
The relationship between handout content, student attendance and learning

Elsie E. Gaskell

Abstract

The quality of teaching and learning may be directly linked to the class size. Across many Universities, traditional didactic lectures are the most economic and convenient way to disseminate information to large numbers of students. However, does this come at a cost of poor motivation and learning, and what simple techniques could be employed to maintain deep learning and high level of student interaction during sessions these sessions?

Background

This study sets out to investigate whether the supplementary materials (handouts) that are provided for the students prior to the class and are aimed to support their learning during lectures have any influence on student attendance and learning. The impact of two different styles of handouts was considered: an 'interactive handout', where student input during the lecture is required to complement the notes, and a 'complete notes' handout where the full set of PowerPoint slides that were used in the lectures was provided. Student access to the handouts, their attendance at the subsequent lectures and consequently performance at exams was monitored in a group of 252 Level 1 students within the School of Pharmacy and Biomolecular Sciences.

There was a marked difference between the access to these two different styles of notes, with 61.90% of the class accessing the interactive handout and only 29.76% of the class accessing the full notes. From the subclass of students that accessed the notes, there were considerably more students at the lectures where interactive handouts were provided (50.62% full student attendance) compared to those supplement with complete notes (20.99% full student attendance). Students that attended all the lectures

(irrespective of the type of handout given and whether or not they accessed them) achieved greater average marks at the examination than those that either attended some or no sessions. This is indicative of the fact that students that show commitment to learning throughout the year tend to achieve better grades at formal assessments. Interestingly, however, a higher proportion of the fully-attending students achieved better marks for the material covered with the interactive handout (72.84%) than the material supplemented with complete notes (58.02%), suggesting that higher levels of cognition were achieved by students when the interactive handout was used.

This study outlines the positive role interactive handouts have on student motivation and facilitation of learning when applied to large groups. The results suggest that note taking during the lectures encourages more students to take an active role in the process of learning during lectures and encourages the students to process the taught information at source. The use of interactive handouts thus may be used to create an encouraging learning environment during, what may be traditionally perceived as, teacher-centred lecture sessions.

Introduction

With the increasing number of students enrolled at Universities, not only in Schools of Pharmacy (Tylor et al. 2004) but other disciplines too (BBC 2008) there is mounting concern that the teaching quality and student learning is compromised. Although lecturing to large groups is common practice in many Universities across various fields of study (Woods et al. 2007; Cantillon 2003), traditional lectures are frowned upon as being unlikely to sustain deep learning and high-level student engagement, as they are primarily teacher-centred (Boyapati 2000). Nonetheless, as Biggs (2003) suggests, lecturing to large groups is not about 'making the best out of a bad job', and 'good teachers' should provide an effective learning environment regardless of the class size.

Within large classes, students will inevitably demonstrate various learning styles. No single teaching strategy can simultaneously accommodate all learning styles; hence there is a call for teachers to use a combination of activities in lectures to promote active learning (Bratt 2003). Huerta (2007) acknowledges the positive impact active learning can have during large lecture sessions. There are various approaches to teaching that aim to actively engage students and build upon their individual learning styles. An example of this is the use of interactive handouts. In this paper, the term 'interactive handouts' will be used to refer to material supplied to the students prior to the class containing incomplete notes from the lecture, requiring them to individually complement these during the session in order to obtain sufficient notes.

Instructional materials are largely used to aid the delivery of lectures (Ingram et al. 2004). However it is the questionable whether they always encourage student engagement with the subject matter and thus result in deeper learning. Students may perceive the handout material as

being the only content that needs to be studied for the topic, and this may discourage further reading (Ingram et al. 2004). The structure and content of materials is therefore imperative (Morgan et al. 1988). Moreover, providing the students with a full set of notes may provoke a false sense of security that they are the only material that needs to be revised in order to pass the exams. In addition, they may encourage students to take a passive stance to their learning and consequently diminish student attendance at lectures.

Interactively designed support material has been recognised as linking '*self directed learning with face to face learning*' (Farrow 2003). Thus the students may feel they are gaining 'added value' by attending lectures and complementing handouts, which may lead to improved learning. If students are engaged with the lecture material and take an active part in the learning process by recognising and noting the key points taught, then their learning is more effective, motivated and higher cognitive levels may be achieved (Smith 1997). Morrison et al. (2002) found that their students achieved better marks when using a handout, similar to that used in this study, which combined available notes and note-taking. This emphasized the positive influence interactively designed handouts may have on student learning. The research presented here monitors the influence of interactive handouts on student attendance and learning (established via exam performance).

