

What is CBM ?

CBM (confidence-based marking) offers an [alternative grading algorithm for learning tests](#): individuals' personal self-efficacy (or self-confidence) is challenged at responding each multiple choice item. The learners' grades are adjusted based on the correctness/error of their answer in connection with their declared self-confidence (*high, middle, low*). Very soon authors reckon a formative potential in it (Gardner-Medwin, 2007).

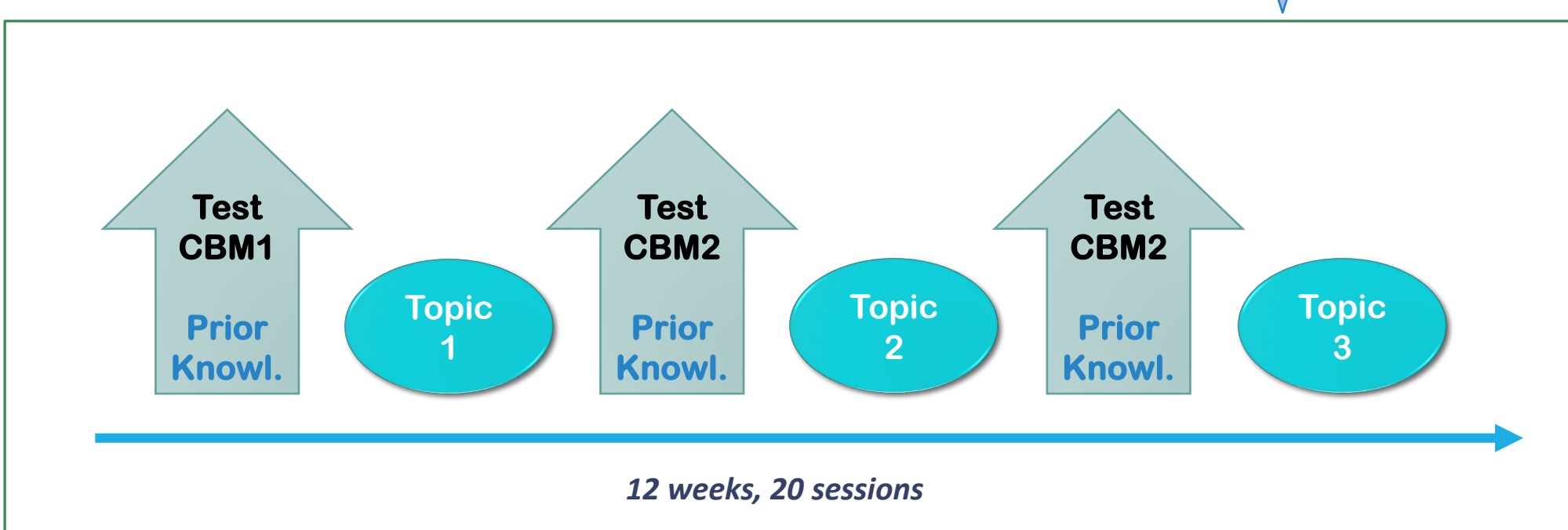
The final grading range transcends the traditional 0-10 grading scheme, and so [learners need to relearn to re-interpret their result](#), which has potentially a formative (+motivational +cognitive, hence metacognitive) effect.

Our Teaching program

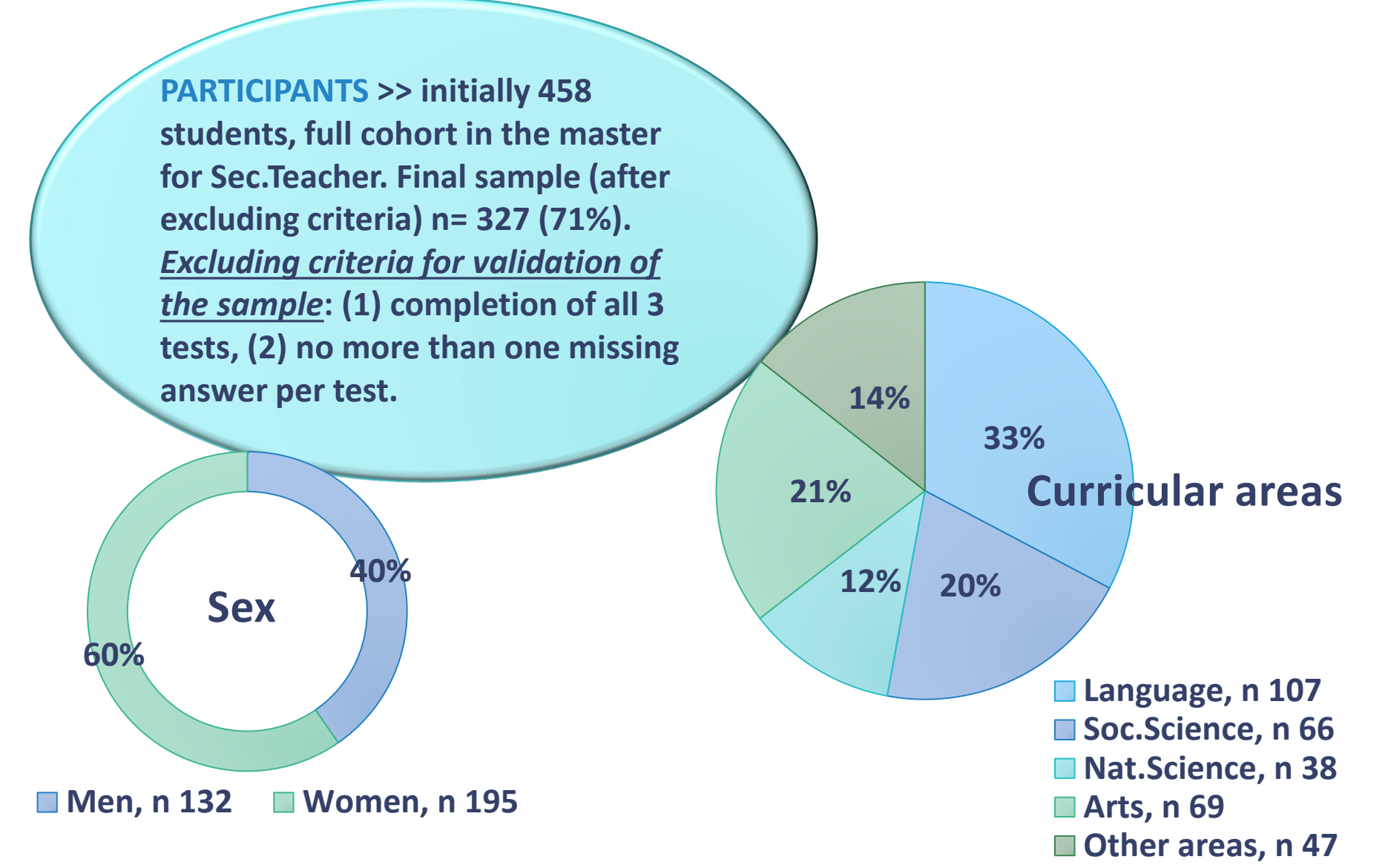
PURPOSE >> carry out a formative use of CBM to consistently foster reflexive self-assessment and metacognition.

