



A review of the one-minute paper

DAVID R. STEAD University of York, UK

ABSTRACT Lecturers who use the 'one-minute paper' generally praise it as a learning tool, for the teacher as well as the students. This article surveys the literature on this widely applicable technique and presents new evidence on students' opinions of it and the extent of its use in the classroom. The benefits for both students and teachers appear sizeable for such a modest amount of time and effort, and students generally perceive the one-minute paper favourably. However, the one-minute paper can be easily employed to excess, reflected in quickly declining response rates over the course of two lecture series. Survey evidence suggests that the one-minute paper is perhaps not used especially extensively in UK and US higher education, largely due to lack of knowledge of its existence and the perception that it would be too time-consuming to analyse the responses.

KEYWORDS: *evaluation, lecturing, one-minute paper, student learning, teaching techniques*

Introduction

Lecturers who use the 'one-minute paper' (hereafter, OMP) normally praise it as a learning tool, not only for the students but the instructor as well. Typical comments made by practitioners across a wide variety of disciplines include 'invaluable' (Magnan, 1991), 'outstanding benefits' (Anon., 1993) and the pedagogical innovation that 'swamped all others' (Light quoted in Chizmar and Ostrosky, 1998: 3). This article surveys the literature that specifically assesses the value of the OMP and presents some new evidence on student reactions to it and the extent of its use in the classroom. As long as it is not employed excessively, the benefits of the OMP seem sizeable for a method that requires no technology and only a small investment of time and effort. Moreover, students' opinions of it are generally favourable, in both small and large group teaching. In short, the currently available evidence, although largely confined to the experience of students and lecturers in the US and UK, provides a quite positive assessment of the OMP. Yet surveys of teaching practices suggest that the method is perhaps not particularly widely used in UK and US higher education. A

purposely-designed questionnaire survey of lecturers in economics and economic history indicates that this is mainly due to lack of awareness of its existence and the (to some extent inaccurate) belief that it would be too time-consuming to analyse and respond to students' replies.

What is the one-minute paper?

The OMP (alternatively known as the 'minute paper' or 'half-sheet response') is typically assigned at the end of a class, and requires each student to briefly write down answers to two questions, generally: (1) What was the most important thing you learned in class today? (2) What question is unanswered? As the name suggests, students are given a minute or two to complete the exercise. After collecting the papers, the lecturer reads the answers and ideally responds to them in the next class, or privately on an individual basis.

Innumerable variations on this basic format are possible. Among other things, the questions can be made more specific to address particular issues raised in a lecture, and students' responses can be anonymous or signed, and may or may not be graded. The OMP could be completed collaboratively in small groups or conducted at the start of, or midway through, a class. Charles Schwartz, a physics professor at the University of California, Berkeley, is often credited with originating the method during the early 1980s (Light and Cox, 2001: 203; Zeilik, c. 2003), although its individual elements can be found in other texts written around that time (e.g. Gibbs et al., 1984; Weaver and Cotrell, 1985). Angelo and Cross (1993: 148–53) have been important popularizers of the OMP, but it has doubtless been reinvented countless times.

Potential benefits

The characteristics of the OMP would seem to make it a useful learning tool for instructors and students across a wide range of disciplines. It encourages the active learning that is recognized as best practice teaching. This feature is especially useful in large lecture groups where it can be difficult or daunting to achieve significant lecturer/student interaction. Replies to the first question test students' ability to rank the relative importance of what they have heard, encouraging active listening during the class. Significantly, this part of the OMP also provides a brief chance for students to reflect on what they have learned. Reflection is widely recognized to be an important element of adult learning styles. On a theoretical level, for example, the need for students to reflect is based in constructivism, and forms one of the four elements of the well-known Kolb learning cycle (see

the survey by Fry et al., 1999). The second OMP question prompts the asking of questions, another higher order cognitive skill (Harwood, 1996: 229): the easy and anonymous opportunity provided may be particularly valued by students who, owing to shyness or difficulties with an unfamiliar second language or academic culture, are reluctant to ask questions in public.