Methods

For this investigation, a cohort of 252 Level 1 students was studied. Data was collected from a series of six lectures in a single module. Due to the large student numbers, the cohort was taught in two groups, but both groups received identical, timetabled lectures. The need to contact the student cohort and inform them of the study was not deemed necessary, as it was understood that

this may affect their behaviour. Blackboard course statistics software was used to monitor student access to materials. To protect anonymity, all student results were processed anonymously and are presented in sub-groups only.

Handout material

Two different style handouts were prepared for the sessions that were under investigated. For the first series of three lectures an interactive handout was produced. This was designed to complement the lecture material delivered and required the students to add notes to the handout during the lecture. This series of lectures will be referred to as '*interactive handout sessions*'. The second handout contained all the PowerPoint slides that were used during the lecture with space allocated for additional notes to be made by the students (complete handout). This series of lectures will be referred to as '*complete handout sessions*'.

The handout materials were then individually posted on the University's Blackboard site one week before the relevant lectures. The students were advised, via e-mail, about their location and the requirement to bring a copy of the handouts to the lectures. It is acknowledged that students may disseminate their downloaded notes to peers that have not accessed Blackboard, thus skewing the actual predicted use of the notes during lectures. Nonetheless, the data collected indicates level of class involvement with such material first hand and will be interpreted in such a way. The Blackboard site's integrated function to track material access was employed. The data was collected on the last day of the week's lectures.

Attendance

Attendance at the lectures was monitored via a sign-in sheet, as per normal practice. As each week consisted of three lectures on two separate occasions, the overall attendance of the students

was assigned as none-attendance, half-attendance or full-attendance.

Exam performance

Student learning was formally assessed during an examination consisting of multiple choice questions. This formed part of the normal module assessment strategy. There were a total of 70 questions in the paper, but only 10 questions relevant to the material covered in the two handouts were considered here. Thus it was not the students' final exam performance that was analysed in this work, but only that which related to the handouts.

There were six questions set from the first week's lectures (the interactive handout sessions) and four from the second week's lectures (complete handout sessions). Exam performance in these questions was marked using the EDPAC[®] sheets for the optical mark reader (DRS Data Services Limited) and separated from the full 70 question exam paper. The results from the 10 relevant questions were collated as a percentage for each handout and as a combined percentage for all 10 questions.

Analysis

The attendance at classes was compiled with the data obtained from the Blackboard site and compared to exam performance. Various statistical analyses were completed using the Minitab version 15.1.1.0 software, including paired and two-sample T-tests.

Ethical considerations

There are no significant ethical issues in this study. It did not interfere with the normal teaching and learning processes and only utilised available institutional data. Hence, there was no need to inform students about the study as this may have influenced their engagement with Blackboard and lecture attendance. Equal opportunities were available for all the students

with the whole student cohort receiving the same handouts and lectures, they had the same opportunity to download all notes in time, attend all lectures and undertake the exam. No students with disclosed disability (e.g. dyslexia) were present in the group, thus no special arrangements were needed. Student names were omitted and the information gathered and processed anonymously. The data was analysed and presented so as to ensure that students could not be identified.

Results and Discussion

Overall 252 students were enrolled onto the module under investigation. From these, nine students did not attempt the exam for various reasons not considered here and were therefore removed from the analysis.

