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Approaches to Exploring the Information Worlds of Women Engineering Students

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Abstract. This paper explores the application of two theoretical approaches within Library and Information Science (LIS) literature, and critically reviews them for inclusion within a proposed PhD study. The two approaches are Women's Ways of Knowing, a model of women's epistemological development; and intersectional feminism, an inclusive and holistic approach to feminist research. The paper outlines both concepts, presents a critical literature review of their application in LIS research, and identifies their potential future use both within the proposed PhD study, and within LIS research more broadly.

Keywords: Information behaviour, Women's Ways of Knowing, undergraduate engineering, feminist research.

1 Introduction

This paper explores topics arising from planned doctoral research into the information worlds [1] of female undergraduate engineering students. The research will use a phenomenological approach [2] to explore how female engineering students use information as part of their learning process, and how the gender balance of the engineering classroom affects the information behaviour of minoritized genders. The information worlds approach will be used to frame how women engineering students occupy multiple small worlds (as women, as learners, and as novice engineers), which may have conflicting social norms and information values.

This paper will present a critical review of the literature. It will focus on two theoretical approaches currently being explored: intersectional feminism [3,4], and Women's Ways of Knowing (WWK) [5]. These concepts will be outlined, their application within Library and Information Science (LIS) literature reviewed, and gaps for further research identified.

Although the information behaviour of engineers has been extensively studied [6,7], with some papers focusing on students in particular [8], the female perspective is under-researched. There is a lack of research on the impact of marginalised identities on information behaviour, including variables such as gender, race, and class [9]. Intersectional feminism and WWK both present opportunities to explore women's experiences in heavily masculinised environments such as the engineering classroom,

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and the impact this may have on their information behaviour. This paper will suggest ways in which these theoretical frameworks could inform further research, both in the planned PhD research and within the wider LIS research field.

2 Women's Ways of Knowing

This section will outline the concept of Women's Ways of Knowing (WWK) [5], and then critique its use in LIS literature, particularly in the higher education (HE) context.

Educational psychologists Mary Belenky, Blythe McVicker Clinchy, Nancy Goldberger and Jill Tarule¹ set out in the 1980s to investigate their observations that women students often doubted their intellectual capacity, felt "alienated" by formal education, and that "learning" for women was often something that occurred outside of formal education [5]. Building on earlier research by William Perry [11], which had presented a model for epistemological development among primarily male undergraduates, the WWK authors aimed to extend Perry's scheme to incorporate women's experiences.

The study identified five "Ways of Knowing" which are common among women:

1. Silence: voiceless and passive.
2. Received knowledge: capable of receiving knowledge from authoritative sources, but not of producing knowledge.
3. Subjective knowledge: truth is experienced privately, intuitively.
4. Procedural knowledge: using reasoned reflection to construct meaning.
5. Constructed knowledge: all knowledge is contextual, anyone can create knowledge, subjective and objective strategies are both valued. [5, p.15].

In the "procedural" and "constructed" positions, women may also show a preference for either "separate knowing", where the focus is on knowledge as separate from the self; or "connected knowing", where the focus is on understanding and empathy.

The positions are not intended to be linear or sequential. Women may experience them at different points in their lives, move back and forth between positions, and may not experience all of them [5]. Neither are the positions intended to apply to women universally or exclusively, although they may be more common among women [12].

3.1 Women's Way of Knowing in LIS Literature

Julien [9] argues that WWK has unused potential in LIS, having only been able to identify two examples of the model being applied in information behaviour research (including her own doctoral thesis).

Since then, WWK has occasionally appeared as a concept within LIS research, although most citations of WWK within LIS literature merely mention it briefly but do not engage with the model. The four papers outlined below are the few examples identified which discuss and apply WWK in the context of LIS-related research.

¹ The authors' full names are listed here in respect of their wishes that they receive equal credit, reflecting the collaborative nature of the work, rather than being grouped as "Belenky et al." [10].