Furthermore, the OMP provides instant and detailed feedback for the class and their teacher. Students' replies reveal what concepts have not been fully understood, and what points were perceived as being of greatest importance. If needed, the tutor can clarify these issues in the very next class, before misperceptions become lodged (Harwood, 1996: 230). In this respect anonymous answers may be preferable to signed ones so as to encourage students to complete the OMP openly rather than writing what they perceive to be an acceptable response for the teacher (Almer et al., 1998: 494), although of course this means the tutor cannot respond privately to individuals. Perhaps most importantly of all, students know that their instructor values their opinions and learning needs and this, together with the establishment of some sort of one-to-one dialogue even in a large group, may improve student motivation. Because their comments are processed almost immediately, students' contributions improve their own learning experience rather than – as so often – those of the next cohort. Thus they may be more inclined to give considered feedback compared to the responses in traditional end-of-course questionnaires (Draper, 2003). For the teacher, the OMP answers help ascertain the extent to which the aims and objectives of the class have been achieved, as well as help set the future pace of teaching. The speed at which the feedback is received is likely to be especially useful to inexperienced lecturers and the teachers of new courses. If student responses are signed, then the OMP can serve as an attendance register that is more active than signing a list (Becker, 1997: 1361). It can also be one means of developing students' writing skills, indicated by the improvements in the content of replies OMP users have noted over the course of a teaching programme (Davis et al., 1983). Finally, these benefits are achieved in a very short time at the end of the class when the students and the tutor are at their least effective. Alternatively, conducting the OMP midway through a lecture could be one of the types of activity needed to re-engage listeners' attention, which is known to dwindle after about 20 minutes.

The disadvantages of the OMP are relatively few and many can be overcome with experience (Angelo and Cross, 1993: 153; Weaver and Cotrell, 1985). Lecturers must allow sufficient time for completion. At least initially more than one minute is required, partly because it is more difficult than it may appear for students to quickly process material and prepare

questions. As with any teaching method, excessive use might make the OMP monotonous for both parties, although this could be overcome by varying the OMP's format or timing in one of the ways mentioned above. It is also important that the lecturer provides feedback on the points raised, but to temper expectations students should be told in advance that it might not be possible to respond to every comment. There is a time cost to analysing the responses – perhaps up to half an hour for a group of 250 students (Harwood, 1996: 229) – although this may be substantially reduced by analysing a sample of papers (Light and Cox, 2001: 203) or offset by time saved answering queries out of class (Chizmar and Ostrosky, 1998: 9). The OMP's specificity means that it is not especially useful for planning changes in overall course design (Zeilik, c. 2003), yet on the other hand it can provide information on exactly what needs to be altered, in contrast to the general criticisms of lecture style often given in end-of-course feedback forms (Draper, 2003).

Empirical evidence on benefits

A good deal of the evidence specifically evaluating the OMP indicates that its potential benefits are realized in practice. According to a recent survey of teachers of auditing and accounting courses, the OMP was seen as a valuable means of obtaining timely feedback about students' understanding of course material (see Almer et al., 1998: 486). The author's experience of using the OMP in undergraduate economic history lectures and tutorials at the University of York, UK, is that the comments also provide useful feedback on students' perceptions of their learning experience more widely, including his teaching style, as in the following statements on signed OMPs: 'I liked the role play'; 'There are a lot of people that know more about History than I do. There's a lot of reading to do'; and 'its OK to ask Q's he's not an ogar [sic]'.

