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International Master of Science on Cyber Physical Systems

Identified needs of the female in the host partner countries

D1.5

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Disclaimer

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1 Introduction

This report focuses on the results of a survey conducted across the partner institutions.

The results and the consequential recommendations are intended to help partners identify the needs of females in their respective institutions as part of work package D1.5, specifically to identify key trends in the data to inform best practice, highlight any issues and help focus on key areas for development and training to address and improve these. The themes of interest include: Recruitment of Students and Staff, Equality and Diversity, Student Experience, Workplace and Study Culture, Student Performance, Career Development and Employability and Training.

2 Demographic Data

Subjects

Participants were asked as whether they identify their work area as (a) Computer Science or (b) Engineering. Out of the 8 participants, 6 identified themselves as Computer Science and 4 identified themselves as Engineering. This means that 4 participants identified themselves as Computer Science only and 2 identified themselves as Engineering only, and 2 identified themselves as both Engineering Computer Science.

Job role

Among the 8 participants, their job roles were 1 Research Fellow, 1 Lecturer, 5 Professors, and 1 Head/Associate Head.

Gender

Out of the 8 participants, 5 of them were male and 3 of them were female.

Duration worked at current institution

Among the 8 participants, one worked 2-5 years, three worked 5-10 years, two worked 10-20 years, and two worked 20+ years at the current institution.

Programme level teaching

Out of the 8 participants, two participants were teaching at Bachelor level only, two participants were teaching at Masters level only, and four participants were teaching at both, Bachelor and Masters level.

Staff	Male	Female
University of Hertfordshire	30 (60%)	20 (40%)
University of Sfax, Tunisia	31 (44%)	39 (56%)
Tafila Technical University	24 (83%)	5 (17%)
Palestine Technical College (PTC)	40 (85%)	7 (15%)
Al-Quds University	78 (80%)	19 (20%)
Carthage University	51 (56%)	40 (44%)
German Jordanian University	18 (95%)	1 (5%)
University of Siegen	115 (75%)	39 (25%)

Table 1: Male: Female Staff Ratio by School/Faculty within the University

UG Student	Male (FT)	Male (PT)	Female (FT)	Female (PT)
University of Hertfordshire	150 (47%)	40 (13%)	100 (31%)	30 (9%)
University of Sfax, Tunisia	300 (43%)	0	400 (57%)	0
Tafila Technical University	147 (71%)	0	60 (29%)	0
Palestine Technical College (PTC)	100 (59%)	0	70 (41%)	0
Al-Quds University	416 (45%)	0	502 (55%)	0
Carthage University	293 (49%)	0	301 (51%)	0
German Jordanian University	200 (67%)	0	100 (33%)	0
University of Siegen	674 (78%)	0	191 (22%)	0

Table 2: Full-time (FT), Part-time (PT) Student Ratio on Undergraduate (UG) programmes

PG Student	Male (FT)	Male (PT)	Female (FT)	Female (PT)
University of Hertfordshire	60	30	50	10
University of Sfax, Tunisia	60	0	140	0
Tafila Technical University*	0	0	0	0
Palestine Technical College (PTC)*	0	0	0	0
Al-Quds University	89	0	100	0
Carthage University	51	0	80	0
German Jordanian University	5	10	0	3
University of Siegen	492	0	76	0

Table 3: M: Full-time (FT), Part-time (PT) Student Ratio on Postgraduate (PG) programmes

Note: * - no PG programmes

When asked to identify any issues in the progression between undergraduate and postgraduate student's participants noted "a lack of equipment and financial support to promote new research projects" and "difficulties to disseminate skills to industry and a lack of attractiveness of existing curricular". PTC do not have graduate programmes however, it is believed that gender progression to graduate has approximately a similar ratio to undergraduates.

Recommendations

1. Universities donate unused equipment to those universities that want to set up research facilities.
2. Provide training in their use for staff, as well as help mentor supervisors and co-supervise PhD students with these institutions at the start.

3 Recruitment of Students and Staff

While traditional promotion approaches still prevail for student recruitment, such as open days, and outreach activities, advertising in local newspapers, etc., it can be observed that a significant amount of effort have been put into online strategies, which in fact is the most widely used approach for student recruitment, as shown in Figure 1. In the pervasive climate of Internet and digital living, the expectation of online activities is inevitable in the perspective of both institutions and potential students.

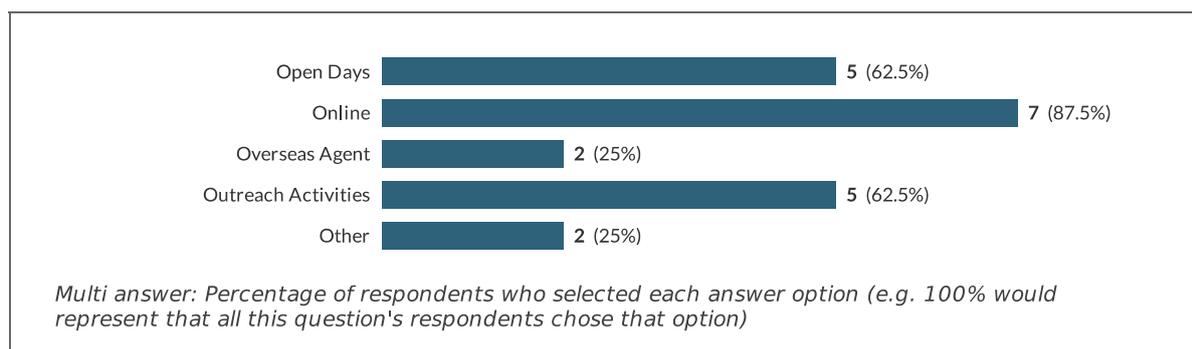


Figure 1. Channels of Student Recruitment

When it comes to promoting women to study in the Computer Science and Engineering related programmes, there is a clear shortage of endeavours among various institutions that have participated in the survey. When participants were asked for suggested improvements for improving recruitment for staff and students in their respective Schools participants key words included “nothing”, “no special”, and “limited”, which indicates the gap of achievements in the area of encouraging female learners to take on science and engineering subjects.

