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Promoting Equity by Gender into the Classroom: Lessons learned from the development and implementation of a Web-based course

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ABSTRACT

The Institute of Technology at Linköping University has taken several steps forward to promote equity by gender and developed a web-based course to support Course Assistants in their professional role. This case study describes Course Assistants' expressed experiences of the effectiveness of the web-based course. The results show that the course is considered effective mainly due to: (i) the correspondence between its goals and the knowledge mediated, and (ii) its contribution to understanding issues that diminish gender bias within the interaction that takes place between Course Assistants and students in STEM areas. Some students expressed, however, that they were well aware of gender gap problems, because of the society in which they live today and because of the work adopted to promote gender-sensitive teaching at the Institute of Technology. The findings can have a significant impact in identifying innovate strategies when developing courses that aim to implement a gender perspective in the STEM field.

KEYWORDS

Equity by gender, web-based gender course, Course Assistants, STEM areas.

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INTRODUCTION

While the status and representation of women in academia in Sweden have improved since the 1960s, female faculty remains underrepresented in STEM areas (science, technology, math, and engineering). The Institute of Technology at Linköping University has, since 2009, been engaged in developing an agenda for the promotion of gender sensitive teaching (Vimarlund, 2007). The main goals have been the development of long-term gender sensitivity approaches that can be used in undergraduate educational programs to stimulate equity by gender as well as to diminish eventual bias within the interaction that takes place between Course Assistants and students in classroom contexts.

Gender and equality projects in the higher education sector and especially in STEM areas, have mainly focused on (i) how to diminish the gender gap, with focus on the inequality that females experience in education, (ii) how to change the persistence of gender inequality (Bergvall, Sorby & Worthen, 1994 ; Butler, 1985), (iii) how to capture the effects of teacher-student interaction (or the absence of it) on student achievements (Di Pietro, Ferdig, Black & Preston, 2008; Rice, 2006; Smith, Clark, & Blomeyer, 2005; Robinson & Lubienski, 2011), (iv) how to manage gender disadvantages[1] (Robinson, Lubienski & Copur, 2011; Riordan, 1999; Sommers, 2000) or, (v) how to maintain high rates of equity in education opportunities (Pekkarinen, 2012).

Studies that focus on the effectiveness of the implementation and the use of web-based courses and online learning in STEM areas, have mainly focused on how to develop the right set of tools that stimulate learning for both male and female students. Online learning has been reported to show clear potential to be a disruptive innovation (Christensen, Horn & Johnson, 2011) that improves and transforms the current system of education (Staker, 2010), allowing male and female students equal access to high quality education. Existing research on gender issues and online learning paints a mixed picture of whether women fare better or worse in an online environment (Kramarae, 2007), and often discusses the relative impact of online learning in male and female students' perceived learning outputs. To our best knowledge, studies that report the effectiveness of web-based courses that provide knowledge about the importance of avoiding gender bias and stereotyping in classroom activities in STEM areas, are not common.

AIM

In this case study we describe the findings from an evaluation of the effectiveness of a web-based course on gender equity developed to support Course Assistants in their professional role in STEM undergraduate educational programmes at the Institute of Technology in Linköping, Sweden.

Course Assistants are senior students who work under a teacher's supervision to give students additional attention and instruction in the courses included in the educational programs. They are students[2] that attend regular classes and that are employed as assistants during one term. Course Assistants' roles can vary widely across the STEM disciplines and courses and can include: meeting with students to help them to learn more and better; guidance and supervision during laboratory exercises; leading labs and conducting discussion and study groups; assignment grading; and/or administrative responsibilities.

The context of the case study

The Institute of Technology is a fully integrated part of Linköping University, with a body of more than 9 000 students, a faculty of more than 1 000 employees and a budget exceeding 1 billion Swedish kronor. It is one of Sweden's largest higher education engineering institutions.

