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Attracting a new clientele for computer science with a women-only IT degree course

Juliane Siegeris¹

Abstract: A degree course in IT and business administration solely for women (FIW) has been offered since 2009 at the HTW Berlin – University of Applied Sciences. This contribution discusses student motivations for enrolling in such a women only degree course and gives details of our experience over recent years. In particular, the approach to attracting new female students is described and the composition of the intake is discussed. It is shown that the women-only setting together with other factors can attract a new clientele for computer science.

Keywords: Women and IT; STEM; Course marketing; Courses for female students; Curricula Development

1 Motivation and objective

Currently only about 15 % of employees in the IT sector in Germany are women [St19]. The situation is similar regarding the numbers of female IT students. Despite an upward trend, the mean proportion of women in the 1,700 IT-related degree courses was only 21,8 %² (cf. [Je20, p. 15]). This is despite the high demand for IT graduates. According to a representative survey in 2020 of companies in all sectors, seven out of ten reported a shortage of IT specialists [Bi20]. In order to address this shortage, the IT sector's Bitkom association has also called for improved further training and for increased numbers of women in IT.

In Germany, there have been various attempts to increase the numbers of female undergraduates in STEM³ courses i.e. science, technology, engineering and mathematics, so that as a consequence more women will be employed in the

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2 Numbers refer to winter term 2017/18.

3 The German translation is MINT.

relevant occupations. Outstanding examples are the national network initiative ‘Komm, mach MINT’⁴ and the project ‘FRUIT: Frauen in IT’⁵ funded by the Federal Ministry of Education, which aims to increase the numbers of women studying IT by offering flexible, practically oriented and interdisciplinary courses.

Offering degree courses solely for women could be one possible way of increasing the numbers of women in the IT sector. In Germany’s higher education sector, there are currently three such courses in the STEM disciplines offered at Universities of Applied Sciences [De21].

In 2020, the Centre for Higher Education Research (CHE) updated its recommendations to increase the numbers of women taking IT degree courses [Fr19]. One of their recommendations was ‘No women-only classes’, cf. [Fr19, p. 10]. The authors claimed these were viewed sceptically by many, and only attracted few women. There was a risk that women would perceive themselves as a minority that needed special promotion⁶.

In this paper, we argue that there is indeed a justification for offering women-only degree courses. Since 2015, women starting the IT and business administration (FIW) course at the HTW Berlin – University of Applied Sciences have been presented with a questionnaire. A preliminary evaluation of the responses shows that a women-only IT course, if suitably presented, can attract female students who would otherwise not have studied computer science. Still, not all enrolments go back to the women-only setting. Therefore some of the design ideas or the addressing approach may also be useful in adapting existing STEM courses to increase attractiveness for a more diverse clientele.

The paper is organised as follows: In the next section, the design and the priorities of the degree programme are presented. An extra section is used to describe how the target group is addressed and how many students apply and enrol. We then present the results of the annual questionnaire and reason about the factors that led to enrolment. Finally we provide some remarks on dropouts and graduates and conclude with a summary and outlook.

4 <https://www.komm-mach-mint.de/> last access: 01.10.2022

5 <https://www.che.de/projekt/bmbf-forschungsprojekt-fruit-frauen-in-it/> last access: 01.10.2022

6 The recommendations are based on the results of a survey of computer science students, i.e. persons that already decided for a classical Computer Science programme. Among the 627 female participants (24.1 %), the proportion of university students was 58.9 percent. At the time of the survey, the average age of the female students was 22.8 years.)

2 Design and priorities of the degree programme

The degree course ‘Computer Science and Business Administration’ (for women) was started in 2009 at the HTW Berlin – University of Applied Sciences. The aim was to create an alternative IT option which would attract women in terms of the curriculum and the approach and would open up a way into careers in the IT sector.

The undergraduate course for IT and Business Administration over six semesters corresponds to 180 ECTS credits. Each year, at the start of the winter term, a new intake of 40 female students begin their studies. The name of the degree course suggests that it consists in equal parts of IT and economics. However, if the students visit the course website⁷, they will see that the focus is on computer science and its practical application, which accounts for almost 80 % of the teaching content.

The course has meanwhile been through three accreditation cycles. Initially, the course design placed a greater emphasis on economics and additionally included subjects such as contract negotiation and presentation techniques. As this orientation led to criticism of the degree programme as an ‘IT light’ option, the profile of the curriculum has since been shifted towards computer science.