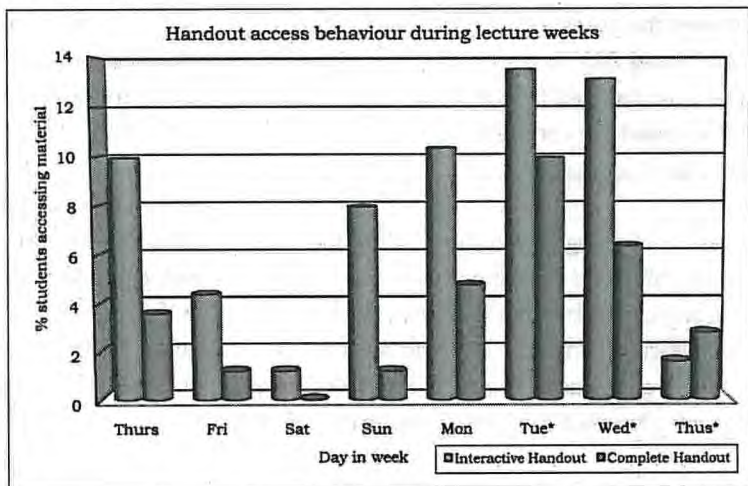
Student handout access behaviour

Blackboard was used to monitor student access to the handouts prior to the lectures. It was observed that 61.90% of the whole student cohort accessed the interactive handout while only 29.76% of the students accessed the complete handout. A possible explanation may be the nature of the handout material. The interactive handout required additional notes to be made during the lecture and the complete handout contained all the notes from the lecture. Hence, students may have felt that the complete

handout would not aid them during the lecture as they could access the notes at a later date to aid their revision. As they were not of immanent importance, they did not engage with Blackboard during the monitored time. Conversely, for the interactive handout, students needed to make their own notes to complete the handout and subsequently use it to aid their revision. Hence, the importance of them downloading the interactively designed handout and bringing to the lecture was recognised, leading to the observed interaction with Blackboard. However, an alternative possibility is that, although Blackboard is a commonly used information exchange medium from staff to students, students may have lost interest in the process of accessing the handouts and chose not to engage with the exercise as the module progressed.

Figure 1 shows the distribution of students accessing the handout material during the relevant weeks. If students accessed the handout several times during the week, only the first hit was considered. From this data the difference between the volumes of students accessing the different instructional material is evident. Also notable is the increased access to the relevant handout material immediately upon posting them and prior to the lectures – and this was a common pattern for both handout styles.

Figure 1 Student percentage access of the handout material during the weeks of lectures. The days indicated with an asterisk are the days the lectures took place.



Handout content and student attendance

Student interaction with the handout material and their attendance recorded at the lectures was considered and the results are shown in Figure 2.

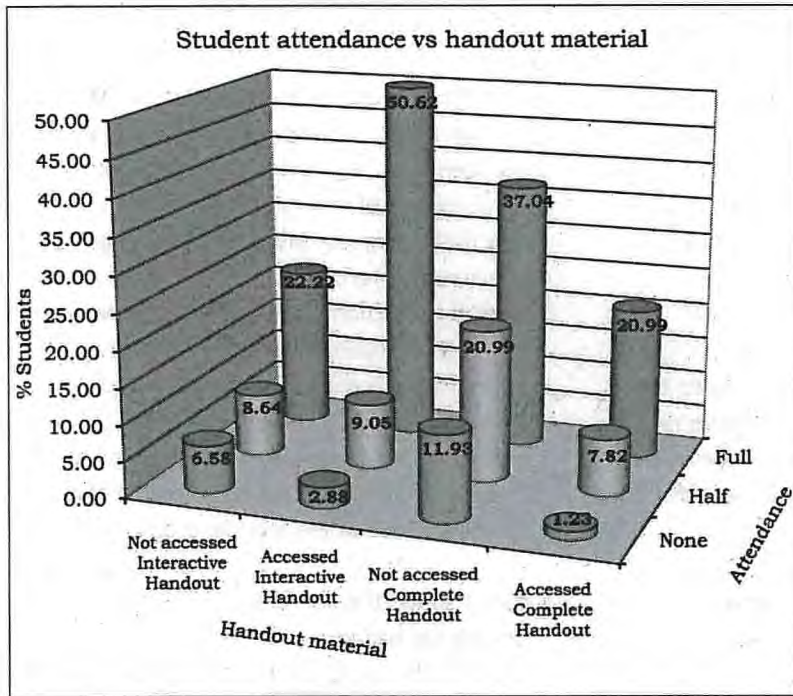


Figure 2 The relationship between student attendance at lectures and their access behaviour for the two distinct handout materials (interactive and complete handouts). The terms 'None', 'Half' and 'Full' attendance indicate the level of student attendance at the lecture series and are described in the methods section. The numbers in the cylinders represent the percentage students accounted for in those subgroups.

Overall the data indicate that the students who accessed the interactive handout were the ones that attended the full lecture sessions (50.62%). This was not, however, the case for the complete handout. Considerably more students who attended all the lectures did not access the complete handout compared to those that accessed the notes and attended all the sessions (37.04% and 20.99% respectively). The lowest value was observed for the student subgroup that accessed the complete handout but did not attend the lectures (1.23%).