The low intention of attracting female students in the Science and Engineering sector can also be mirrored by the imbalance of male and female staff. As shown in Table 4, the Science and Engineering sector is clearly male-dominated in most institutions (or Faculties) that participated the survey. This is a global issue which begins at primary school, see as an example the origins of gender human capital gaps and how teacher’s unconscious bias [impacts](#) girl’s progression to STEM subjects.

Recommendations

1. Ensure high visibility of women on outreach and recruitment activities, including websites and promotional materials.
2. Include more female images on websites and other publicity to help demonstrate that the School/Faculty is an inclusive working environment committed to the advancement of gender equality.
3. Each School to host its own Equality and Diversity webpage with case studies of successful females.
4. Awareness-raising of women in science through events and other key activities to encourage more female students to apply.

Besides the low intake of female employees in the science and engineering field of higher education, the responsibilities given to existing female staff mainly reside in administration, management, and various other networking jobs, with very few involved in teaching and research, as shown in Figure 2.

This is supported by research, Morley, (2013)¹ demonstrates that women academics do much more of the 'institutional housekeeping' than men arguably because men avoid them to do research (Fitzgerald, 2014)²

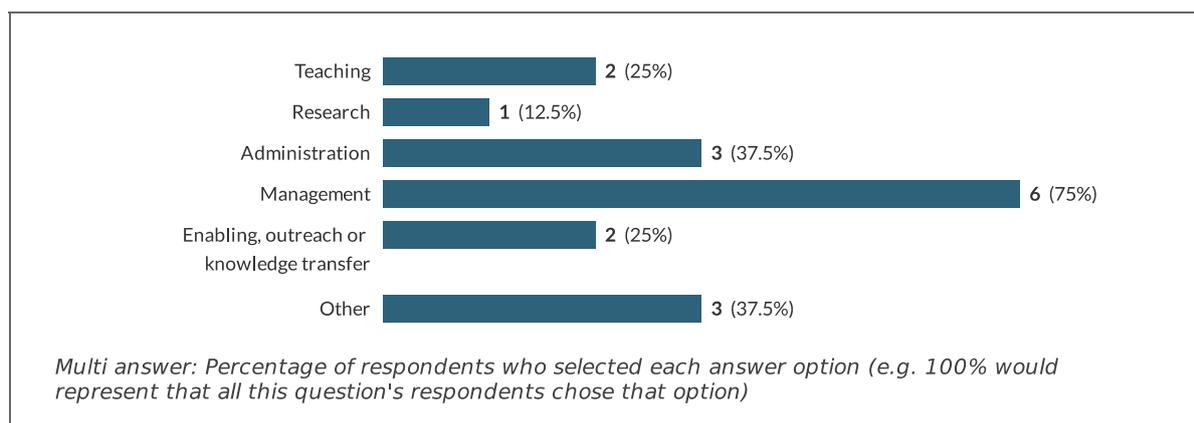


Figure 2. Responsibilities of Female Staff in Workplace

It is recognised that there exists a conscious/unconscious discrimination against female employees. Most institutions/faculties claim that the opportunities of recruitment are equal for both men and women in the sector, though women may face more challenges in daily lives such as childcare, which may prevent them from being engaged in the sector. The institutions/faculties in this study have shown an awareness of the shortage in females both in terms of staff and in students, and have demonstrated clear intentions when asked for further comments or suggestions for improving recruitment for staff and students in their respective school/faculty to include: more market appeal and offering scholarships to female students. Moreover, comments related to "the social status of women who have children as infants or at kindergarten". It was recognised that childcare is expensive and as a consequence "work as no economic value

Recommendations

1. Raise awareness of promotional procedures.
2. Ensure Universities have policies on recruitment and selection, train staff and monitor their use.
3. Ensure gender neutral language in job advertisements.

¹ Morley, L. (2013) 'The rules of the game: Women and the leaderist turn in higher education'. Gender and Education. 25(1) pp. 116-131.

² Fitzgerald, T. (2104) Women Leaders in Higher Education: Shattering the Myths. London: Routledge.

4. All those involved on decision-making committees and panels to undergo mandatory training including Equality and Diversity and Unconscious Bias.
5. Interview panel chairs to also attend cultural awareness training.
6. Interview panels to include at least one woman.
7. Ensure University Equal Opportunities Employment policy in place and that it is understood by all involved in recruitment and adhered to.
8. Ensure all management aware and follow promotion policy and procedures and monitor impact to increase number of female applicants and retain these staff.
9. Ensure female staff have a mentor and a coach when recruited to help retain and progress their career.
10. Ensure family-friendly policies in place for all staff.

4 Equality and Diversity

50% of the respondents consider timetabling classes before or after picking up children from school as the most common Equality and Diversity issues for female students. Even more 62.5% of participants considers the same timetabling issue as the most common Equality and Diversity issue for female staff who have caring responsibilities as shown in figure 3. Among others, career development (50%) and career progression (37.5%) are the mentioned issues in Equality and Diversity for staff as shown in figure 3. When a student or staff experience an Equality issue, the participants are confident that they would know where to seek help from, 62.5% for student, and 75% for staff.

