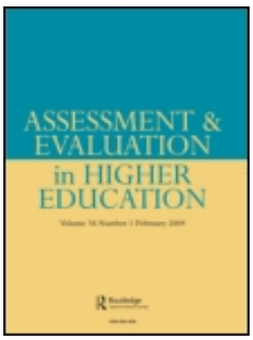

Assessment & Evaluation in Higher Education

ISSN: 0260-2938 (Print) 1469-297X (Online) Journal homepage: http://srhe.tandfonline.com/loi/caeh20

Rethinking feedback practices in higher education: a peer review perspective

David Nicol, Avril Thomson & Caroline Breslin

To cite this article: David Nicol, Avril Thomson & Caroline Breslin (2014) Rethinking feedback practices in higher education: a peer review perspective, Assessment & Evaluation in Higher Education, 39:1, 102-122, DOI: 10.1080/02602938.2013.795518

To link to this article: http://dx.doi.org/10.1080/02602938.2013.795518

Assessment & Evaluation in Higher Education, 2014
Vol. 39, No. 1, 102–122, http://dx.doi.org/10.1080/02602938.2013.795518

Rethinking feedback practices in higher education: a peer review perspective

David Nicol[a]*, Avril Thomson[b] and Caroline Breslin[a]

[a]*Department of Education Enhancement, University of Strathclyde, Glasgow, Scotland;* [b]*Department of Design, Manufacture and Engineering Management, University of Strathclyde, Glasgow, Scotland*

Peer review is a reciprocal process whereby students produce feedback reviews on the work of peers and receive feedback reviews from peers on their own work. Prior research has primarily examined the learning benefits that result from the receipt of feedback reviews, with few studies specifically exploring the merits of producing feedback reviews or the learning mechanisms that this activates. Using accounts of their experiences of peer review, this study illuminates students' perceptions of the different learning benefits resulting from feedback receipt and feedback production, and, importantly, it provides insight into the cognitive processes that are activated when students construct feedback reviews. The findings show that producing feedback reviews engages students in multiple acts of evaluative judgement, both about the work of peers, and, through a reflective process, about their own work; that it involves them in both invoking and applying criteria to explain those judgements; and that it shifts control of feedback processes into students' hands, a shift that can reduce their need for external feedback. The theoretical and practical implications of these findings are discussed. It is argued that the capacity to produce quality feedback is a fundamental graduate skill, and, as such, it should receive much greater attention in higher education curricula.

Keywords: peer review; feedback; higher education; producing feedback reviews

Introduction

Feedback is a troublesome issue in higher education. Whilst it is recognised as a core component of the learning process, national surveys, both in the UK (Higher Education Funding Council for England 2011) and in Australia (James, Krause, and Jennings 2010), consistently show that students are less satisfied with feedback than with any other feature of their courses. The natural response to this predicament has been to put effort into enhancing the quality of the feedback information provided by teachers, in particular, its promptness, level of detail, clarity, structure and relevance. Well meaning as these interventions are, there is little evidence that they have had any effect on student satisfaction ratings in national surveys, and, indeed, there is a growing number of studies now showing that such enhancements of teacher feedback do not result in improved student learning (e.g. Crisp 2007; Bailey and Garner 2010; Wingate 2010). In addition, such interventions usually require a

*Corresponding author. Email: d.j.nicol@strath.ac.uk

significant increase in academic staff workload, which is problematic given current resource constraints and rising student numbers in higher education. In sum, the feedback from such feedback interventions continues to be disappointing.

This state of affairs has in recent years stimulated scholars and researchers to re-examine feedback in higher education, both in terms of how it is conceptualised and how that translates into actual classroom practices (Boud 2007; Nicol 2010; Sadler 2010). Underpinning this re-examination is the important recognition that, if feedback processes are to enhance learning, we must move beyond a view of feedback as transmission and acknowledge the active role that students must play in such processes. Sadler (2010), for example, maintains that merely 'telling' students what is right and wrong in their work, and how it might be improved, will not on its own enhance learning nor develop deep disciplinary expertise. Nicol (2010) argues that feedback should be conceptualised as a dialogue rather than as a one-way transmission process and notes that from this perspective both the quality of feedback inputs and of students' responses to those inputs are important for productive learning. Most researchers are now in agreement that, if students are to learn from feedback, they must have opportunities to construct their own meaning from the received message: they must do something with it, analyse it, ask questions about it, discuss it with others and connect it with prior knowledge (Nicol 2010; Carless et al. 2011; Price, Handley, and Millar 2011). Interestingly, this switch from a transmission to a social constructivist paradigm took place in learning research almost two decades ago (Barr and Tagg 1995), yet it is only now having an influence on feedback research.

One way of engaging students actively with feedback processes that is beginning to receive more attention in higher education is to implement peer review (Liu and Carless 2006; Cartney 2010; Nicol 2011). Peer review is defined here as an arrangement whereby students evaluate and make judgements about the work of their peers and construct a written feedback commentary. In effect, students both produce feedback reviews on others' work and receive feedback reviews on their own work. Peer review is an important alternative to teacher feedback, as research indicates that both the production and the receipt of feedback reviews can enhance students' learning without necessarily increasing teacher workload.

Receiving feedback reviews from peers

A number of learning benefits have been identified in relation to the receipt of feedback reviews from peers. First, research shows that students often perceive the feedback they receive from peers as more understandable and helpful than teacher feedback, because it is written in a more accessible language (Topping 1998; Falchikov 2005). Secondly, where multiple peers are involved, the quantity and variety of feedback that students receive are naturally increased (Topping 1998); this, in some situations, can enhance the likelihood that students will locate the feedback they need rather than receive only the feedback that teachers believe is useful or that teachers have time to produce. Indeed, Cho and MacArthur (2010) have shown in a controlled study that, when students received feedback from multiple peers, they made more improvements to the quality of their draft assignments than when they received feedback from a single peer or a single teacher. Interestingly, this study also showed that students not only received more total feedback from multiple peers than from a single teacher, but that they also received proportionally more non-directive feedback – for example, comments on general

features of the text such as the clarity and flow of the argument. Such non-directive feedback is particularly valuable as it is positively associated with complex repairs in meaning at the sentence and paragraph level. Thirdly, some researchers maintain that the receipt of feedback from multiple peers helps sensitise students, as authors, to different readers' perspectives (Cho, Cho, and Haker 2010). Such audience awareness is regarded as important for the development of writing skills.