Although the focus of the course is now more on IT, the combination with economics is still valuable. The economic subjects introduce the students to the language of a broad field of business applications, and ensure they are prepared, should they go on to start up their own business. The interdisciplinary aspect is also important, as studies in the past showed, that women enrol relatively more frequently for interdisciplinary STEM-courses ([Fr18, p. 23]).

Figure 1 gives an overview of the course of study.



Fig. 1: The six-semester undergraduate course ‘Computer Science and Business Administration’

The first two semesters provide a theoretical introduction (including programming I + II, software engineering, theoretical computer science, computer architecture and operating systems, computer networks). In the third semester, the students work on their first practical project (as well as taking classes on

⁷ <https://fiw.htw-berlin.de/studium/aufbau-des-studiums/> last access: 01.10.2022

subjects including databases, web technologies, data protection and data security). In the fourth semester the students work for 18 weeks on a full-time internship. In the fifth semester there is another practical project (accompanied by classes in distributed systems, modelling information systems, and two other chosen IT options). In the sixth semester, the students write their BA thesis.

A special focus of the degree course is on the practical orientation. On the one hand this can be again an advantage in attracting women for a STEM subject. In [Fr18, p. 28], it was shown that a greater emphasis on practical applications or a closer link between profession and academic studies can make IT courses more attractive in particular for women. On the other hand, a strong practical orientation can help the students to confront prejudices about the women only setting. The question: ‘Can such a degree programme prepare the students properly for the real work field?’ can be encountered in regard to the numerous practical formats, carried out in cooperation with industry partners. In total, the students have up to ten opportunities to gain insights into the professional world and gather practical experience. For more information on the practical orientation we refer to [SFK16].

3 Marketing and intake

In the early years, considerable efforts were made to attract interested students. Flyers and presentations were developed so that the teaching staff and the students of the course could visit schools and promote the course. At present the presentation of the course is restricted to the existing channels of HTW, such as the website⁸ and participation in internal event formats such as ‘(Digital) Insights’⁹, ‘Mädchen machen Technik’¹⁰ and ‘Girls’ Day’¹¹.

In the FIW marketing material the following three slogans are relevant for addressing interested students:

1. We start at zero. This slogan addresses the expectation of previous IT knowledge at the start of the course. Many students are concerned that they will not know as much as other students when the classes start. The objective of this slogan is to recruit women who are interested in the subject but perhaps

8 <https://fiw.htw-berlin.de/> last access: 01.10.2022

9 <https://events.htw-berlin.de/hochschule/digitale-einblicke/> last access: 01.10.2022

10 <https://events.htw-berlin.de/hochschule/maedchen-machen-technik/> last access: 01.10.2022

11 <https://www.berlin.de/sen/frauen/bildung/girls-day/> last access: 01.10.2022

do not dare to apply, because of their assumption that prior IT knowledge is a prerequisite. Enjoying mathematics and logical thinking are, however, a requirement.

2. Family-friendly timetable. Right at the start it was decided that students with children or dependants in need of care would have the guarantee that classes would only be held between 9.00 am and 4.00 pm. FIW is the only course at the HTW to offer this. However, requests of other students have shown that the need for a specific time frame is not limited to women-only courses and female students. Such provisions could also make other degree courses more attractive.

3. Questions welcome. In [ACM17] the authors investigated the behaviour of students in mixed gender computer science courses and found that female students were more likely to feel inhibitions about asking questions in class. With the slogan ‘Questions welcome’ we emphasises that FIW encourages its students to ask questions and use the given safe space to take an active part in learning new matters.

In general the marketing efforts together with individual recommendations lead to a sufficient number of enrolments. Table 1 shows the numbers of applicants and enrolments for the decade 2013–2022¹².

Tab. 1: Numbers of applicants and enrolments since 2014

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Applied	101	113	199	225	250	215	194	162	123	166
Enrolled	42	61	40	44	52	40	39	42	38	46

4 Examining the motivation for the women only degree programme

This section reviews the composition of study groups and the motives women have for choosing FIW.

After examining the history of FIW and conducting many discussions with the students, the following hypothesis was formulated:

¹² The increase in the number of applicants in 2015 can be explained by the introduction of a new online application system. Since then, it has been possible to use a standard web platform to apply for several courses at the same time.