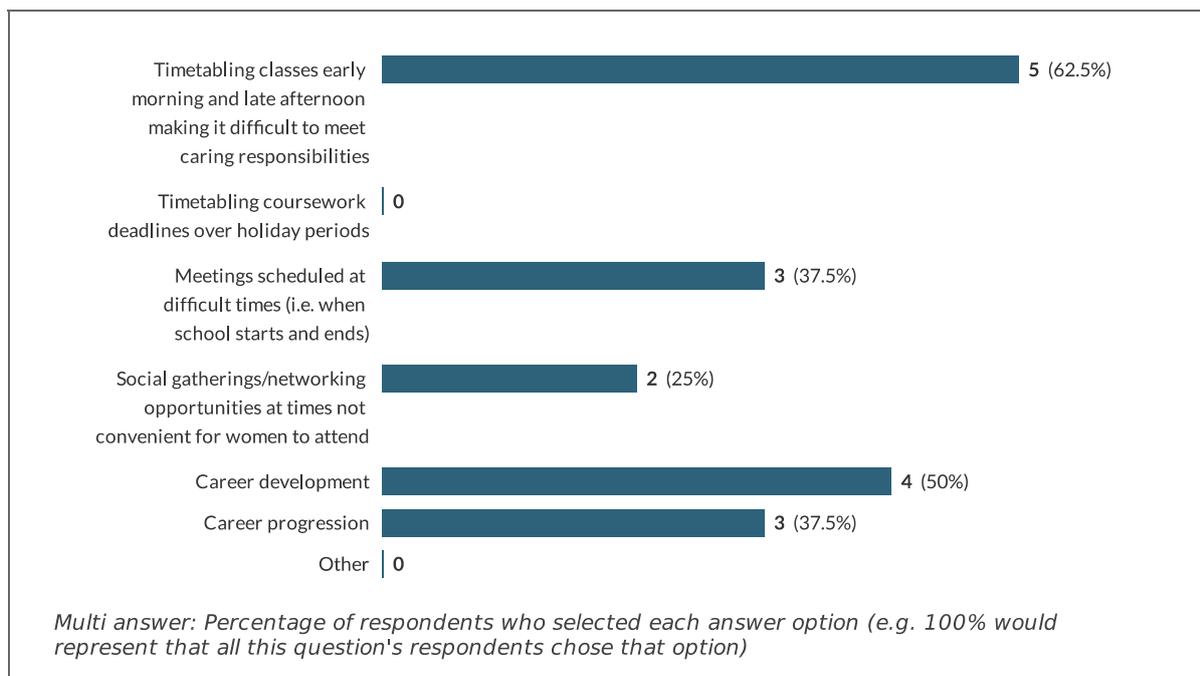


Figure 3. Most Common Equality and Diversity Issues for Female Students

Students having study needs are handled differently across partner universities, with a wide range, from having study needs agreement in place, to verbal agreement only, or no agreement at all (although tuition fee waiver is possible). Most participants (75%) feel that there are Equal opportunities for progression and achievement for students because “students are treated the same”, “there is no problem for progression even for women or men, “for students there are equal opportunities as number of students in both genders are equal”, and “progression opportunities only depend on achievement or whether they want to exploit these opportunities or not”.

The same percentage (75%) of participants feel that there are equal opportunities for progression and achievement for female staff in their school/faculty, because “many women have progressed in research”, “equal opportunities for progression and achievement are available for both female and male staff”, and “(there is) no discrimination between female and male staff for progression”. However, when asked what issues need addressing, participants felt that “women are underrepresented at senior management level”. Participants also pointed out that “men tend to shout more loudly” and “due to family conditions such as having children who need care and sometimes due the social arrangement and traditions it might be difficult for women to travel alone, e.g., attend conferences and/or workshops. Such issues make chances of progression for women at work less than that of men.

Most participants (75%) think their School or Faculty is an equitable place in which to work and study, which agrees with the findings of above. Some (37.5%) however, think their University/School/Faculty could do better on Equality and Diversity, by “offering scholarship for female students at fields which witness low presence of female students”, “providing possibly day care centres for infant children”, and “offering more freedom to work from home or part time jobs to help female staff balance work and family needs”. Some others argue that the University should try to recruit more female faculty and students and address the level of education of females.

Recommendations

1. Provide flexible working opportunities for all staff including those with caring responsibilities including job share.
2. Provide child-care facilities and support payment.
3. Put in place parental leave for fathers which will enable mothers to invest more time in their careers.
4. Timetable classes to accommodate both staff and students with caring responsibilities.
5. Schedule meetings to accommodate staff with caring responsibilities (this predominately affects females).
6. Encourage female staff to develop their career through a line management appraisal process.
7. Provide opportunities for female staff to engage in conferences, talks and workshops online when unable to attend in person.
8. Create an inclusive culture for staff and students.
9. Put Equality policies in place, all staff and students should be treated fairly in day to day operations and work related decisions (including recruitment, training, promotion, allocating work, pay etc.)
10. Provide training in Equality and Diversity for all staff (male and female).
11. Identify the barriers for females to progress to senior management positions and put actions in place to address these.
12. Put a mentorship scheme in place to help guide females throughout their career.

5 Student Experience

The majority of respondents consider the atmosphere for students, particularly when working or studying together in mixed groups (male/female) to be friendly and state that students enjoy working together. Moreover, some reported that students “work better and achieve the required task on time” and “work more efficiently whilst working in groups on tasks”. When students are allocated to small working groups there are positive practices employed related to females. The majority of University/Faculty/School try to ensure 50% women and 50% men however, this is not always feasible due to smaller numbers of female students.