One feature of peer review that has perhaps not been given adequate recognition in the research literature is that its implementation allows students, more effectively, to close the gap between the receipt of feedback and its application. In peer review, the normal practice is that students produce a draft assignment, receive feedback from peers and then rework and resubmit the same assignment. Hence they have opportunities to directly use the feedback they receive. Such structured opportunities to update the same assignment are rare after teacher feedback, as students usually move on to the next assignment after receiving such feedback. Seen from this perspective, peer review practices might benefit learning, not just because of the quantity and variety of feedback students receive from multiple peers, but also because the provision and use of feedback are more tightly coupled temporally. In this respect, peer review practices are especially effective in bringing into play the constructivist learning principles advocated by feedback researchers.

Constructing feedback reviews for peers

Most research on peer review has either examined the specific learning benefits that result when students receive feedback from peers, or the general benefits deriving from peer review implementations. Almost no studies have directly investigated the learning benefits that might result from having students produce feedback reviews for their peers, although there have been a few very recent exceptions. One of these was a controlled study carried out by Cho and MacArthur (2011), intended to ascertain the effects of peer reviewing on students' writing performance, independently of the effects of receiving reviews. The experiment compared a reviewing, a reading and a control condition. In the reviewing condition, a group of students rated and commented on the quality of papers written by peers from a similar past course. In the reading condition, another group merely read the same set of papers. In the control condition, a third group read materials unrelated to the assignment topic. After carrying out these tasks, students from each group were then asked to write a paper themselves on a different but related topic. The results showed that students in the reviewing condition wrote higher quality papers than those in the reading or control conditions. Cho and MacArthur (2011, 73) maintain that 'this research provides support for peer review of writing as a learning activity'.

In another study, Cho and Cho (2011) directly examined the effects of both feedback comment provision and receipt of feedback comments on writing revisions made by undergraduate physics students to their laboratory reports. The researchers found, unlike previous studies, limited effects from received peer comments and that overall 'students seem to improve their writing more by giving comments than by receiving them' (640).

Whilst the two studies described above do provide evidence that reviewing and constructing feedback have a positive effect on student learning, in both cases these effects were evidenced through an outcome measure, namely, students' performance in writing tasks. Hence the studies are more informative about *what* students learn

from reviewing rather than *how* they learn. Nonetheless, Cho and MacArthur (2010) and Cho and Cho (2011) propose three possible interpretations to account for students' learning from reviewing. One interpretation is that reviewing provides students with opportunities to examine peer texts from the perspective of a critical reader; in so doing, they develop a better understanding of how readers might interpret the texts they produce; this, in turn, helps them better monitor and improve their own writing. Another interpretation is that reviewing brings into play important problem-solving processes: students must analyse the work of peers, diagnose problems and suggest solutions. Regular practice in these cognitive processes, it is argued, helps students learn to produce good quality work themselves. A third interpretation is that reviewers learn by producing explanations, by generating comments about what makes the work of peers strong or weak. This interpretation is consistent with the extensive work of Roscoe and Chi (2008) on peer tutoring, where they propose that the act of constructing explanations for peers leads student-tutors to rehearse, evaluate and hence improve their own understanding of the topic. Roscoe and Chi (2008) use the term reflective knowledge building to refer to this 'explanation' effect.

These interpretations are interesting, as they not only contribute to the theoretical shift away from feedback as a 'telling' or 'delivery' paradigm, but they also re-frame the way we might view feedback within a constructivist paradigm; in reviewing, students are not just learning by constructing meaning from feedback provided by others, rather they are learning by constructing feedback 'meanings' themselves (Nicol 2011).

Aims of the study

The research reported in this paper complements and adds to the research by Cho and MacArthur (2011) and Cho and Cho (2011). However, rather than focusing on learning outcomes, this investigation focuses directly on the learning processes that are activated when students engage in reviewing activities. The aims of the research were to identify the different learning benefits resulting from receiving feedback reviews from peers, and from producing feedback reviews for peers, and also to gain a deeper insight into the cognitive processes that are activated when students engage in reviewing activities. More specifically, the following research questions framed the investigation:

(1) What were students' experiences of and attitudes towards peer review in general?
(2) What were students' perceptions of the learning benefits associated with the different components of the peer review process, giving and receiving feedback, and how did these processes influence their own assignment productions?
(3) What mental processes did students engage in whilst carrying out reviewing activities and whilst constructing feedback reviews?

Methodology

The context

This study reports on an implementation of peer review within a first-year engineering design class at the University of Strathclyde. In that class, which comprised 82

students, the major assignment is to research and design a product. Students must provide all the information required to enable the manufacture of the product. The theme for the design in the year of this study was 'eating and resting in the city', and typical designs included seating arrangements, food trays and sandwich boxes. Students learn about a variety of design processes and methods, from investigation through to detailed design. The design project starts as a group task with student teams researching possible designs through desk research, observations and analysis of products in current use, etc. This process is intended to replicate practice in an industry context. Each student then individually produces a product design specification (PDS) and layout drawings for their own design. A PDS is a complex and detailed document specifying the requirements and constraints on the product being designed. A PDS is a core element of the design process and, as such, represents a fundamental learning outcome for this class. The PDS served as the focus for the peer review task.

Key features of a PDS include detailed requirements on how the product must perform, what environment it must operate in, what maintenance is expected, what materials will be used and details of manufacturing facilities, etc. For this particular design, students were also asked to include a rationale for key PDS components and values. Students are given an exemplar of a PDS from another area (in the year of this study it was a design for a stainless steel hot water cylinder), and they receive lectures about the importance of a PDS and guidance on its construction.

The peer review task

All 82 students individually produced a draft PDS. The peer review task involved two review activities that were carried out in sequence in relation to these draughts. First, each student reviewed and provided feedback comments on the PDS drafts produced by two of their peers. Second, each student reviewed their own PDS using the same criteria as for the peer reviews; this was intended to encourage students to rethink their own assignment based on the reviewing activities. All the review activities were conducted online supported by PeerMark software, part of the Turnitin suite. This software guided students through the review activities and automated the anonymous distribution of assignments and of peer review comments, which were distributed to students a few days after the deadline for completion of the reviewing activities. An updated PDS was required as part of the final submission for this design class. Importantly, students could update their PDS before final submission at any time, for example, after they had produced their feedback reviews and their self-review, or after they had received feedback reviews from peers. Participation in the peer review task was high. Sixty-two out of the 82 students completed all three reviews – two peer reviews and a self-review. Fifteen students completed two peer reviews without a self-review, and five students completed only one peer review.

