

*Research article***Changes in Use of Technological Methods of Teaching and Learning in Undergraduate Pharmacology in UK Higher Education**

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Abstract

A survey of methods of teaching and learning used in pharmacology in UK Higher Education was conducted in 1996 (Markham et al., 1998). A further survey involving 342 UK pharmacologists has now (2001) been conducted and with respect to 1996: the findings were as follows:

(a) there has been a large drop (78% to 33%) in the utilisation of chalk and talk lectures and there is high use of PowerPoint presentations (60%);

(b) there has been a large increase in the more than occasional utilisation (23% to 62%) of CAL materials;

(c) utilisation of video material as increased markedly (13% to 28%);

(d) there has been a small increase in the utilisation of problem based learning;

(e) self- and peer- assessment by students is not used extensively and use is little changed since 1996;

(f) there has been a small improvement in the encouragement/support/recognition provided by institutions for teaching;

(g) the adequacy of IT hardware/support/resources for teaching has improved from 1996 when resources were viewed as inadequate.

Teaching staff have increased use of technology based teaching are now much more positive about its availability and use. This may reflect the operation of a variety of programmes aimed at increasing technology-based teaching operating during the period.

Keywords: Teaching methods; pharmacology; survey of pharmacologists; changes in teaching method utilisation

Introduction

In 1996 a survey of the methods of teaching and learning used in teaching pharmacology in UK higher Education (HE) was conducted (Markham *et al.*, 1998). This survey was primarily concerned with technology-based teaching and aimed to:

- (1) determine the extent to which non-tradition teaching and learning methods were used (with particular reference to technology-based methods);
- (2) find what factors influenced pharmacology teachers in deciding whether to use traditional or non-traditional methods;
- (3) establish the perceptions of pharmacology teachers with regard to the possible benefits of non-traditional teaching methods;
- (4) determine if pharmacology teachers were satisfied with the level of support and recognition by their institutions of the use of non-traditional teaching methods.

A number of initiatives which might influence the methods of teaching and learning used in teaching pharmacology have been operating since 1996. Teaching Quality Assessment

(TQA) visits have been carried out by the Quality Assurance Agency (QAA) and other programmes aimed at encouraging changes in teaching and learning methods have been active (e.g. the Computers in Teaching Initiative (CTI), the Teaching and Learning Technology Programme (TLTP), the Fund for the Development of Teaching and Learning (FDTL), the National Teaching Fellowship Scheme (NTFS) and the Learning and Teaching Support Network (LTSN)). In order to see if these initiatives have impacted on pharmacology teaching a second survey has recently been conducted (June 2001) and the results are reported here in comparison with those obtained in 1996.

Methods

The methodology adhered as closely as possible to that used in 1996 to enable valid comparisons to be made and is reported in full elsewhere (Markham *et al.*, 1998). In outline, the population surveyed (anonymously) comprised pharmacologists, thought to be involved in teaching undergraduates, whose names were obtained from a variety of published directories. Questionnaires (responses to which were designed to be compatible with an optical mark reader for ease of data processing) were sent out during June 2001 to be returned by July 30th, 2001. Responses to questions were generally required on a 5 point scale. The number of respondents in each category was determined and these data were processed as follows. Where the 5 point scale rated usage it was: A = never; B = occasionally; C = frequently; D = predominantly; E = always. Responses were assigned values of 1–5 respectively and to provide an overall usage rating ('OUR') the fraction of respondents at each scale point was multiplied by the assigned value and summed to provide an OUR measure from 1–5. The percentage usage ('PU') was calculated by taking the total of the respondents in categories C, D & E, dividing by the number of respondents to the question and expressing the result as a percentage. Where the 5 point scale measured agreement/disagreement with a given statement it was: A = strongly agree; B = agree; C = neutral; D = disagree; E = strongly disagree. The responses were assigned values of +2, +1, 0, -1 and -2 respectively and were multiplied by the percentage of respondents in each category and summed to give an agree/disagree measure of +200 to -200 (strong disagreement). For comparison, data from the 1996 survey where an equivalent question was asked is presented in parentheses [].