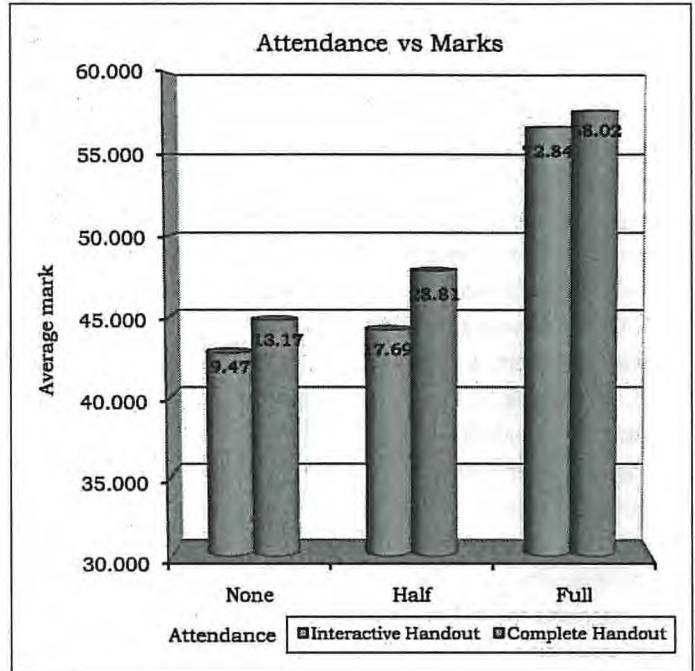
It was encouraging to find that most of the students attended all of the sessions, however a notable increase in attendance was observed at the interactive handout supported sessions (72.84%), as opposed to the full lecture material containing handout (58.03%). Conversely, more

students (13.16%) did not attend any of the complete handout supported lectures compared to the 9.46% that did not attend any of the sessions complementing interactive handout. A possible explanation for this behaviour may be partially contributed to the content and the nature of the handout material as discussed above. However the influence of external and individual factors cannot be eliminated. One such factor might be the time of day the lectures were timetabled. It was noted that there was a marked decline in student attendance at the 9-10am slots, when compared to attendance for sessions timetabled later in the day. However, this was not investigated in detail here and may form part of future investigations. Nonetheless, more students attended all the lectures that required the interactive handout.

Influence of handout content and student attendance on exam performance

The influence of attendance and content of handout material on exam performance was considered and the results obtained are graphically presented in Figure 3. Six subgroups were identified based on the handout material covering the lectures and the students'

Figure 3 The relationship between handout content, lecture attendance and exam results. The values shown are the percentage of students that make up the subgroups.



A direct relationship between learning (exam performance) and attendance was observed for both lecture series (interactive handout and complete handout). The observed incremental difference was statistically significant ($p < 0.05$) for both types of handouts. This corroborates the hypothesis that students learn more when they attend lectures. No statistical significance at 95% confidence was observed between the related subgroups. However, regardless of whether the students attended the lectures or not, the mean mark for both the instructive materials was identical (53.151%, with marks ranging from 0-100% in both instances). Nonetheless, the prominent finding here is that from the fully-attending student cohort more students (72.84%) achieved better marks when supplied with an interactive handout than when given the complete handout (58.02%).

Further analysis of the data revealed that, for the full-attendance subgroups, the highest number of students achieved marks within the range 60-70%. This was not the case for the none- and half-attendeers, where marks of 50% and lower were more frequent. From the cohort of 243 students, 4.53% did not actively engage with any of the handout materials and did not attend any of the lecture sessions. The average mark for this subgroup of students was $40.91\% \pm 22.81$ standard deviation (SD) for interactive handout and $50.00\% \pm 11.81$ SD for complete handout material. Hence, on average, higher marks were achieved within this group when the full lecture notes were made available to be accessed beyond the monitored time, prior to the final exam. Though these mean marks fall within two separate marking classes (i.e. third and 2.2), it is not a significant difference, at 95% confidence,