Many peer review studies require students to produce feedback both as marks and comments, despite some researchers having shown that students do not learn much from simply grading peer work (Sadler and Good 2006), and others highlighting that students are uncomfortable about being assessed by peers and that they have reservations about the fairness and accuracy of such processes (Liu and Carless 2006; Kaufman and Schunn 2011). Kaufman and Shunn's paper certainly suggests that the potential learning benefits of peer review might be undermined, at

least for some students, when peer marking is involved. Hence, this study did not involve students marking or rating other students' work; instead, it specifically focused on peer review and feedback rather than peer assessment. In effect, it sought to identify the effects of peer review without any confounding effects from peer marking.

The reviewing process was anonymous, in that students providing online feedback reviews did not know the identity of those who had produced the work, and those receiving feedback reviews did not know the identity of the reviewer. Also, each student's design was different, although in the same topic domain, so they could not directly copy ideas from another's PDS, rather they would have to interpret them. The software PeerMark not only enabled anonymity, but it also meant that the peer review intervention did not increase the administrative workload of academic staff. The teacher did not directly award marks for carrying out the peer review activities, but participation was a stated course requirement. Also, students were given a mark for 'professionalism' in this class (worth 10% of the overall mark) and, when discussing this in class, the teacher made it clear that participation in the peer review activities would influence that mark.

The criteria for the peer review activity comprised four questions formulated by the teacher. Students could see these questions when they accessed each peer assignment online, and there were boxes in which to type their responses. The assignments they were asked to review were randomly assigned by the software. The following are the review criteria/questions:

(1) Do you feel the PDS is complete in the range of headings covered? If not, can you suggest any headings that would contribute towards the completeness of the PDS and explain why they are important?
(2) Is the PDS specific enough? Does it specify appropriate target values or ranges of values? Please suggest aspects that would benefit from further detail and explain.
(3) To what extent do you think the rationale is convincing for the PDS? Can you make any suggestions as to how it might be more convincing? Please explain.
(4) Can you identify one main improvement that could be made to the PDS? Provide reason(s) for your answer.

Evaluation

The evaluation of the peer review activities was carried out in two ways. First, students completed an anonymous online survey after the peer review activities had ended. The survey comprised 21 items and sought information pertinent to all three research questions – about students' attitudes towards peer review in general, about their perceptions of different learning benefits associated with giving and receiving feedback, and about the mental processes activated by reviewing. Thirteen questions were of the fixed-response type where students selected an answer or answers or rated their agreement using a five-point Likert scale. There were also eight open-ended questions that prompted for further written comments on a previous fixed-response answer or asked about a specific aspect of the peer review process; for example, one open-ended question asked students to 'give examples of what

you learned from providing reviews of others' work'. The qualitative data deriving from these open-ended questions usually comprised a phrase or a short sentence or two. This data were analysed and categorised under common themes relating to the research questions. Sixty-four out of the 82 students (78%) completed the online survey and responses to the open-ended questions were high, ranging from 40 to 60 responses per question.

Second, focus groups were held with two groups of six students and with one pair of students. A single student was also interviewed separately. In this paper, all these are referred to as the 'focus groups' for ease of reporting. These interview arrangements were pragmatic and resulted from fitting meetings around examinations and on the availability of students. The focus groups and interviews deliberately built on the open-ended survey responses, but were specifically used to gain a deeper insight into the mental processes involved in reviewing and constructing feedback – the third research question. The following are typical prompts used by the researcher to promote discussion regarding that issue:

- How did you go about doing the review of the other students' work?
- When you were doing it what was going on in your head, can you remember?
- What was the sequence of steps you took in carrying out the review?
- What were you thinking as you were carrying out the review?

The recorded interviews were transcribed. Responses that elaborated on the findings of the survey were categorised accordingly and additional themes, usually relating to the production of feedback reviews, that emerged were categorised and recorded. The procedures used in the analysis have enabled the researchers to tell the students' story of their experiences of peer review using their own words. However, it is recognised that the data collected and the interpretation are driven by the research questions that informed this investigation.

Results and interpretation

Experience of and attitudes to peer review: survey and focus group findings

In this study, a great deal of data was collected about students' general attitudes to peer review. However, in this article, only a brief account of some key findings is reported as the issue of attitudes, whilst crucially important, is only one of the research interests in this paper.

With regard to attitudes, the main finding from the survey was that students were generally positive about their experiences of engaging in peer review. Even though the majority of them (55%) had not participated in such activities before, most reported that they would definitely choose (76%) or might choose (19%) to participate in a peer review exercise in the future. In the open-ended survey questions, students were asked 'How did you feel about reviewing other students' work and having them review your work?' There were 56 written responses, and again, the majority of students (86%) confirmed that their peer review experience had been positive. Comments included that 'it was good to get feedback from each other', 'it was good knowing everyone wanted to help each other', 'good because it showed me what others had done', and 'I've seen how helpful and useful it can be'. A few students were positive but qualified their comments, for example, 'I didn't like the

idea at first but found it to be quite helpful', 'not completely comfortable but it was worthwhile' and 'I felt that it was useful but ended up feeling that I had put more work into my reviews than others'. A number of students maintained that anonymity was important, for example, 'I felt fine as you didn't know who was looking at yours or whose you were looking at' and 'glad it was anonymous though'.

In the survey, students were asked to rate the quality of the feedback they received from peers and the feedback they provided to peers. The quality of the feedback reviews received was rated as excellent or good by over 53% of the students, as of fair quality by 31% and as poor by 13%. Students rated the quality of the feedback reviews they provided as either excellent or good (65%), as of fair quality (25%) and as of poor quality (12%). In the focus groups, some students discussed the poor quality of the feedback reviews they had received, and the lack of effort made by some reviewers. This was identified as the main limitation of received feedback by students. When asked how poor quality reviews might be addressed, students suggested either that 'it might be better to have more reviews as then you had a better chance of getting one of good quality' or 'lecturers could mark the review process to address effort issues'.