Much more systematic evidence is available on the benefits to student examination performance from regularly writing OMPs. The studies, which are limited to accountancy and economics courses taught in the US, compare the test results of students in the same cohort who did and did not complete OMPs. Comparison of the performance of 867 introductory accounting students by Almer et al. (1998) indicated that regular completion was associated with a statistically significantly superior performance on subsequent essay quizzes (a mean gain of 0.93 points on a 10 point scale). No statistically significant advantage for OMP writers over non-writers was found for multiple-choice tests, suggesting that the method is only helpful in improving examination scores if the assessment includes some subjective, rather than purely objective, material. If

confirmed by other studies, this result might have implications for the use of the OMP in particular subject areas. However, the evidence elsewhere is not always supportive. McElroy and Coman's (2002) study of 81 introductory managerial accountancy students is consistent with that result in that the authors found a significant (and increasing) advantage for OMP users in tests which included some subjective elements. Conversely, Chizmar and Ostrosky's (1998) data on 571 first-year economics students taking multiple-choice tests indicated that the impact of the OMP, *ceteris paribus*, was to increase a student's performance by a statistically significant 6.6 percent relative to the mean test score. It therefore appears that the OMP can enhance test performance even when the assessment is comprised of entirely objective material.

Both Almer et al. and Chizmar and Ostrosky found that the increases in test scores associated with repeated OMP completion did not depend upon the student's ability level, and that the latter study found that it was also unaffected by the instructor involved suggests that the non-trivial benefits of the OMP are available to all. Almer et al. also found that asking students to address their OMP to a friend with no specialist subject knowledge rather than to the instructor (in the hope of forcing students to rephrase class material in their own words) did not significantly affect test performance. Finally, students whose OMPs had been graded performed less well in subsequent tests than those whose papers were not graded. The most probable reason for this result is that graded students tended to write acceptable responses instead of using the exercise to understand more fully what was covered in class. On the basis of this study, then, non-grading of papers is recommended.

Students' opinions

Even if student evaluations of teaching methods need to be treated with some caution (Bligh, 1998: 174–85), previous surveys suggest that students generally perceive the OMP to be a useful learning tool. In Weaver and Cotrell's (1985) survey of about 150 students, most responses were 'enthusiastic', and the negative replies numbered 'less than five' (p. 24). A more recent survey of auditing and accounting students revealed that students thought the OMP enhanced their learning process, but despite much of the evidence reported in the previous section, the majority did not perceive that the papers improved their test performance (Almer et al., 1998: 486). In contrast with the results from these purposely-designed questionnaires, McElroy and Coman (2002) found that unsolicited comments about the OMP in standard feedback forms were infrequent but, when made, were always negative. However, when their students were

given the option to discontinue completing a signed OMP, only three decided to stop. Although at first sight this suggests that almost all students perceived there to be some value from undertaking the OMP, it could have been due as much to the students not wanting their teachers to think poorly of them by abandoning the exercise.

To supplement the existing information, feedback was collected from students taught by the author at the University of York over the first five terms in which the OMP was utilized in his first- and second-year undergraduate economic history lectures and tutorials. The students taking these courses were mostly studying for a degree in economics, with a small minority reading economic history, politics or sociology degrees. As a first source of feedback, unsolicited comments about the OMP as used in first-year tutorials were collated from remarks made on the departmental end-of-term feedback form. The traditional OMP was used in all tutorials (4–6 classes per term; group size 12–15 students), with the author utilizing it as an attendance register and briefly responding to two or three unanswered questions at the start of the next class. Pooling the results across three terms of students ($n = 154$), only 14 percent of replies mentioned the OMP, but in stark contrast to McElroy and Coman's finding of uniformly negative unprompted comments, 91 percent of the unsolicited responses were favourable. A similarly positive view was indicated by a second survey, where a subsequent cohort of students was specifically asked to comment on the OMP in their end-of-term feedback forms. Of the sample ($n = 71$), 68 percent mentioned the OMP, and 94 percent of these prompted responses were favourable. In short, the students saw the OMP as being valuable even in small group teaching.

