

The Impact of Signature Pedagogy for Women in Information Sciences

Caroline Sheedy

The School of Informatics and Creative Arts
Dundalk Institute of Technology
Co. Louth, Ireland
Email: caroline.sheedy@dkit.ie

Maria Moloney

School of Computer Science and Statistics,
Trinity College Dublin
Dublin, Ireland
Email: mmolone2@scss.tcd.ie

Abstract—This paper reviews the relatively recent concept of ‘signature pedagogy’ within computer science, and the manner in which it has evolved to date. One consideration of this work is to examine how well the powerfully reinforced value systems, in the form of the signature pedagogy, are understood in this field. The work then queries whether the reviewing process of the field is impacted. The gender breakdown acceptance statistics of a top tier journal of Information Systems are presented, which result in some interesting observations. The paper concludes with directions by which the investigation topic can be continue, towards furthering the description of a signature pedagogy in computer sciences and the need for it to be a balanced description.

I. INTRODUCTION

Computer science is a relatively new discipline that changes quickly, thus requiring educators to continually update their skills as well as their course curricula. Over the last decade, published papers in both the Computer Science (CS) and Information Systems (IS) disciplines have also evolved. While once, information systems papers stuck to management issues and computer science papers described novel approaches to the development of computer systems or architectures, both disciplines have broadened their scope to include papers on systems design, security, networking and social issues like cultural and human behavioural issues. Arguably, what has not evolved is a clear understanding of the signature pedagogy that exists in these two disciplines and more importantly the impact these signature pedagogies are having on the gender balance within the disciplines. This paper attempts to introduce such a study. It first discusses Computer Science and Information Systems pedagogical norms. It then goes on to look at signature pedagogies in general. This is followed by preliminary findings of a study conducted to ascertain the gender balance of publications from a top IS journal. A discussion follows with recommendation for future research.

A. Computer Science and Information Systems Pedagogical Norms

The field of Computer Science and Information Systems, and specifically research within the area, is quite new. As mentioned above, they are ever evolving, with each covering ever increasing areas of interest. By research, we take Boyer’s understanding of research, that is, the scholarship of

discovery is what is typically meant when academics speak of ‘research’ [1]. Pedagogical literature has primarily focused on undergraduates of the field.

Wench [21] asked students what a lecture hall said about learning, and in response, they listed the following:

- To learn is to acquire information
- Information is scare and hard to find
- Trust authority for good information
- Authorized information is beyond discussion
- Obey the authority
- Follow along

What these responses reflect is the tendency of students to imbibe unquestioningly the standards and norms put forward by the lecturer. As such, it is correct to question how and where such norms are derived. As pointed out by [19]

These are obviously at odds with what most educators regard as key components in learning, such as dialogue, reflection, critical analysis, etc.

The responses also identify how quickly the field of computer science is evolving, as the answers even a few years later seem outdated. Information is no longer scare and hard to find, albeit that the Internet comes with it’s own difficulties regarding verifiability and quality of information.

Traditional pedagogy identifies three stages of learning: the development of basic skills, the acquisition of content relevant to addressing relevant problems and lastly, the ability to integrate the knowledge and apply it to practical work [2]. Roughly applied, the three stages conform to primary, secondary and tertiary education levels, with research traditionally occupying the space past undergraduate degree. This leads to a significant aperture in the field, with each subfield dictating it’s own norms.

B. Gender Imbalance

Throughout the field of computer science and information systems, there is an established gender imbalance. One study [10] concludes that merely encouraging women into the field in undergraduate level is not sufficiently redressing the balance. Added to this, it finds that the lack of female role models is having a discouraging effect for young women considering a profession in the field. A positive correlation between the

number women lecturers a female student is exposed to and their success in the computing field, which does not exist in other fields [14].

Worryingly, while women have made significant advances in their involvement in other scientific fields, including engineering, physics, and chemistry, over the last twenty years, womens representation in CS degrees in those years dropped by nearly a third [18]. One analysis of data from 21 countries, researchers noted a “striking cross-national uniformity in the sextyping of computer science programs.” [4].

Wenneraas and Wold [20] performed the first-ever analysis of peer-review scores for postdoctoral fellowship applications, and conclude that the policy of secrecy in evaluation must be abandoned. They assert

the peer review system does not judge scientific merit independent of gender and that, as a result, women do not publish as frequently or in top academic journals as male academics.

This work provides interesting insight into the field of medical and biomedical research, providing breakdowns of the actual impact that gender has as a barrier to success of women in this field. Their access to genuine peer-reviewer evaluation sheets concerning a large cohort of applicants was unprecedented, and has no comparable work in the area of information sciences.

Women with high math competence, traditionally associated with success within the computing field, are disproportionately more likely to have high verbal competence [3], which the authors propose offers women a wider choice of professional opportunities. This insight leads to a strong case for stating women should be actively participating in leading the description of pedagogy in this field. However, initial findings show that women are not well enough represented in the publications of the field to have sufficient impact. Indeed, although there exists a wide body of papers and articles dealing with pedagogical issues in gender and technology, most merely provide descriptions programs without evaluating outcomes.