The Institute of Technology awards BSc, MSc and PhD degrees in engineering, computer science, mathematics and natural sciences. The main focus is on advanced engineering programmes leading to a master's degree. Other study options integrate engineering, industrial management, natural science and/or computer science with the disciplines of sister faculties, such as medicine, the humanities, business law, and languages.

The main areas that contribute to all educational levels are:

- Computer Science, Information Technology, Media Technology, and Visualisation
- Electrical Engineering, Applied Physics, and Computational Sciences
- Mechanical Engineering and Design
- Industrial Engineering and Management
- Biology, Chemistry, Biotechnology, and Biomedical Engineering

The structure of the course

A web-based course was developed with the aim of providing knowledge about the importance of avoiding gender bias and stereotyping in classroom activities, and the importance of avoiding behaviour that perpetuates gender bias that can create negative effects on students. The course comprises 10 modules. Each module contains a number of chapters, which can be reached from a link at each chapter heading[3]. The modules contain:

(I) An introductory block that presents an overview of the course, as well as a declaration of the importance of considering gender issues at the Institute of Technology, written and signed by the Dean.
(II) A description of the various roles and tasks of Course Assistants including links to official documents in which norms of conduct, ethical principles and the responsibility and approach required of Course Assistants, are described.
(III) Examples of gender bias that have to be avoided, examples of behaviour to be counteracted, and information about contact persons and managers that have to be involved in case problems arise.

(IV) A series of examples in which gender issues influence the interaction between Course Assistants and students. The examples have been captured from real-life situations and described in collaboration with students from different STEM-educational programmes.
(V) A list of advice from Course Assistants to Course Assistants related to how to avoid gender bias and how to improve the interaction between them and students.
(V) A database with a series of reflections written by Course Assistants after completing the course. The reflections contain examples and comments about how they have applied the knowledge delivered in the course during the time they have worked as Course Assistants.

The course includes two discussion seminars and an introductory lecture. In the seminars the Course Assistants are asked to discuss the material of the course and discuss how and if they can apply the knowledge delivered in the course in their everyday work activities. They are also asked to bring questions about issues that can interfere with the interaction between them and students, and to actively discuss them in groups of a maximum of 5 individuals during the first seminar. At the end of the course, Course Assistants are asked to write a two-page reflection task and discuss (i) the importance of gender issues in classrooms, (ii) describe how they used and applied the knowledge delivered in the course, and (iii) reflect on how to transfer their experiences and knowledge to future Course Assistants. The outcomes from the reflections are discussed during the last seminar. Both seminars and the reflection task are compulsory to pass the course. After completing the course, Course Assistants are expected to have acquired knowledge and understanding of the influence exerted by gender issues in their professional role. Course Assistants, after passing the course, receive a diploma signed by the Dean which describes the aim of the course, the name of the Course Assistant and the date they passed the course.

CAPTURING THE IMPACT OF THE WEB-BASED COURSE

The evaluation of the effectiveness of the course was performed during August-November 2016. Data was collected from 88 reflections, written by Course Assistants who had completed the course, that were available in the course database at that time. The data was then analyzed using inductive content analysis methodology (Elo & Kyngäs, 2008).

All reflections were read by two individuals, the person responsible for the course, and a Masters student employed to analyze the data and to perform the validation of the results. After reading all the documents, a total of 64 reflections were included in the data. Reflections that did not contain comments or criticisms about the course, its blocks or the material included, or that did not express any comment, positive or negative, about the effectiveness of the knowledge delivered in the course for their professional role were not included in this study.

After reading the reflections and categorizing data, a total of 3 main areas and 17 indicators were identified. Areas and respective indicators were sorted by the percentage of reflections that mentioned them.

