Using peer reviews to examine micropolitics and disciplinary development of engineering education: a case study

Kacey Beddoes*

School of Engineering Education, Purdue University, West Lafayette, IN, USA

This article presents a case study of the peer review process for a feminist article submitted to an engineering education journal. It demonstrates how an examination of peer review can be a useful approach to further understanding the development of feminist thought in education fields. Rather than opposition to feminist thought per se, my experience reveals that opposing beliefs about what a feminist contribution to engineering education entails pose a challenge to those aiming to engage with feminist thought.

Keywords: peer review; feminism; engineering education; disciplinary development; interdisciplinarity; Science and Technology Studies (STS)

Introduction

Prior scholarship has identified a widespread lack of engagement with feminist thought in education fields (Hart, 2006; Hart & Metcalfe, 2010; Weiler, 2008; Yates, 2008). It has been recognized that feminist research and insights are largely excluded from mainstream education research (Biklen, Marshall, & Pollard, 2008), and a variety of factors contributing to the exclusion have been identified (Weiler, 2008; Yates, 2008). I propose that an examination of peer review offers another important means to understanding the limited engagement with feminist thought, as well as other critical traditions, in education fields. Opening up the ‘black box’ of peer review can offer insight into what a community believes, how it defines quality research, and why feminist thought has not made significant inroads into the mainstream literature.

Although not related to feminist engagement specifically, some journals have initiated and advocated more open peer review practices. For example, Reflective Practice will sometimes publish, with authors’ permission, reviews and authors’ responses to reviews along with the article (e.g., Banerjee & Pawley, 2011). The Medical Journal of Australia has also led initiatives to publish reviews, making them available for community scrutiny (Bingham & van der Weyden, 1998), and, in 2002, Science Education published a special issue in which authors discussed their own peer review experiences, including quoting directly from reviews (Roth, 2002c). These examples represent important steps toward increased reflection upon and transparency of peer review practices.

Sharing similar aims of increased reflection and transparency, this article presents a case study of one feminist article submitted to an engineering education journal.
The purpose is two-fold. The first is to advance an argument for increased attention to peer review in education fields. The second is to shed light on an under-studied topic within engineering education: the development of feminist thought. Using as data reviews I received for a feminist article submitted to a leading engineering education journal, I analyze the reviews, and highlight tensions and challenges, with the aim of contributing new knowledge to the state of the field and the challenges of advancing feminist thought. In this regard, the article also builds on prior personal narratives (e.g., Biklen et al., 2008) to produce insights into the development of feminist thought in education fields.

The article begins with a brief introduction to the field of engineering education and the current state of feminist thought therein. Next, the methodological inspiration for this case study is explained. Following that, I summarize the article that is the subject of the case study before describing the three sets of reviews I received. I conclude with a discussion of the relevance and implications for engineering education specifically and other education fields more generally. While this analysis focuses on review of a feminist article in one particular field, its purview necessarily extends to broader topics, including peer review more generally, introducing new perspectives or approaches into a field, and interdisciplinarity.

Background: engineering education and feminist thought therein

In the USA, Europe, and Australasia, engineering education is increasingly being promoted and studied as a distinct field of scholarship, or even a discipline (Borrego & Bernhard, 2011; Borrego, Streveler, Miller, & Smith, 2008; Jesiek et al., 2011; Jesiek, Newswander, & Borrego, 2009). In this paper, then, the term engineering education refers to that emerging field of scholarship rather than the content and practices of engineering classrooms per se (while recognizing the two are necessarily related). The increased activity around engineering education has included journal articles on the status and emergence of the field, large-scale research and advocacy projects undertaken by professional societies and their journals, research networks and groups, refashioning journals to focus on empirical research, university departments, centers, degrees, and new conference series (Benson, Becker, Cooper, Griffin, & Smith, 2010; Borrego & Bernhard, 2011; Jamieson & Lohmann, 2009).

