

Fostering Perceptions of Gender through Cooperative Learning

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Abstract: This article explores, quantitatively and qualitatively, how gender-neutral groups of pre-service teachers in homogenous and heterogeneous cooperative learning prioritize individual responsibility, promotive interaction, and positive interdependence. The study took place in the 2022–2023 academic year. The participants in this study were 535 pre-service teachers registered on Kindergarten, Primary, and Secondary Education undergraduate degree courses in the Faculty of Education and Psychology (FEP) at the University of Girona. In the study, the CAC instrument (20 items) was applied along with 11 items that were added. The results indicated that the participants scored higher in all the categories of cooperative learning when they were in homogenous groups than when in heterogeneous ones. Female students scored higher than male or non-binary students in all the cooperative learning categories in both types of cooperative structure. In both settings, female students valued individual responsibility higher, while non-binary individuals valued it lowest. Male students valued individual responsibility higher when working in heterogeneous groups. Most students believed that their role did not change when carrying out cooperative challenges. However, among those who did believe that their role altered, the majority were female. The study shows that while female, non-binary, and male pre-service teachers are equally sociable, they develop social skills differently. Diversity in educational institutions should therefore be taken into account as an influence on tertiary students' development and success in later life.

Keywords: cooperative learning; cooperative dimensions; cooperative groups; gender



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1. Introduction

Society is constantly changing and needs people who are authentic, creative, collaborative, competent, and responsible. This creates significant challenges for the education system, particularly tertiary education [1]. Most research into the education of pre-service teachers has concluded that they are committed to education, understand how to share goals, and employ innovative methods in the classroom. This is consistent with the educational model of the European Higher Education Area [2], which has the development of competences as one of its learning objectives. This model has influenced, and will continue to influence, university teaching and educational approaches, which must promote autonomous and cooperative learning. Learning through cooperative groups meets the requirement to encourage significant learning that allows pre-service teachers to confront real-life situations, ensuring equality of opportunities [3,4].

One of the issues that emerges from fostering competences and values in education is gender equality. The interaction between gender and sustainable development in education needs to be assessed, and the role education can play in understanding and improving inequality among individuals or on a larger scale needs to be strengthened. A quality education that promotes gender equality and reduces inequalities is primarily dependent

on educational institutions providing sustainable educational approaches, values, and competences to future generations of students and professionals [5,6], given that students can bring these skills and values to the labor force [7]. This study focuses on whether there are gender differences between cooperative homogeneous and heterogeneous groups when pre-service teachers are embedded in cooperative learning.

1.1. Cooperative Learning

Cooperative learning is an educational learning approach in which students cooperate in small groups including diverse levels to attain a common goal [8]. According to Johnson et al. [9], cooperative learning involves students collaborating in small groups to maximize their own and others' learning. Other, fuller definitions agree that cooperative learning must have the following five important elements [8]:

1. Positive interdependence. Each member of the group requires the help of the others to achieve a common goal (although this does not mean each individual cannot achieve multiple goals). As a result, everyone wins and no one loses.
2. Individual responsibility. Each member of a cooperative group is responsible for a portion of the task, even if it is minor. As a result, all members contribute in some way.
3. Face-to-face interaction. Mutual support is required to complete tasks successfully, because without support, there is no cooperation [10]. According to Pujolàs [11], instilling confidence in students through motivation, goals, feedback, practice, etc., is essential.
4. Group processing. It is important that the group evaluates how it works so that it improves. The information required to complete the task must be processed in a way that all members can take on board and use in their personal learning.
5. Interpersonal skills. Students must learn positive relationship skills such as listening, conflict resolution through dialogue, motivating, criticizing ideas rather than individuals, respecting turns, sharing materials and space, recognizing the success of others, and defending one's own point of view without harming anyone. According to Colomer et al. [6], teacher-led feedback improves interpersonal skills by providing "relevant information to improve the process and produce significant learning outcomes, facilitating self-regulation of learning and provoking cognitive challenge" (p. 7).

1.2. Structuring Cooperative Groups

In cooperative learning, students set up small groups. They receive instructions from the teacher before beginning work on the task they have been assigned. Each member of the group takes on a responsibility. The members of the group contribute to completing the work and achieving a common goal through mutual assistance, interaction, and communication. The group's performance depends on its members and their roles [4].