The dominant teaching methods employed across partner institutions is shown in figure 4. As can be seen the lecture, hands-on practical and tutorial/seminars are commonly used to deliver content, aid understanding and students development of knowledge and skills in Computer Science and Engineering disciplines. 87.5% of participants encourage group work practices, 62.5% of participants encourage student centred discussions and 75% active learning. Peer-Assisted-Learning and Student-led learning is the least practiced amongst participants.

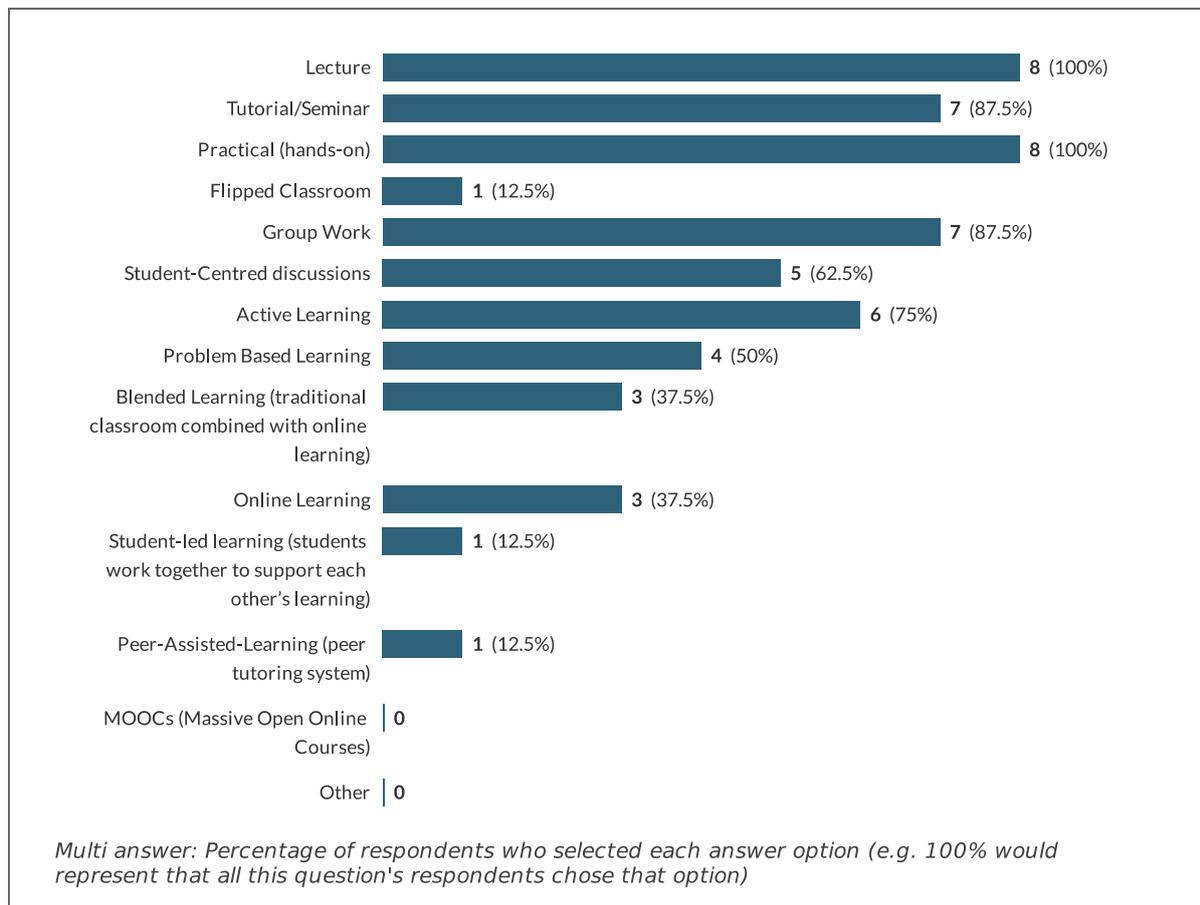


Figure 4. Most Common Teaching Methods used with Students

37.5% think the lecture, tutorial/seminar, and practical hands-on group work is the preferred teaching method for females as shown in figure 5. The majority of free text comments from participants noted that females are more capable when it comes to group work and that they prefer to be in a group with

other female students particularly, when working in labs. Two respondents feel that female students do not have a preference for a specific teaching method noting "all the teaching methods are welcomed by women".