CONTEXT >> Master for Secondary Teachers Education at the Universitat de Barcelona. 1-year program. Compulsory module of *Human Development in Adolescence and Instructional Psychology* (4 months in 20 sessions).

INSTRUCTIONAL DESIGN >> students respond to 10 CBM-items starting each topic (of three). Each test tackles general and usual misconceptions revolving the program's contents. After responding to the CBM-test, they receive direct result with an *interpretation guide* and a *reflection questionnaire* to foster metacognitive reflection.



CBM algorithm	if right...	if wrong...
High confidence	+3	-6
Middle confidence	+2	-2
Low confidence	+1	0



GUIDING INSTRUMENTS >> Students receive a general CBM-interpretation guide starting the module, plus automatic feedback after responding each test, with their CBM-result. The interpretation guide models likely results following CBM algorithm in terms of "levels of desirable performance". Students *voluntarily* respond a reflection questionnaire after responding CBM tests.

DESIRABLE LEVELS OF CBM PERFORMANCE
Level 0 >> CBM result in negative range
Level 1 >> CBM result [1-10] (1*/#items/)
Level 2 >> CBM result [11-20] (2*/#items/)
Level 3 >> CBM result [21-30] (3*/#items/)

QUESTIONS FOR GUIDED REFLECTION:

- How do you feel about the result? (M.C.answer)
- Does it meet your expectation? Is it below? Above? (M.C.answer)
- Why do you think this result came about? (free answer)
- What can you do to improve? (free answer)

Our study

PURPOSE >> to evaluate the instructional experience with CBM.

METHODOLOGY >> Mixed methodology, with quantitative and qualitative data.

DATA >> Logfiles, CBM results, CBM single responses, reflective open answers (voluntary).

RQ-1: Are there differences in CBM results regarding curricular area?

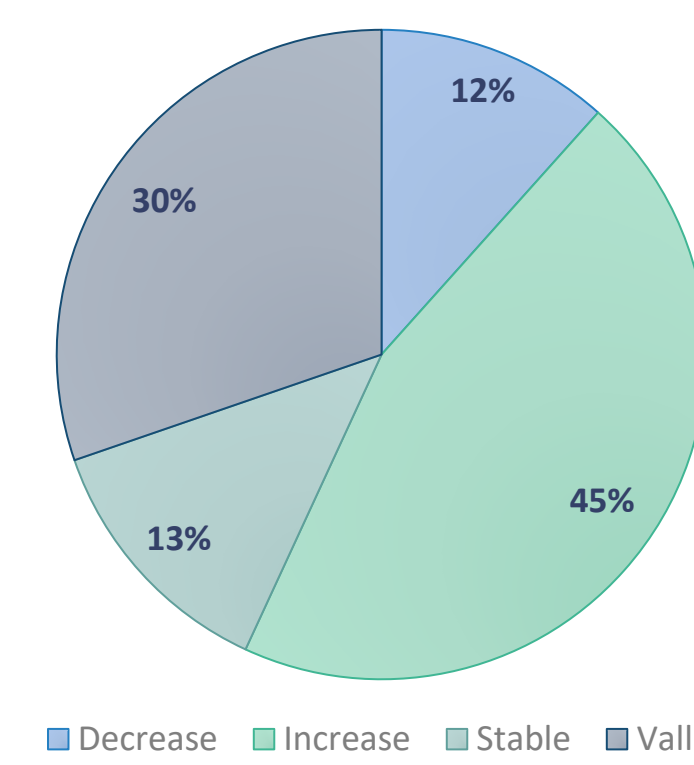
RQ-2: Are there differences in CBM-results regarding sex?

RQ-3: Are there differences in confidence regarding curricular area?