Cooperative groups can be homogeneous or heterogeneous, depending on the level and gender of the members. Homogeneous groups based on student level are organized according to their abilities or weaknesses in specific subjects [12,13]. This is a common practice throughout the world, due to the belief that it maximizes the efficiency and effectiveness of teaching and learning. In contrast, heterogeneous groups [14,15] bring together students with diverse abilities who collaborate to assist and motivate one another to achieve personal and group goals [5].

According to Cotič et al. [16], the effectiveness of grouping students into homogeneous or heterogeneous groups varies significantly depending on how the groups work. For example, those who teach in homogeneous groups believe that their students will achieve greater success than those who teach in heterogeneous groups. Other studies, such as those conducted by Černilec et al. [17] that compared the use of the two modes, found that heterogeneous groups performed better. Teachers can choose to use homogeneous or heterogeneous groups based on student performance or interests [18–21] and the type of activity offered.

All members of a group must take on a certain role and understand their role in the group; in this way, everyone participates and has a responsibility. There are various positions, each with a specific function that must be performed. Examples of these include manager or coordinator, assistant to the manager or coordinator, speaker, secretary, and materials manager [22].

1.3. Composition of Cooperative Groups by Gender

A significant but little-studied factor in the composition of cooperative groups is gender. It is essential for groups to be heterogeneous in terms of gender, because women and men can have higher scores for different abilities. Various sociological studies have examined how both genders may differ in developing gender relationships when embedded in cooperative networks [23–25]. However, there are contradictory studies in this regard. Some authors have found that men have much more cooperative tendencies than women [26–29], whereas others, such as Fox et al. [30], believe that women are more likely to respond to stressful situations by seeking and providing support. Men, according to Nickels et al. and Bedrov et al. [31,32], are more likely to react egoistically and competitively.

In a study conducted by Fernández-Rio et al. [33], girls demonstrated superior levels of competence in the five variables previously cited by Johnson and Johnson [8] as necessary for the effectiveness of cooperative learning. The most recent international reports show that there is a gender gap in, for example, reading comprehension [34]. In contrast, Spadaro et al. [35] found no differences between men and women in cooperation skills, though they did find that the levels of cooperation were slightly higher in studies with predominantly female participants. Several researchers have hypothesized that women collaborate in subtle, non-confrontational strategies [36–38]. Cassar and Ringdon [39] argued that women may inhibit competing behaviors to preserve the possibility of cooperative relationships.

Groups that are heterogeneous in terms of gender can benefit from the influence of the different competitive pressures that men and women face [40]. According to Cañabate et al. [41], cooperative learning can help reduce gender differences and disparities. It is therefore important that pre-service teachers put their cooperative learning skills into practice, forming heterogeneous gender groups when possible, because in the future they will need to assign cooperative tasks to their students and rely on interpersonal relationships in the classroom to solve creative and constructive problems. Vicent and Aparicio-Flores [42] reported that most participants in a study conducted with first- and second-year Elementary Education students agreed that cooperative work was beneficial for improving social skills and relationships with their peers [43].

The main objective of our research is to analyze the differences and similarities in homogeneous and heterogeneous cooperative groups in relation to gender, based on the evaluations of students who participated in them.

We aimed to achieve this objective by:

Visualizing and understanding changes in roles and behaviors in different types of cooperative groups based on gender, if there are any.

Contrasting whether individual responsibility, mutual assistance, and listening regarding gender are valued in the same ways or differently in homogeneous and heterogeneous groups.

2. Materials and Methods

The instrument we used was based on the Cooperative Learning Questionnaire (CAC) by Fernández-Rio et al. [44], which is completely closed. A quantitative method was used, combined with a qualitative method where the students were asked to explain their answers to five of the eleven questions added to the beginning of the instrument.

The collaborative learning was led by four professors with expertise in the field. Before the research began, the researchers held a 1.5-h seminar on cooperative learning for all the participants, in which the characteristics of cooperation were defined, especially the organization of cooperative groups; the possible roles within the groups, the basic

conceptions of gender roles, and their influence on group participation were explored. Additionally, a description of the cooperative challenges that needed to be addressed was provided. Specifically, in the field of educational research, students were required to conduct a small research project in cooperative groups to enhance educational practice. In this research, students had not only to set objectives but also develop an instrument that each member of the group subsequently applied in their practicum center. The groups were formed voluntarily, both homogeneously and heterogeneously, and within each group, participants distributed roles. The vast majority of participants had previously worked in both types of cooperative groups in various assignments for their bachelor or master degrees, and as a result, they were familiar with the cooperative groups' structures and functions.