given the large standard deviations. Nonetheless, they both are lower than the contrasting subgroup of students that accessed both handouts and attended all the sessions (15.64% of students). Their average exam mark for the interactive handout material was $63.60\% \pm 21.17\text{SD}$ (significantly higher than the none-attending/none-accessing subgroup described above) and $52.63\% \pm 27.13\text{SD}$ for the complete handout material (no significant difference compared to the none-attending/none-accessing subgroup). Here the opposite was observed, higher marks were achieved for the interactive handout supported lecture material (interactive handout). From these observations it may be suggested that there is no appreciable difference in marks achievable by lecture-attending and none-attending students if the full lecture notes are supplied (mean marks 52.63% and 50.00% respectively). However, there is a marked difference in their marks when provided with interactive handouts (63.6% and 40.9%). This further supports the hypothesis that supplying the learner population with the lecture notes before the session does not aid their attendance nor learning and thus exam performance. The benefit of attendance combined with the use of interactive notes is evident in the results collected and presented, as this subgroup of students achieved the highest average mark. Not taking into consideration the instructional material supplied, and solely focusing on attendance at the monitored classes, there is a significant difference ($p=0.06$) between the marks achieved by the none-attending students subgroup, $44.5\% \pm 12.9\text{SD}$, and those accomplished by the fully attending subgroup, $59.2\% \pm 16.2\text{SD}$. Thus, it was concluded that students attending lectures and engaging with the taught material achieved higher exam marks.

Considering only student attendance and style of handout material (i.e. not considering their engagement with the Blackboard to access the

notes prior to the lectures), larger student populations constituted the subgroups analysed nonetheless, a similar trend in results was achieved. This data is represented in Table 1 below.

	Non-attending	Fully-attending
Interactive Handout	$42.86\% \pm 20.37$	$59.00\% \pm 22.53$
Complete Handout	$51.79\% \pm 18.25$	$52.22\% \pm 24.28$

Table 1 Summary table showing average marks (%) \pm standard deviation of the 4 subgroups of students.

On average, none-attending students achieved higher marks when supplied with the lecture material (complete handout) rather than an incomplete interactive handout. Though this difference was not found to be statistically significant, the influence of handout content cannot be ignored. Higher average marks were noted for those students that attended the lectures. Here the opposite correlation was found, with the highest average exam performance being noted for the interactive handout ($59.00\% \pm 22.53\text{SD}$) compared to the complete handout ($52.22\% \pm 24.28\text{SD}$). This difference emphasises the important role active engagement within the session can have on student learning.

Additionally, a significant difference was found between none-attending and fully-attending students for the interactive handout covered material with the latter achieving higher marks. A significant correlation, however, was not observed when considering attendance during the complete handout sessions and the assessment marks. This again, may be explained due to the nature of the handout material.

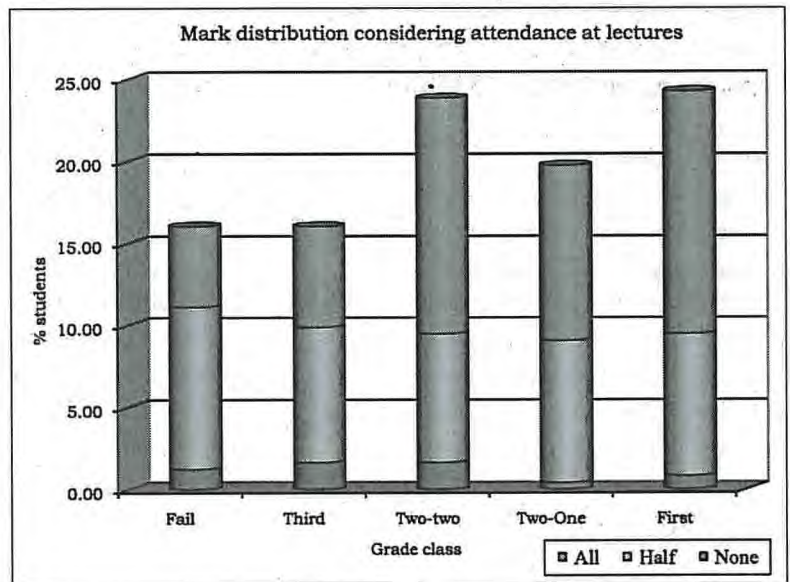
The observed correlation between improved performance and student attendance at lectures may be solely due to the fact that the higher achieving students are usually more enthusiastic about their studies and thus attend the lectures. It could be postulated that they would achieve high marks regardless of whether they attended the taught sessions or not. Nonetheless, the evidence presented here supports the school of thought that students who attend lectures and are encouraged to actively engage with the lecture material during the lecture achieve higher levels of cognition of the taught material, hence perform significantly better in formative assessments than students who do not attend the lectures.

