The value of peers and support from scaffolding: Applying constructivist principles to the teaching of psychology

Naomi Winstone & Lynne Millward

The legacy and sustainability of a university education requires student independence and ownership of learning. Adopting a student-centred constructivist approach to teaching and learning allows students to develop a web of self-constructed, interconnected understanding, and supports their development into lifelong learners. The efficacy of this approach is illustrated with a case study relating to a series of academic skills tutorials for first-year psychology students. The tutorial materials, activities and teaching techniques were rated as more useful by students when delivered using constructivist principles. The use of constructivist techniques also enabled students to make larger gains in their essay grades over the course of the academic year. The implications of using such teaching methods in higher education are discussed.

Keywords: *Constructivism; scaffolding; peer collaboration; student-centred learning; sociocognitive conflict.*

A CENTRAL AIM of higher education is to engender in students an independent, lifelong approach to learning. This requires the student to fully invest in the learning process, and take ownership of their learning and development. As neatly argued by Chickering and Gamson (1987, p.3), 'learning is not a spectator sport'. A constructivist approach to education centres around the learner's individual construction of understanding, using support from teachers and peers. In the context of education, the cognitive developmental theories of Lev Vygotksy and Jean Piaget, both examples of constructivist epistemology, have been used to inform instructional design and assessment.

For example, for Piaget, peer collaboration can be a useful source of learning, whereby two peers with conflicting perspectives on a topic experience what is termed sociocognitive conflict, and then work together to reach a common understanding (Davis & Winstone, 2011). The experience of asymmetry in the perspectives of oneself and a peer forces perspective taking, and a detailed examination of one's own understanding that promotes metacognitive awareness.

For Vygotsky, learning is an inherently social process, where knowledge and understanding are co-constructed through social interaction (Davis & Winstone, 2011). Indeed, according to Vygotsky, all knowledge exists intermentally (possessed between people) before it is internalised and possessed intramentally by the individual. Interaction between the learner and others in their educational environment allows them to traverse their zone of proximal development, moving from what they are currently able to do to what they have the potential to do through interaction and guidance. The guidance that allows the learner to reach this higher level is termed scaffolding (Bruner, 1983). Scaffolding is a process whereby structured guidance is provided that allows the learner to reach a higher level of understanding or competence; it can subsequently be taken away and the learner is able to achieve that level independently. From an instructional point of view, this means tailoring teaching to involve learner-generated advances in under-

standing, by providing the environment within which learners can reach new levels of understanding, without being prescriptive and providing all the answers.

Within higher education, Vygotsky's principles remind us that there is a difference between what students can do independently and what they can do with structured guidance. We should aim all teaching and learning activities not at what they are already able to do, but what they have the potential to do if provided with effective support from scaffolding. Teaching should support them in reaching a new level of competence, but the advance has to come from them, in order to build personal and academic self-efficacy. Thus, teaching methods become much less directive; teachers need to guide learners towards understanding, not tell them the things they need to understand. For example, case studies are an effective constructivist teaching tool as their exploration allows students to reach conclusions about the material that have been self-constructed through critical analysis (e.g. McDade, 1995; Sudzina, 1997). Problem-based learning has also been framed as a way of enabling students to traverse their zone of proximal development (Harland, 2003), and there are reports in the literature that higher education institutions have effectively implemented a scaffolding approach to both teaching and assessment (e.g. Murtagh & Webster, 2010). The basic principle of providing structured support and guidance whilst allowing the actual advance to come from the student can be applied to any aspect of higher education, from basic study skills to dissertation supervision, and even in written feedback on assignments (e.g. 'You have done X well, and you have obviously thought about Y. Now think about how you could improve Z. Why would this be an important part of communicating your ideas to your reader?').

In our undergraduate and postgraduate taught programmes in psychology, we embarked on a project to explore the extent to which constructivist principles could be used as key organising themes in the ways in which teaching is designed and delivered. The key ideas were that learning activities should involve problems for learners to solve, and that learning is essentially social in nature (Clements & Battista, 1990). As a case study illustrating how this approach has been implemented, and how it is perceived by students, this paper reports findings pertaining to the use of scaffolding in a first-year academic tutorial programme to support the transition to study in higher education.