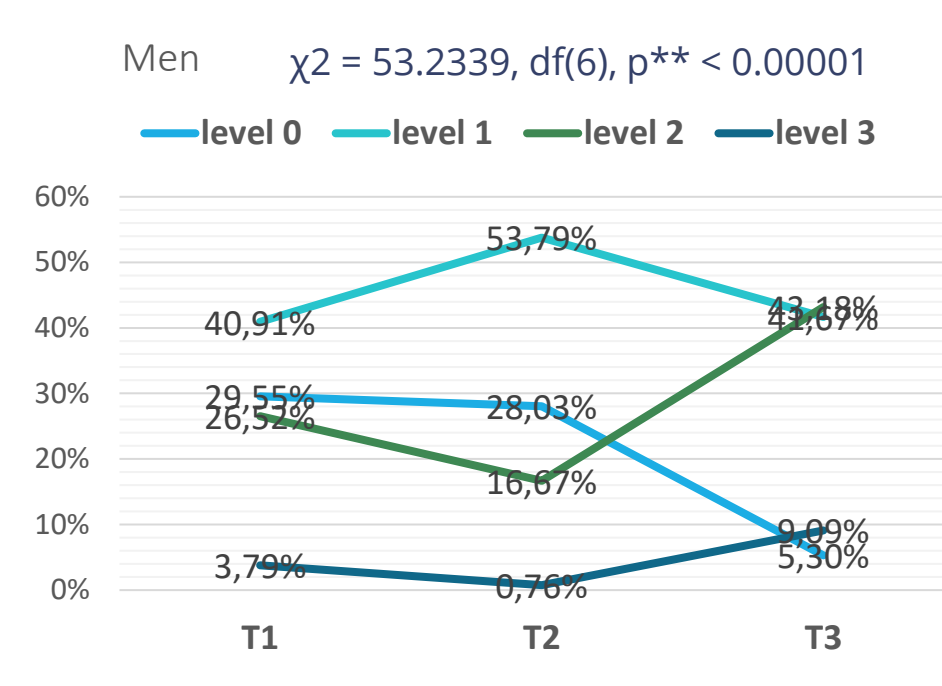
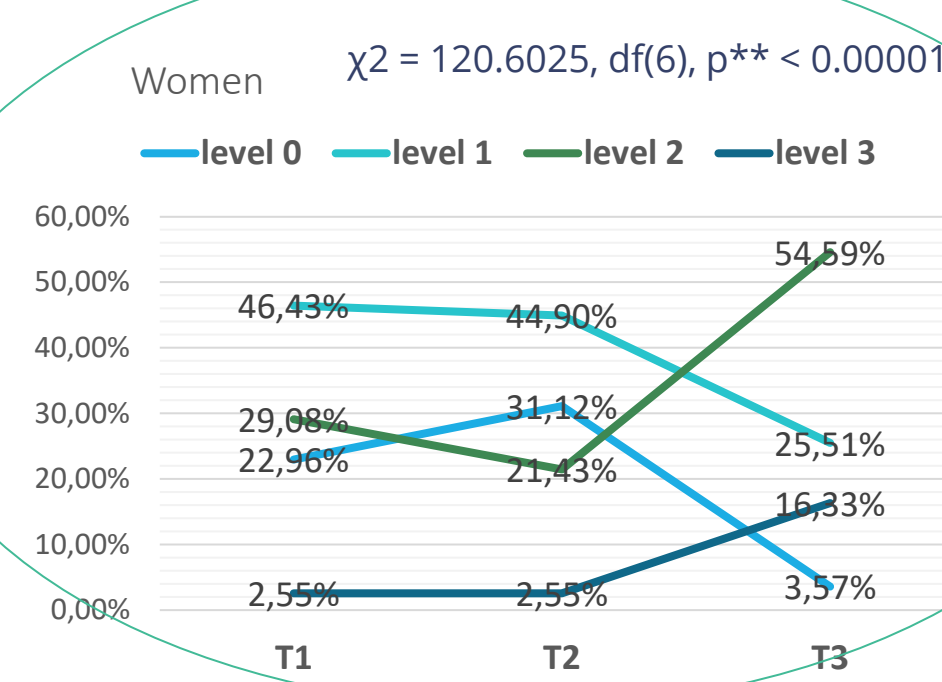
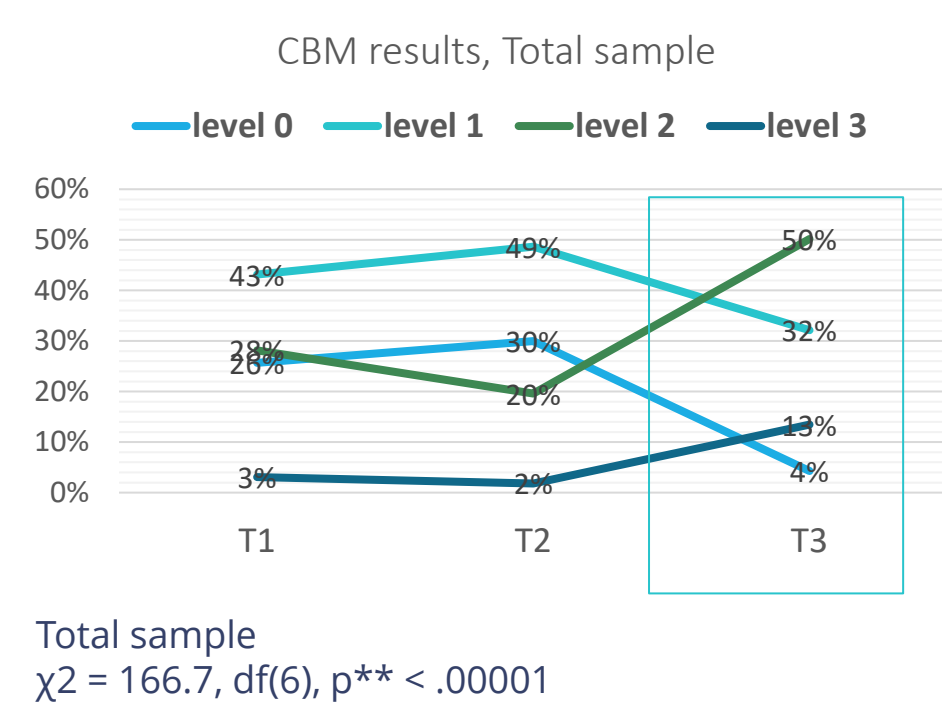
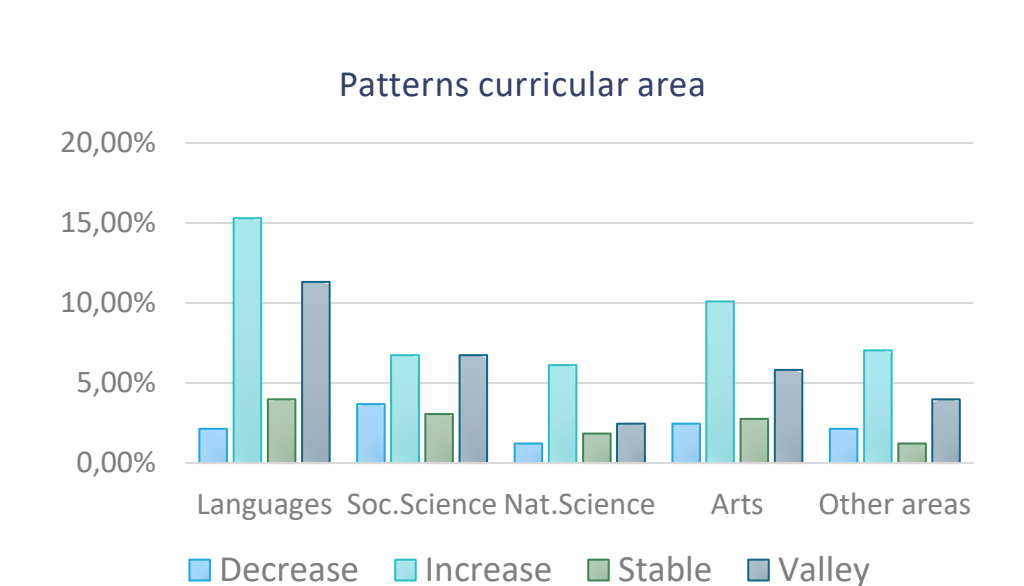
RQ-4: Are there differences in confidence regarding sex?