Interestingly, the students' positive attitudes in this study contrast with the difficulties and negative attitudes to peer review often reported in the literature (Liu and Carless 2006; Kaufman and Schunn 2011). In part, this difference might be attributed to the way in which peer review was presented to students by the teacher and to the quality of the guidance provided. For example, in the survey almost all students (89%) reported positively on the guidance they received. However, what most notably distinguishes this study from many others is that students were not asked to mark the work of peers when providing feedback comments. Hence, it is tempting to conclude that this was the causal factor, as the research shows that it is the marking component of peer review that causes most dissatisfaction (Kaufman and Schunn 2011). Some evidence for this assertion comes from the survey where a significant proportion of students were unfavourable to the idea of marking. Specifically, when asked whether it would be worthwhile for students to allocate a mark for each piece of work as part of the peer review process, students were divided in their answers with 39% responding 'yes' it would be worthwhile, 38% responding 'no' and 23% responding 'don't know'. In the survey, 47 students also provided reasons for their answers. Over 50% of these responses were reasons for *not* having students award marks; the main reasons were that students did not have enough expertise to mark and/or were not likely to be accurate or fair (e.g. 'would not have enough insight into comparative performances to score', 'everyone will have a different standard', 'students would be too harsh'). Those agreeing that students should allocate a mark mainly commented that this would give them a 'more accurate picture of how they were doing'. Similar concerns about marking were also raised in the focus group discussions.

Although more research is required on attitudes to peer review, these findings suggest that teachers should consider carefully whether to include marking in their peer review designs.

Learning from producing and receiving reviews: survey responses

A central interest in this study concerns the students' perceptions of the learning benefits that result from the production and receipt of feedback reviews. Table 1

shows the results from two survey questions that asked students about their learning from these different processes. The responses to question 7 show that almost all students believed that they learned from some aspect of the peer review activity (93%). However, whilst over half reported that they learned from both giving and receiving feedback, some reported that they learned only from giving and others only from receiving feedback. In the latter two categories, more than twice as many students felt that they learned from receiving rather than from giving feedback.

Question 10 addressed the same issue as question 7, but focused on reports of behaviour rather than perceptions of learning. Again, the responses indicate that most students (76%) did indeed learn something from the peer review processes, in that they reported making modifications to their draught assignment. However, in contrast to question 7, the responses to question 10 show that, in terms of actions to make improvements, both giving and receiving feedback were perceived as equally beneficial.

In the survey, students were also asked to give examples of the actual modifications they made to their draft PDS based on the peer review activities. Forty-one students responded to this question. The responses were wide ranging; however, the following are typical examples:

> I included specific materials and changed the formatting of the document so it looked more professional.

> I provided more specific numeric values and expanded my rationale after seeing someone else's PDS and after receiving feedback.

> I added a legal and patents section.

> Improved the rationale, included more facts.

> I made some of my numeric points more specific to my final concept.

Table 1. Learning from peer review: students' responses and reported actions to survey questions 7 and 10 ($n = 64$).

Q7. Which aspect of the peer review activity did you learn from?	% [no of students]
Giving feedback	11 [7]
Receiving feedback	27 [17]
Both giving and receiving feedback	55 [35]
Neither giving or receiving feedback	8 [5]
Q10. Did you modify your initial assignment as a result of the peer review activity to improve it?	**% [no of students]**
Yes, as a result of peer review given	23 [15]
Yes, as a result of the peer review received	25 [16]
Yes, as a result of the peer review given and received	28 [18]
No	22 [14]
Not applicable	2 [1]

These comments show that students do revisit, rethink and update their work as a result of engaging in peer review activities. They also show that students believe that the changes they make to their assignments are improvements.

In order to gain deeper insight into the differential effects of receiving and giving feedback in peer review, students were also asked in the survey to comment on what they learned from receiving feedback reviews from peers, and what they learned from providing feedback reviews to peers. These two questions elicited quite different responses.

Fifty-four students provided comments describing what they learned from receiving reviews. The majority (63%) reported that receiving reviews from others either helped highlight specific areas for improvement (e.g. 'more rationale needed', 'I learned to put more numerical data and figures into my PDS') or that it helped bring deficiencies in work to their attention (e.g. 'problems that I didn't know of before were highlighted'). Around a quarter of the students (23%) reported that receiving reviews was valuable, because it helped them appreciate how other readers might interpret their work (e.g. 'I could see points from others' viewpoints', 'ways in which other students see my work'). A small number of students (5%) noted that receiving feedback could be motivational (e.g. 'the person who reviewed my PDS gave me positive feedback which helped me a lot'), and a small number (5%) reported that the reviews they received were not valuable (e.g. 'they weren't very good'). These findings are consistent with prior research on the benefits of feedback receipt from peers (Topping 1998; Cho and MacArthur 2010).

Forty-five students made comments in the survey describing what they learned from producing reviews. As highlighted above, this process was perceived as conferring quite different learning benefits from receiving reviews. Some students (15%) reported that through providing reviews they learned how to think critically or how to make critical judgements (e.g. 'how to look at work critically that isn't your own, it helps make you a better critical thinker'). Others (13%) reported that it enabled them to see others' work from an assessor's perspective (e.g. 'looking at the work from a markers point of view') or that it helped them better understand the assessment standards, as illustrated by the following comments from two different students:

> I was given a greater understanding of the level of work the course may be demanding.

> I learned what the standards were and what other people's standards were.

Importantly, the majority of the students (68%), through their survey comments, reported that reviewing resulted in their reflecting back on their own work and/or in their transferring ideas generated through the reviewing process to inform that work as the following extracts show.

> When giving advice to people on theirs it gave me greater perception when reviewing my own work by listening to my own advice for example.

> I had a chance to see other people's work and aspects of their work that I felt were lacking in my work – this helped me to improve my work.

> From identifying missing pieces in other people's work I was able to amend my own.

Also notable in the survey data reported above is that comments about receiving reviews tended to focus more on subject content (i.e. 63% of the total comments were about areas in need of improvement or that needed clarification, etc.), whereas those about producing reviews focused more on learning processes (i.e. 96% of total comments were about critical thinking, taking the assessors perspective and transfer of learning, with the majority being about learning transfer).

Cho and Cho (2011) have shown that producing reviews for peers leads to greater improvements in students' written assignments than the receipt of reviews from peers. The findings above add to this prior research by providing insights, from the students' perspective, into the cognitive processes that might account for these different effects. In particular, the students' own accounts suggest that reviewing is especially effective in triggering some powerful mental processes, including critical thinking, the active interpretation and application of assessment criteria, reflection and learning transfer – processes that are normally associated with high-levels of academic achievement. In essence, these findings suggest that the practice of reviewing offers considerable potential, arguably even beyond what might be possible through received feedback, for teachers wishing to develop students own thinking and assessment skills.