Method
Participants
Level HE1 students on the BSc (Hons) Psychology course are assigned to a small tutorial group at the beginning of their course. Each group has a dedicated academic tutor (a graduate teaching assistant) responsible for marking their coursework essays and providing feedback, and running a series of tutorials on basic academic and study skills, to help students make the transition to university-level study. Tutorials cover topics such as essay writing, critical evaluation, citation and referencing skills, presentation skills, reading journal papers and writing research reports.

Of the six academic tutors that deliver the programme each year, three had worked on the programme for two consecutive years. In order to control for individual teaching style, student evaluations of the tutorials were analysed only for those students from two subsequent cohorts taught by one of the tutors that worked on the programme over both years; 78 students from a cohort that were not taught using scaffolding techniques, and 47 students from the subsequent cohort who were taught using scaffolding principles. As data were sourced from anonymous feedback forms, details of participant age and gender are not available. The University Ethical Guidelines permit the analysis of student evaluations for purposes of peda-gogical research.

Design

Student ratings of various components of the tutorial programme were compared between two cohorts. The first cohort of students attended the course of tutorials before the use of scaffolding was incorporated into the course. The second cohort of students were the first to experience the new constructivist emphasis. As a key part of the reorganisation of the course to incorporate constructivist principles was an emphasis on the social nature of learning, the size of each small tutorial group was cut from around 12 students to around seven students. It was felt that this would better facilitate the student-activating discussion that was to form a key part of the way in which the course was run.

By the very nature of the tutorial programme, there are many factors that could have varied between the two cohorts. However, whilst it was not possible to control every aspect of the tutorial process, the key variables (e.g. teaching style of the individual tutor, topics to be taught) that could have an impact on the outcomes we were interested in were controlled. Both cohorts were taught by the same tutors, had the same number of tutorials, and covered the same topics. The only key differences between the two cohorts were the group size and the way in which the material was delivered; either with or without scaffolding techniques.

Materials

Each student followed a course of 20 academic tutorials over the course of a single academic year. These tutorials involved preparation for and feedback on coursework essays, as well as study skills. At the end of the academic year, students were asked to provide feedback on their experience of the tutorial programme using a specially-designed feedback form. This feedback form asked students to rate how useful they found the tutorials overall, on a scale from 1 (not at all useful) to 5 (very useful). Other aspects of the tutorials that were rated were the teaching techniques used by their tutor, the size of the group, the use of group work and group discussions, practical exercises, and handouts. The return rate of evaluation forms was 86 per cent for the non-scaffolding cohort and 71 per cent for the scaffolding cohort.

Procedure

In reorganising the tutorial programme, each aspect of the tutorials was adjusted to embody a constructivist scaffolding approach, such that students were not instructed in study skills but came to develop them through structured guidance. This was motivated by observations that whilst the non-scaffolding cohort followed in-class exercises well, and showed an understanding of relevant principles, they were not able to apply their understanding to new contexts. For example, whilst they seemed to show a good understanding of the factors that make a 'good' essay, they were not demonstrating these principles in their own essay writing. This context was thus seen as ideal for the introduction of constructivist principles, to promote greater independence and stronger self-constructed understanding. The procedure for the constructivist reshaping of each topic covered on the programmed is outlined below.

Citation and referencing skills

The non-scaffolding cohort learnt about citation and referencing techniques through following a handout that explained formatting in detail. Students had a clear reference guide to use when presenting citations and references in their own essays, but they were still making many mistakes in their formatting of references and citations. Thus, in order to promote a constructivist approach to this topic, the tutorial was restructured such that students were given limited information, but encouraged to work out for themselves how references and citations should be formatted. Students were presented with examples of publications utilising the appropriate referencing format (American Psychological Association, 2010); this was their only source of information.

They were then given a citation 'treasure hunt' requiring them to find, and provide appropriate citations and references for, a series of academic sources. This was also effective in incorporating library and literature searching skills with learning how to reference correctly. Their academic tutor was available to provide scaffolding support, and if students had differing perspectives on the formatting of a particular reference, they were encouraged to discuss it as a pair to reach a common understanding.