Results

Total sample, CBM results patterns

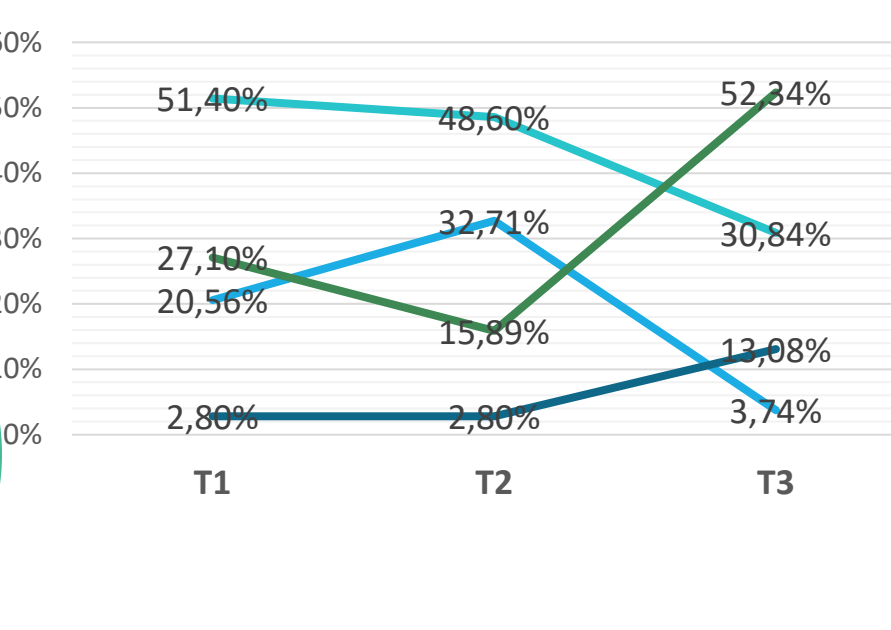


No difference per curricular area nor sex

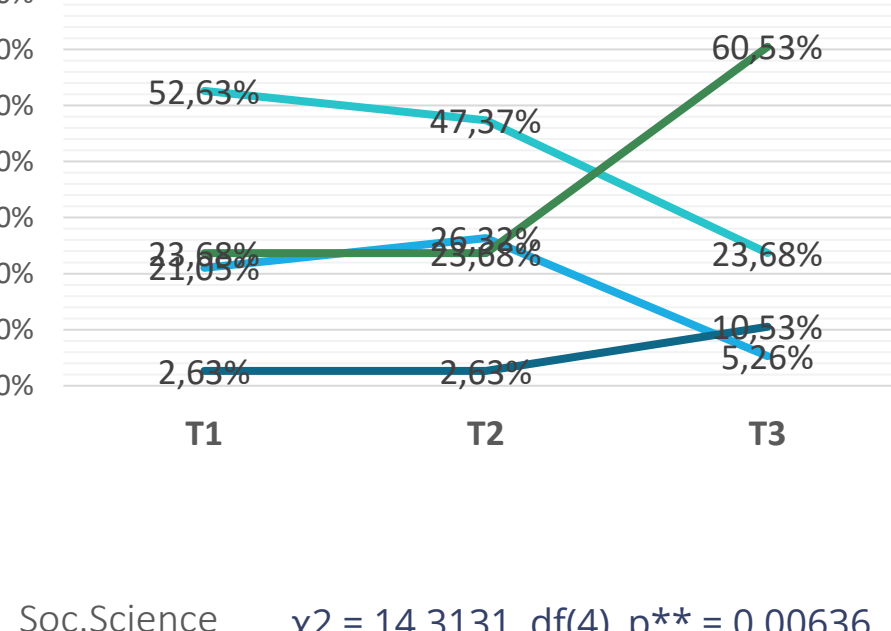


Inter-sex
 T1: $\chi^2 = 17.5478$, $df(3)$, $p^{**} = .000545$
 T2: $\chi^2 = 3.8432$, $df(3)$, $p = .2789$
 T3: $\chi^2 = 12.1318$, $df(3)$, $p^{**} = .0069$