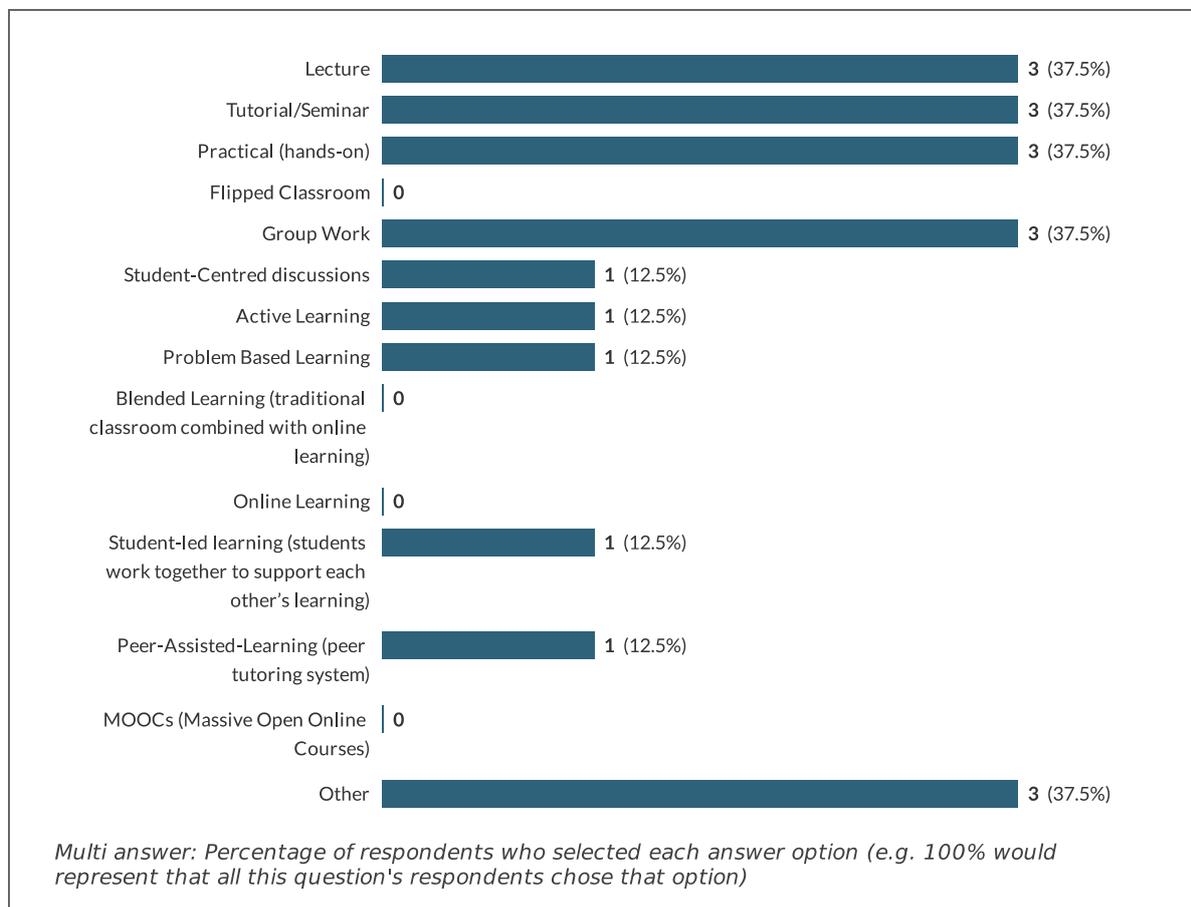


Figure 5. Female Student Preference for Teaching Methods

Further data analysis highlights 90% of participants feel it is more desirable from a student's perspective to have more female role models. The rationale for this includes "desirable to have more women as teachers" and it encourages more female students to join the program in the future". 80% of respondents do not have a personal tutoring system, 90% do not deploy peer-assisted learning (by senior students) to support other students in their learning. Moreover, 90% of respondents do not have mentoring or coaching in place for female students and 80% do not student proctors to support other students in their learning in their respective school/faculty.

Recommendations

1. Allocate female staff as mentors to small groups of mixed (male and female).
2. Train staff in and deploy Inclusive curriculum practices.
3. Practice peer assisted learning, employ students (male and female in equal numbers were appropriate) specifically for this purpose and to make better use of students and help them acquire employability skills.

4. Recruit student proctors and student mentors.
5. Ensure female staff and students are more visible at events, in study literature, images on the web etc.
6. Include collaborative learning teaching approaches (where feasible include both male and female students in small groups of no more than 6 include student led activities inter and intra groups).
7. Encourage Blended Learning approaches to learning and teaching to provide flexible opportunities particularly for females (in terms of when, how and where to learn).