In critiquing hierarchical knowledge organisation standards such as Dewey and Library of Congress Subject Headings, Olson [13] uses the concept of connected knowing to propose “a web instead of a hierarchy” (p. 522), as a way of presenting concepts that are connected rather than structured. She discusses in depth how “Connected knowing privileges experience and relies on connections to others to discover what they know” (p. 523), and how this concept could be used to create a feminist knowledge organisation scheme.

In an exploratory paper, Lloyd [14] explicitly links WWK to information literacy, arguing that “information literacy should be viewed as a *way of knowing* about the information environment” [14, p.89]. In presenting information literacy as a way of knowing, Lloyd draws on the WWK concepts of “received knowing” and “constructed knowing” to describe development from novice to expert.

Westbrook and Fourie [15] propose a three-part “investigation framework” for the information experiences of women with gynaecological cancer, using three “lenses” to examine these experiences: environmental, embodied self, and lifestyle. They use the WWK model to centre their own framework on women's experiences. They include a discussion of “information engagement from the WWK perspective”, relating the ways in which gynaecological cancer patients find, share, discover and use information to the ways of knowing identified in WWK.

The most extensive treatment of the WWK model in the LIS literature comes from Fields [16], who examines the Information Literacy Competency Standards for Higher Education [17], comparing them with the WWK epistemological stages. She notes that some foundational IL competencies are likely to be problematic for women in the earlier stages of the WWK model. For example, the performance indicator “Recognizes that existing information can be combined with original thought, experimentation, and/or analysis to produce new information” could be challenging for received knowers, who perceive information as set in stone; or subjective knowers, who may reject information that contradicts their personal experience. Fields uses this comparison to recommend strategies for a woman-centred model of information literacy teaching.

Although each of these papers makes good use of WWK as a lens through which to understand information literacy and behaviour, use of the model within LIS literature in general is underdeveloped. Further potential for the use of WWK in LIS will be discussed in the conclusion to this paper.

3 Intersectional Feminism

Intersectionality, a term credited to Kimberlé Crenshaw [18], is a concept emerging from Black feminism. Crenshaw critiqued the ways in which Black women are multiply disadvantaged: as women, as Black people, and as Black women. The intersections of these identities produce an experience that is distinct from that of Black men, who experience racism but not sexism; and white women, who experience sexism but not racism. Use of the term has developed from this initial conceptualisation to incorporate many different aspects of marginalisation, such as class, disability, and sexuality [3].

Intersectional feminism refers to an approach that moves away from viewing women as a monolithic category of people who experience discrimination and oppression in the same way, and towards an understanding of how “socially constructed markers” such as race, class, and ethnicity interact [19, p.833].

Within adult education, intersectionality has been used to understand not just if and how women’s learning needs might differ from men’s, but how the different life experiences of women and men impact their learning [20]. This is particularly pertinent within male-dominated educational fields, such as science, technology, engineering, and mathematics (STEM). Women who seek training and careers in occupations traditionally defined as masculine are seen as deviating from gender norms, which can lead to backlash from their male peers [21]. They are perceived as both hyper-visible [22] and invisible [23], an experience which is compounded for women who are marginalised in other ways such as by race or disability.

3.1 Intersectionality in LIS research

Floegel and Costello have argued that intersectionality could assist in developing research that pays attention to the power dynamics in information encounters [24]. They draw from assemblage theory [25], a concept from technofeminism that considers categories such as gender and race as “events, actions, and encounters between bodies, rather than simply entities and attributes of subjects” [26, p.58].

There is some LIS literature on gender difference in information literacy or information behaviour. However very little considers gender explicitly [27]. Of the research that does discuss gender in-depth, most aims to compare women’s and men’s behaviours. Few papers either consider women’s experiences in their own right, or discuss the intersectional identities of the participants in their studies and how these might contribute to their information experiences.

A literature search of LIS papers published since 2000, for initial exploration of the concept to inform the PhD research, has uncovered a small number of papers relevant to the theme of intersectionality. Some explore the potential sociocultural reasons for gendered differences in information behaviour in HE, while others discuss marginalised women specifically.