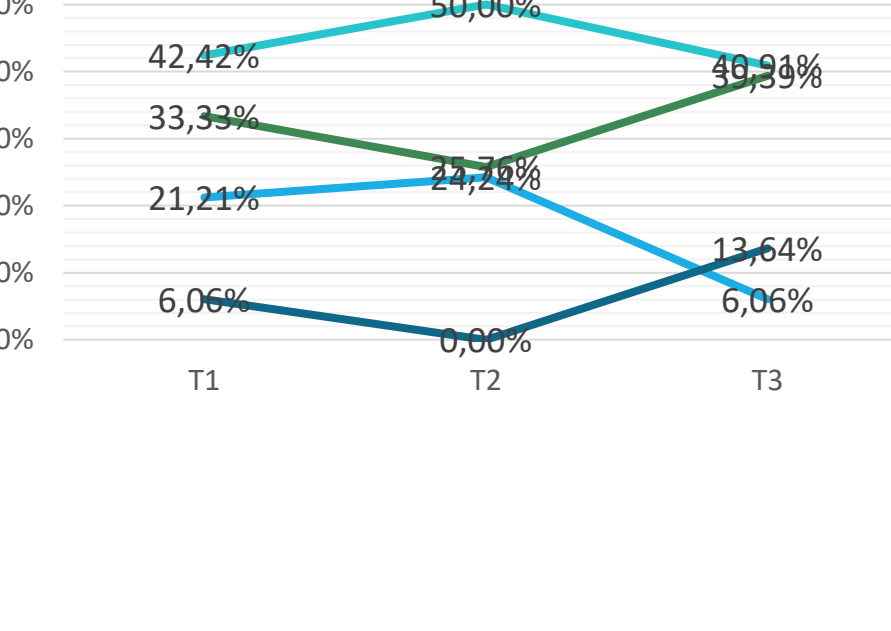
Languages $\chi^2 = 54.6564$, $df(4)$, $p^{**} < .00001$



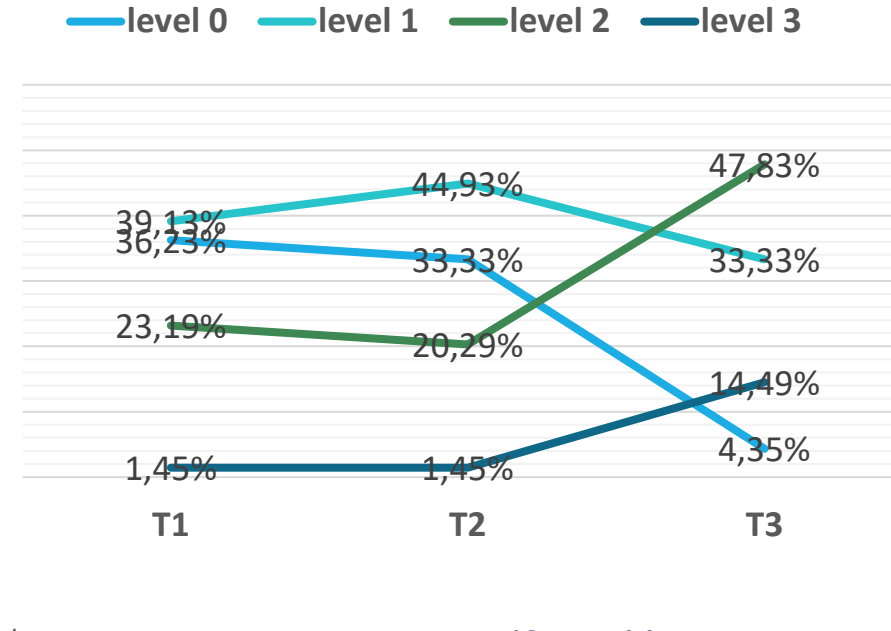
Nat.Science $\chi^2 = 20.9247$, $df(4)$, $p^{**} = 0.000029$



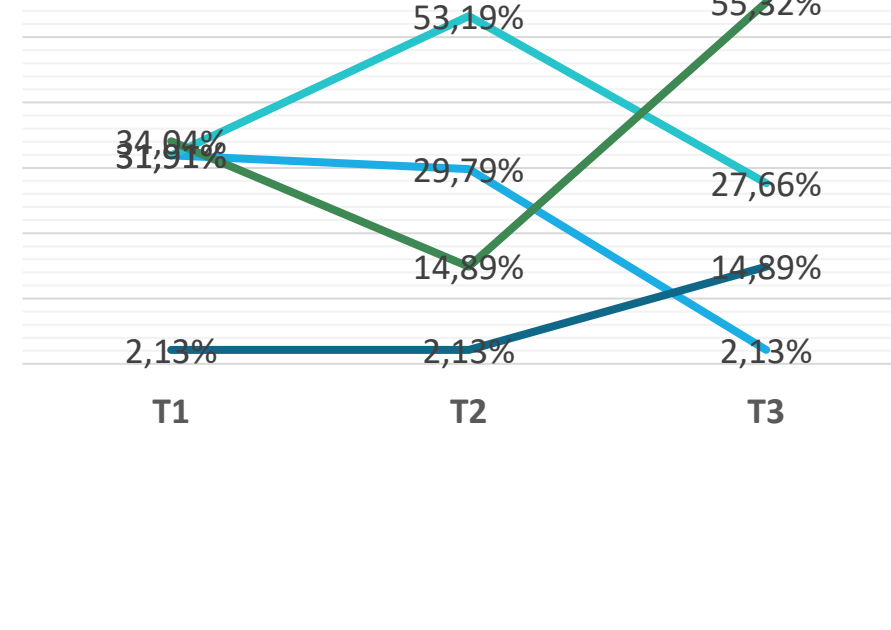
Soc.Science $\chi^2 = 14.3131$, $df(4)$, $p^{**} = 0.00636$