Learning from producing and receiving feedback: focus group data

The focus group interviews allowed deeper probing into perceived differences between producing and receiving feedback reviews. Students were again asked which they thought was more beneficial for their learning, producing feedback reviews or receiving feedback reviews. Unlike the quantitative survey data, most students in the focus groups reported that giving feedback was more beneficial, often coming to this realisation as they discussed and thought deeply about the focus group questions. Nonetheless, all students agreed that there was potential value in both processes as this typical comment shows:

> I think you need both parts but you gain more yourself from giving it as you're analysing your own and theirs.

Students also reported through the focus group discussions that, in comparison with receiving reviews, producing reviews involved them in thinking critically and in learning to be critical. Many students noted that, if they developed this capacity for critical thinking, then this would help them to make more objective judgements about their own work. For example, as one student pointed out:

> Giving it is better because that's what you need to learn – how to be critical of your own work – how to stand back – and where to be judgemental.

Another benefit highlighted by some students in the focus group discussion was the idea that reviewing gave them more control over, or more responsibility for, feedback processes:

> If you're reviewing it yourself you are more likely to learn as a whole and be able to apply things in the future. Whereas if you're just reading someone's feedback,

> probably because of how we've always learned, you are supposed to take it on board and apply it but you think yes that's how I can improve but you don't do anything.

> I think it's more useful if you've had to go away and do it yourself … [produce feedback] … rather than rely on others' feedback.

Some students also commented that the act of producing feedback on the work of peers had reduced their need for, and the value of, feedback from peers. As one student noted:

> I'd already made improvements by the time it came to actually reading what people had said about mine, I'd already spotted those things.

Indeed, in the focus groups, over half the students interviewed reported that they had actually updated their own work after the reviewing activities, and before they received the reviews. Many also reported that having done this, the receipt of reviews from others did not add to the process.

Reviewing was also seen by some students to address a common limitation of received feedback, namely that it is usually framed with reference to what has been produced and that it does not necessarily push the student to think beyond the confines of their own production, to open up new avenues of inquiry, new perspectives and ways of thinking about the work they have produced. This argument is captured in the following student comment:

> For me it would probably be to give feedback because I think seeing what other people have done is more helpful than getting other people's comments on what you have already done. By looking at other people's work you can see for yourself what you have forgotten or not even thought about. When people give feedback on yours they generally just talk about what is there. They don't say, well I did this on mine and you could put that in yours.

Exposure to others' work through reviewing was also seen as motivational to some students, incentivising them to improve the quality of their own work, as the following extract shows:

> Seeing the quality of other' work was a bit of a shock, I was, yes, I really need to step mine up, but then it was fine because we could then go and improve on it.

The results presented in this sub-section are very important. They suggest that, through reviewing the work of peers, students can learn to take control over their own learning, to generate their own feedback and to be more critical about their own work. As students themselves reported, reviewing not only puts feedback processes in their hands, but it also reduces their need for received feedback from others. In addition, some students in the focus groups went further, as shown in the quote above, by noting that reviewing brings into view new perspectives on their own work, perspectives that might not become available through received feedback. Overall, these findings suggest that peer reviewing offers great promise as a method through which students might develop their capabilities as independent and self-regulated learners, seen as one of the main

goals of higher education (Nicol and MacFarlane-Dick 2006; Boud and Associates 2010).

Cognitive processes activated when producing reviews: survey and focus group findings

In the survey, students were asked to comment on how they carried out the peer review, that is, 'how they evaluated the quality of the work to provide responses to the peer review questions'. Thirty-seven students answered this question. Over 50% of them wrote about how they had used their own work as the benchmark for the reviewing activity. The actual word 'compare' was used by 32% of the students who responded to this item (e.g. 'I compared it against my own work and examples given by the lecturer', 'I compared the reviews to my own to see if it was better or worse and what they could do to change it').

In the focus groups, students were also asked how they carried out the review activity. The following comment made by one student and confirmed by others provides deeper insight into this comparative process:

> I read it through and compared it with what I had done to see if they had put something I had not … The four questions were useful as they provided a framework for the review. If we hadn't had the questions it would have been difficult. I did the reviews separately and then answered one then the other. The first was a better standard than the other – so I used the ideas from the better one to comment on the weaker one. I also read the guidelines … [the review questions] … when I did the peer review. There were ideas from the good one that I hadn't even thought of in mine.

As in the survey responses, this student talks about 'comparing' the work of others with what she has produced. It appears that because she has produced work in the same domain as her peers, she already has an 'internal' standard with which to evaluate the peers' work. Hence this comparison of the peers' work against this standard inevitably results in a backward reflection on the student's own work. However, the process is more complex than this. This student also reports making comparative judgements across the reviews using her evaluation and interpretation of one assignment to comment on another, with the review questions informing the written feedback responses. This demonstrates the value of requiring multiple reviews.

In the survey, students also commented on the use of the review questions as a framework for their analysis of the peer assignment or for their commentary (e.g. 'I analysed the assignment in the context of the review question', 'I used the review questions to help formulate my commentary'). In the focus groups, the effects of the review questions were probed further. The following are typical comments from students in different focus groups about the impact of those questions:

> You compare it [the other student's work] to the criteria, but then in the back of your mind you're comparing it to your own at the same time. So you're kind of seeing the bad points compared to yours and the good points where you can do better on your own.

> I went down the questions and compared it to my own … I was trying to think what has this person done. Have they put in more effort or more knowledge than me?

> I went through the questions keeping my own in mind.

> You've got what you've done in the back of your mind whilst you're going over theirs so you see where you've gone wrong without anyone pointing it out so you learn it yourself.

> Tending to mark theirs as if they were trying to do a product like yours.

What is notable here is that, even whilst discussing the use of the review questions, all students still allude, in different ways, to a background reflective process involving an active comparison of the other's work with their own. Arguably, this reflective process, which depends on students having produced work in the same domain as their peers, is one of the defining features of peer reviewing. Indeed, this type of reflective comparison would not occur if students were merely asked to review a published article or to provide an explanation of ideas to other students as in peer tutoring (Roscoe and Chi 2008). This suggests that the benefits of peer reviewing do not just derive from producing explanations, one of the interpretations offered by Cho and MacArthur (2010), but rather from students producing critical reviews which are grounded in comparison with their own work.