C. Signature Pedagogies

Shulman [17] presents the concept of a *signature pedagogy*. This refers to the fundamental learning that students of a discipline receive, and which in turn has an impact on the discipline’s professional standards. These standards are developed by the majority of professionals within a discipline. He provides examples such as the medical instruction practice of ‘doing rounds’, which is core to the professional development of doctors. Signature pedagogies focus on what is required to apply the education received to the profession. Students are guided towards the expected practices of a professional in their field by signature pedagogies, which instruct them on how to mirror the behaviours of their established members of their profession.

As [8] outlines, researchers in a given field work within established traditions, into which a doctoral student immerse themselves as part of the literature review. Ultimately, formulating a signature pedagogy for ones discipline not only

guides personal pedagogical decisions but also provides a clear agenda for future SoTL. However, as Shulman’s call for descriptions only occurred in 2005 [17], much work still is required in this field.

Learning to think like a member of a chosen field is a well established aspect of education [12]. Research in the area has tended to focus on undergraduate level [5], [16], [7], [11], [9]. Roberts [13] highlights the importance of identifying and achieving a critical mass of women to remain in the field.

We are aware of no research on the impact of gender on the signature pedagogy of computer science and information systems. Indeed, the description of the signature pedagogy for computer science is recent and we are unaware of any formalisation of one for Information Systems.

II. FINDINGS

Our study examines the extent of signature discrimination in a top IS journals by looking at the percentage of female authors compared with the percentage of male authors over a three year period (2009-2011). The results are shown in the tables I and II.

In IS, by simply looking at the authors of the top academic journal, it is clear that the gender imbalance is well identified. However, to our knowledge, no work has been done to examine the impact that signature pedagogy within this largely male dominated field, as detailed in our review of the gender and the field above, has on the accepted standards for scientific writing in the IS field.

Across all four years, the ratio of female authors to male authors has averaged at approximately 4:1. In many cases where there are female authors there are also male authors. Having both male and female authors on the same paper would likely have an impact on the research methodologies used during the research projects and how the paper was written. If the signature pedagogy of a discipline truly is a contributing factor for such a low female author rate, then collaborating with male authors may provide a valid means of entry for females to publish in top journals as the current signature pedagogy seems to favour male authors.

Remarkably, only two papers each year were published by one or more female authors without any male co-authors, in comparison to a much higher number of only male author papers each year. One interesting finding [4], which we do not address here but is of definite relevance, is that women with high math competence, traditionally associated with success in the computing field, are disproportionately more likely to have high verbal competence, allowing greater choice of professions.

However, upon closer examination, the results show that of the females that actually manage to publish, a large percentage of them are primary authors. Again, this indicates that of the females actively publishing, a strong percentage of them are leading research projects. These results, from the perspective of signature pedagogies, can be interpreted in various ways, two of which are 1) these female authors have adapted themselves to the dominant signature pedagogy of the discipline

TABLE I
IS JOURNAL 4 YEAR PERIOD RESULTS

Authors	2011	2010	2009	2008
Male Authors	120	95	98	83
Female Authors	24	25	18	20
Papers with only male authors	39	31	27	39
Papers with only female authors	2	2	2	2
Male primary authors	46	36	35	34
Female primary authors	8	14	5	6

TABLE II
IS JOURNAL 4 YEAR PERIOD RESULTS AS PERCENTAGES

Authors	2011	2010	2009	2008
Male Authors	83%	79%	82%	81%
Female Authors	17%	21%	18%	19%
Papers with only male authors	27%	26%	28%	38%
Papers with only female authors	1.6%	2.1%	2.0%	2.0%
Male primary authors	94%	88%	95%	94%
Female primary authors	6%	12%	5%	5%

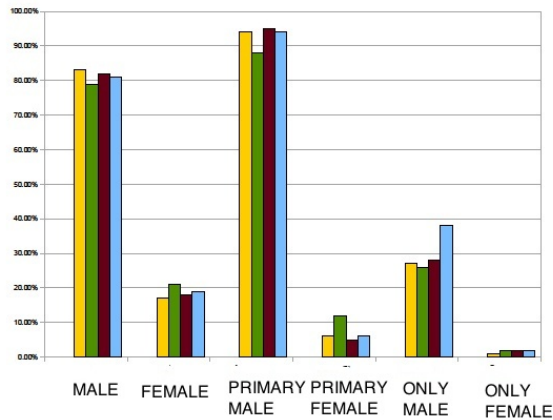


Fig. 1. Authors years 2011 - 2008 descending

in order to succeed or 2) their research was well directed and valid to the area.

III. FUTURE WORKS & CONCLUSIONS

The exploratory findings here do not necessarily mean that woman are being shunned in the review process, as they may be less likely to apply for these positions. However, work is required to further clarify what is actually causing this.

We propose adding the following question to [15] list of 'What we need to know': **What is the relationship, if any, between the evolving signature pedagogy for computer science and information systems, and females academic achievement and persistence in technology?**

As Clear points out [6],

We need to work together as colleagues to reduce

isolation, share expertise, teaching materials, re-search techniques, and even data where appropriate.

Gender isolation is but one aspect of the issues facing researchers. However, the findings outlined above suggest that it is one that should be given priority in order not to further isolate an already minority community.

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