Results and Commentary

The survey was distributed by post to 342 [339] pharmacologists. While the basis of the distribution was the address list used for the 1996 survey it was found that a surprisingly large number of pharmacologists had changed jobs or moved. Some of this was no doubt due to the rearrangement and amalgamation of many of the pharmacology departments within the University of London. Ninety-eight pharmacologists on the 1996 list were identified as having moved or left teaching; some of these (52) were replaced by individuals not included in the 1996 survey while the others were included at their new addresses (but were not necessarily in the same jobs). While the survey may still be representative it should not be thought that exactly the same individuals were surveyed on both occasions. Of the 342 forms sent out 214 returns were obtained (62.5%) [59%]. Of these 12 [14] provided no data, the individuals having no longer any involvement with teaching. The data below refer to the 202 remaining returned survey forms. Not all questions were answered on every form.

Responses to the question 'What is your present age?' are shown in Table 1. Clearly there has been a dramatic alteration in the age distribution of the respondents making returns. One explanation is that in the 5 years since the previous survey those at that time in the 41–50

group have aged into the 51–60 group and have not been replaced by a similar movement from the 31–40 group indicating that these must have been at the early part of the range in the previous survey. Equally, these differences could simply reflect a different distribution of respondents from the sample surveyed. There is a rise in the percentage in the 20-30 age group possibly indicating an encouraging influx of new teachers to the discipline.

Table 1. Age distribution of survey respondents in comparison to the results obtained in 1996

| Age Range | Percentage (2001 survey) | Percentage Range (1996 survey) |
|-----------|--------------------------|--------------------------------|
| 20–30 | 19 | 1 |
| 31–40 | 36 | 32 |
| 41–50 | 7 | 40 |
| 51–60 | 36 | 24 |
| 61–65 | 2 | 3 |

In response to the question 'Do you have any formal teaching qualification or are you currently taking any course leading to a formal teaching qualification?', 14.7% of respondents answered 'yes' [7%]. The proportion having or taking a course leading to a formal teaching qualification has therefore doubled possibly reflecting the introduction of the Postgraduate Certificate in Learning and Teaching in Higher Education programmes (PGCLTHE) for many new members of university staff. These courses generally contain information on the availability of technology based teaching aids though they would directly affect the data returned by the survey only with respect to the relatively small numbers of respondents who had undertaken such a course.

The first set of questions related to usage of different types of teaching method or teaching aids and are shown in Table 2. The rank order of the use of the teaching methods surveyed was: e-mail (79.5%) > slides/OHP acetates (62%) = CAL (62%) > computer presentations (e.g. PowerPoint 60%) > problem-based learning (48%) > simulations (45%) > chalk/talk lectures (33%) > videos (28%) > peer assessment (24%) > self assessment (23%). In comparison with 1996, there has been a notable increase in the use of computer-aided presentations, computer aided learning materials and video material. Chalk and talk lectures have decreased considerably. It is notable that self- and peer- assessment by students has remained little changed despite the documented advantages of these methods in terms of staff time and student learning outcomes (Race, 2001; Hughes, 1995: Hughes *et al.*, 1993). Introduction of such methods is initially time-consuming and may meet with resistance from both students and other staff all of which might contribute to the lack of increased utilisation.

The second set of questions related to agreement or disagreement with various statements designed to measure staff attitudes and views relating in particular to technology based teaching. The results are shown in Table 3 and are overall quite positive in relation to the responses obtained in 1996. Technology-based teaching has substantially increased (Qu No19), views on its popularity and effectiveness are much more positive (Qu No18, 20), institutions are somewhat better at encouraging/supporting/rewarding teaching activity (Qu No11) and both the hardware and support for technology based teaching are substantially better (Qu No12,13). Factors inhibiting the use of technology-based teaching are shortage of time (Qu No15) and lack of pre-prepared support materials (Qu No16) rather than lack of knowledge of what materials are available (Qu No14).

The survey also asked some additional questions. Only 1.5% of respondents checked the box when asked 'If you NEVER use any form of computer materials or information technology in your teaching, check this box' indicating that 98.5% made some use of information technology in their teaching. The question 'Are you aware of the existence of the pharma-CAL-ogy software produced as part of the TLTP program and available through the British Pharmacological Society' (Qu No22) produced a 96.8% positive response and 'In your teaching do you use any pharma-CAL-ogy material (or the material produced by TLTP projects from which it was derived)' (Qu No23) gave a 61.8% positive response.