Essay writing
The non-scaffolding cohort learnt about effective essay-writing techniques by following a detailed handout and discussing each section of an essay in turn. Example essays were handed out to illustrate the principles discussed. In order to promote self-constructed understanding, the scaffolding cohort were not given a list of factors that make a 'good' essay; instead, they were required to generate this themselves through analysing example essays as a group. Students were required to adopt the perspective of a critical marker, and to generate a list of techniques that enabled the writer's understanding to come across clearly, and to also list the techniques used that inhibited the clarity of the writing. These were discussed as a group, again with scaffolding support from the tutor. Thus, students left the tutorial with not only an understanding of what makes a good essay, but why, from the perspective of a marker.

Critical evaluation
To develop students' critical thinking skills, the non-scaffolding cohort were given handouts about what critical thinking entails and things to look for when reading sources. The scaffolding group developed critical thinking skills through the analysis of case studies and discussion of research papers, guided by their tutor. For example, students were given a research paper, and divided into teams. Each was required to take a particular section of a research paper, and

create a short report of the section, noting any points of evaluation. The teams then reported back to each other; for example, the 'results section team' would look for any unsupported claims in the discussion section when the 'discussion section team' made their presentation.

Reading journal papers
It is important that during the first year of their degree students develop confidence in reading and understanding journal papers. For the non-scaffolding cohort, this was addressed by providing a helpsheet that described the main purpose of each section of a research paper. For the scaffolding cohort, their confidence in reading papers was built gradually, using a series of guided reading questions. Each week, a paper that related to one of the topics covered in lectures was posted on the Virtual Learning Environment, together with a list of questions for the students to think about whilst reading that paper. For example, students' reading of a paper on eye movements during reading (Rayner et al., 2003), relating to one of their cognitive psychology lectures, was supported by questions such as:

'Why is it important that the order of blocks was counterbalanced across participants?'
'Why do you think that total gaze duration (GD) is a better measure of processing time for a word than the duration of a single fixation on a word (SFD) or the duration of the first fixation on a word (FFD)?'
'If eye movements are under visual/oculomotor control (and not cognitive control), then no word frequency effect would be expected under disappearing text conditions. Was this supported by the results?'

In line with a scaffolding approach, over the course of the year the guided reading questions decreased in specificity, handing over more and more responsibility to the student to find and understand the important information within the paper.

Writing research reports

The non-scaffolding cohort were given a detailed handout that explained how to construct a research report, and the purpose and content of each section. The scaffolding cohort were not given this information directly, but generated it themselves through examining research papers. For example, when learning how to write abstracts, students read and discussed abstracts in published papers. They were then given a published paper with the abstract blanked out, and in pairs they were required to construct an abstract by searching for the appropriate information within the rest of the paper.

Presentation skills

Whilst both the scaffolding and non-scaffolding cohorts were required to give a short presentation as a part of the tutorial programme, for the non-scaffolding cohort, discussion of what makes an effective presentation was conducted after all presentations had been given. Before students in the scaffolding cohort began to work on their presentations, they were given the task of paying particular attention in their lectures that week to aspects of information presentation, manner, and style, and to consider what makes a presentation and presenter both easy and difficult to understand. These were discussed as a group. Feedback on presentations came not only from the tutor but also from peers.

Thus, for all topics covered in the tutorial programme, the techniques, discussions, activities, exercises and handouts were all restructured to incorporate the necessary guidance students would need, without providing all the information. Such information was individually constructed using support from peers and scaffolding from the tutors.