Further insight into the reviewing process emerged from a discussion in one focus group where members compared peer reviewing with the receipt of teacher feedback.

> I think when you are reviewing (the work of peers), it's more a self-learning process, you're teaching yourself, well, I can see somebody's done that and that's a strength, and I should maybe try and incorporate that somehow into my work. Whereas getting (teacher) feedback you're kind of getting told what to do. You're getting told this is the way you should be doing it, and this is the right way to do it. You're not really thinking for yourself … I think it [reviewing] would help you not need so much of teacher feedback if there was more of this. Whereas, I think if you're not being able to do this [reviewing] then you will always be needing more. [teacher feedback]

From this comment, it is clear that this student perceives reviewing as an active and self-regulatory learning process, in contrast to receiving feedback reviews, which instead is characterised as a telling process. This perception resonates with arguments in the research, that transmission is a flawed way to think about learning from feedback (Sadler 2010), and with the findings reported earlier that reviewing gave students a sense of control over their own learning. This student also locates a key benefit deriving from such regulatory feedback activities, namely, a reduced dependence on the teacher for feedback.

Discussion

As mentioned in the introduction, recent research has identified peer review as a fertile context for enhancing student learning through feedback processes. However, whilst that research has demonstrated performance improvements, both when students receive feedback reviews from peers (Cho and MacArthur 2010) and when they produce feedback reviews for peers (Cho and Cho 2011), little is known about the learning mechanisms that might account for these improvements. The study reported here advances this research by exploring, from the students' perspective,

how receiving and producing reviews differ and, importantly, by teasing out the cognitive processes activated by reviewing, the most under-researched aspect of peer review, and by highlighting the role of these processes in the enhancement of student learning.

From the results reported, it is clear that students are keenly aware that receiving feedback reviews involves different learning benefits and processes from producing feedback reviews. Receiving reviews is seen by students as beneficial primarily because it alerts them to deficiencies or gaps in their work, or because it sensitises them to the different ways in which readers might interpret what they have written. Providing reviews, instead, is viewed as beneficial because it engages students actively in critical thinking, in applying criteria, in reflection and, through this, in learning transfer. These latter cognitive processes, activated through reviewing, and their theoretical and practical implications, are discussed below.

Evaluative judgement and vicarious learning

This study shows that producing reviews engages students in multiple and overlapping acts of evaluation or critical judgement, both about the work produced by others and, in many different ways, about their own work. First, students reported that reviewing involves a comparative process wherein they evaluate each peer assignment against an internal representation of their own work. According to the students, this comparison triggers a reflective process, where they use the feedback they generate for others to update their thinking about their own assignment. Second, students reported that reviewing involved them in comparing one peer's work against another and using the feedback generated from one to comment on the other. This process also generates internal feedback that students use to inform their own work. Third, as required in the peer review task, all students evaluated the work of peers against the review criteria – the questions provided by the teacher – in order to produce a written feedback response. Once again, however, students reported that, even in constructing this written response, they were conscious of concurrently making background comparisons of others' work with their own work.

These complex evaluative processes have not been identified in earlier research, which has primarily interpreted reviewing as a process that calls on and develops problem-solving or explanatory skills (Cho and Cho 2011; Cho and MacArthur 2011). Yet these findings are important, not just because they expand our understanding of the reviewing process, but also because they resonate with recent calls by writers on assessment and feedback that more attention be paid to developing the students' capacity to make evaluative judgements (Boud and Associates 2010; Cowan 2010; Sadler 2010; Nicol 2013). For example, Sadler (2010) has proposed that, if undergraduate students were given regular opportunities to engage in acts of critical appraisal, then this would significantly enhance their ability to produce quality work themselves. In turn, Cowan (2010) maintains that learning to make sound evaluative judgements is a professional skill that must be explicitly developed as it underpins both critical thinking and reflective capabilities. Findings from this engineering design study suggest that producing feedback reviews, which gave students experience in making judgements both about the work of others and, through a vicarious reflective process (Mayes et al. 2001), also about their own work, could be a productive platform for the development of these essential professional skills.

One question arising with regard to these evaluative processes is to what extent the requirement that students produce a self-review after completing the two peer reviews acted as the driver for the students' backward reflection on their own work. This is difficult to establish, as in the focus groups students did not indicate this as a causal factor. However, in two further investigations of peer review by the lead author conducted since this study, students reported engaging in the same reflective processes, even though there was no requirement for self-review. This latter finding suggests that peer review on its own does indeed encourage reflection; however, it does not establish what added value, if any, is realised by having students consolidate their reflections by writing them down. This issue warrants further research. In the meantime, however, it might still be wise to include self-review in peer review designs, given that maximising reflection on students' own work is a fundamental learning objective.

Engagement with assessment criteria

A specific issue in the published literature on assessment and feedback relates to assessment criteria. Research has shown that when students have a poor understanding of criteria, and hence do not share their teacher's conceptions of what is important, they are less likely to produce quality work themselves (MacLellan 2001). Also, the feedback that the teacher provides often does not result in improvements as it does not 'connect' (Hounsell 1997). Various strategies have been proposed to address this issue, including engaging students actively in discussing criteria before beginning an assessment task and having students derive the criteria themselves through analysing assignments produced by student cohorts from previous years (Nicol 2010). Peer reviewing, however, might offer a new way of conceptualising such engagement with criteria.

In reviewing, students are by necessity creating criteria themselves as they compare others' work with their own. This is an inductive, and even holistic, process, as it is the students' own work that acts as the standard or reference for the comparison. In reviewing, students also use the explicit criteria supplied by the teacher to construct a feedback response. This is a more analytical and deductive process, as the peer's work is evaluated against formally-defined criteria. Indeed, in creating this response, students gain experience in applying formal criteria to real instances of practice; earlier work suggests that this should facilitate their internalisation (Price and O'Donovan 2006). Importantly, both these inductive and deductive processes were described by students as taking place simultaneously. Whenever they talked about the evaluation of the work of peers against the supplied criteria they also, often in the same sentence, talked about a reflective process whereby they compared their own work with that of peers. This is perhaps unsurprising, given that students, before carrying out the reviews, would have already spent considerable time producing an assignment in the same topic domain as their peers. Hence, it is likely that the primary benchmark that students use to evaluate others' work derives from the work that they have produced themselves.