Scholarship focused on women and gender is a small but increasingly prioritized part of the emerging field more broadly (Beddoes, 2011). However, that scholarship by and large does not engage feminist theory, use the word ‘feminist’, or treat gender as socially constructed hierarchical categories rather than a sexual dichotomy (Beddoes & Borrego, 2011; Godfrey, 2003; Riley, Pawley, Tucker, & Catalano, 2009; Tonso, 2008). Nonetheless, some efforts have been made by small pockets of engineering education scholars to advance explicitly feminist research that engages a wide range of feminist theories and methodologies. In the USA, beginning in 2004, there have been papers and special sessions on feminist research and pedagogy at Frontiers in Education (FIE), an annual engineering education conference (Eschenbach, Cashman, Waller, & Lord, 2005; Lord, Cashman, Eschenbach, & Waller, 2005; Lord, Eschenbach, Waller, & Cashman, 2004; Pawley, Riley, Lord, & Harding, 2009; Riley, Catalano, Pawley, & Tucker, 2007; Tucker, Pawley, Riley, & Catalano, 2008; Waller, 2005a, 2005b). Recently, there have also been journal
articles on *feminisms in engineering education* and *feminist engineering*; however, these were published in women’s studies journals, not engineering education journals (Riley, 2008; Udén, 2009). Additionally, Australia and the USA now both have feminist engineering research groups (Mills, Gill, Sharp, & Franzway, 2011; Pawley, 2012).

Several other pertinent features of engineering education research (EER) should be noted here. First, engineering professors and administrators are the primary audience for engineering education scholarship:

> At present, the majority of scholars who identify with the emergent field of engineering education have been formally trained as engineers and have instructional responsibility for engineering students, or they work closely with engineering educators in a staff/faculty development role. (Borrego & Bernhard, 2011, p. 23)

This fact influences expectations and norms for engineering education publications; generally, quantitative and positivist research is dominant (Borrego, 2007; Borrego & Bernhard, 2011; Borrego, Douglas, & Amelink, 2009; Douglas, Koro-Ljungberg, & Borrego, 2010; Koro-Ljungberg & Douglas, 2008).

Despite the fact that the majority of those involved in EER are still engineers, however, engineering education is an interdisciplinary field that draws from and collaborates with fields such as education, psychology, sociology, and women’s studies. The extent to which it draws on those fields varies greatly, however, and positivist contributions from fields like psychology are more readily accepted than are critical qualitative or poststructural approaches from, for example, gender studies. The interdisciplinarity means that reviewers are coming to the field from diverse disciplines, bringing differing disciplinary-based norms and expectations of quality research with them.

Further adding to the field’s interdisciplinary nature is the fact that EER is published in many different outlets. There are several journals devoted specifically to engineering education; however, EER also appears in general education journals, women’s studies journals, and discipline/domain-specific journals. These and other features contribute to a field whose boundaries are in flux and wherein participants (albeit a minority) come from widely ranging disciplinary backgrounds. Leading scholars in the field have asserted that, ‘As both an emerging and interdisciplinary field, EER does not have widely agreed upon expectations for what constitutes quality work’ (Borrego & Bernhard, 2011, p. 24). The interdisciplinarity is important to note because interdisciplinary evaluation, including criteria for quality research, is particularly challenging (Aagaard Hansen & Svedin, 2009; Boix Mansilla & Dawes Duraisingham, 2007).

In summary, then, engineering education is an emerging research field of which scholarship on women and gender comprises a notable part. Yet, it has remained largely in the feminist empiricist (Harding, 1991) and liberal traditions (Lorber, 2001) rather than examining how gender is (re)produced and functions as a social hierarchy. Largely, this can be attributed to the fact that the majority of the community consists of engineers who bring with them engineering disciplinary norms and expectations of what quality research is. Moreover, their identities are tied to engineering, further increasing the difficulty of critique.
Methodological basis for peer review analysis