The outcomes obtained during this first step, were then validated with 8 Course Assistants, 4 males and 4 females belonging to two different institutions and two different STEM programs (mathematics and computer science). The students were randomly selected from the list of Course Assistants who passed the course during 2015 and 2016. The Masters student employed to validate the results of the evaluation of the course, contacted the 8 Course Assistants via e-mail and invited them to participate in the validation process. All agreed to participate in a one-hour individual meeting and to discuss and comment on the results obtained from the analysis of the data. During the meeting, they were asked what they thought about the outcomes from the evaluation of the course. The use of open-ended questions to discuss the outcomes of the evaluation, allowed the Course Assistants to comment on the outcomes as they experienced them. Additionally, it gave the participants the opportunity to add any new ideas or criticisms they considered of relevance for the future improvement of the course. All data remained anonymous. Only verbal descriptions that the respondents authorized to publish were considered. In August 2017, and with the aim of avoiding bias or misconceptions, the results of the evaluation were compared with the opinions about the effectiveness of the course expressed by 19 Course Assistants (17 males and 2 females) belonging to the areas of computer science, mathematics and engineering, that had passed the course. No new issues were identified.

Outcomes

The outcomes obtained from the analysis of the data have shown that the effectiveness of the course was associated with three main areas: (i) the effectiveness of the information and knowledge mediated, (ii) issues to consider when interacting with students in the classroom and (iii) innovativeness of the knowledge and information provided. A total of eight indicators were associated with the first area, eight with the second area, and two with the third area (see Table 1).

One of the major contributions of the course expressed by Course Assistants, has been to have the opportunity to discuss, reflect and analyze the importance of gender issues in classroom contexts for their professional role. Some of the reflections mentioned the effectiveness of the examples described to identify "not seen signs of problems", to become gender sensitive, and to improve their own behavior when interacting with students in the classroom. The examples presented in the course were therefore considered as valuable contributions in finding strategies to limit their roles and to behave professionally in interaction with "their" students.

Many Course Assistants expressed the importance of using tactics to include all individuals, something they felt helped them remain trustable and professional. They also mentioned that the course stimulated them to be more self-reflective about the aspects of teaching they found easier, and how they try to find examples that could be considered as gender-neutral to explain difficult issues.

Table 1: Areas and respective indicators sorted by the percentage of reflections that mentioned them.

Areas and indicators	*Percentage of reflections (%) that mention the indicator.*
I. The correspondence between the information and knowledge mediated with the goals of the course	
Examples in which gender issues influence the interaction between teachers and students	100
Examples of effects that diminish gender-bias in classroom contexts	90
Examples of tactics that can be used to include all individuals, independent of gender, ethnic or social background	85
Knowledge about the importance of active gender awareness	67
Description of the role of the Course Assistant	62
Knowledge that stimulates reflections on their own behavior as a Course Assistant	56
Examples that support the identification of "Not seen signs of problems"	53
Series of advice from other Course Assistants about how to avoid conflicts and misunderstandings	36
II. Usefulness of the examples provided to improve interaction with students in the class-room	
Examples of behavior to avoid in class-rooms	47
Relevance of gender sensitiveness for both Course Assistants and students	46
The importance of inclusion in classroom activities	45
Examples that illustrate the importance of being equally treated	40
Examples of how to share the "discussion space" between students	39
The importance of gender distribution in working groups	37
How to handle the relationship between Course Assistant and students in cases where they are friends with each other	29
III. Innovativeness of the knowledge and information provided	
The course does not add new knowledge about gender sensitivity or equal opportunities. Students have a good knowledge about the gender gap problem	26
The examples are too general and are of "common sense" nature in a Swedish context	24

Further, the seminars the course offered were appreciated because of the possibility of discussing issues such as gender differences in communication styles in the classroom, how to distribute the time the students are given for answering/asking specific number of questions, and how Course Assistants must self-critically examine their own behavior in responding to gender sensitively. They mentioned having observed a difference between female and male students in the manner of their use of the "discussion space". Female students asked more questions after the labs and male students asked more questions in general.

