International Conference
NEW PERSPECTIVES in SCIENCE EDUCATION
New Perspectives in Science Education
3rd Edition

Why Doing More Practical Work Does not Necessarily Mean More Student Motivation

Ian Abrahams
University of Leeds (UK)
i.z.abrahams@leeds.ac.uk

Abstract

This paper reports on a study that examined whether practical work can be said to have affective outcomes and, if so, in what sense. The term 'affective' is used here to refer to the emotions, or feelings, engendered amongst students towards science in general and/or one or more of the three sciences (biology, chemistry and physics) in particular. The study, based on 25 multi-site case studies, employed a condensed fieldwork strategy. Data were collected using tape-recorded interviews and observational field notes in a sample of practical lessons undertaken in English comprehensive (non-selective) schools during Key Stages 3 and 4 (students aged 11-14 and 15-16, respectively). The findings suggest that whilst practical work generates short-term engagement, it is relatively ineffective in generating motivation to study science post compulsion or, indeed, longer-term personal interest in the subject. Furthermore, it also emerged that what science teachers frequently refer to as 'motivation' is, when analysed from a strictly psychological perspective, better understood in terms of situational interest. The fact that situational interest is short-lived and is, as such, unlikely to endure beyond the end of a lesson helps to explain why students need to be continually re-stimulated by the frequent use of practical work. Indeed, this study has found, despite frequents claims by students to like practical work, that their reasons for doing so appear to be primarily that they see it as preferable to non-practical teaching techniques that they associate, in particular, with more writing. These findings suggest that those involved with science education need to develop a more realistic understanding of the limitations of practical work in the affective domain. The implication is that simply doing more of the same practical work, whilst generating short-term situational interest, is unlikely to lead to enhanced student motivation towards the study of one, or more, science subjects in the post-compulsory phase of their education.

Introduction

This paper presents findings from a study on the affective value of practical work as it is typically used in science classes for 11-16 year old students in schools in England. Whilst the term 'motivate' was frequently used by science teachers within this study to describe the value of practical work it emerged that they were using it as a 'catch-all' term that embodies elements of interest, fun, enjoyment and engagement. It has been suggested [1: 243] that the terms 'motivate' and 'interest' have been used, in the literature, interchangeably even though "there is a major difference between a motive, which is an inner drive to action, and an interest, which is a fascination with something". It is therefore necessary to clarify what is meant by 'motivation' and 'interest' so as to be clear what the differences are between these terms.

Motivation

Motivation refers to "an inner drive to action" [1: 243] that, in terms of observable consequences, might manifest itself in a pupil's decision to pursue the study of one, or more, science subjects in the post-compulsory phase of their education, or in additional, science related, voluntary actions undertaken by the student. A comparison of claims regarding the motivational value of practical work, with students' actions both in and out of the laboratory - including particularly their intentions to pursue science in the

post-compulsory phase provides a useful means of appraising the extent to which such claims are supported by the evidence.

Interest

From a psychological perspective 'interest' is defined as "a person's interaction with a *specific* class of tasks, objects, events, or ideas" [2: 8. Italics in original] although many psychological theorists make a distinction between what has been termed 'personal' and 'situational' interest [3].

Personal interest

Personal (or individual) interest "asks what dispositional preferences people hold, or what *enduring* preferences they have for certain activities or domains of knowledge" [3: 87. Italics added]. Whilst numerous factors such as relevance, competence, identification, cultural value, social support, background knowledge can stimulate personal interest [3], it has been argued [4] that these are not, in the short-term, susceptible to teacher influence [4].

Situational interest

Situational interest refers to the interest that is stimulated in an individual as a consequence of their being in a particular environment or situation [4] such as, for example, when a pupil undertakes practical work within a science laboratory. Unlike personal interest, situational interest *is* susceptible to teacher influence in the short-term [5]. Although it is less likely than personal interest to endure over time [6] it does provide an opportunity for teachers to influence the effectiveness of pupil learning in specific lessons in a positive manner [7].

Research strategy and methods

This study adopted a multi-site approach, involving a series of twenty-five case studies in different schools, similar in scale to that undertaken by [8] and avoids what has been referred to [9] as the 'radical particularism' of the traditional single in-depth case study. All the schools approached were maintained state comprehensive schools, in a variety of urban, suburban and rural settings and were broadly representative of secondary schools in England.

Field notes were taken in each lesson observed and tape-recorded interviews were carried out with the teacher before and after the lesson. The pre-lesson interview was primarily used to get the teacher's account of the practical work to be observed and of his or her view of the learning objectives of the lesson. The post-lesson interview collected the teacher's reflections on the lesson, its success as a teaching and learning event and their views on the affective vale/role of practical work. Where possible, conversations with groups of students during and after the lesson were also tape-recorded.

Students' claims to like practical work

Almost all 96/97 of the students questioned in this study claimed to like practical work. Yet when these responses were probed further it was found that in many cases it was not that the students actually liked practical work *per se* - although some students in Year 7 did - but merely *preferred* it to other methods of teaching science. Students' reasons for claiming to like practical work fell into two categories: those indicative of a relative preference (containing comparative terms such as; better than, less than, more than), and what might be termed 'absolute' claims (such as: it is fun, it is exciting, I just like it). Of the ninety-six claims, sixty-five (68%) were indicative of a 'relative' preference for practical work, whilst thirty-one (32%) were 'absolute'. In terms of the claims made 'because it is less boring than writing' and 'because it is fun' were the most common 'relative' and 'absolute' responses respectively in every Year group.