Table 2. Questions (numbered, Qu No) and responses measuring usage of different teaching methods and aids. The number of respondents in the A (never) to E (always) categories are shown together with the Overall Use Rating (OUR; the fraction of respondents in each category, multiplied by an assigned value A to E = 1 to 5 respectively) and summed) and the percentage utilisation (PU%, the total number of respondents in categories C, D, E expressed as a percentage of the total respondents to the question). Comparable values from the 1996 survey are shown in [parentheses]. The survey form presented the question: On a 1 (never) to 5 (always) scale how often do you use the following in your teaching:

| No | Question | A | B | C | D | E | 'OUR' | PU% | Commentary |
|----|--|-----|----|----|----|----|----------------|------------|---|
| 1 | ...chalk and talk lectures | 77 | 53 | 23 | 25 | 16 | 2.22 [3.25] | 33 [78] | Large decrease in utilisation of chalk and talk lectures |
| 2 | ...computer-based presentations (e.g. PowerPoint) | 38 | 41 | 20 | 52 | 47 | 3.14 | 60 | High utilisation of computer presentations; probably accounts for fall in use of chalk and talk |
| 3 | ...computer-based or web based learning materials | 31 | 45 | 77 | 42 | 3 | 2.7 [1.9] | 62 [23] | A large increase in the utilisation |
| 4 | ...video material | 61 | 82 | 51 | 5 | 0 | 2.0 [1.8] | 28 [13] | Increased markedly |
| 5 | ...slides or OHP acetates | 38 | 39 | 26 | 44 | 55 | 3.2 | 62 | |
| 6 | ...problem-based-learning | 39 | 63 | 62 | 30 | 4 | 2.47 [2.35] | 48 [37] | Small increase in utilisation |
| 7 | ...email or web-based facilities for communication with students | 22 | 18 | 29 | 54 | 72 | 3.69 | 79 | Now very widely used |
| 8 | ...self-assessment by students | 102 | 52 | 30 | 12 | 4 | 1.82 [1.8] | 23 [17] | Small increase |
| 9 | ...peer assessment by students | 101 | 52 | 30 | 15 | 3 | 1.81 [1.7] | 23 [17] | Small increase |
| 10 | ...simulations of situations | 45 | 65 | 62 | 27 | 3 | 2.38 | 45.5 | Substantial current use |

More than 40% of respondents had heard of the LTSN Centre for Bioscience even at this early stage of its existence (1 year of operation).

Space was provided for respondents to make additional free-text comments and 30 did so. These comments were diverse and the only discernable themes were along the lines of shortage of time for teaching activities because of other pressures and a perception that there was a lack of recognition of teaching activities at institutional level.

Table 3. Questions (numbered, Qu No) and responses measuring agreement/disagreement on survey questions. The number of respondents in the A (strongly agree) to E (strongly disagree) categories are shown together with the Agree/Disagree Rating = ADR; = the percentage of respondents in each category, multiplied by +2, +1, 0, -1, -2 respectively) and summed to give an agree/disagree measure from +200 to -200 (strongly disagree). Comparable values from the 1996 survey are shown in [parentheses]. The survey form presented the question: On a 1 (strongly agree) to 5 (strongly disagree) scale to what extent do you agree with the following statements:

| No | Statement | A | B | C | D | E | ADR | Commentary |
|----|--|----|-----|----|----|----|----------------|--|
| 11 | Over the last 3 years (or in current employment if shorter) the environment within my unit/institution has provided more encouragement/support/recognition for teaching activities | 14 | 82 | 56 | 26 | 24 | +17.9 | There has been a small improvement in the encouragement / support / recognition provided by institutions for teaching in the last 3 years. |
| 12 | In my unit IT hardware resources match the requirement for widespread use of IT based teaching and learning methods | 14 | 71 | 34 | 69 | 14 | +1.0 [-45] | Opinion is neutral regarding adequacy of hardware resources; this represents a large improvement as 5 years ago resources were very inadequate. |
| 13 | In my unit technical support for IT does not meet demand | 17 | 65 | 39 | 64 | 17 | +0.5 [-46] | Opinion is neutral regarding adequacy of technical support for IT; this represents a large improvement as 5 years ago technical support was viewed as very inadequate. |
| 14 | My use of technology-based teaching materials is constrained by my knowledge of its availability | 6 | 56 | 58 | 69 | 12 | -13.4 | Lack of knowledge of availability of technology based teaching material did not constrain its use by teachers. |
| 15 | My use of technology-based teaching materials is constrained by availability of my time to incorporate this in my teaching | 47 | 81 | 43 | 26 | 5 | +68.8 [+80] | There were quite strong feelings that time availability does limit initiation/use of technology based teaching. |
| 16 | My use of technology-based teaching materials is constrained by lack of support materials to integrate technology-based teaching into my courses | 15 | 78 | 60 | 42 | 6 | +27.6 | There is some feeling that lack of support material constrains use of technology based teaching. |
| 17 | Use of technology-based materials in my teaching is limited by the time I spend on research/consultancy | 54 | 50 | 36 | 36 | 26 | +38.0 [+29] | Research/consultancy is a constraint on use of technology based teaching materials. |
| 18 | Technology-based teaching materials are generally liked by students | 22 | 92 | 61 | 17 | 4 | +56.6 [-23] | Strong view students like technology based materials. View in 1996 was very negative. |
| 19 | Over the last 3 years (or in my present employment) my use of technology based teaching has increased | 54 | 109 | 24 | 4 | 1 | +100.4 | Very strong agreement that use of technology based teaching has increased in last 3 years. |
| 20 | Technology based teaching materials assist and encourage student learning | 71 | 116 | 56 | 8 | 0 | +74.6 | Strong view that technology based materials encourage student learning. An exactly similar question was not asked in 1996 but related questions revealed a predominantly negative view at that time. |