Arts $\chi^2 = 38.1169$, $df(4)$, $p^{**} < .00001$

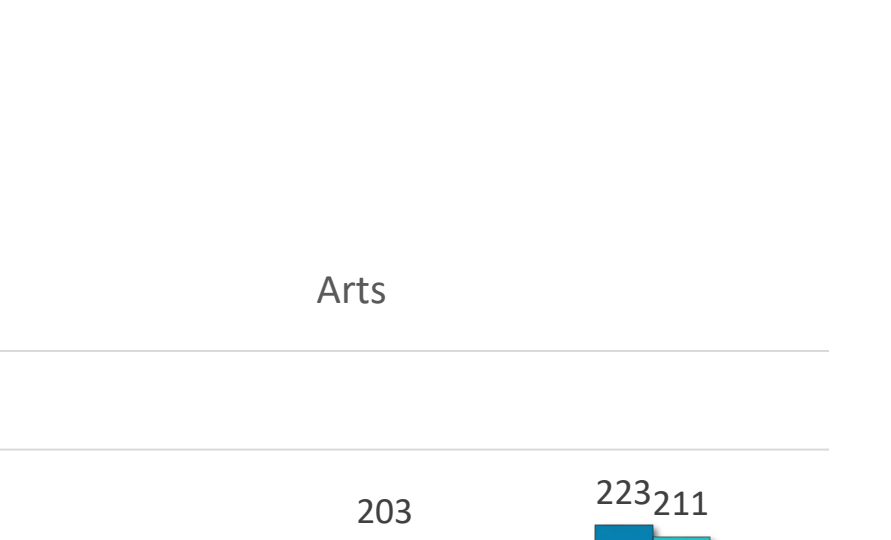
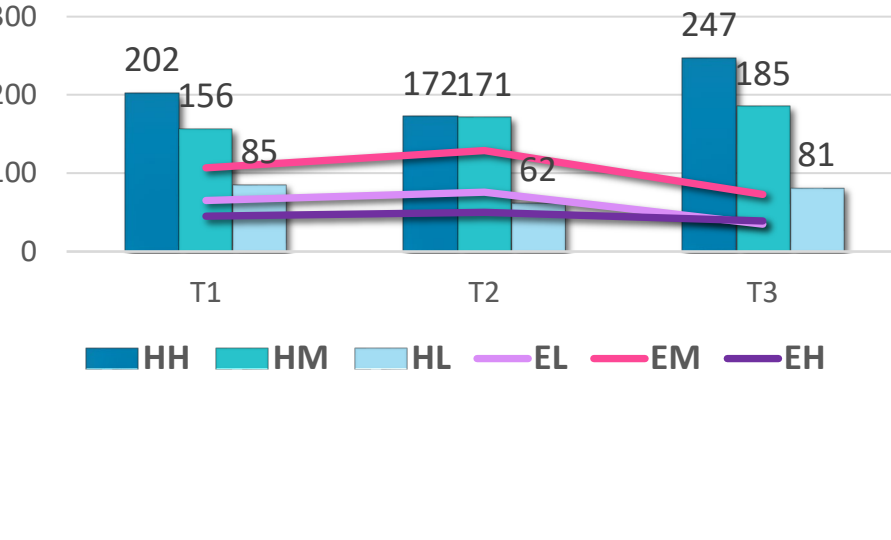
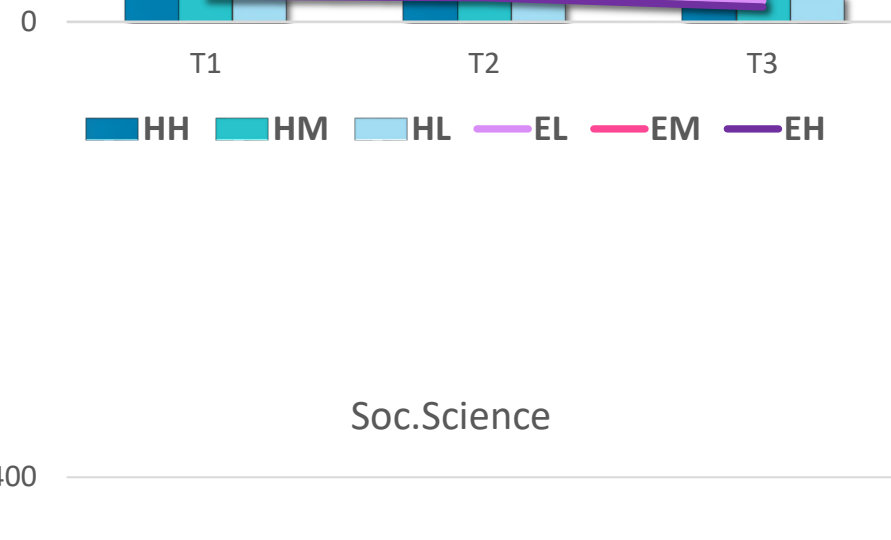