What is important in this analysis, however, is not just that reviewing calls on two sets of criteria, one set implicit and deriving from the student's own experience in producing an assignment, and the other explicit and deriving from the teacher, but also that these two sets overlap in use. This has interesting implications; first,

that students might be able to use the teacher-provided criteria to help calibrate and strengthen their own evaluative capabilities; second, that engagement with the teacher-provided criteria might be enriched through their use alongside student-produced criteria. Speculating further, it might be argued that, through reviewing, students generate richer criteria than those provided by the teacher, but sounder criteria than those they might be able to formulate themselves.

Students as feedback producer: reflection and learning transfer

The findings reported in this paper provide a new perspective on what might constitute good feedback practice in higher education, one which moves thinking away from a sole concern with how students learn from constructing meaning from received feedback, to a concern with how they might also learn through becoming better feedback producers.

In reviewing, students construct feedback 'meanings' for themselves as they produce it for others; that is, the catalyst for meaning construction is not an external input, rather it is an input generated directly by the students themselves as they engage in making critical judgements. When students become the source and generators of feedback then a number of benefits ensue, as identified by students in this study. First, in the focus groups, students maintained that reviewing, or more specifically the reflective process it engenders, gave them more control over feedback processes and hence over their own learning. It resulted in their 'teaching themselves', to paraphrase their words. This form of control goes well beyond students becoming better users of teacher feedback, as it puts feedback processes firmly in their hands. Students also maintained that, were they to be given more control in this way, their need for the receipt of feedback from peers or even the teacher might actually be reduced. Some students also reported that reviewing might enhance the range of feedback perspectives they were exposed to, beyond those provided through received reviews. Whilst good teachers will always try to alert students to alternative perspectives, the range of possibilities is likely to be greater through students reviewing the work of peers, and especially, if they produce a number of reviews. Such exposure to examples of work of varying quality is, according to Sadler (2010), what is required if students are to learn to recognise and produce high-quality work themselves.

This focus on learning through reviewing and providing feedback is important from both a theoretical and a practical perspective. First, it highlights the importance of *inner* feedback processes, an often neglected consideration in feedback research. Whenever learners produce a piece of work, they generate internal feedback, even in the absence of a teacher. This feedback is a by-product of task engagement; it derives from the learner's inner monitoring and evaluation of discrepancies between current and intended performance (Butler and Winnie 1995). Also, when external feedback is provided it does not operate alone – it triggers and also adds to learner-generated feedback, at times confirming, supplementing or conflicting with it. For the most part, research on feedback has ignored the complexity of these inner feedback processes. For example, little has been written about how these inner processes might be harnessed so that the need for external feedback is reduced, or specifically about how students might develop the ability to cope with discrepancies and conflicts between external and inner feedback. This paper begins to address this gap by highlighting how producing feedback reviews might

strengthen inner feedback processes and enable students to compare and calibrate inner and external feedback, in ways that support their learning.

Second, reviewing addresses a development need that, arguably, is not fully tackled through higher education curricula. In their future careers, most graduates are likely to encounter situations where they are required to appraise and comment on the work or performance of others. Hence, one would expect feedback practices in higher education to echo these requirements. Yet, this is not the case; most students neither receive practice in producing feedback nor, indeed, practice in making sense of feedback when it is received from multiple sources (Nicol 2011). Teachers could, however, easily address both these issues by ensuring that peer review activities are given a more prominent role, than currently happens, in higher education curricula.

Future research and implementation

There is no doubt that more research is required on peer review and its different components, including more studies of students' experiences, perceptions and responses to the different feedback arrangements that are possible during its implementation. Whilst one must be cautious about inferring mental processes from self-reports, our understanding of peer review processes and their effects on learning will be much weaker without the analysis that such reports enable, as the present study has shown. Future research, amongst other things, might usefully focus on establishing whether the results found in this study would generalise to, and be applicable in, other situations and in other disciplines. In that context, it should be mentioned here that such work has already begun. Indeed, one of the authors of this paper has just completed two further implementations of peer review, one with over 250 first-year sociology students and another with 30 biochemistry students. This research also involved, amongst other measures, focus groups and the use of a survey instrument with items that overlapped with those used in this study. The findings of these studies confirm and extend those reported here.

Many readers will have practical concerns about the implementation of peer review, for example, about the students' ability to provide meaningful feedback, about fairness and biases in reviewing, about collusion and plagiarism and about the implications for teacher workload. Arguably, however, most of these concerns can be addressed through well-designed peer review tasks, as some researchers have recently suggested (Pearce, Mulder, and Baik 2009). As discussed earlier in this paper, it is also apparent that many implementation problems can be circumvented if students are not asked to mark each others' work when they engage in reviewing activities. What is important, however, is that such practical concerns do not act as a barrier to the increased implementation of peer review in higher education, given the potential educational benefits that this practice offers.

Conclusion

The research reported in this paper throws new light on the theory and practice of feedback in higher education. It shifts the focus of analysis firmly away from old delivery models of feedback, which cast the teacher as the transmitter of feedback messages to students conceived as passive relays. However, whilst it takes on board more recent theoretical positions which recognise the importance of an active role

for learners in constructing meaning from received feedback, it goes further than those positions in that it identifies conditions which would make these processes of construction even richer and more productive. These conditions involve the staging of feedback in peer review contexts, where feedback production is recognised as just as valuable for learning as feedback receipt. Such staging will not only result in students gaining a deeper insight into subject matter but, crucially, it will also enable them to acquire skills which are currently not explicitly developed through the curriculum, even though they constitute an important requirement in professional life beyond university. These skills include the ability to engage with and take ownership of evaluation criteria, to make informed judgements about the quality of the work of others, to formulate and articulate these judgments in written form and, fundamentally, the ability to evaluate and improve one's own work based on these processes.

Acknowledgements

The authors would like to thank Dr Michela Clari of the University of Edinburgh for her many perceptive and constructive feedback comments which helped improve the quality of this manuscript. We would also like to thank JISC UK for funding the PEER Project which allowed us to research this topic, and for their further funding for the PEER Toolkit project. Details of these projects can be found at www.reap.ac.uk Last, and not least, we thank the Design Engineering students for providing such deep insight into the mental processes elicited by peer review activities. This went beyond what we had anticipated when we designed the survey and focus group protocols.

Notes on contributors

David Nicol is an emeritus professor of Higher Education at the University of Strathclyde. He has published extensively on assessment and feedback in higher education from a pedagogical, technological and institutional change management perspective (see www.reap.ac.uk).