Remark 1 *The women-only degree course FIW reaches female students who would otherwise not have studied computer science.*

A first indication of this is the number of women beginning other IT courses at HTW. It was feared that numbers of female IT students in other programmes would decrease, but this has not been the case. Figure 2 shows the numbers of female students starting to study three other IT degree courses at HTW – before and after the start of the FIW degree programme in 2009. They show an overall upward trend.

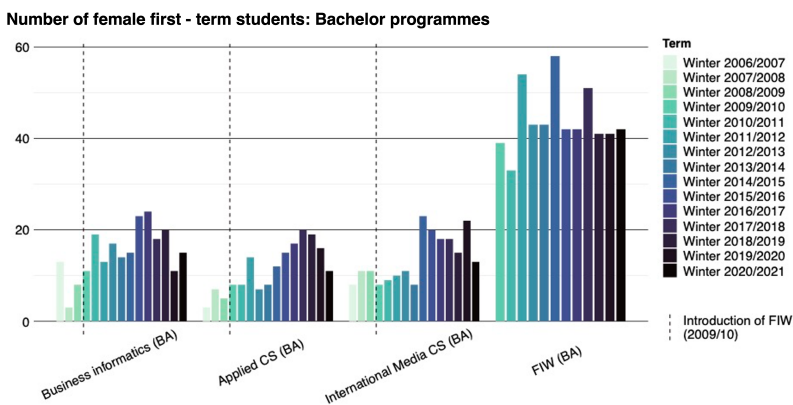


Fig. 2: Number of women among first-term students of related Bachelor programmes

The same numbers also show for the master's programme Business Informatics (cf. Figure 3) the significant increase of female students following the first graduation of FIW students in the winter term 2013/14.

In order to further investigate the reasons why students choose the women-only degree programme, all first-semester students since 2015 have been asked to complete a questionnaire about their motivation and their background. This questionnaire is handed out on paper during the introductory week. The average return rate is more than 90 %.

In order to determine the relevance of the fact that the degree course was only for women, questions were asked about the following points among others: the motivation for the application, the numbers and priority of the applications for other degree courses, the number of acceptances, and the reasons for the final choice.

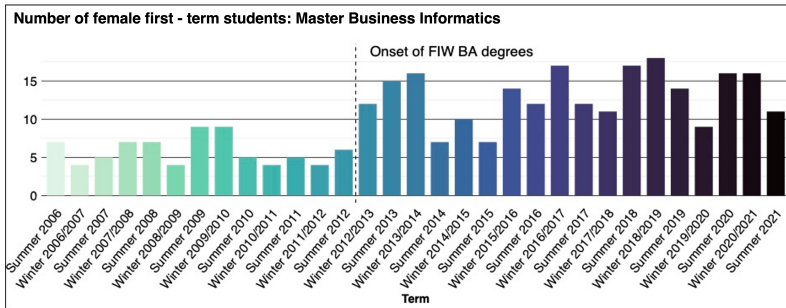


Fig. 3: Number of women among students of the master’s programme Business Informatics

The following evaluation shows the aggregated data as percentage for the years 2015–2021. The responses about the reasons for the application and the final decision are shown in Figures 4 and 5. In both cases, multiple answers were possible.