Results

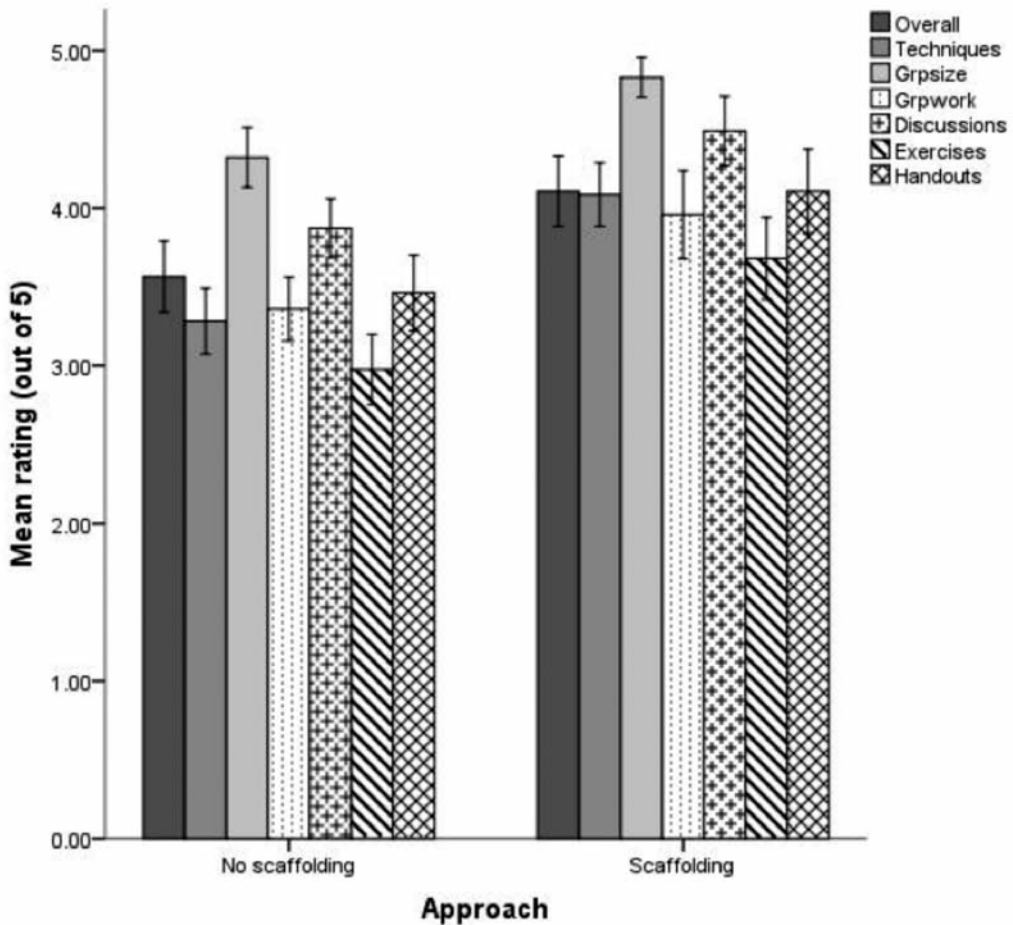The ratings for the usefulness of each component of the tutorial programme, out of the highest possible score of five, were compiled for each cohort. Figure 1 (overleaf) shows the mean ratings for each component of the tutorials, for the non-scaffolding and scaffolding cohorts.

The ratings for each component were compared between the two cohorts using independent samples t-tests. The tutorials overall were rated as significantly more useful by students in the scaffolding cohort than students in the non-scaffolding cohort, $t(117)=3.42$, $p=.001$, $d=0.54$. The same was true for the teaching techniques used in the tutorials, $t(118)=5.55$, $p<.001$, $d=0.87$; the discussions within tutorials, $t(123)=4.19$, $p<.001$, $d=0.75$; the exercises used in tutorials, $t(123)=4.01$, $p<.001$, $d=0.71$; and the handouts that were distributed, $t(123)=3.45$, $p=.001$, $d=0.61$. Not surprisingly, as the size of the groups was cut when the tutorials were reworked to have a constructivist emphasis, students in the scaffolding cohort rated the group size as significantly more useful than students in the non-scaffolding cohort did, $t(120)=4.44$, $p<.001$, $d=0.60$. However, the group work undertaken was also rated as significantly more useful by students in the scaffolding cohort, $t(123)=3.53$, $p=.001$, $d=0.62$.

Whilst students rated the scaffolding approach more favourably, did it actually improve their learning? We also compared the 'value-added' to their academic performance, by comparing the average increase in essay grades from the first essay they completed, to the sixth essay they completed, which was the final assignment for the academic year, across the entire cohort (see Figure 2, overleaf).