The distribution of mark frequency within the five grade classes (fail, 3rd, 2.2, 2.1 and 1st) amongst the student cohort is shown in Figure 4. There were three major sub-categories of students based on their attendance behaviour that were considered (not taking into account their interaction with Blackboard and the posted handout materials):

1. None-attending students ('None') – not present at any of the lecture sessions delivered. A total of 14 students constituted this group.
2. Half-attending students ('Half') – those attending some of the taught sessions. This category consisted of 105 students.
3. Fully-attending students ('All') – attending all the sessions in both weeks. This group was the most populated with 124 students.

The stacked column graph, Figure 4, displays clearly the contribution from each attendance subgroup to each grade classification.

Figure 4 'Stacked columns' histogram indicating the contribution from each of the three student attendance subgroups to the different grade classes.



In the 'Fail' category the majority of students were from the half-attending subgroup of the student cohort. However the higher grades (2.2, 2.1 and 1st) were more populated by the fully-attending student sub-group. These results further support the conclusions that attendance at lectures does improve learning and thus aids the achievement of better exam performance.

Overall, from the work presented here, the notable increase in exam performance after attending lectures is documented, together with the findings that interactive handouts encourage attendance and therefore improve student learning (based on formal assessment of learning).

Conclusion

"Personally, I'm always ready to learn, although I do not always like being taught."
(Winston Churchill)

Although lectures as a form of teaching have been criticised as an inappropriate way of teaching and therefore facilitating students' learning, given the increasing number of students Universities take on (BBC 2008), it is hard to comprehend an alternative strategy. In this study, a module was considered that had 252 students enrolled. With no facilities available at the campus to accommodate such a large class size and the recognised difficulties in teaching such groups, the student cohort was split into two.

Given these circumstances, this work set out to investigate whether the active engagement of students within such large groups is enhanced by handout materials. Specifically designed interactive handouts were employed and it was assessed whether they positively influenced student learning as previously reported by Tam et al. (1993). One of the major findings from this study was that given an interactive handout, student attendance at lectures was greater than during lectures for which the full lecture material

was available to download prior to the session. As attendance at lectures is generally poor (Clay & Breslow 2006; Clearly-Holdforth 2007) which is not consistent with the high module pass rates, the inevitable question is whether students do actually learn more if they attend lectures? If so, any initiative that improves attendance will offer significant pedagogical advantage. As the students were required to access the posted handout material, the pattern of engagement with the uploaded material revealed an initial 'burst' of hits followed by a gradual increase up to the days when the lectures were scheduled, when the majority of students downloaded the documents. This was common for both handouts. However there was a marked decrease in the number of students accessing the complete handout. The trends also suggest that, prior to the start of the lecture series, more students had accessed the incomplete handout (54.5%) than the complete handout (36.0%). This suggests that they recognised the need for the interactive material during the lecture sessions and opting to download the complete notes only after the corresponding lectures had been started.

Mattick et al. (2007) found that some students value lectures and use them to aid their learning, whereas others prefer alternative learning methods. Therefore, the students' preferred learning styles may well have a far more significant impact on their eventual performance than any supplementary material. Nevertheless, from the whole cohort of students analysed, more than 50% attended all the relevant lecture sessions and accessed the interactive handout, thus had it available during the lectures. Overall most of the students attended all of the sessions, with an increase in attendance observed at the interactive handout supported sessions. Although the influence of additional external and internal factors cannot be eliminated, this data does indicate that supplying the students with the complete handout discouraged attendance, as

lower than average attendance was observed during these classes. This suggests that the use of interactive handouts encourages attendance. Nonetheless, this finding, though indicative of a possible way of improving student attendance, may not have any relevance on student learning. Therefore the students' ability to answer multiple choice questions under exam conditions was considered as a means of assessing student learning. There was a significant increase in students' mean marks for those who attended all the relevant lectures, though the results for the two handout materials were comparable. Murphy et al. (2002) in a related study of the outcomes of the availability of lecturer's notes, found that providing the student cohort with full lecture material did not improve exam performance, as those that did not download these notes achieved higher scores.