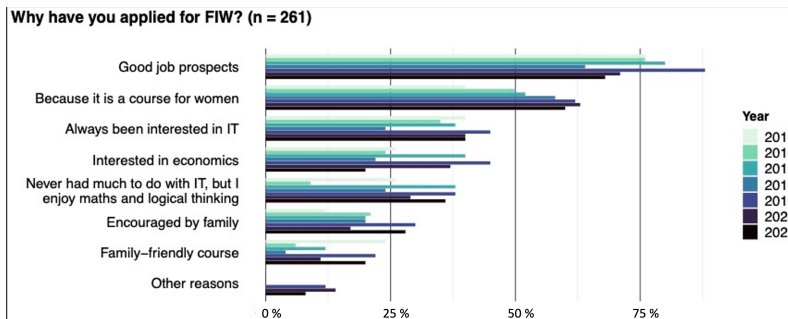


Fig. 4: Motivation for applying to FIW

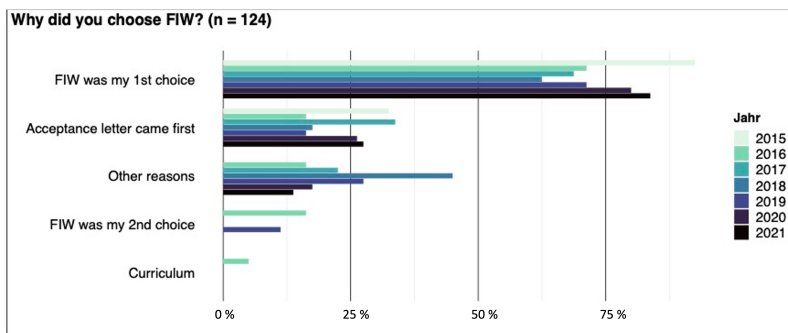


Fig. 5: Reasons for choosing FIW over another study programme

With regard to the motivation (cf. Figure 4), good career prospects were most important (as indicated by a total of 75 % of students naming this among their reasons). However, more than half of the respondents (55 %) said that the fact that it was for women only motivated them to apply for FIW.

About half of the students were also accepted for other study programmes. When asked why they chose FIW over the other programmes they were eligible for, 60 % stated that FIW was their first choice (cf. Figure 5). Comparable responses were received for the question ‘Have you applied for other degree courses?’ (cf. Figure 6). The results show that almost 80 % of the new students would not have started any other IT degree course in that semester if they had not matriculated for FIW. 30 % of the students did not apply for any other degree course besides FIW. A further 25 % only applied for non-IT-related degree courses besides FIW. The majority of them received an offer for at least one of these IT-unrelated options but decided in favour of FIW. Of the 21 % of newly enrolled students who had also received an offer for another IT degree course, almost all said that FIW was their first choice.

One assumption for choosing the women-only degree course could be that with limited prior IT knowledge the applicants would feel more accepted in a group together with other women. These applicants were targeted specifically with the measures outlined in section 3: ‘We start at zero’ and ‘Questions welcome’. In order to examine the assumption, we asked: ‘Have you already had some IT experience?’. The results depicted in Figure 7 show that in total 48 % of respondents answered with ‘No’.

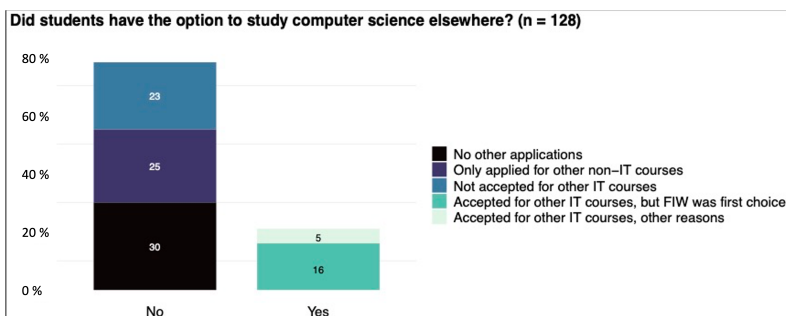


Fig. 6: Option to study another computer science programme

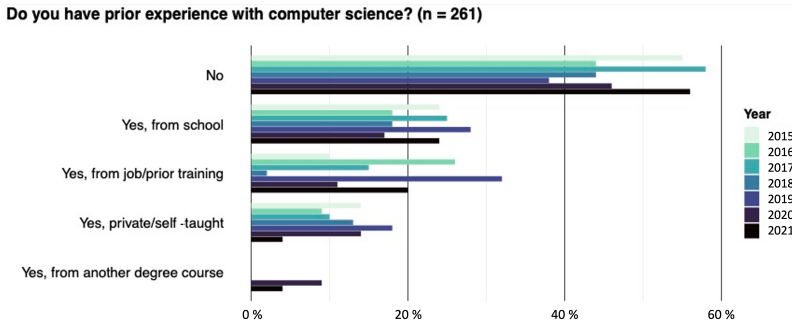


Fig. 7: Self-assessment of previous IT knowledge

The FIW degree course is of particular interest for cross-over students who have already begun or completed vocational training or another course of studies. This is shown by the responses to a question about previous training and education (cf. Figure 8).