6 Workplace and Study Culture

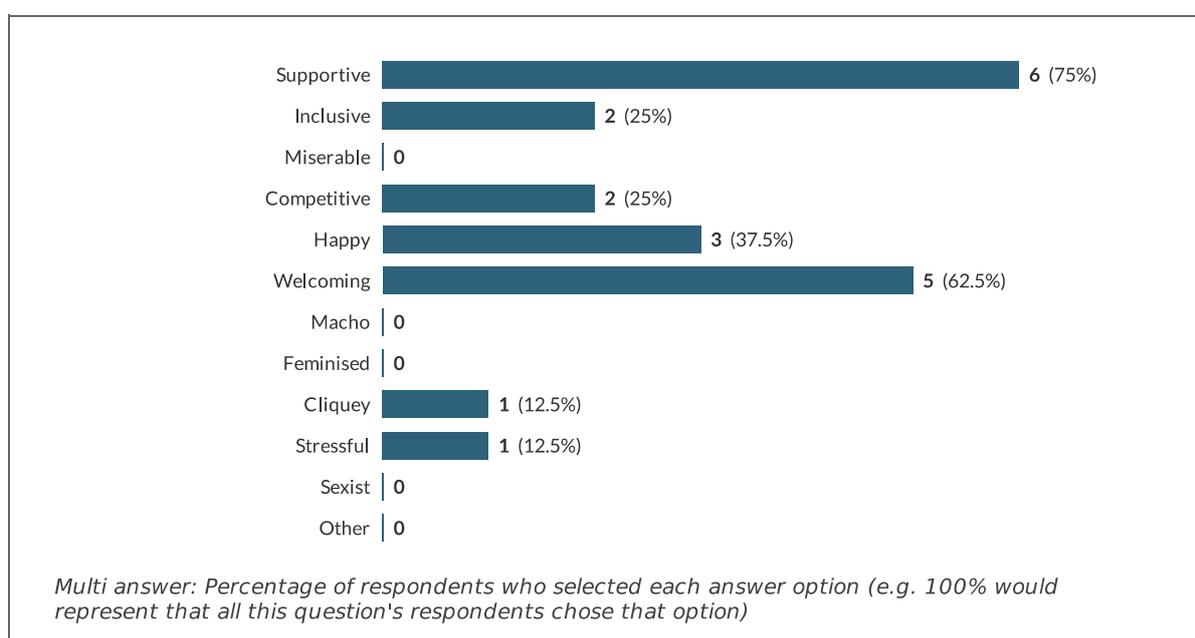


Figure 6. Perception of Workplace

Figure 6 shows the perceived workplace from all the participants in the survey. Most responses are quite positive about the work environment. The keywords “supportive”, “welcoming”, and “inclusive” reflect favourable relationships between fellow colleagues, and the keyword “happy” indicates that the overall impression of work experience is more than satisfactory. The participants have commented that there is nothing major to be improved in the current workplace (except for some enhanced sports or cultural activities). Nevertheless, the minority of choices for the keyword “cliquey” and “stressful” should not be ignored. In terms of the keyword “competitive”, there has been no proven theory whether this brings positive or negative impact on working culture.

It is interesting to discover that the perceived equality among various staff mainly fall into three categories:

- Equal in gender (i.e. No discrimination against women. As a matter of fact, the survey shows that some funding opportunities are in favour of women applicants in particular.)

- Equal in pay scale (i.e. Salary should be awarded fairly in proportion to workload.)
- Equal in duties (i.e. all staff should be given a fair amount of responsibilities.)

As mentioned earlier, female staff often face various challenges in life (such as childcare, looking after elderly, etc.) that may prevent them from being engaged in the science and engineering sector. Some institutions/faculties have established considerate systems to aid these matters, for instance, supplying childcare services on site, offering caring time and extended maternity leaves. Some institutions/faculties will take the female staff life duties into account when allocating timetables and teaching tasks. It is also worth noting that some institutions/faculties are yet to develop a solid strategy to assist their female employees, and 62.5% of participants have reported the lack of initiatives from the institutions to support their female staff.

On the other hand, 62.5% of participants have confirmed the positive support from the institutions towards female students, with measurements including dual career service, indoor housing with low fees, conducting research projects to promote female graduates and devising regulations in favour of female students.

7 Student Performance

Table 5 shows the percentage of female students who have achieved outstanding or good performances as reported by the eight participating institutions/faculties. Over 37.5% (i.e. 3 out of 8) institutions/faculties have witnessed a large portion (more than 35%) of female students who completed their BSc and MSc degrees with distinctive achievements, averaging a final score of above 70. This serves as a clear evidence of the competence and devotion of female students in computer science and engineering field, having been given the same opportunity to study equally as others.

Percentage	BSc First Class Degree (Average $\geq 70\%$)	BSc Good Degree (Average $\geq 60\%$)	MSc Distinction (Average $\geq 70\%$)	MSc Merit (Average $\geq 60\%$)
< 5%	12.5%	0.0%	25.0%	25.0%
5% – 15%	25.0%	25.0%	12.5	0.0%
15% – 25%	0.0%	25.0%	0.0%	37.5.0%
25% – 35%	25.0%	37.5%	25.0%	12.5%
> 35%	37.5%	12.5%	37.5%	25.0%

Table 5. Performance of Female Students Reported by Eight Institutions/Faculties

Recommendation

Monitor the degree attainment of UG and PG by gender and benchmark with the higher education sector and put in place actions to address any issues.

8 Career Development and Employability

As illustrated in figure 7 three quarter of participates feel that all staff have equal access to training/development opportunities whether male or female, and an even larger percentage (87.5%) think that all staff no matter their gender are encouraged to undertake activities which contribute to a stronger CV, such as attending conferences, present at conferences, sit on department or external committees, training opportunities, and networking opportunities. One participant also stated that female/male staff are equally encouraged to take up management activities.

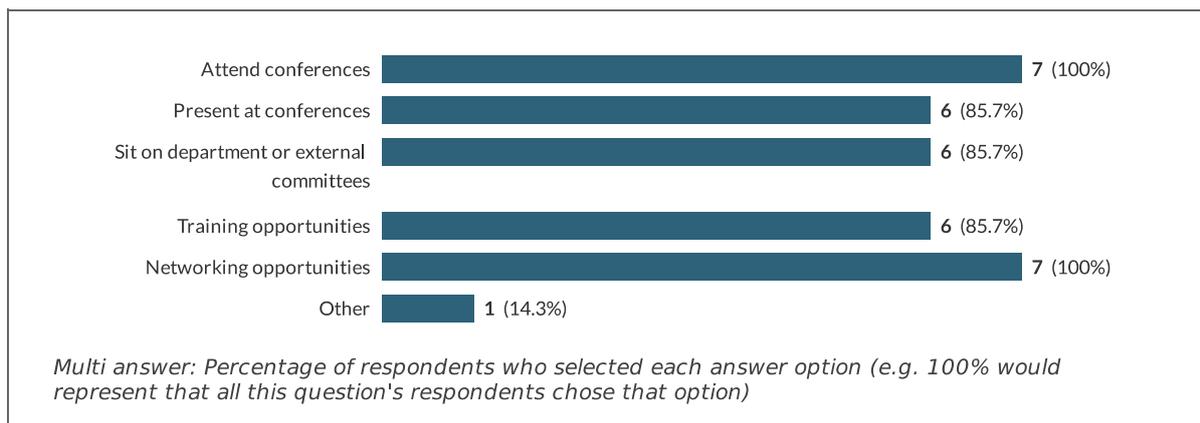


Figure 7. Equal Opportunities to Engage in Activities that Contribute to a Stronger CV

Five out of eight participants commented on the support given to students that enable them to make informed decisions about their career, including the transition to a sustainable academic career. Two stated that careers advice is provided to all students at university level, which two other participants revealed that personal interviews and regular meetings are also available. Only 1 participant commented that such support is not given.