To collect information on students' opinions of the OMP in its more traditional lecture setting, a purposely-designed questionnaire was distributed at the end of two lecture series in which attenders were asked to anonymously complete the standard OMP at the end of each lecture (two lectures a week). In one lecture series ('British Economic History') the author responded to two or three unanswered questions at the start of the next lecture, while in the other ('The Global Web') on about half of the occasions a written response to the whole class via email was instead provided. Doing the latter approximately doubled the time needed to respond to a class's OMPs even though no student ever replied to one of these emails. Part of the questionnaire asked students to give a score on the OMP's 'overall rating' out of five (1 = poor; 3 = average; 5 = excellent). Table 1 presents the results. Students graded the OMP as above average as a learning tool, a reasonable score although one that was below the overall assessment of the author's lectures at the time (mean score of 4.2 on similar response rates). The OMP's mean score, and distribution, were strikingly

Table 1 Student feedback on the one-minute paper: Quantitative evidence

<i>Lecture course</i>	<i>Mean score^a</i>	<i>Median score</i>	<i>Modal score</i>	<i>Year</i>	<i>Sample size</i>	<i>Response rate (%)^b</i>
British Economic and Social History, 1870–1945	3.63	4	4	1	102	47.4
The Global Web: The Development of the World Economy since 1950 ^c	3.64	4	4	2	29	70.7

Notes. ^a Scale of 1 (poor) to 5 (excellent). ^b as % of students registered for the module. ^c some of the author's responses to OMPs were provided by email rather than verbally.

Source. Author's questionnaires.

similar across the two different years, despite the second year group receiving some feedback via email instead of verbally in the next lecture.

The reasons why the York economic history students surveyed generally liked the OMP are evident from the comments made on the various feedback forms. By and large, their points were familiar from the secondary literature. The most popular benefit of the OMP was said to be the opportunity to get questions/uncertainties addressed, particularly since 'You can ask whatever you like without looking stupid'. This chance was also valued by students who experienced the OMP in tutorials, indicating that reluctance to publicly ask questions is apparent even in comparatively small discussion groups. Only a handful of replies in all the feedback forms mentioned another learning objective as a benefit, such as 'helps "sort" knowledge of what has been covered in lecture'; 'Gives you info on how we feel about lectures. This is important' and 'a useful way of making sure everyone understood + to check for problems'. Among the less frequently stated benefits was the reassurance that 'Other peoples problems are often the same as your own', and that revisiting difficult concepts at the start of class did help recall of the previous class's content. Another benefit mentioned was 'They give a feeling of feedback and Tutor satisfies curiosities heightening interest'. A few students expressed a preference for having the responses in writing, although this does not show up on the quantitative scores reported in Table 1.

The most popular criticism of the OMP was easily 'Having to do it every time – even though didn't always have any questions'. A less frequently stated drawback was that 'Your question might not be read out!' Some students disliked it because 'We had to stay longer', even though the exercise was undertaken in the closing minutes of the timetabled class time. Another common reply was that 'I had not enough time writing it, because

I had to rush to following lectures'. Thus even the two minutes that tended to be allocated to complete the OMP was insufficient in many cases. Allowing enough time is important because a few students found it 'difficult to say "what most important thing learned" actually was', and even that 'it is difficult to find a question immediately after the lecture'. Indeed, one respondent said what was liked least about the OMP was 'Making me think about the lecture'. These comments all suggest that at least some students found reflection to be a non-straightforward exercise. A few pertinent criticisms of the method were made, most notably 'Excuse for people not to listen, then ask silly questions', and 'Doesn't always help that much if it's a concept/more substantial question you need explaining in more detail'. Other criticisms were more the fault of the lecturer than the underlying method, including 'Some questions were answered which I don't think needed to be', and 'Can just lead to repetition of the key points of the previous lecture'. Users of the OMP, then, need to take care in selecting what they follow up, and the author's inexperience in this might help explain why the scores in Table 1 are above average rather than excellent.