What emerged from the study was that after Year 7 (age 11), in which the majority of students' responses were 'absolute', the situation reverses to one in which the majority of claims are statements

of relative preference. This remains much the same in Years 8, 9 and 10 before shifting even further towards 'relative' in Year 11. One possible explanation for this is that amongst Year 7 students many of these practical tasks provide the first opportunity to use scientific equipment and/or materials and this is something that the students appear to like in an 'absolute' sense. Many Year 7 students spoke excitedly simply about being allowed to use standard pieces of laboratory equipment and/or materials such as Bunsen burners, electrical wire and acids - something that was not observed amongst students in later Years.

What this suggests is that an 'absolute' liking of practical work, that arises out of the fun, enjoyment and excitement, that many students appear to associate with using new equipment and/or materials in what is a novel environment – the science laboratory – starts to wane during the latter part of their first year at secondary school.

Because it appears that many students, especially after Year 7, cease to like practical work in an 'absolute' sense, the interest that it generates seems best described as situational rather than personal. Since situational interest does not persist beyond the immediate period of an individual's interaction with the subject or activity [4] it might be expected that without regular practical work – to re-stimulate situational interest – students will perceive science as boring *despite* their having used practical work on numerous previous occasions.

Yet the following examples illustrate that whilst practical work might be preferred to 'theory' it is not necessarily succeeding in *motivating* students towards the study of science as a subject in the post-compulsory phase of their education.

> Researcher: Have you enjoyed this practical?
> SK28: Yeah it was all right; it wasn't as fun as other ones we've had though.
> Researcher: Are you going to take science at 'A' level?
> SK28: No not really I'm not really in to it all.
> Researcher: But you did say you liked practical.
> SK28: Yeah but, 'cause sometimes it's fun, and practical's easier than, well, writing.

Claims such as these illustrate the fact that for many students practical work is perceived as being distinct from, and separate to, science as a subject. This study has found that, generally speaking, students do not like practical work *per se* but rather "regard practical work as a 'less boring' alternative to other methods" [10: 34].

Teachers' views on the affective value of practical work

Whist some teachers initially used the term 'motivation' when talking about the value of practical work it emerged, during further discussions, that they were frequently using the term 'motivate' to mean situational interest. As situational interest is unlikely to endure beyond a particular lesson [4] the need to continually re-stimulate the students', through the regular use of practical work, becomes more understandable. It might be argued here that the fact that students sometimes enter a science laboratory requesting to do practical work exemplifies the motivational value of practical work and that its frequent use is designed to enhance the effect. However, the fact that it was reported by the teachers that the absence of practical work for even a few lessons, even amongst students who have been undertaking regular practical work for almost five years, made them behaviourally harder to manage suggests that its affective value is better understood in terms of its generating non-enduring situational interest.

Conclusion

This paper has suggested that what teachers frequently refer to as 'motivation' is, in a strict psychological sense, better understood as situational interest. The fact that situational interest is, unlike motivation or personal interest, unlikely to endure beyond the end of a particular lesson [6] helps to explain why students' need to be continuously re-stimulated by the frequent use of practical

work. Once this fact is recognised the reason why many of those students who claim to like practical work also claim to have little, if any, personal interest in science, or any intention of pursuing it post compulsion, becomes clearer. For whilst these students *do* like practical work their reasons for doing so appear to be primarily that they see it as *preferable* to non-practical teaching techniques that they associate, in particular, with more writing [10] and, as such, simply providing more practical work will not mean more student motivation.

References

[1] Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

[2] Krapp, A., Hidi, S., & Renninger, K. A. (1992). Interest, learning, and development. In K. A. Renninger, S. Hidi & A. Krapp, (Eds.), *The role of interest in learning and development*. Hillsdale, NJ.: Lawrence Erlbaum Associates.

[3] Bergin, D. A. (1999). Influences on classroom interest. *Educational Psychologist,* 34, (2) 87–98. Blumenfeld, P. C., & Meece, J. L. (1988). Task factors, teaching behavior, and students' involvement and use of learning strategies in science. *Elementary School Journal*, 88, 235-250.

[4] Hidi, S., & Harackiewicz, J. M. (2000). Motivating the academically unmotivated: A critical issue for the 21st century. *Review of Educational Research*, 70 (2), 151-179.

[5] Hidi, S., & Berdorff, D. (1998). Situational interest and learning. In L. Hoffmann, A. Krapp, K. Renninger & J. Baumert, (Eds.), *Interest and learning: Proceedings of the Seeon conference on interest and gender.* Kiel, Germany: IPN.

[6] Murphy, P. K., & Alexander, P. (2000). A motivated exploration of motivation terminology. Quoted in S. Hidi & J. M. Harackiewicz, Motivating the academically unmotivated: A critical issue for the 21st century. *Review of Educational Research*, 70 (2), 151-179.

[7] Hoffmann, L., & Häussler, P. (1998). An intervention project promoting girls' and boys' interest in physics. In L. Hoffmann, A. Krapp, K. Renninger & J. Baumert, (Eds.), *Interest and learning: Proceedings of the Seeon conference on interest and gender.* Kiel, Germany: IPN.

[8] Stenhouse, L. (1984). Library access, library use and user education in academic sixth forms: An autobiographical account. In R.G. Burgess, (Ed.), *The research process in educational settings: Ten case studies* (pp. 211-234). Lewes: Falmer Press.

[9] Firestone,W.A. & Herriott, R.E. (1984). Multisite qualitative policy research: Some design and implementation issues. In D. M. Fetterman, (Ed.), *Ethnography in educational evaluation* (pp. 63-88). Beverly Hills, CA.: Sage.

[10] Hodson, D. (1990). A critical look at practical work in school science. *School Science Review,* 70 (256), 33-40.