Only one participant (12.5%) observed activities for female PG students to meet with PhD/postdocs/staff that they think would benefit their careers or that would be beneficial in the future. Two out of the five participants commented there are not, or they are aware of, special initiatives within their school/faculty to encourage PG students to pursue a PhD or become an academic while two other institutions offer/seek funding for top students.

Five out of eight participants agree that all female students are provided with opportunities to go on placement or study abroad, or post-graduation employment because such opportunities are provided to all students on campus or via an international office overseas.

As shown in figure 8 when it comes to a career in STEM for females, most participant (62.5%) think that being male dominated as the biggest barrier for females to choose to study STEM subjects and marriage as the second biggest barrier (50%). Unsuitable working hours and STEM not perceived as female come next as the third biggest barrier (both 37.5%). Interestingly, 1 participant thinks there are no societal factors as barriers and enablers for females to choose to study in STEM.

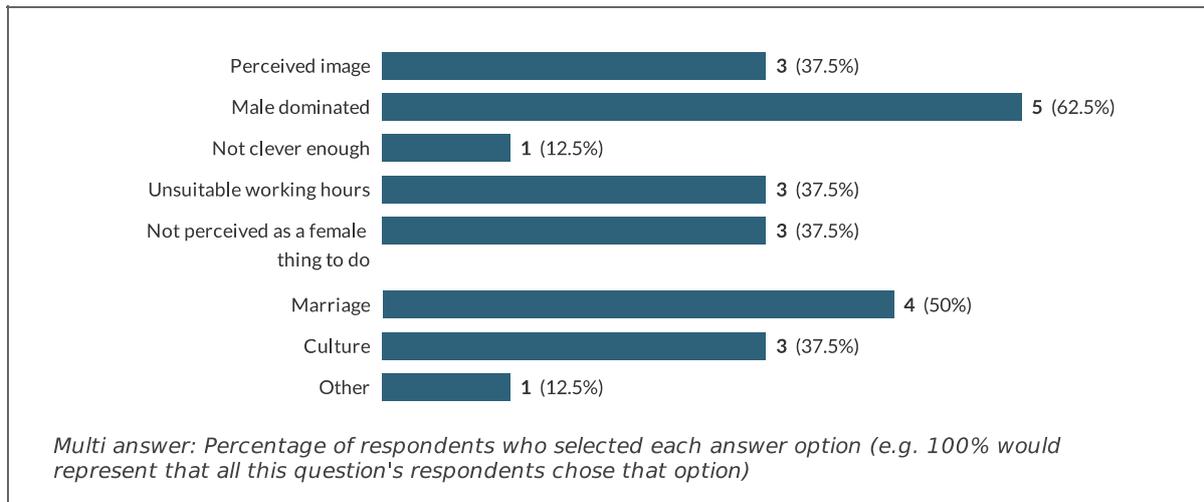


Figure 8. Societal Factors as Barriers and Enabler for Females to Study in STEM

Half of the participants (4 out of 8) think that half of the female graduates go to full-time employment, of which half enter the information technology, computer science or engineering sector. According to one participant, this is because these sectors hire free lancers, giving flexibility in working hours and location of work for female graduates.

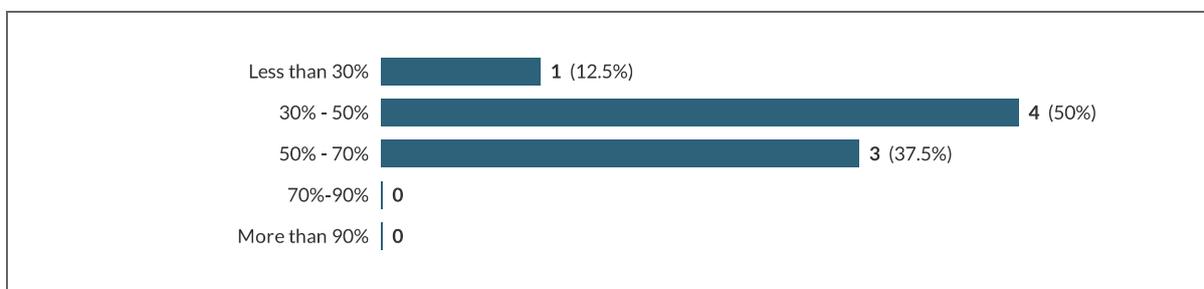


Figure 9. Ratio of Female Graduates who go on to Fulltime Employment

Recommendations

1. Set targets for progression to PhD for undergraduate and postgraduate students.
2. Run workshops/events to encourage female undergraduate and postgraduate students to pursue a PhD or become an academic.
3. Present opportunities for undergraduate and postgraduate students to meet/be mentored by female academic staff including PhD students/postdocs.
4. Expose undergraduate and postgraduate students to the full range of STEM careers including academia.
5. Provide Educational and Research opportunities for undergraduate and postgraduate students including research training in STEM disciplines with a long term goal for them to enter PhD programs in these disciplines.

6. Set targets to enhance the diversity in PhD study programs.
7. Send out a strong message by setting visible targets for female staff and students.
8. Showcase successes of females within the University/Faculty/School and Externally such as on a website of successful female case studies.
9. Monitor Retention and progression by gender
10. Make gender parity a personal issue- it is the responsibility of both male and female, set initiatives and targets to reduce the macho image even when the subject is male dominate.
11. Raise awareness of Equal Opportunities, keep talking about this on public platforms, share successful stories to inspire, attract and retain females.
12. As recommended earlier, provide flexible opportunities including job share for staff with caring responsibilities.