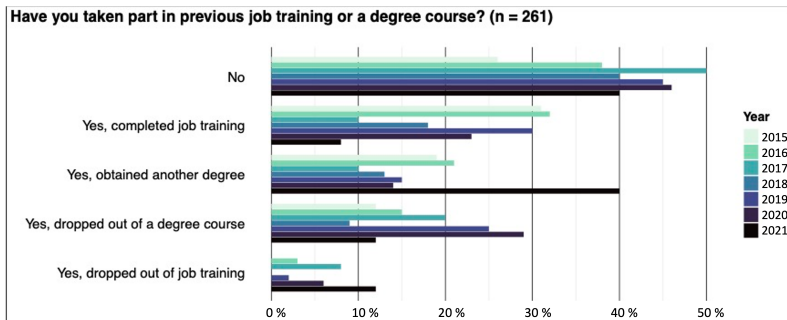


Fig. 8: Prior training and education

Fewer than half of the students (41 %) had begun the course directly after leaving school. All the others had already begun or completed a vocational training or a study programme.¹³ The qualifications completed and subjects studied included management assistant, industrial clerk, foreign language assistant, German studies, Scandinavian studies, social pedagogy, business administration, media and communication sciences, philosophy, political and social sciences, and communication design (examples stem from the survey period 2017/18).

13 No data are available for a comparison of the proportion of those changing from other IT courses.

A confirmation that at least part of the cross-over students would not have studied computer science can be concluded from the answers to ‘What would you have done if you had not been accepted here?’. In total 21 % of respondents chose: ‘Continued my previous employment.’

The variety of backgrounds is also reflected in the age of the first-term students (cf. Figure 9). The largest group comprises those under 22 years (58 % of respondents). The next largest age groups are 23–27 years (18 %) and 28–32 years (15 %).

The average age of students starting their FIW studies during the last 10 semesters was 24.4. The average age for the faculty during the same period was 22.7. This emphasises again that the group of FIW students differs from those of other IT course participants at HTW Berlin, but also other IT programmes, i. e. the respondents of the survey described in [Fr19].

The FIW degree course offers a family-friendly timetable, as referenced in section 3. Individual students gave verbal feedback that they were explicitly looking for family-friendly degree courses. FIW was the only one they found, and so they decided to study computer science. This priority was also reflected in the responses about motivation (cf. Figure 4). 14 % cited ‘family-friendly’ as a reason for applying for the FIW degree course.

In order to back up this assessment, we also asked the newly enrolled students whether they have children (cf. Figure 10). About 11 % were mothers.¹⁴

Finally, the family background of the students was considered. We asked about a possible migratory background to determine whether the degree course is of interest to international students. We asked: ‘Have you got a migration background, i. e. were you or at least one of your parents born outside Germany?’ More than half of the new students (56 %) responded in the affirmative.

A comparison with other degree courses at HTW is possible regarding the ‘inter-nationality rate’. This describes the ratio of foreign students to the total number of students. The FIW degree course has a ratio of 23.7 %, which is higher than other IT-courses at HTW Berlin (Applied CS: 18.3 %, Business Informatics: 19.1 %) and the faculty average (21.7 %). An exception is the International Media CS course with 29.7 %.