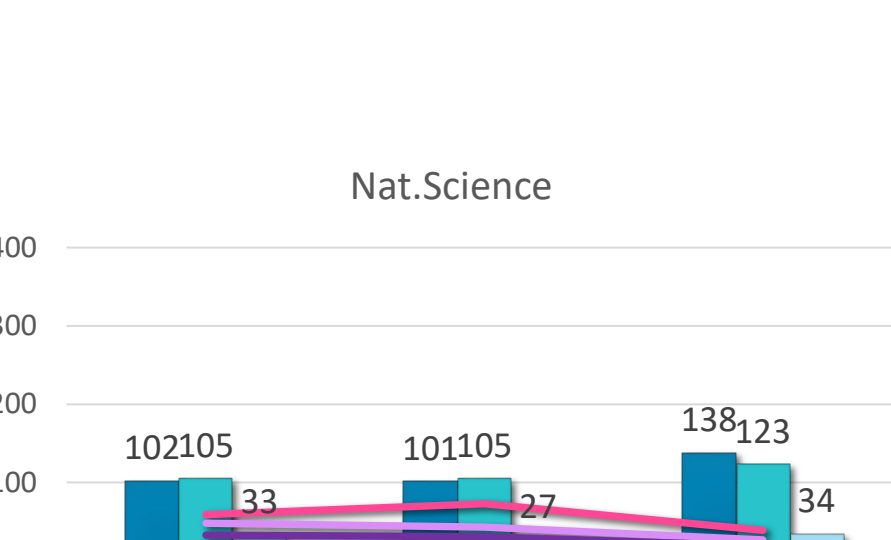
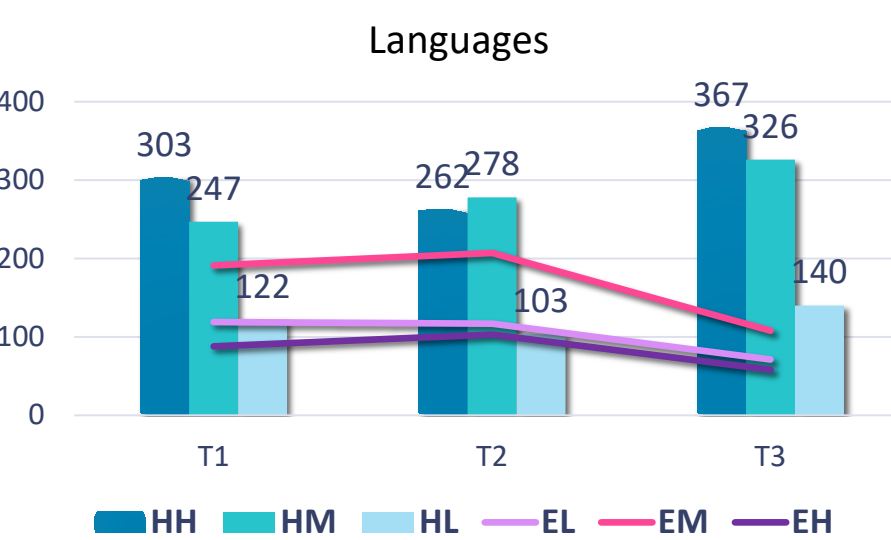
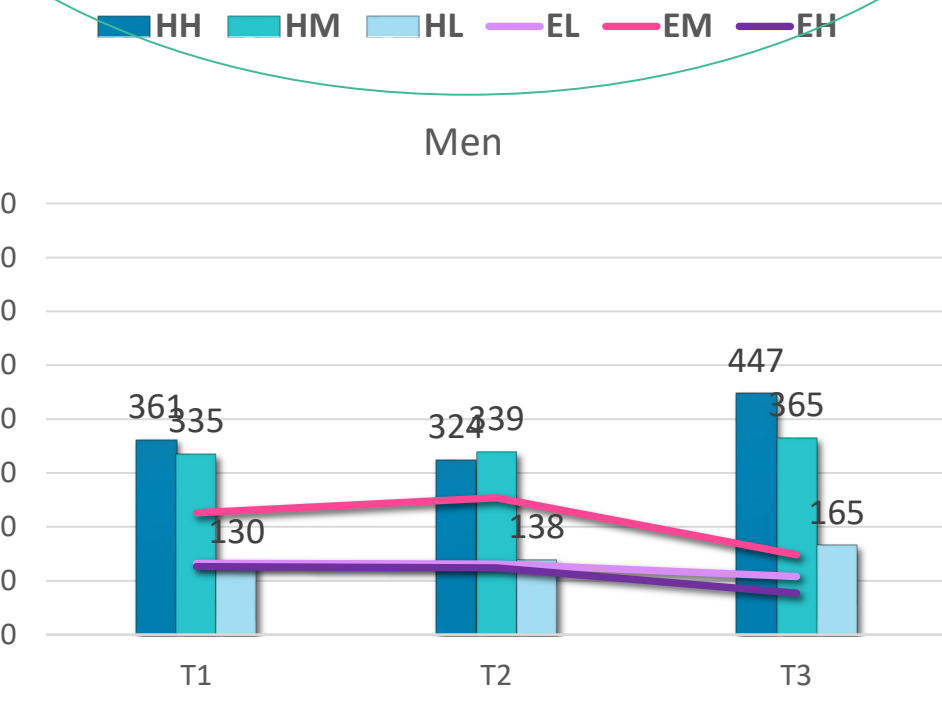
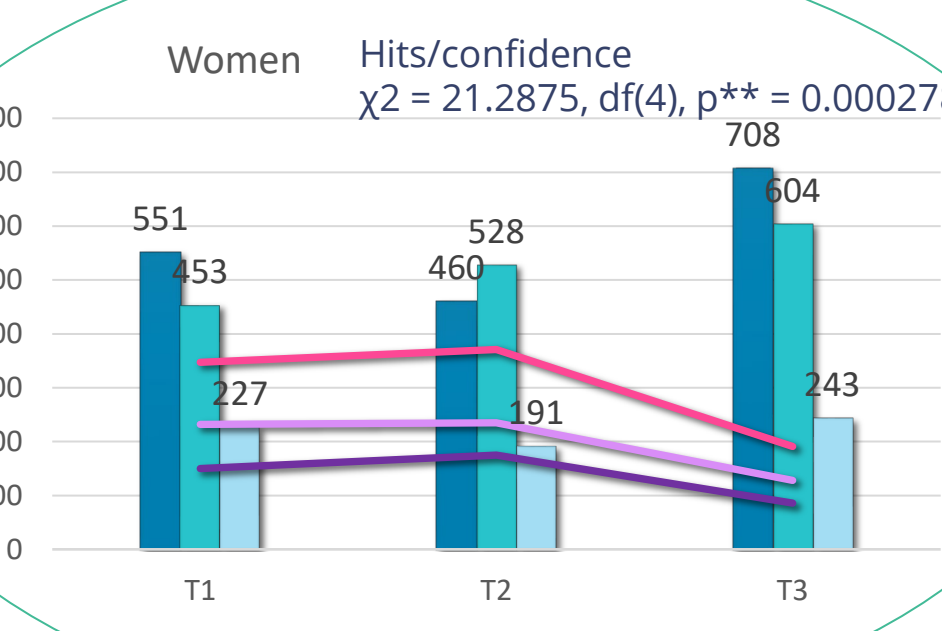
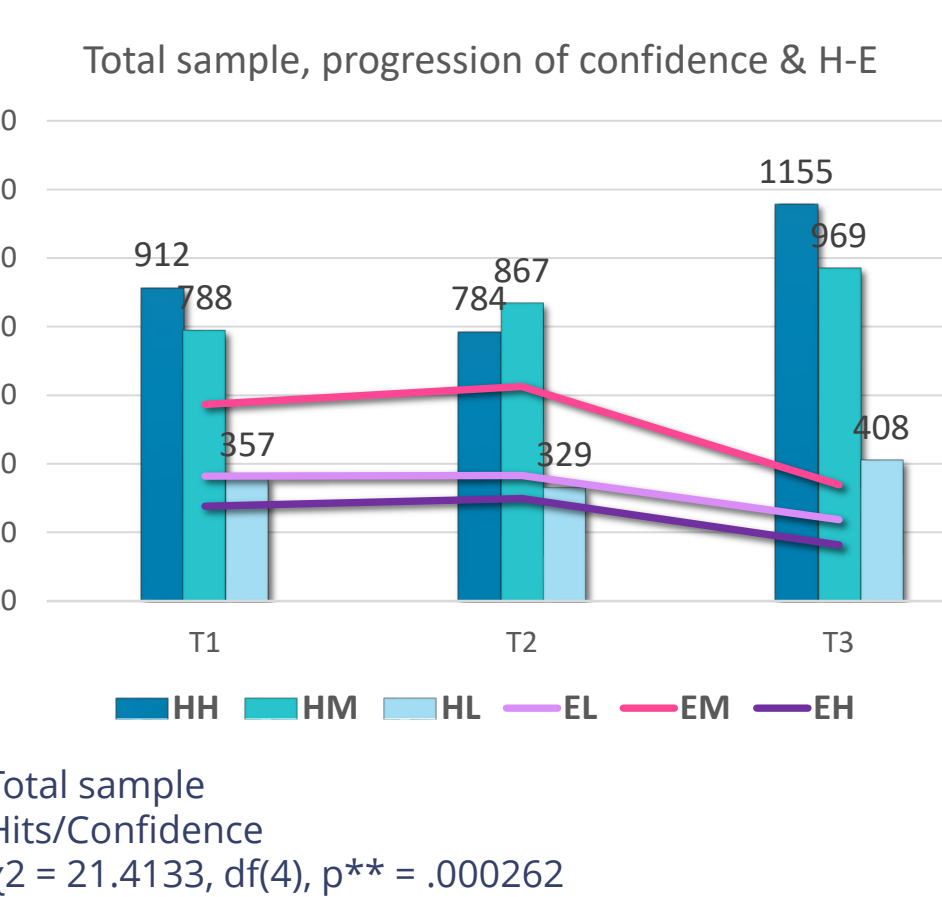