9 Training

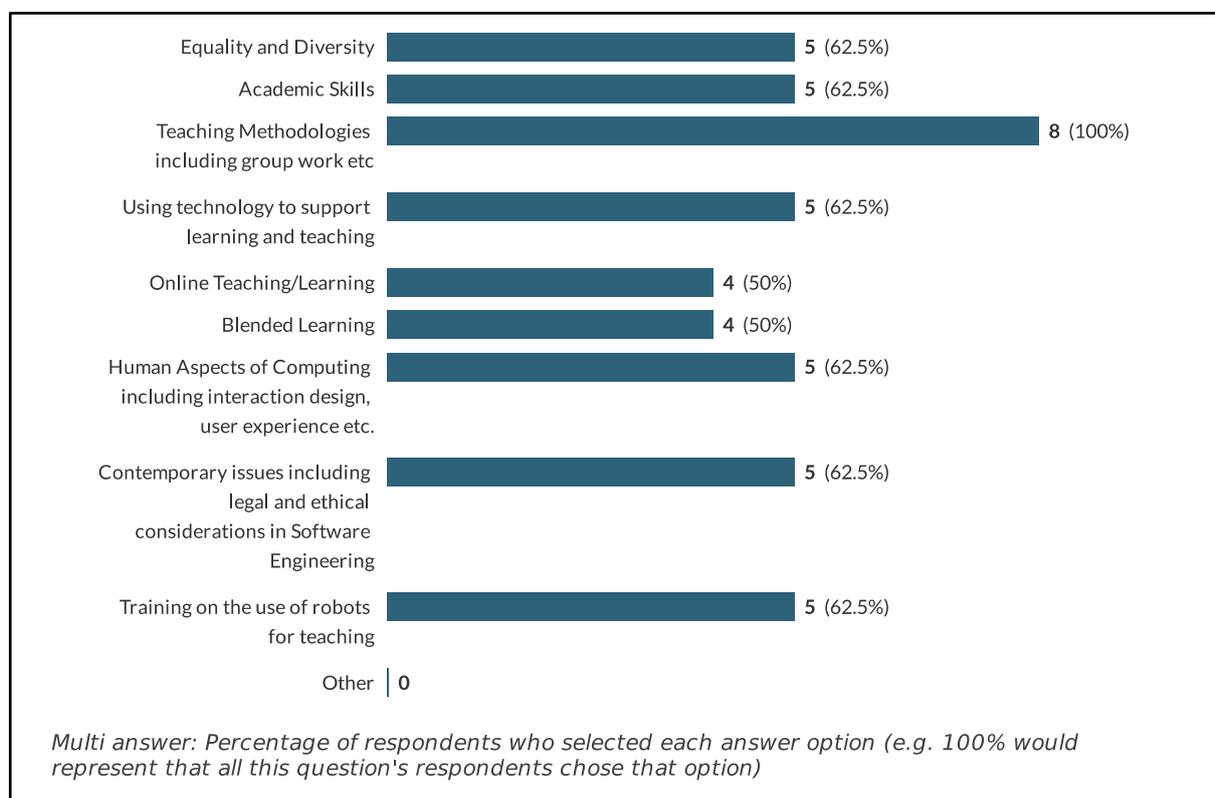


Figure 10. Training Requirements from the UK Partners at the University of Hertfordshire

All partners require training in Teaching Methodologies (including group work). 62.5 % of participants would like to receive training in Equality and Diversity, Academic Skills, Human Aspects of Computing (including interaction design and user experience, Contemporary Issues (legal and ethical) and using robots for teaching. 50% require training in Online Teaching and Learning and Blended Learning.

Training will be provided during the meeting of the 17-19 March 2020 by partners and colleagues at the School of Computer Science, University of Hertfordshire.

10 Conclusion

The survey has provided some interesting insights for the subject. Despite various modern marketing strategies, there is a shortage of efforts among the participating institutions that are yet to attract female students to study science and engineering disciplines in higher education. Once the female students commence their study in the sector, they are able to receive considerable amount of support from the institutions. Despite various societal barriers that prevent female students from excelling in STEM subjects, a substantial portion of female students have completed their BSc and MSc degrees with distinctive achievements, which indicates the competence and devotion of female students in computer science and engineering field. Nevertheless, only a small portion of female graduates would enter desirable employment in the sector. It is advised that all institutions should ensure high visibility of women in outreach activities and promote events and opportunities to the full range of STEM careers.

The academic workplace has been regarded as a positive environment overall, although minor stress has also been reported. Most staff have experienced equal opportunities in terms of career development, training, and employability. Academia highly value the equality in the workplace in terms of gender, pay scale, and duties. In the science and engineering sector it is still a male-dominating environment, and the female employees are not advantaged either in staff numbers or in their responsibilities. There is no deliberate discrimination against female staff, as the recruitment opportunities are equally distributed to both men and women in the sector. The main obstacles for women reside in their social and family duties, which several participating institutions have attempted to provide assistance for. All institutions should be encouraged to continue to take various measurements to ensure university-wide equal opportunities and female-friendly policies are in place. A wide range of recommendations have been given under each section of the main report to enhance female performance in the sector.

11 Acknowledgements

Dr Christabel Tan, School of Engineering and Computer Science, University of Hertfordshire and participants of this study at the University of Sfax, Tunisia, Taflia Technical University, Palestine Technical College (PTC), Al-Quds University, Cathage University, Higher Institute of Applied Sciences and Technology, German Jordanian University and University of Siegen.