Some studies have identified the impact of sex segregation on information behaviour. In Kuwait, sex segregation was perceived to have had a negative effect on learning, as male and female postgraduate students were no longer able to visit the library together or study in mixed groups [28]. In Oman, sex segregation was posited as an explanation for women final-year undergraduates’ higher self-ranking of their IL skills: women students are housed on campus, so have better access to the library, while male students live in off-campus accommodation. [29].

A recent PhD thesis [30] examined the academic library experiences of Muslim Arabic-speaking women international students in the USA, finding that many had experienced barriers such as a cultural taboo over asking for help. Although some overcame these barriers and learned to use the library effectively, others who had experienced racist or Islamophobic interactions in or around the university were further hampered from making full use of academic libraries.

In a phenomenological study of first-generation students in the USA, Amanda Folk notes that those marginalised beyond their first generation status (for example, by race or sexual identity) were often motivated to use self-selected research assignment topics as a way to “develop or assert an authoritative voice”, and were more likely than their less intrinsically-motivated peers to demonstrate “the modes of critical, analytical and reflective thinking included in the ACRL framework” [31, p.50]. Although Folk’s study did not explicitly address gender as a variable, she notes that social capital is an enabling factor for students’ development of information literacy [32]. Social capital has been identified as a potentially important factor in information behaviour, for example in influencing the choice of human information sources and the avenues available to an individual to seek information from others [33]. Marginalised people are likely to have lower social capital, therefore could face barriers to their information seeking and use.

This literature review demonstrates that little LIS literature considers women’s identities in a holistic way. Most studies either aim to uncover gendered differences [e.g., 34,35], or report on gender differences uncovered as part of their overall analysis [e.g., 36,37]. The studies outlined above are the few examples identified of LIS research that considers the sociocultural context of women’s information behaviour (such as the impact of sex segregation in Kuwait and Oman), or how the life experiences of marginalised learners may impact on their information literacy.

4 Conclusion

Both WWK and intersectional feminism are underused in LIS research. As much LIS research on gendered information behaviour within HE has sought only to compare women with men, rather than consider women’s needs in isolation, there is a lack of understanding of the different ways in which women’s experiences may inform the ways they seek, acquire, and use information. This is where WWK could be useful.

One fruitful avenue could be in considering the role of uncertainty and self-doubt. For example, early development in the procedural knowing stage of WWK is associated with diminished confidence. This echoes findings from LIS research such as Kuhlthau’s Information Search Process [38], which identified that uncertainty increases and confidence decreases after the start of a search. If women find doubt and uncertainty in education processes “at best redundant and at worst destructive, confirming the women’s own sense of themselves as inadequate knowers” [5, p. 228], then librarians should take this into account when supporting women learners.

WWK also has potential in the understanding of authority and expertise. Tarule [39] notes that without prompting to talk about experts/expertise, most interviewees in the original WWK research spoke about learning new things by asking others or discussing with friends. This could be informative when investigating information seeking and collaborative information behaviour.

Intersectional feminism has also been neglected. Most LIS research that does focus on women tends to consider women as a homogenous group. This may be accounted for by the usually small sample sizes in LIS studies, and frequent quantitative approach:

it is not usually possible to analyse data according to multiple axes of marginalisation without a large dataset. However, it should be possible to use qualitative methods to explore how women's lived experiences inform their information behaviour.

WWK itself has also been criticised for its lack of intersectionality, particularly with regards to race [40-42]. Using both WWK and intersectional feminism in combination would allow for a more detailed, holistic view of the ways in which the life experiences of women impact their information behaviour and information literacy.

The proposed PhD study into the information worlds of women engineering undergraduates will use WWK as a sensitising lens to examine the information behaviour of participants in the study. It will take an intersectional feminist approach to exploring the experiences of women, including an expansive view of "womanhood" (for example, incorporating the perspectives of trans women or nonbinary individuals), to gain an holistic picture of the information worlds of the study participants.

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