Methodologically, this analysis is built upon insights from fields such as Science and Technology Studies (STS) that what gets published in scientific/academic outlets, and what becomes recognized as knowledge, is the result of social processes and deliberations, reflecting what communities value. As such, those processes and the resulting published artifacts merit examination as sites of knowledge construction as a social phenomenon that can reveal insights about how a community thinks and what they value. Examples of other work that analyzes peer review processes and texts include Myers’ (1990) *Writing Biology* and Lamont’s (2009) *How Professors Think: Inside the Curious World of Academic Judgment*. Additionally, scholars in science education have documented and analyzed their own review experiences and critically written about review processes more generally, including publishing reviewer and editor comments and their formal responses to those comments (Eisenhart, 2002; Roth, 2002a, 2002b, 2002c, 2004; Scantlebury, 2002; Tobin, 2002), and in the field of biomedicine, researchers have interviewed editors and reviewers about their experiences (Lipworth & Kerridge, 2011). Their work demonstrates the value in examining the review process by writing about the micro-processes involved with the aim of empowering other actors. Very recently, several engineering education scholars in Australia have also begun to publish conference papers that analyze peer review practices in engineering education (Gardner, Willey, Jolly, & Tibbits, 2012; Jolly, Willey, Tibbits, & Gardner, 2011; Willey, Jolly, Tibbits, & Gardner, 2011a, 2011b), asking questions such as *Does peer review ‘actually work to discriminate against innovation and impede the development of the field?’* (Willey et al., 2011a, p. 1). Explaining her motivation to examine peer review, Lamont (2009) states:

> I approach the riddle of success by analyzing the context of evaluation – including which standards define and constrain what we see as excellent . . . Most of all, I want to open the black box of peer review and make the process of evaluation more transparent, especially for younger academics looking in from the outside. I also want to make the older, established scholars – the gatekeepers – think hard and think again about the limits of what they are doing, particularly when they define ‘what is exciting’ as ‘what most looks like me (or my work)’. (pp. 3, 12)

This analysis similarly aims to examine peer review of one feminist engineering education article in order to provide insights for other scholars and, perhaps, to encourage ‘gatekeepers’ to re-examine their own judgments in a new light. In addition to the methodological inspiration from work on the production of texts, peer review, and value judgments therein, my project also draws inspiration from scholars in STS, women's studies, and education who use personal narratives as sites of knowledge creation and theory development (e.g., Anyon, 2009; Biklen et al., 2008; Cohen & Galusky, 2010; Mayberry, Subramaniam, & Weasel, 2001).

Overview of the case study article

The article discussed here was submitted to a leading engineering education journal in 2009. It was published in that same journal in 2011. The article aimed to bring new and under-utilized perspectives from feminist theory into engineering education and
to explain why they are important for the development of the field. It analyzed a set of international engineering education journal articles spanning 14 years, examining the ways in which feminist theory had been engaged. As there was only limited engagement with feminist theories outside the liberal vein, and the limitations of liberal feminist approaches were not widely recognized, the article introduced five branches of feminist thought and explained how each could help move beyond the status quo.

I wanted the article to have value to a wide audience, not just those already familiar with or interested in feminist theory. I aimed to make the article accessible, and ideally therefore more valuable to an engineering education audience. To accomplish this, I worked with a leading scholar in the field who had published numerous articles in the journal (although none on women or gender). The preparation is discussed in greater detail elsewhere (Beddoes, 2011). I do not want to imply that no one in the engineering education community is familiar with feminist theory. Indeed, as discussed in the Background: engineering education and feminist thought therein section, there are some who are. However, because this was the first paper of its kind in an engineering education journal, I wanted the article to be introductory, that is, to be understandable to anyone reading the journal.

The reviews
First revision
I first received a major revision decision from the Associate Editor and reviews from three reviewers. Two of the reviews were quite positive and one was quite negative. Moreover, they contained opposing views on specific, significant issues. I discuss those differences with the aim of highlighting disparities among those working on women and gender in EER. The extent of the reviews was not limited to what I discuss here, where I focus only on one theme that emerged from the review process. Other themes are discussed elsewhere (Beddoes, 2011).