Other areas $\chi^2 = 28.1766$, $df(4)$, $p^{**} < .00001$



RQ1 + RQ2

RQ3 + RQ4



Conclusions:

- No, we found no differences in CBM results in terms of curricular area. Students' disciplinary background does not affect.
- No, we found no differences in self-confidence in terms of curricular area. Students' disciplinary background does not affect.
- Yes, we found differences in CBM results in terms of sex. Women get significantly better results at third test, after two previous trials and after significantly worse results in first trial.
- Yes, we found differences in self-confidence in terms of sex. Women fluctuate stronger and gain significantly better self-confidence by the third attempt compared to men.

These results are all positive as much as they offer new directions of research and instructional design for improving formative practices not only in teacher education but also in other areas. In fact, prior studies do not offer evidence on gender-differences (Gardner-Medwin, 2006), however our results point to these kind of differences and hence to the interest of considering particular instructional strategies to:

- Support women in their loss of self-competence and confidence
- Support men in a more self-critical reflection process

Qualitative results of students' guided reflection are still to be analysed. In coherence with these first analysis of quantitative data, we want to inquire further on gender-differences and on other contextual conditions such as previous education level to access the Teacher Education masters program (Bachelor, Postgraduate, Doctorate)

Some references

Barr, D. A., & Burke, J. R. (2013). Using confidence-based marking in a laboratory setting: A tool for student self-assessment and learning. *Journal of Chiropractic Education*, 27(1), 21-26.
 Gardner-Medwin, A. (2006). Confidence-based Marking: towards deeper learning and better exams. In Bryan, C. & Clegg, K. (eds) *Innovative assessment in Higher Education*. pp.141-149. Routledge.
 Remesal, A., Vega, F., Alvarez-Brinquis, M., & Pérez-Clemente, G. (2019). Confidence based marking for SRL in Secondary Teacher Education: students' voice. EARLI 2019. Aachen, Germany, 12th-16th, August, 2019.

Challenging the traditional grading scheme for metacognitive engagement at teacher education