Discussion

Interpretation of comparisons of data from surveys not involving the same populations are fraught with uncertainty. The identical respondents were not involved in these two surveys

and the age distribution of the respondents had changed. To what extent this is responsible for the differences observed cannot be determined but it is noteworthy that there has been a substantial increase in the respondents in the younger age bracket who might be expected to be more receptive to the use of non-traditional teaching methods. While the results indicate attitudes have changed, it is difficult to determine if this represents a change in attitudes of individuals or a change in the responding population. Consideration of the numbers involved in this survey who were not involved in the previous survey (52, only a proportion of whom would be respondents) and the size of the changes in attitude would suggest it is unlikely that the new individuals wholly account for the overall attitudinal changes found. It is more likely that a real modification of individuals' attitudes has taken place.

The fact that only 1.5% of respondents indicated they never used technology based materials/methods in their teaching and only 15.6% (Qu No.3) never use computer-based learning materials indicate substantial uptake of technology-based teaching methods. The use of these methods has clearly moved beyond the 'enthusiast' and has embraced the mainstream teacher as is indicated by the increase from 23% utilisation in 1996 to 62% in 2001. From Qu No.23, it is apparent that 62% of respondents used materials produced as part of the TLTP programme (pharma-CAL-ogy) indicating a substantial contribution from this source though other programmes may have contributed to the motivation to change (e.g. the TQA visits by QAA).

While use of technology-based methods has increased substantially, there has been relatively little change in the use of some other non-traditional methods such as self- and peer- assessment. There is considerable scope, therefore, to alter attitudes to non-traditional teaching methods other than those which are technology based. The survey data give no indication of any accompanying change in the pedagogical basis of teaching which may or may not have accompanied the increased use of technology-based methods. It is possible that traditional 'transference model' lectures with emphasis on content are still being given but are now presented in PowerPoint rather than with a stick of chalk. Any future survey needs to examine not just the use of technology-based methods but also the pedagogical basis of their use.

The changes in the use of and attitudes to technology-based teaching since 1996 have been substantial and may well reflect the influence of the mature programmes active in the period i.e. TLTP (phases 1,2 & 3 in which pharmacology was strongly represented), TQA and CTI. If this is so, it is likely that the more broadly based programmes currently operating (i.e. LTSN, FDLT and NTFS) will, as they mature, make an impact on teaching and learning methods more generally, particularly on the pedagogical rather than the technological underpinning.

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Reference list

- Hughes, I E and Large, B J (1993) Staff and peer group assessment of oral communication skills. *Studies in Higher Education* **18**, 379—386
- Hughes, I E (1995) Peer assessment of student practical reports and its influence on learning and skill acquisition. *Capability*, **1**, 39—43
- Markham, T, Jones, SJ, Hughes, I E and Suttcliffe, M (1998). Survey of methods of teaching and learning in undergraduate pharmacology within UK higher education. *Trends in Pharmacological Sciences*, **19**, 257—262
- Race, P (2001). A briefing on self, peer, and group assessment, 24pp. In: *LTSN Generic Centre Assessment Series (9)*, York, UK: Learning and Teaching Support Network