Reviewer 1 and Reviewer 3 had very different opinions regarding the article’s level of appropriateness for an engineering education audience and its contribution to the field. While both reviewers commented on the level (depth) of analysis and its contribution to the field, they held directly opposing views on the subject. Their reviews thus raise questions about how one can and should attempt to incorporate feminist thought into engineering education. Reviewer 1 commented that the paper was:

...a pleasure to read both in content and composition. Clear, concise construction, not jargon laden, very appropriate for intended audience. Coupled with Riley, Pawley, Tucker and Catalano (NWSA Vol. 21, #2, 2009) this publication would contribute to a synergistic moment in engineering education research. I applaud all your efforts to bring feminist theory out of the closet and into main stream discussion in engineering education research.

However, Reviewer 3 began her/his comments by stating:

I was very interested when I saw the title and abstract for this paper and had high expectations. These expectations were unfortunately not fully met; in general I found the
paper a bit superficial and I am not sure it is adding much new to the literature in its current form. For example, the authors quote in several points an editorial from a 2002 IJEE [International Journal of Engineering Education] special issue in Women & Engineering; it is worth reading this editorial and then judging what the present paper is offering that goes beyond that editorial. At this stage my judgement is that the answer is ‘not much’.

As described elsewhere (Beddoes, 2011), much of the preparation that had gone into crafting the article for an engineering education audience was intended to produce precisely the features that Reviewer 1 appreciated. And yet, it seemed that many of those features led Reviewer 3 to see it as ‘superficial.’ Such disagreements surely pose challenges for a developing field, for authors, and for readers when an article is assessed by one reviewer as ‘very appropriate’ and contributing to a ‘synergistic moment in engineering education research’ but by another as ‘superficial’ and contributing ‘not much’ to the field.

The Associate Editor recognized the conflict and was in agreement with Reviewer 3, as evidenced by the major revision decision and the following comments:

As evident in the reviews, there is divergence in opinion as to the readiness of this article for publication. One reviewer has little to say and assigns an ‘accept as written’, while on the other end, a reviewer asks for more in-depth analysis that would push the work further so as to make contributions back to the field of feminist studies. We encourage the authors to take these latter comments seriously so that the article will both challenge the [journal’s] community while potentially serving as a vehicle for motivating non-engineering education folks to engage with issues faced in the field.

In other words, both the Associate Editor and Reviewer 3 wanted the paper to be deeper and to contribute not only to engineering education, but to women’s studies as well.

However, many of the changes Reviewer 3 suggested went against precedent in the journal. Furthermore, I believed the expectation that the first article of its kind in the journal should be both accessible and relevant to an engineering education audience and simultaneously advance gender theory literature was unreasonable. Reviewer 3 seemed to believe that there had been a lot more work done in this area, and/or that the work that had been done was much more engaged with feminist theory than my research had discovered, but the reviewer did not point to any specific literature to support her/his impressions. I never did come to understand why Reviewer 3 had such a different belief about the existing work than the other reviewers and myself. I made the small changes that Reviewers 1 and 2 requested, and the changes from Reviewer 3 that I thought were reasonable. In the response letter, I responded to each comment of Reviewer 3 explaining when a change was not made why I believed that it went against precedent and/or reflected a lack of familiarity with engineering education.

Second revision

Next, I received another major revision letter from the Associate Editor and a second set of reviews, this time from four reviewers, two of whom I believe were not in the original group of reviewers. Again there was disagreement over the appropriateness and contribution of the article, and in addition to the reviewer who thought the
article was ‘very accessible’ and the one who thought it was ‘superficial’, I now had an additional reviewer who thought it needed to be ‘more accessible’ and less in a ‘tone of a feminist theorist.’ In other words, Reviewer 2 was recommending changes that conflicted with what Reviewer 3 wanted. Reviewer 2 wrote:

I agree with the authors that the topic of this paper is of great import to engineering education and the development of the engineering education discipline. I think it is important that this information be made available to the engineering education community. However, I do not think the paper is yet ready to be published. The authors need to make the information more assessable to the typical reader of [the journal]…If we could really define such a reader!