The non-scaffolding cohort increased their essay marks over the course of the year from an average of 59.81 (SD=5.70) for their first essay to an average of 64.12 (SD=4.93) for their sixth essay. The scaffolding cohort increased their essay grades from an average of 60.06 (SD=5.87) for their first essay to an average of 66.25 (SD=5.58) for their sixth essay. A 2 (cohort; non-scaffolding and scaffolding) x 2 (essay grade; first and last) mixed ANOVA revealed that whilst both

Figure 1: Mean student ratings (out of 5) for the usefulness of each component of the academic tutorial programme (error bars show 95% CIs).

cohorts showed a significant increase in their essay grades over the course of the year ($F(1,235)=140.59$, $p<.001$, $\eta^2=.37$), the increase in grades for the scaffolding group was higher than for the non-scaffolding group, as shown by a significant cohort x essay grade interaction ($F(1,235)=5.30$, $p=.02$, $\eta^2=.02$).
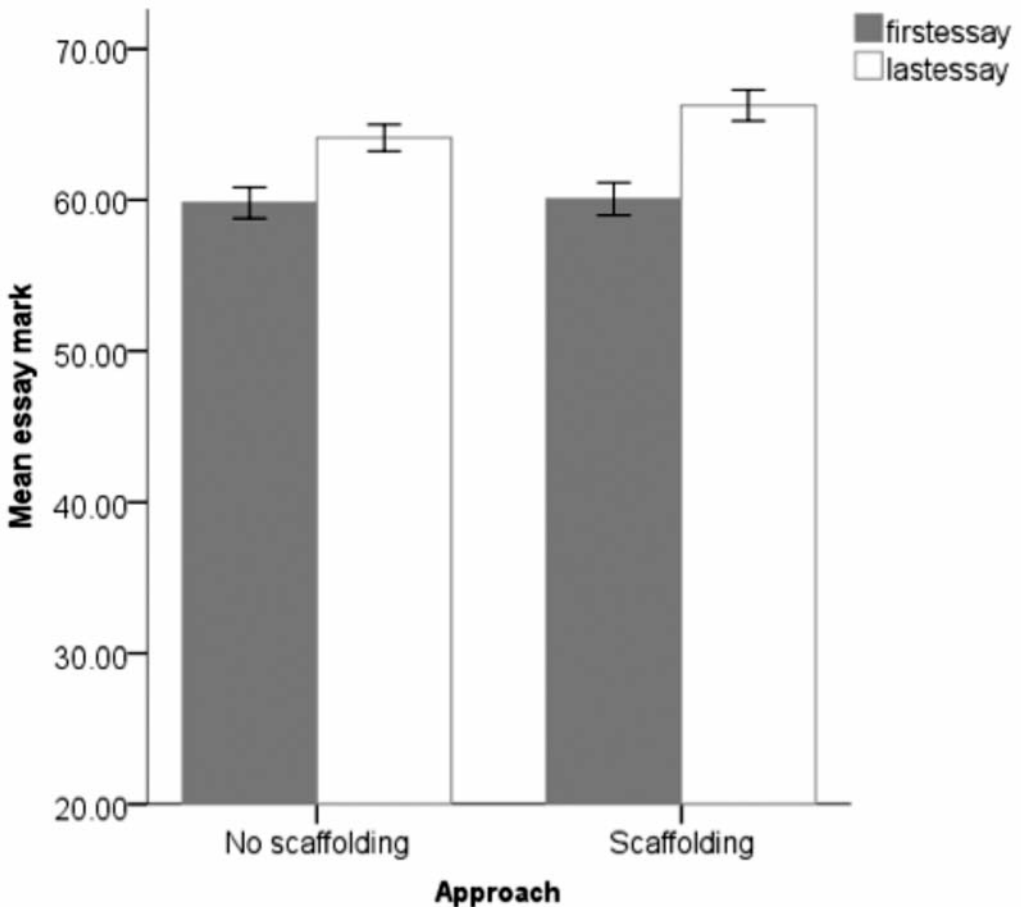
Discussion

Inspired by Chickering and Gamson's (1987, p.3) reminder that 'learning is not a spectator sport', we adopted a constructivist scaffolding approach in the delivery of a series of academic tutorials to first-year undergrad-

uate students by providing an environment in which students generated their own understanding of key academic skills rather than being given the information directly. Student ratings of the usefulness of the tutorials were significantly higher under the scaffolding approach, compared to the previous cohort of students that received the same programme of tutorials delivered without a scaffolding approach.