14 No comparable data are available for other courses.

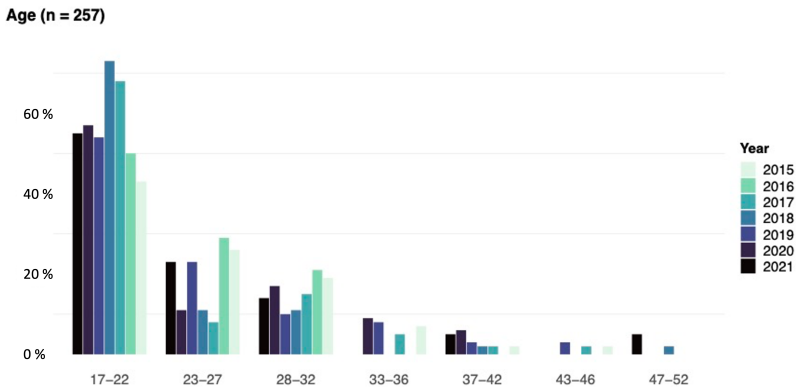


Fig. 9: Age of students

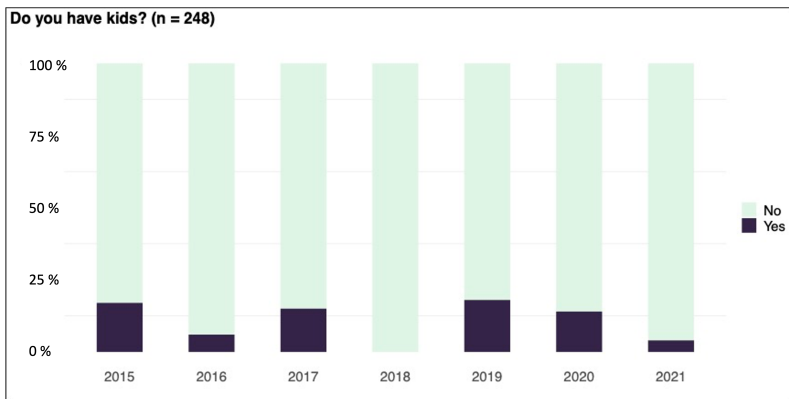


Fig. 10: Percentage of mothers among first-term students

5 Excursus – Dropouts and graduates

All the data shown so far referred to newly enrolled students. As with other IT degree courses, many students drop out of the FIW programme. For a comparison within HTW Berlin, the ‘remainder ratios’ are considered. These ratios describe the number of students in the final semester compared with the start of the first semester. The remainder ratio for FIW is 73.8 % (mean for annual values from 2009/10–2018/19), which is comparable with other undergraduate IT courses at HTW Berlin (Applied CS: 68.8 % , Business Informatics: 72.7 % , and International Media CS: 76.7 %).

From an observation of the Xing Alumnae Group, it is apparent that about half the FIW graduates go on directly to work in business. The other half study for an MA degree. There is particularly high demand for the post-graduate courses in Business Informatics and Applied Computer Science at HTW Berlin. Here we refer again to Figure 2, which shows the significant increase of female students in the post-graduate course Business Informatics after the first graduation of FIW students in the winter term 2013/14.

6 Summary

This paper shows first conclusions from a survey during the period 2015–2021, complemented by statistics of HTW Berlin. From the combination of these data sets it is possible to draw two key conclusions:

1. Spectrum of students: The group of female students shows a high degree of variety regarding factors like age, background, (prior) IT experience, educational background, and parental status.

2. Choosing FIW as study programme: The results of the accompanying survey indicate that a large group of students who chose FIW did apply for FIW because of the good career opportunities. Different prior career paths (59 %) and often little or no prior IT knowledge (48 %) suggest that this subject was not their first choice. More than half of the enrolled students (55 %) consciously opted for a women-only degree course as an entrance path into computer science. The rest of the group also considered other IT courses. Still, within this group 16 % said that FIW was their first choice.

The trends shown by the responses support the hypothesis that a considerable proportion of FIW students chose to study computer science because this subject was offered by the HTW Berlin as a women-only degree course.

However, the women-only characteristic is not the only factor supporting the decision for studying computer science. The responses also show that it could be attractive for other study programmes to actively address students (male or female) who do not have prior IT knowledge. Almost half of the FIW students answered the corresponding question 7 with ‘no prior IT knowledge’. If the programme description suggests a welcoming atmosphere for these applicants which incidentally appeared to have little connection to IT as a subject a new clientele may be acquired. Another argument, not only for an IT programme, is the family friendly time table. In our survey 14 % of respondents described this

as decisive for their application. This experience is backed up by requests from male students who asked for similar conditions for their studies.

A high potential for the recruitment of more IT professionals is the group of cross-over students. These are people that have already completed vocational training or a different study programme and only notice the value of IT knowledge afterwards. Our experience shows that there is a high interest for an IT upgrade within this group. An important obstacle in gaining these student are the university admission regulations, which restrict the number of students allowed to study for a second degree to 2–3 %. Here, political will could lower the barriers in favour of more IT professionals.

7 Outlook

There are no plans to introduce an MA degree specifically for women as a follow-up to the undergraduate degree course presented here. The FIW degree course is intended to provide an introduction to computer science. The results of the survey presented here show that a new clientele of female students is gained for computer science by the women-only IT degree course. With their graduation a highly varied additional group of women enter the IT employment market – contributing to greater variety in the IT sector. As long as women-only degree courses lead to more women choosing to study STEM subjects, they are a valid and commendable option.

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