As also demonstrated in the first revision, among reviewers, the Associate Editor, and myself, there were competing ideas about the goal of the paper, communities it could and should engage, and what the members of those communities already knew. Another tension that arose at this time was that comments from Reviewer 3 revealed that s(he) had interpreted the aim to make the paper accessible as tantamount to claiming that the journal’s audience was unable to understand sophisticated social science scholarship, thus revealing very different valuation and interpretations of ‘accessibility’ within the engineering education community. This time, I significantly rewrote several sections of the paper, accommodating all reviewers as best I could and resubmitted it.

Third revision

I received a minor revision decision letter and another set of reviews. Most of the changes requested this time were for wording and grammar choices. However, one reviewer’s more extensive comments are worth highlighting, as they speak once again to how reviewers understood the state of the field and the place of my article therein:

[T]his is a timely and important article. You are correct in stating that this article is just the beginning to encourage a deeper, more sophisticated and nuanced relationship between feminist theory and engineering education. For some of us who cut our scholarly teeth in feminist and critical cultural theory, this article reads like a beginning primer, but having now worked in engineering education research….I understand just how new and frightening feminist theory is viewed by [engineering education] researchers, including the female engineers I work with….I completely understand and support your observation that some of the limited application of fem theory in [engineering education] research is a result of authors intuitively understanding what would and would not get published in engr. educ. journals. We know our audience, yet because we know our audience (faculty, male, white, middle-class) we must continue to bring discussions such as this to the fore and encourage colleagues to engage feminist theory.

This final evaluation highlights the challenges and tensions surrounding scholarship on women and gender and suggests several reasons why there has not been deeper engagement with feminism in engineering education, including an assumption on the part of authors that explicitly feminist work will not get published. Indeed, interviews with feminist engineering educators support the claims this reviewer makes (Beddoes, 2012).
Discussion
The case study presented here revealed that those reviewing feminist engineering education scholarship had not only different but opposing beliefs and understandings of the state of the field and feminist thought therein. They also differed in the value they placed on presenting feminist theory in a clear and accessible manner to a new audience. Additionally, they differed in the value they placed on systematic research as opposed to editorials that merely present arguments (as seen in the comment equating the article with an editorial). It seems difficult, then, to draw any conclusions about a typical ‘peer’ reviewer of feminist engineering education scholarship. The lack of consensus raises questions about the future of feminist thought in engineering education and how to promote increased engagement with feminist thought in other education fields as well.

In order to introduce feminist perspectives into a field, scholars must do so in a way that is appropriate and accessible for that field. This can be challenging, however. Attempting to identify what is appropriate and accessible is made even more challenging when there is disagreement on these points within an emerging and interdisciplinary field. Presently, the nature of engineering education is such that reviewers (and audiences) have significantly different knowledge backgrounds. Thus, authors are caught between fields and held accountable to reviewers from different fields with divergent opinions over what is appropriate and accessible. The challenge of finding appropriate reviewers in interdisciplinary fields such as education, including for feminist scholarship specifically, has also been discussed by science educators (Eisenhart, 2002; Roth, 2002b; Scantlebury, 2002).

A related point to note here is that numerous individuals are involved in bringing an article to its published version. The review process documented in this article highlights the fact that articles are often the result of multiple and competing deliberations and negotiations. They contain knowledge and opinions not only of the authors, but also of reviewers and editors. In more traditional disciplinary-based publication outlets, authors are held accountable to reviewers and editors who bring with them a narrower range of disciplinary-based norms, expectations, and values. However, in outlets that are more interdisciplinary, authors can be held accountable to reviewers and editors who may have significantly different disciplinary norms, expectations, and values. The expectation to incorporate such divergent opinions and satisfy reviewers from a variety of backgrounds creates extra challenges for authors attempting to introduce new feminist perspectives into an emerging and interdisciplinary field such as engineering education.