The overall usefulness of the tutorials was rated significantly higher by the scaffolding cohort, yet each subcomponent of the tutorials was also perceived as more useful from students' perspectives when it was delivered

Figure 2: Increase in average essay grades for both cohorts (error bars show 95% CIs).

using scaffolding techniques. Students rated the group size as more useful when it was smaller, and it therefore makes sense that students felt the discussions within tutorials were more useful where this group size was smaller, under the scaffolding approach. Activities and exercises were also rated as more useful when they involved structured guidance in the scaffolding approach. Students also felt that the handouts were more useful under the scaffolding approach, even though they contained less information, as the goal was that students would generate the information themselves rather than being provided with it explicitly.

Teaching techniques were also rated as more useful in the scaffolding cohort than the non-scaffolding cohort, supporting the use of structured guidance rather than directive teaching. It is also important to mention that the tutors themselves reported feeling a greater sense of reward from 'scaffolding' students rather than 'teaching' them. In true Piagetian fashion, some of the tutors mentioned that being exposed to the perspectives of students challenged their own thinking surrounding some of the topics covered.

Subjective ratings of the usefulness of the tutorials provide one level of support for

adopting constructivist approaches, but we were also interested in obtaining more objective evidence for the efficacy of this approach. Beyond student ratings, our findings suggest that over the course of an academic year, the use of scaffolding within academic tutorials helps students to make larger gains in their essay writing skills. The content of the tutorials, for example essay writing and critical thinking skills, was the same in both cohorts, yet the scaffolding cohort increased their essay grades to a larger extent than the non-scaffolding cohort. This indicates that reaching a self-constructed understanding of the key principles underlying essay writing, rather than being taught these skills explicitly, better enabled students to apply them to their own essay writing. As well as improved structure, clarity, and critical evaluation in student essays, students in the scaffolding cohort also showed a stronger grasp of citation and referencing skills. Indeed, key skills such as critical thinking cannot be effectively taught in a formulaic way since a strong ability to think critically in an independent way requires students to find their 'critical voice', and develop their own evaluative stance on the material they read and are exposed to in lectures. Similarly, strong essay writing requires students to develop their own style of expression and presentation, and whilst there are general principles that enable effective communication of ideas, there is no 'magic' formula that can be taught to students to make them good writers. Effective writing comes from a self-constructed approach to the subject material.

The efficacy of this scaffolding approach in supporting the development of academic skills in the first year of the degree builds on previous research findings that have demonstrated the positive application of constructivist principles to higher education contexts (e.g. Harland, 2003; McDade, 1995; Murtagh & Webster, 2010; Sudzina, 1997). Whilst these approaches have a sound theoretical basis, it is important that the use of these techniques is supported by strong support from peers and scaffolding, so that students do not feel overwhelmed by being given the primary responsibility for the generation of information. These approaches can require a reframing of students' perspectives in terms of what we really mean by 'teaching'. Scaffolding approaches can cause anxiety in students, as they can take students out of their 'comfort zone' of teacher as expert, and teaching as the filling up of a vessel of knowledge. Furthermore, this approach does not necessarily involve an answer that is 'right' and answers that are 'wrong', as it is students' own constructions that are important. The finding that students rate these techniques positively is encouraging, and suggests that if we socialise students into these kinds of techniques early on in their degree, we can develop in students a more independent approach to learning that helps them learn how to learn, thus extending the legacy of higher education beyond the university years themselves. Indeed, as one student in the scaffolding cohort commented at the end of the tutorial programme, '…[the approach used in tutorials] builds your confidence, because you're the one helping yourself to improve, not someone else doing it for you. It's like the proverb about either giving a man a fish or teaching a man to fish. Rather than telling me things, you've given me the skills to go and teach them to myself!'

The Authors
Naomi Winstone & Lynne Millward
School of Psychology,
University of Surrey,
Guildford, GU2 7XH.

Correspondence
Dr Naomi Winstone
Email: n.winstone@surrey.ac.uk

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