Physics workshop tutorials: views of life-science students

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Physics workshop tutorials, their implementation, and the purpose of this research

Workshop tutorials involve small groups of students using hands-on demonstrations and answering questions under the auspices of a tutor. Physics education research underpinned the development of workshop tutorials (Sharma, Millar and Seth 1999; Wilson, Peseta, Sharma and Millar 2002). Greater attendance at workshop tutorials is correlated with better examination marks (Sharma et al. 1999).

Physics workshop tutorials were introduced at the University of Wollongong in 2004 for a class of life-science students. None of the students expected to continue physics into second year. Many had a poor background in physics. Each week the class spent an hour in workshop tutorials, an hour in conventional tutorials, two hours in lectures, and two hours in laboratory. In contrast to Sharma et al. (1999), attendance was not voluntary but expected, and the timing was tutor-controlled not self-paced. Participation in the workshop tutorials was not assessable. The purpose of this research is to ascertain student views on this implementation of workshop tutorials: (a) their overall satisfaction, (b) aspects they rank most highly and (c) suggested improvements.

Research methods and data analysis

The students completed a standard survey comprising of a set of statements and open-ended questions. Table 1 gives the statements; the mean, standard deviation and mode of the n = 11 student responses on a five-point Likert scale; and a ranking of the statements on the basis of the Likert score. Where there were two modes these are indicated. Responses to statements 9, 14 and 25 are bimodal. In each case, the two modes are adjacent (there is no minimum between the two maxima); if there are two underlying populations their separation is small. There were no trimodal responses. The standard deviation measures the uniformity of response. Statements 22, 12, 16, 7, respectively, received the most uniform responses.

Of great interest is the relative ranking of the various aspects of the workshop tutorials. The highest score is given to a rather mechanical matter: there was time enough to complete the tasks. The students rate next most highly the hands-on aspect. Then come tutor rapport, availability and encouragement. This contrasts to the negative comments about tutors reported by Sharma et al. (1999), possibly due to the ratio here of 1:12 tutor:student being more favourable than the ratio 1:15-25 in that implementation. At the other end of the scale, students do not see the tutorials as changing fundamentals, such as the way they study physics or other subjects; or as enhancing generic skills, such as oral or written literacy.

Open-ended questions asked what was helpful, what might be improved, and for any other comments. The most helpful aspects were: hands-on work (5 responses) ‘I learn better if I put the principles into practice’; group work (4) ‘enabled me to find out other people’s ideas about the questions and helped me learn by discussing concepts’; worksheets (3) ‘helped consolidate the activities. Gave examples to apply knowledge to’; also mentioned were the grounding in everyday life, the emphasis on the students’ thinking themselves, and the tutor’s clear explanations in English rather than mathematics. The responses to what might be improved were fewer and more scattered: more complex quantitative questions, more formulas and explanations of terms, more time, better and more wide-ranging equipment, a more talkative group, more explanation of theory, reading lists. Only

one student had other comments, but plenty: 'It did not help. My time could have been better spent elsewhere. I found these lectures to be a bad way to spend an hour which could have been better spent trying to understand the relationships of relevant topics. Annoyed my university fees are not helping me learn!'

Interpretation and implications

(a) Overall, the students gave an overall positive account of workshop tutorials. All things considered, the students were satisfied with the tutorials (statement 25). The implication is that students agree with continuation of workshop tutorials. (b) The students ranked most highly the pacing, demonstrations, tutor availability and rapport, implying these aspects should be retained. (c) Suggested improvements were few and variable, implying there is no strong case to modify any specific of this implementation.

Table 1. Directed statements ranked according to mean Likert score (1:strongly disagree, 2:disagree, 3:neutral, 4:agree, 5:strongly agree). Two values are shown for the mode where the distribution is bimodal. Standard deviation is 's. d.'

#	Statement	Mean	s. d.	Mode	Rank
21	There was enough time in the tutorials to complete all the tasks	4.2	0.8	4	1
5	Having the demonstrations helped me to understand how Physics can be put into practice	4.1	0.9	4	2
12	The tutor developed good rapport with students	4.1	0.5	4	3
23	The tutor was available to discuss any difficulties I encountered	4.1	0.9	4	4
7	The tutor encouraged me to actively participate in the tutorials	4.0	0.6	4	5
25	All things considered, I was satisfied with the tutorials	4.0	1.0	4,5	6
15	The qualitative questions helped me to understand ideas in Physics	3.9	0.8	4	7
18	The range of activities in the tutorials helped to keep them interesting	3.9	0.7	4	8
10	The modules covered in the tutorials were appropriate	3.8	1.1	4	9
11	The structure of the tutorials helped to develop my understanding of Physics concepts	3.8	0.9	4	10
16	The tutor created an effective learning environment	3.8	0.6	4	11
22	The quantitative questions helped to understand ideas in Physics	3.8	0.4	4	12
2	I understood the relationship between tutorials & lectures	3.7	0.9	4	13
3	The tutor's feedback helped me to understand Physics concepts	3.7	0.8	4	14
17	I enjoyed working in small groups with other students	3.7	0.9	4	15
4	Being able to talk with other students in a small group environment helped me to learn	3.6	1.0	4	16
9	The tutor effectively managed small group interaction so that it helped me to learn	3.6	0.9	3,4	17
13	Completing the answer sheets in team helped me to learn	3.6	1.0	3	18
1	The tutorials helped to develop my problem solving skills	3.5	0.8	4	19
8	To understand Physics, I need to remember formulas	3.5	1.1	4	20
19	I feel more confident that I have understood Physics concepts	3.5	0.8	3	21
24	The way I learn in Physics helps me study in other courses	3.1	0.9	3	22
20	The tutorials have changed the way I study in Physics	3.1	0.8	3	23
6	The tutorials improved my skills in written communication	2.9	0.7	3	24
14	The tutorials helped to improve my oral communication	2.6	0.7	2,3	25

References

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