During the validation process, Course Assistants said that they found it difficult to know how to limit or open the discussion space to all students. They also commented that the differences between who asked questions and who took up the classroom space is sometimes gender–related. In many cases, they believed however, it seems to depend on individuals' personality and/or preferences more than on gender issues.

One interesting result is the fact that some Course Assistants indicated that the knowledge and information provided in the web-based course did not add new knowledge to the discussion of the importance of considering gender issues in classrooms. In 26 % of the reflections it was mentioned that Course Assistants are well aware of social and gender equality issues and the importance those issues have for the society in which they live today. Two main factors of key relevance were mentioned: a) the fact that Sweden has been celebrated for being at the forefront of generating gender equality (Wittung-Stafshede, 2016); and b) the work adopted to promote gender-sensitive teaching at the Institute of Technology. This has contributed to recognizing the integration of gender issues as a key issue to improve quality aspects in all basic education activities. Some Course Assistants wrote that they have been taught since they started their educational programs about the importance of treating people as equals and about the significance of the gender gap in society. They also mentioned the importance of understanding that gender equity is not about "fixing the women" or "training the men". Rather, it is about changing the culture and the manner of interacting with students, so gender equity becomes an important factor that contributes to the inclusion of everyone in teaching activities.

Further, many Course Assistants agreed that gender is something that cannot be pasted on afterwards, rather it must be integrated throughout the duration of the studies at any technical school. This is because of the importance of gender for students, as well as Course Assistants, in their professional roles in the future.

COMMENTS

In general, the course was considered to fulfill its aims and be effective because it led to further understanding on how gender issues can influence interactions and learning. Most of the reflections analyzed indicated that Course Assistants had turned from passive into active agents who reflect on their role, evaluate their own behavior as teachers, and search for tools that diminish gender gaps.

It is interesting to note that many Course Assistants referred to the correlation between the examples provided in the course and their own experiences. Some of the respondents said they did "not let themselves get dragged into discussions about football, cars, or other 'guy'-stuff" any longer when they interacted with students in the classroom. They also recommended future Course Assistants avoid situations in which they, or the examples they use, confirm stereotypes, and to avoid situations in which examples can be considered stereotyped in negative ways.

Gender issues in academia are usually dealt with very differently in different subjects. It often depends on individual teachers' knowledge and motivation. The web-based course implemented to promote gender-sensitive teaching at the Institute of Technology can be considered as an important input to improve quality aspects in all basic education activities. With a focus on students, the course can be considered to be vital to understanding the importance of gender perspectives in classroom contexts. The efforts realized at the Institute of Technology have shown that to succeed in integration of gender issues in academia, it is necessary to stimulate changes at all levels, especially in the interaction between Course Assistant and students.

From the results, we also learnt that the web-based gender course has the potential to be a vehicle to improve the current routines and systems used by Course Assistants in classrooms, but also to help them become more aware of gender related issues in STEM areas providing them with ideas about how to address these issues in their own classrooms. The findings can have a significant impact on methods for improving interactions between teachers, Course Assistants and students in general and to increase the chance that all students, independent of their social background or gender, use their intellectual abilities and become motivated enough to achieve credits and graduate.

Good teaching that creates a welcome climate, and that avoids gender-related differences, should attract students from all socio-economic backgrounds and increase the number of students that join our educational programmes. The promotion of gender sensitivity cannot focus exclusively on obvious abuses, such as sexual harassment and pay gaps, any longer. It must also extend to everyday activities of the University - in the educational material produced, in the laboratories, at seminars, in the teaching, and especially in the interaction between students and teachers.

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END NOTES
[1] Some researchers argue that males today, have more disadvantages than females, that they tend to get lower grades and that they are not as likely to finish high school and attend college as girls.

[2] The majority of the Course Assistants and mentors at the Institute of Technology are male (approximate 80 % males and 20 % females) and belong to computer science, mathematics or engineering.
[3] For more information on the web-based course see: https://www.lith.liu.se/genus?l=en&sc=true

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