That many students felt that the OMP was 'Not necessary every lecture', together with the possibility of overload for the teacher, explains why many users of the OMP only use it weekly (Zeilik, c. 2003) or even just four or five times a term (Wilson, 1986: 199). To quantify the extent to which students' motivation to complete the OMP declines with overuse, the number of students writing a paper in the author's two lecture courses was tracked over time. Recall that, in both courses, there were two lectures a week with no variety in the OMP format. Students were asked to complete it anonymously and leave their response in a box as they left: thus there was no monitoring of completion. Figure 1 clearly shows a sizeable decline in completion over the first few lectures in each course. This fall was greater than the decline in lecture attendance. After the steep initial decline, the response rate generally levelled out. The results for the longer lecture series show fluctuations in completion over the second half of the course. Informal conversations with the undergraduates concerned suggested that these were due to interest in the subject matter covered and especially whether or not they felt they were under time pressure to get to their next class.

The difference between the low rate of discontinuation found by McElroy and Coman (2002) and that shown in Figure 1 is presumably primarily driven by the OMP being signed in the former experiment. Unsurprisingly, with no monitoring of completion students are far less likely to write an OMP, and the attrition rates in Figure 1 indicate that this effect operates as quickly as after about two or three consecutive lectures completing the same OMP. Figure 1 therefore provides quantitative

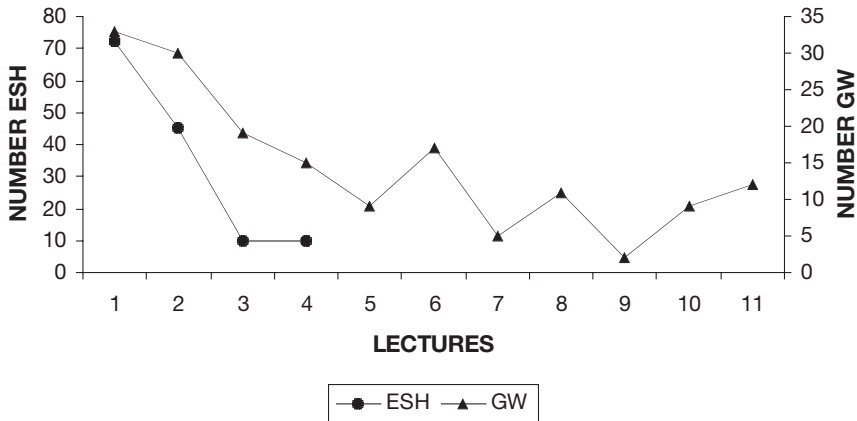


Figure 1 Number of students completing a one-minute paper over two lecture courses

Note. ESH (British Economic and Social History) was a first-year lecture course; GW (The Global Web) a second-year course.

Source. Student one-minute papers.

evidence supporting the recommendation that, if anonymous, the OMP is best used in only a proportion of classes, or else its format or timing be frequently changed to provide students with some variety. Of course, even if this is not done, a standard, unchanging OMP still provides a chance for those who want or need help to receive it.

Use by lecturers in economics and economic history

The previous sections indicated that, if implemented carefully, the OMP can produce beneficial results for a modest investment of time and effort. Yet the currently available evidence suggests that the method is perhaps not especially widely used in higher education. Although Chizmar and Ostrosky (1998: 3) have claimed that the OMP 'has become rather ubiquitous in higher education', this is not always the impression given by other sources. Becker and Watts' recent survey of 591 academic economists in the US found that the median percentage of classes using student self-assessment techniques such as the OMP was zero (2001: 277). Once the likely sample selection bias in responses to teaching questionnaires is taken into account (probably that those with greater interest in teaching will tend to complete them), then the OMP appears to be rarely used to teach economics. Even though economists are not at the forefront of adopting active learning techniques, scattered evidence elsewhere is suggestive that the rarity of the OMP

is not confined to this profession. For instance, the University of York's Forum for the Enhancement of Learning and Teaching arranges for Academic Associates to visit the University's departments to identify and disseminate good practice teaching. Enquiries revealed that none of the three Associates were aware of the OMP being routinely used in any of the departments they had visited, all of which had scored highly in recent independent teaching quality assessments. In general, the traditional passive lecture remains the single most prevalent teaching tool, although its dominance has declined in recent years owing to the increased discussion of, and research on, active learning methods (Bligh, 1998: 6; Brawner et al., 2002; Lammers and Murphy, 2002; Markham et al., 1998).

