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Promoting equality in higher education computer programming courses through cooperative learning

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Evidences

- Technology is not neutral and can harm citizens, specially women.
- The under-representation of women on development teams could be a cause of lack of neutrality.
- The European Union and Spanish laws recommend to introduce the gender perspective to teach in high education.
- Our proposal uses the cooperative learning to motivate the female students in computer programming courses.

Scope of our experience

- Computer programming is a core content for many university degrees in STEM, from math to computer engineering or artificial intelligence.
- Subject: **computer programming**
- Degree: first course of Math degree.
- Academic years: 2018-19 and 2022-23.
- Students: 120 students enrolled (65% men and 35% women)
- Webpage of course: https://persoal.citius.usc.es/manuel.fernandez.delgado/informatica/

Description of our cooperative learning

- In theorical classes (14 hours): first 8 hours we use master classes to teach Fortran programming language and in the last 6 clases we use cooperative learning.
- The cooperative learning activity is based on the Teams-Games-Tournament.
- The activity is optional and can only increase the final score of the subject.
- The teams are built using the gender and academic performance dimensions.
- Last day: final contest between teams, all students has equal probability to add points to their teams.
- Students filled a 10-item Likert-type scale with 4 response values: 1=totally disagree, 2=disagree, 3=agree and 4=totally agree.

Students' perception

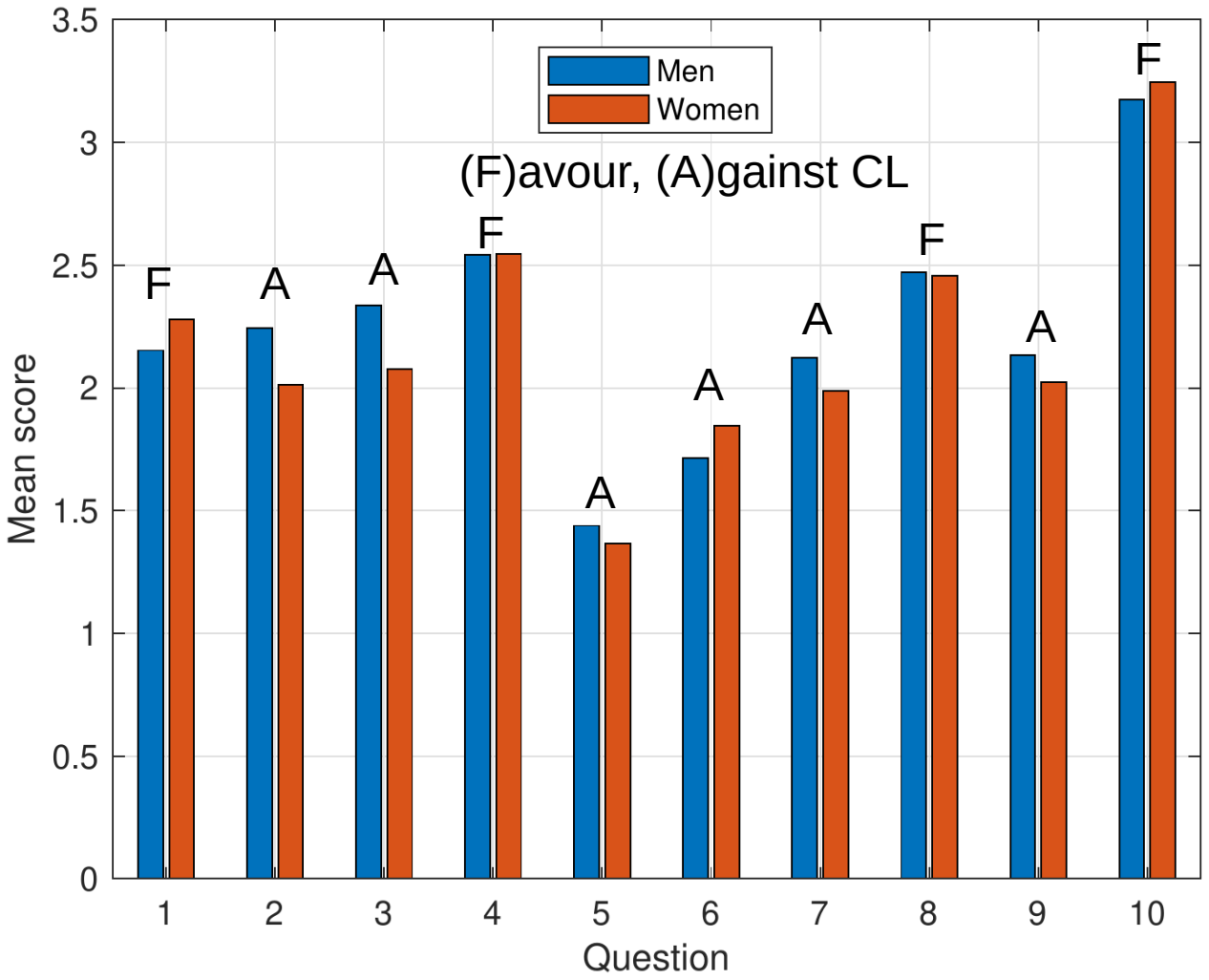
No	Item	Mean	SD
1	I make better use of study time	2.23	0.83
2	Working alone I would have done more activities	2.14	0.86
3	Working alone I would have learned more	2.22	0.93
4	I have more motivation to study	2.57	0.84
5	My groupmates waste my time	1.43	0.67
6	I prefer the teacher's normal classes to the classes using cooperative work	1.81	1.06
7	I would rather do and hand in the exercises by myself	2.09	1.03
8	The way of evaluating seems fair to me	2.51	1.07
9	I prefer to work alone than in a team	2.13	1.08
10	I like having to share my time and my work with other classmates in class activities	**3.26**	1.04

Students' perception

- No significative differences between the two academic years.
- The subjective perception of the student about this active methodology is very positive. Reflected in:
  - Question 10 with mean 3.26 points and question 4 with mean 2.57.
  - The students show their disagreement with question 5 with mean 1.43 and item 6 with M=1.81.

Perception of students by gender

- The differences by gender are not significatives using some statistical test.
- But, female students scored less than the male ones the items 2 and 3, which reference to work alone.



Conclusions

- In cooperative learning (CL), the student has a active role while the teacher is a learning facilitator.
- Gender and academic performance was used to manage the teams.
- The CL is combined with other actions like the use of inclusive language, the type of exercices and student's evaluation with gender perspective.
- Subjective perception of the students about this active methodology is very positive, mainly for women.
- This didactic methologies may motivate the female students in the development of the course.