Avril Thomson is a senior lecturer in Engineering Design at the University of Strathclyde. She is the departmental director of Teaching and Learning and the Engineering Faculty Learning Manager.

Caroline Breslin is a learning technology advisor for the Faculty of Engineering at the University of Strathclyde. Her research publications are in the area of technology-enabled teaching and learning.

References

Bailey, R., and M. Garner. 2010. "Is the Feedback in Higher Education Assessment Worth the Paper it is Written on? Teachers' Reflections on Their Practices." *Teaching in Higher Education* 15 (2): 187–198.

Barr, R. B., and J. Tagg. 1995. "From Teaching to Learning: A New Paradigm for Undergraduate Education." *Change* 27 (6): 13–25.

Boud, D. 2007. "Reframing Assessment as if Learning was Important." In *Rethinking Assessment for Higher Education: Learning for the Longer Term*, edited by D. Boud and N. Fachikov, 14–25. London: Routledge.

Boud, D., and Associates. 2010. *Assessment 2020: Seven Propositions for Assessment Reform in Higher Education*. Sydney, Australia: Australian Learning and Teaching Council. www.assessmentfutures.com.

Butler, D. L., and P. H. Winnie. 1995. "Feedback and Self-Regulated Learning: A Theoretical Synthesis." *Review of Educational Research* 65 (3): 245–281.

Carless, D., M. Salter, M. Yang, and J. Lam. 2011. "Developing Sustainable Feedback Practices." *Studies in Higher Education* 36 (4): 395–407.
Cartney, P. 2010. "Exploring the Use of Peer Assessment as a Vehicle for Closing the Gap Between Feedback Given and Feedback Used." *Assessment & Evaluation in Higher Education* 35 (5): 551–564.
Cho, K., and C. MacArthur. 2011. "Learning by Reviewing." *Journal of Educational Psychology* 103 (1): 73–84.
Cho, Y. H., and K. Cho. 2011. "Peer Reviewers Learn from Giving Comments." *Instructional Science* 39 (5): 629–643.
Cho, K., M. Cho, and D. J. Hacker. 2010. "Self-Monitoring Support for Learning to Write." *Interactive Learning Environments* 18 (2): 101–113.
Cho, K., and C. MacArthur. 2010. "Student Revision with Peer and Expert Reviewing." *Learning and Instruction* 20 (4): 328–338.
Cowan, J. 2010. "Developing the Ability for Making Evaluative Judgements." *Teaching in Higher Education* 15 (3): 323–334.
Crisp, B. 2007. "Is it Worth the Effort? How Feedback Influences Students' Subsequent Submission of Assessable Work." *Assessment & Evaluation in Higher Education* 32 (5): 571–581.
Falchikov, N. 2005. *Improving Assessment through Student Involvement*. London: Routledge–Falmer.
Higher Education Funding Council for England. 2011. *The National Student Survey: Findings and Trends 2006–2010*. Bristol: Higher Education Funding Council for England.
Hounsell, D. 1997. "Contrasting Conceptions of Essay-Writing." In *The Experience of Learning*, edited by F. Marton, D. Hounsell, and N. Entwistle, 106–125. Edinburgh: Scottish Academic Press.
James, R., K.-L. Krause, and C. Jennings. 2010. *The First Year Experience in Australian Universities: Findings from 1994–2009*. Melbourne: Centre for Higher Education Studies: University of Melbourne.
Kaufman, J. H., and C. D. Schunn. 2011. "Students' Perceptions about Peer Assessment for Writing: Their Origin and Impact on Revision Work." *Instructional Science* 39: 387–406.
Liu, N., and D. Carless. 2006. "Peer Feedback: The Learning Element of Peer Assessment." *Teaching in Higher Education* 11 (3): 279–290.
MacLellan, E. 2001. "Assessment for Learning: The Differing Perceptions of Tutors and Students." *Assessment & Evaluation in Higher Education* 26 (4): 307–318.
Mayes, T., F. Dineen, J. McKendree, and J. Lee. 2001. "Learning from Watching Others Learn." In *Networked Learning: Perspectives and Issues*, edited by C. Steeples and C. Jones, 213–228. London: Springer.
Nicol, D. 2010. "From Monologue to Dialogue: Improving Written Feedback in Mass Higher Education." *Assessment & Evaluation in Higher Education* 35 (5): 501–517.
Nicol, D. 2011. *Developing the Students' Ability to Construct Feedback*. Gloucester: Quality Assurance Agency for Higher Education. http://tinyurl.com/avp527r.
Nicol, D. 2013. "Resituating Feedback from the Reactive to the Proactive." In *Feedback in Higher and Professional Education: Understanding it and Doing it Well*, edited by D. Boud and E. Molloy, 34–49. Oxon: Routledge.
Nicol, D., and D. Macfarlane-Dick. 2006. "Formative Assessment and Self-Regulated Learning: A Model and Seven Principles of Good Feedback Practice." *Studies in Higher Education* 31 (2): 199–218.
Pearce, J., R. Mulder, and C. Baik. 2009. *Peer Review: Case Studies and Practical Strategies for University Teaching*. Melbourne: Centre for the Study of Higher Education, University of Melbourne.
Price, M., K. Handley, and J. Millar. 2011. "Feedback: Focusing Attention on Engagement." *Studies in Higher Education* 36 (8): 879–896.
Price, M., and B. O'Donovan. 2006. "Improving Student Performance through Enhanced Student Understanding of Criteria and Feedback." In *Innovative Assessment in Higher Education*, edited by C. Bryan and K. Clegg, 100–109. London: Routledge.
Roscoe, R., and M. Chi. 2008. "Tutor Learning: The Role of Explaining and Responding to Questions." *Instructional Science* 36: 321–350.

Sadler, D. R. 2010. "Beyond Feedback: Developing Student Capability in Complex Appraisal." *Assessment & Evaluation in Higher Education* 35 (5): 535–550.
Sadler, P. M., and E. Good. 2006. "The Impact of Self- and Peer-Grading on Student Learning." *Educational Assessment* 1: 1–31.
Topping, K. 1998. "Peer Assessment between Students in Colleges and Universities." *Review of Educational Research* 68 (3): 249–276.
Wingate, U. 2010. "The Impact of Formative Feedback on the Development of Academic Writing." *Assessment & Evaluation in Higher Education* 35 (5): 519–533.