Explanations of why non-traditional teaching techniques are not used more extensively invoke the lack of time, incentives and resources to adopt them. Also important are the risks of students, at least initially, resisting being taken out of a passive learning environment or the lecturer feeling uncomfortable in a new lecture setting (Markham et al., 1998; Sloman and Mitchell, 2002, Section 2.5; Snyder, 2003). To obtain further evidence on these factors in the specific context of the OMP, two questionnaire surveys of teachers were conducted. The first consisted of colleagues in York's Department of Economics and Related Studies, and the second comprised subscribers to the on-line discussion list EH.Teach, which 'is for all those who would like to discuss and exchange information on issues related to teaching of economic history at all levels of instruction' (see www.EH.Net). Answers to the first survey were anonymous; this was not possible in the second survey, where responses were returned via email. Table 2 presents the results.

The two surveys produced quite different results for the proportion of respondents ever using the OMP in their lectures (these included some of its countless variants, for instance, basing it on the reading set before class). The finding that only a very small number of York economists have utilized the OMP is in line with Becker and Watts' results for US economists, while in contrast nearly two-fifths of the EH.Teach respondents – almost all of whom worked in the US – had used the OMP. This fraction, though, is probably best interpreted as an upper bound estimate of actual use since this sample is almost certainly strongly biased towards those interested in teaching and utilizing the OMP (this bias is probably present in both surveys, but is likely to be particularly acute in the EH.Teach sample). Unfortunately, this strong sample selection bias also makes it impossible to draw firm conclusions over differential disciplinary or international use of the OMP by comparing the two survey results.

There was much more similarity in the reasons why the majority of participants in both surveys had not used the OMP. The most popular reason

Table 2 Use of the one-minute paper by York economists and international economic historians

	York economists	<i>EH.Teach</i> subscribers
Have you ever used the one-minute paper in your lectures? ^a (% of respondents)		
Yes	3.7	38.9
No	96.3	61.1
If no, why is this? (% of responses) ^b		
Not heard of it before	52.6	42.9
Not an effective learning tool for students	5.3	14.3
Too time consuming to read and respond to students' replies	15.8	28.6
Other lecturers use it and students shouldn't complete it in every class	0	0
Already obtain sufficient feedback on lectures through end-of-term questionnaires	5.3	7.1
Prefer the traditional lecture style	13.2	7.1
Use other methods of 'active learning' in lectures	7.9	0
Approximate mean number of years' lecturing experience	16	18
Sample size	27	18
Response rate (%)	71.1	7.9

Notes. ^a Respondents were given a short description of the OMP. ^b multiple answers could be selected.

Source. Author's questionnaires.

stated was lack of awareness of its existence, despite the method being mentioned in many textbooks, articles and conferences on teaching methods – one of which called it a 'widely reported concept' – together with the occasional article on teaching in good general professional journals (see the above references plus Angelo, 2003: 5; Bligh, 1998: 57, 224; Brown and Race, 2002: 176; Hounsell, 1999: 166; quotation from Light and Cox, 2001: 202). One conjecture is that many lecturers are too busy or lack the incentive to regularly read this literature and update their teaching methods, and to some extent this explanation is reinforced by the second most popular reason for not using the OMP being the perceived amount of time taken to analyse the responses. Those seeking to advocate the OMP therefore need to emphasize that the time costs are not as heavy as might be thought at first sight, for example if only a sample of responses are read. A small minority of respondents stated that they preferred the

traditional lecture style, possibly indicating conservatism. No one said that they did not use the OMP because they wanted to avoid students being exposed to it in every class, and a small percentage believed that end-of-term questionnaires provided sufficient feedback on their lectures (although, as noted above, unlike with the OMP such comments typically do not serve the current cohort and are not especially specific).

