, respectively).

There was a significant relationship between satisfaction, easiness of note taking, and concentration of the students with handouts ($p<0.001$). Statistical analyzes showed no difference between medical and pharmacy student's viewpoints on using handouts. Considering the reported differences in learning processes of males and females (Andreano and Cahill 2009; Hoppe, Persson et al. 2009) the students' views were also checked according to their gender and no difference was observed.

They also obtained a general preview of the topic by provided handouts (82.6%). Furthermore, they stated that they could return back to the previous slide during the lecture and thus they did not miss the educational content (70.6%). This easiness was not related to the subject of teaching ($p=0.44$).

We observed no statistically significant response differences between sex and course groups (Chi square $p>0.1$).

4. Discussion

This study was performed to assess the students' points of views about partial handout as an educational support and we find out that most of the participants (66.6%) were satisfied with having handouts. The results of this study corroborates the previous reports indicating students' proclivity to handouts (Tavares and Silva 1999) , although 30.8% of students expressed low satisfaction with handouts. This finding could indicate that such students might prefer to be provided with complete or full notes. Comprehensive note preference has been previously reported, though students with such preference showed better academic performance with partial handouts (Russell, Caris et al. 1983).

Taking notes in the class has some benefits in conveying and comprehension of the contents thus this learning modality should be used in a new format based on technological advances. Partial note-taking by the application of handouts is one appropriate approach.

In partial note taking, students can write down the desired explanations for the images, they can also highlight some parts of the illustrations or text in their printed handouts during the presentation. Providing the partial handouts and giving the students the opportunity to clarify the topic during the class increases the motivation for attending the class and participating actively in educational process. Such interpretations may also promote student's comprehension of the context and subsequently enhance student's learning outcomes (Russell, Caris et al. 1983; Morrison, McLaughlin et al. 2002; Larson 2009; Makany, Kemp et al. 2009).

During a power point presentation, instructor should actively engage the students in the process of conveying information. One strategy is applying handouts. In this approach, students are involved in partially note taking which requires more focus on the lecture to rendition of slides this strategy ultimately leads to improved learning outcomes (McLennan and Isaacs 2002; Makany, Kemp et al. 2009; James and Linte 2010). Focusing to record annotations may also prevent drowsiness due to the "death by power point" phenomenon during power point-based lectures.

Although some students prefer to be provided with full notes, different studies has shown that students who had taken partial note performed better in examinations and also in answering conceptual questions compared to students who received full notes (Russell, Caris et al. 1983; Katayama and Robinson 2000;

Morrison, McLaughlin et al. 2002). Receiving full notes also has a negative effect on class attendance motivation according to the self reports by the students(Cornelius and Owen-DeSchryver 2008). Partially note taking also prevents redundancy effect due to excessive cognitive load in the traditional complete note taking strategies.

With provided handouts, students do not need to write fast without focus on the concepts. Therefore they have more time to listen and focus on the educational content. If the concept is ambiguous, the student can record brief explanation. In this way, taking notes by each student differs from the others and depends on each student's own educational needs. Also student' personal annotations help for subsequent recall and exploring the unclear concepts. A study in 2009 indicated that proper use with a perfect design of the handout increases short time recall (Larson 2009). Moreover these handouts could give the student a general overview to the educational material. With handouts in hand, students at any time can return to the previous slide thus preventing missing the past concepts during presentation.

Having handout in hand, students can make a link between what they see on the projector 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 learning. Another important aspect of handouts is that distributing handouts may cause a positive relationship between the instructor and students and creates a more interesting and attractive educational atmosphere.

It would be ideal if we had conducted the study in a randomized style namely we could have randomly divided the students in two groups one with handouts and the other without handouts. Then learning performance of the two groups could be compared to assess the impact of handouts on learning outcome. However such randomized approach is not feasible and ethical. Meanwhile it was possible that the students receive handouts from their classmates and that might confound the results of the study.

The results of this study and previous consistent investigations underline that preparing handouts creates more effective learning environment; hence, it should not be neglected by instructors in power point-based classes and the faculty administrations are recommended to allocate some resources to provide students with handouts for junior medical and pharmacy students.

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Table 1: The perspectives of students about different aspects of having handout.

	Totally agree N (%)	**Agree N (%)**	**Uncertain N (%)**	**Disagree N (%)**	**Totally disagree N (%)**	**Missing N (%)**
I felt generally satisfied to have handouts.	47 (30.1)	57 (36.5)	32 (20.5)	16 (10.3)	-	4 (2.6)
Having handouts facilitated note taking.	72 (46.2)	50 (32.1)	24 (15.4)	10 (6.4)	-	
I had better focus on the content with handouts.	52 (33.3)	63 (40.4)	30 (19.2)	10 (6.4)	-	1 (0.6)
I could take note faster with handouts.	51 (32.7)	64 (41.0)	31 (19.9)	8 (5.1)	-	2 (1.3)
Handouts gave me an overview about the topic.	62 (39.7)	67 (42.9)	23 (14.7)	4 (2.6)	-	
Less educational content was missed with handouts.	60 (38.5)	50 (32.1)	37 (23.7)	9 (5.8)	-	