It was observed that more students attended the interactive handout lectures and that there was no difference between the exam performances from the two handout lecture series. This resulted in more students achieving better marks when attending all the sessions and being supplied with an interactive handout than when supplied with the complete handouts (14.81% difference). Isaacs (1989) emphasises that note-taking during lectures is 'an integral and essential part' of student learning and interactive materials provide a structured and formalised means of encouraging this.

Further investigations may consider surveying students' views on the different handout material and the use of Blackboard as a disseminating medium. The work presented here highlights the fact that students definitely 'do not always like being taught' as the attendance at various sessions, irrespective of the instructional material supplied demonstrated notable trends. However, the provision of interactive handouts appears to offer a motivational strategy that lecturers can

employ to increase student attendance and consequently their learning during lectures.

■ **Elsie Gaskell** is a lecturer in Pharmacology, School of Pharmacy and Biomolecular Sciences.

References

- BBC (2008) *Record rise in UK undergraduates* <http://news.bbc.co.uk/1/hi/education/7194396.stm> [Accessed 1st March 2010]
- Biggs J (2003) *Enriching large-class teaching. In: Teaching for Quality Learning at University, 2nd edition.* Open University Press, Milton Keynes
- Boyapati B (2000) Learning: Student-centred vs teacher-centred. *Korean Journal of Chemical Engineering*, 17 (3), 365-367
- Bratt AM (2003) A large group hybrid lecture and problem-based learning approach to teach central nervous system pharmacology within the third year of an integrated masters level pharmacy degree course. *Pharmacy Education*, 3 (1), 35-52
- Cantillon P (2003) Teaching large groups. *British Medical Journal*, 326, 437-440
- Clay T & Breslow L (2006) Why Students Don't Attend Class. *MIT Faculty Newsletter*, XVIII (4) <http://web.mit.edu/fnl/volume/184/breslow.html> [Accessed 1st March 2010]
- Clearly-Holdforth J (2007) Student non-attendance in higher education. A phenomenon of student apathy or poor pedagogy? *DIT Level 3*, 5 http://level3.dit.ie/html/issue5/clearly-holdforth/clearly-holdforth_1.html, [Accessed 1st March 2010]

- Farrow R (2003) ABC of learning and teaching in medicine: Creating teaching materials. *British Medical Journal*, 326, 921-923
- Huerta JC (2007) Getting Active in the Large Lecture. *Journal of Political Science Education*, 3 (3), 237 - 249
- Ingram MJ, Edmonds H, Moss GP, Long AJ, Sosabowski MH & McLennan MW (2004) The role of handouts in the M.Pharm degree pathway - Differentiating between the inquisitive and the acquisitive. *Pharmacy Education*, 4 (1), 7-12
- Isaacs G (1989) Lecture Note-taking, Learning and Recall. *Medical Teacher*, 11 (3&4), 295-302
- Mattick K, Crocker G & Bligh J (2007) Medical Student Attendance at Non-compulsory Lectures. *Advances in Health Sciences Education*, 12 (2), 201-210
- Morgan CH, Lilley JD & Boreham NC (1988) Learning from Lectures: The Effect of Varying the Detail in Lecture Handouts on Note-Taking and Recall. *Applied Cognitive Psychology*, 2 (2), 115 - 122
- Morrison EH, McLaughlin C & Rucker L (2002) Medical students' note-taking in a medical biochemistry course: an initial exploration. *Medical Education*, 36 (4), 384-386
- Murphy TM & Cross V (2002) Should students get the instructor's lecture notes? *Journal of Biological Education*, 36 (2), 72-75
- Smith B (1997) *Lecturing to large groups*. SEDA Special 1. Staff and Educational Development Association, London
- Tam M, Wong Leung R & Koo A (1993) *Colloquium: Improving lectures by using interactive handouts*. *British Journal of Educational Technology*, 24 (2), 139-145
- Taylor KMG, Bates IP & Harding G (2004) The implications of increasing student numbers for pharmacy education. *Pharmacy Education*, 4 (1), 33-39
- Woods LN, Joyce S, Petocz P & Rodd M (2007) Learning in lectures: multiple representations. *International Journal of Mathematical Education in Science and Technology*, 38 (7), 907-915