Another small proportion of respondents thought that the OMP would not be effective as a learning tool. One respondent wrote that this 'formulaic approach' might not promote 'critical understanding and debate', and others believed that it 'simplifies lectures too much' or that the traditional format might not be useful for mathematical classes. Another stated that while the OMP 'is probably a good idea in principle . . . my department currently places so little emphasis on teaching compared with research it really wouldn't be worth the trouble or in my self-interest [to re-introduce it]'. Moreover, 'I am not sure that they [students] take the courses that they do that seriously as to want to take time to reflect on what they have learned each class period'. This respondent and one other suggested that the OMP was best conducted on an occasional basis, perhaps once every three or four classes.

Conclusions

This review has suggested that the OMP – a simple, flexible and widely applicable technique requiring no technology – can produce very beneficial results for a modest amount of time and effort. Students are able to briefly reflect on, and ask questions about, what they have heard; thus the OMP provides instant feedback on the class's understanding. The weight of the (albeit imperfect) existing and new empirical evidence reported here indicates that regular completion significantly improves student test performance, and that students typically perceive the OMP favourably, in both small and large group teaching. In practice, though, more than two minutes of class time may be required to complete the exercise, and as with all teaching techniques, the OMP should not be deployed unthinkingly. For example, it appears too monotonous to utilize an identical format in more than two or three consecutive classes, as reflected in the quickly declining student response rates over the course of two lecture series using an unchanged OMP. Despite this generally positive assessment of the OMP, surveys of classroom practice tentatively indicate that it is probably not especially extensively employed in UK and US higher education, chiefly due to ignorance of its existence and the belief that it would be too time-consuming to analyse the responses. An overall caveat to this article, though, is that the evidence cited is largely restricted to the

experience of students and lecturers in the US and UK, and it is an open question whether the findings are equally applicable elsewhere.

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References

- ALMER, E. D., JONES, K. & MOECKEL, C. L. (1998) 'The Impact of One-Minute Papers on Learning in an Introductory Accounting Course', *Issues in Accounting Education* 13(3): 485–97.
- ANGELO, T. A. (2003) 'Finding Out How Well They're Learning What We're Teaching: Techniques and Guidelines for Effective Classroom Feedback', handout of presentation given to the ILTHE Annual Conference, Warwick, July: <http://www.ilt.ac.uk/617.asp> [accessed 8 September 2003].
- ANGELO, T. A. & CROSS, K. P. (1993) *Classroom Assessment Techniques: A Handbook for College Teachers*, 2nd edn. San Francisco: Jossey-Bass.
- ANON. (1993) 'The "One-Minute Paper" – Making Good Use of the Final Minute of Class', *Nutshell Notes* (University of Colorado at Denver Newsletter) 1(8): http://carbon.cudenver.edu/public/OTE/nn/vol1/1_6.htm [accessed 21 May 2002].
- BECKER, W. E. (1997) 'Teaching Economics to Undergraduates', *Journal of Economic Literature* 35(3): 1347–73.
- BECKER, W. E. & WATTS, M. (2001) 'Teaching Methods in US Undergraduate Economics Courses', *Journal of Economic Education* 32(3): 269–80.
- BLIGH, D. (1998) *What's the Use of Lectures?*, 5th edn. Exeter: Intellect.
- BRAWNER, C. E., FELDER, R. M., ALLEN, R. & BRENT, R. (2002) 'A Survey of Faculty Teaching Practices and Involvement in Faculty Development Activities', *Journal of Engineering Education* 91(4): 393–6.
- BROWN, S. & RACE, P. (2002) *Lecturing: A Practical Guide*. London: Kogan Page.
- CHIZMAR, J. F. & OSTROSKY, A. L. (1998) 'The One-Minute Paper: Some Empirical Findings', *Journal of Economic Education* 29(1): 3–10.
- DAVIS, B. G., WOOD, L. & WILSON, R. C. (1983) 'A Berkeley Compendium of Suggestions for Teaching with Excellence', suggestion 95: <http://teaching.berkeley.edu/compendium/suggestions/file95.html> [accessed 25 March 2003].
- DRAPER, S. W. (2003) 'One Minute Papers', January: <http://www.psy.gla.ac.uk/~steve/resources/minute.html> [accessed 25 March 2003].
- FRY, H., KETTERIDGE S. & MARSHALL, S. (1999) 'Understanding Student Learning', in H. Fry, S. Ketteridge & S. Marshall (eds) *A Handbook for Teaching & Learning in Higher Education: Enhancing Academic Practice*, pp. 21–40. London: Kogan Page.
- GIBBS, G., HABESHAW, S. & HABESHAW, T. (1984) *53 Interesting Things To Do in Your Lectures*. Bristol: Technical and Educational Services.
- HARWOOD, W. S. (1996) 'The One-Minute Paper: A Communication Tool for Large Lecture Classes', *Journal of Chemical Education* 73(3): 229–30.