Findings from interviews with feminist engineering educators indicate that there are not enough qualified reviewers to assess feminist scholarship, and that there is resistance to qualitative work and feminist thought specifically (Beddoes, 2012). Other scholars have documented evidence of this phenomenon as well (e.g., Tonso, 2008). In the case study presented here, I did not experience those particular challenges to a great extent, but I did encounter another issue that should be added to the list of challenges and tensions faced by feminist engineering education scholars – namely, even when reviewers are not opposed to feminist thought or qualitative work, they do not necessarily agree on what a contribution to the field looks like. A similar experience I had with a different engineering education journal
and an article on feminist methodology suggests that this was not an isolated incident, but rather representative of a larger issue in the field.

Reviewers’ divergent expectations are likely one cause of feminist work remaining outside the mainstream. First, the negative reviews, even if only from one reviewer, can mean that an article does not get accepted. Second, if authors experience or perceive the process of publishing feminist work in mainstream journals as too onerous, they will likely opt instead to submit to more receptive outlets. Indeed, this account demonstrates that significant persistence was required in order to get the article published in an engineering education journal. In fact, in engineering education, feminist scholars often do not even attempt to publish in mainstream journals, submitting instead to women’s studies journals, gender and education journals, or Engineering Studies (Beddoes, 2012). This is to the detriment of engineering education because it means that the status quo remains largely unchallenged. As noted, the vast majority of engineering education scholarship on women and gender is in the liberal tradition and takes a feminist empiricist approach. This is problematic because liberal and feminist empiricist approaches leave many problematic features and assumptions unchallenged (Harding, 1991; Lorber, 2001; Riley, 1999). Thus, gendered facets of engineering are maintained, while work that challenges the status quo and could advance the field ends up in journals in other fields. Openly discussing peer review could potentially further engagement with feminist thought and other critical approaches by challenging the status quo in educational research, opening it up for critique in new ways and by new or marginalized scholars. Engineering education is not unique in this regard. Scholars in a variety of fields have discussed the challenges of incorporating feminist approaches and perspectives into the mainstream scholarship (Paludi & Steuernagel, 1990; Riley, 1999; Stacey & Thorne, 1985; Stanley, 1997; Stanton & Stewart, 1998; Strathern, 1987).

Finally, it should be noted that several overlapping issues were at play in the review process described here, and it is difficult to disentangle them given the dearth of published accounts to which I can compare my experiences. Issues such as reviewer disagreement are common across fields, although, as discussed above, prior scholarship suggests it is likely more common in interdisciplinary fields. Questions remain as to what in this account is representative of all fields, what is specific to interdisciplinary fields, what is specific to engineering education, and what is specific to feminist scholarship as compared to other critical approaches. My account alone cannot provide answers, and accounts of others’ experiences are needed. To that end, ongoing research by Douglas and Bumbaco (2012) examining peer review of qualitative research in engineering education is an important step. Additionally, a workshop to be held in late 2012 will also be a step in that direction (Beddoes, Gardner, Jolly, & Willey, Forthcoming 2012). Ideally, these projects will prompt reflection and further scholarship on issues that others (e.g., Barton, Johnson, & The students in Ms Johnson’s Grade 8 science classes, 2002; Roth, 2002c; Tobin, 2002; Willey et al., 2011a), have already highlighted, including the roles of reviewers and editors, types of scholarship peer review works against, and beliefs about meritocracy in the publishing process. Further examination of the discursive politics of peer review may allow more conclusions to be drawn about the many intersecting issues raised here.
Acknowledgements

This article is based on my dissertation work, and I would like to thank my committee members: Gary Downey, Maura Borrego, Brent Jesiek, and Tim Luke. I am also grateful to Alice Pawley for discussions that informed this work.

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