- HOUNSELL, D. (1999) 'The Evaluation of Teaching', in H. Fry, S. Ketteridge & S. Marshall (eds) *A Handbook for Teaching & Learning in Higher Education: Enhancing Academic Practice*, pp. 161–74. London: Kogan Page.
- LAMMERS, W. J. & MURPHY, J. J. (2002) 'A Profile of Teaching Techniques Used in the University Classroom: A Descriptive Profile of a US Public University', *Active Learning in Higher Education* 3(1): 54–67.
- LIGHT, G. & COX, R. (2001) *Learning and Teaching in Higher Education: The Reflective Professional*. London: Paul Chapman.
- MAGNAN, B. (1991) 'Teaching Idea: The One-Minute Paper', *Teaching Concerns* [University of Virginia Newsletter], January: <http://trc.virginia.edu/tc/1991/OneMinute.htm> [accessed 21 May 2002].
- MARKHAM, T., JONES, S. J., HUGHES, I. & SUTCLIFFE, M. (1998) 'Survey of Methods of Teaching and Learning in Undergraduate Pharmacology within UK Higher Education', *Trends in Pharmacological Sciences* 19(7): 257–62.
- MCELROY, B. W. & COMAN, C. L. (2002) 'Writing to Learn in Managerial Accounting Classrooms: Further Evidence About Student Performance and Perception', *Business Quest*: <http://www.westga.edu/~bquest/2002/writing.htm> [accessed 16 June 2003].
- SLOMAN, J. & MITCHELL, C. (2002) 'Lectures', in P. Davies (ed.) *Handbook for Economics Lecturers Section 1: Teaching*. Economics LTSN: <http://www.economics.ltsn.ac.uk/handbook/> [accessed 23 June 2003].
- SNYDER, K. D. (2003) 'Ropes, Poles, and Space: Active Learning in Business Education', *Active Learning in Higher Education* 4(2): 159–67.
- WEAVER, R. L. & COTRELL, H. W. (1985) 'Mental Aerobics: The Half-Sheet Response', *Innovative Higher Education* 10(1): 23–31.
- WILSON, R. C. (1986) 'Improving Faculty Teaching: Effective Use of Student Evaluations and Consultants', *Journal of Higher Education* 57(2): 196–211.
- ZEILIK, M. (c. 2003) 'Classroom Assessment Techniques: Minute Paper', *Field-Tested Learning Assessment Guide*: <http://www.flaguide.org/cat/minutespapers/minutespapers7.htm> [accessed 25 March 2003].

Biographical note

DAVID R. STEAD is a Lecturer in Economic History at the University of York. He graduated from Gonville and Caius College, University of Cambridge, and wrote his doctoral thesis on eighteenth and early nineteenth century English land tenure at Nuffield College, University of Oxford. His thesis has provided the basis for a number of articles on English agricultural history.

Address: Department of Economics and Related Studies, University of York, Heslington, York YO10 5DD, UK. [email: drs7@york.ac.uk]