Cooperative challenges are activities that promote active participation through problem solving. The students are the protagonists of learning and developing a positive interdependence that facilitates the development of life skills. Cooperative challenges are a structured technique that is part of cooperative learning in education. They are small group activities which all participants must participate in to achieve a common goal. The fundamental characteristics of cooperative learning have already been established [41,45]. Each team must not only agree on how to perform as a group but also, more importantly, consider and value the individual characteristics of each member [5]. Cooperative challenges are cooperative learning activities with a clearly defined objective. They are collective (team) challenges in which the group must first solve a concrete problem with multiple solutions and then reflect on the entire process. A specific solution to a challenge that may be valid for one team may not be valid for another. Cooperative challenges enhance the acquisition of skills through individual cooperation in teamwork, the intrapersonal construction of professional identity, and the definition of strategic decisions [5,8].

The cooperative project took place in the second semester of the 2022–2023 academic year. There were 12 one-and-a-half hour sessions during the 14 weeks of the semester. The first week was dedicated to the presentation of the activity and in the last week the conclusions were discussed. After the cooperative project had finished, the students were given a questionnaire to complete on paper. They were asked to reflect on gender inequality and learning behavior patterns that would lead to more equitable relationships between men and women in the future [7,41].

2.1. Participants

The participants in this study were 625 pre-service teachers registered on Kindergarten, Primary (from 1st to 4th year), and Secondary Education undergraduate degree courses in the Faculty of Education and Psychology (FEP) at the University of Girona. The participants' ages varied from 18 to 25 and they were from the middle class. The eventual data-generating sample was 535 students, of whom 174 were male, 353 female, and 8 identified as non-binary. The 174 men and 8 non-binary gender individuals took part and 174 of the 353 women were chosen using a random systematic selection process. The majority of those surveyed had experience of both homogeneous and heterogeneous cooperative groups (86.2% and 94.7%, respectively) and, therefore, had knowledge of how both modalities work. This is because in both the bachelor's and master's programs, a high number of tasks are carried out in cooperative groups.

2.2. The Instrument

The study was based on the CAC instrument (20-item) [44]. (It should be emphasized that the authors' written consent was obtained before using their work). All the components of the CAC instrument were included, although they were reformulated in the first person. The CAC instrument has 5 categories: promoting interaction; positive interdependence; individual responsibility; group processing; and social skills. Each category has four items. Even in the most difficult circumstances, confirmatory factor analysis confirmed that all the reliability indices were satisfactory [44]. The questionnaire was valid.

The CAC instrument is a straightforward tool for assessing each key component of cooperative learning and provides a way of measuring cooperation, leading us to believe that the categories and items were appropriate for FEP students at the University of Girona. However, in this study, eleven additional items were added (see Table 1). The first four questions were intended to get to know the student (gender, course, and whether they had worked in homogeneous or heterogeneous groups), and the next seven questions (numbers 5–11) were intended to obtain their thoughts on how cooperative groups related to gender. It is important to note that 4 of them required a qualitative analysis because the student had to justify their choice after responding positively or negatively to the question (questions 5, 7, 9, and 11). Finally, question 10 was completely open.

Table 1. Introductory items added to the CAC instrument.

(1) Gender
(2) Year of undergraduate degree
(3) Have you worked in homogenous cooperative groups (with respect to gender) before? Yes/No
(4) Have you worked in heterogeneous cooperative groups (with respect to gender) before? Yes/No
(5) Did your role in a cooperative group change depending on whether it was homogeneous or heterogeneous in terms of gender? Yes/No. Please explain your answer.
(6) Did you notice changes in the behavior of your colleagues depending on whether the group was homogeneous or heterogeneous? Yes/No
(7) If so, what changes did you observe and why do you think they happened?
(8) Was your individual responsibility the same when you worked in one type of group or the other? Yes/No
(9) Do you think that your contributions were heard and valued in the same way in a heterogeneous group as in a homogeneous group? If not, please explain your answer.
(10) How would you rate and what differences did you find in mutual aid within a homogeneous or heterogeneous group. Please explain your answer.
(11) Do you think that gender conditioned the relationships that were established within the cooperative group? Yes/No. If so, please explain how.

Once these eleven items were answered, the students were then asked to score the CAC items on a scale of 1 to 5, based on their perceptions, in terms of gender, of their most recent participation in homogeneous and heterogeneous cooperative groups.

2.3. Statistical Analysis

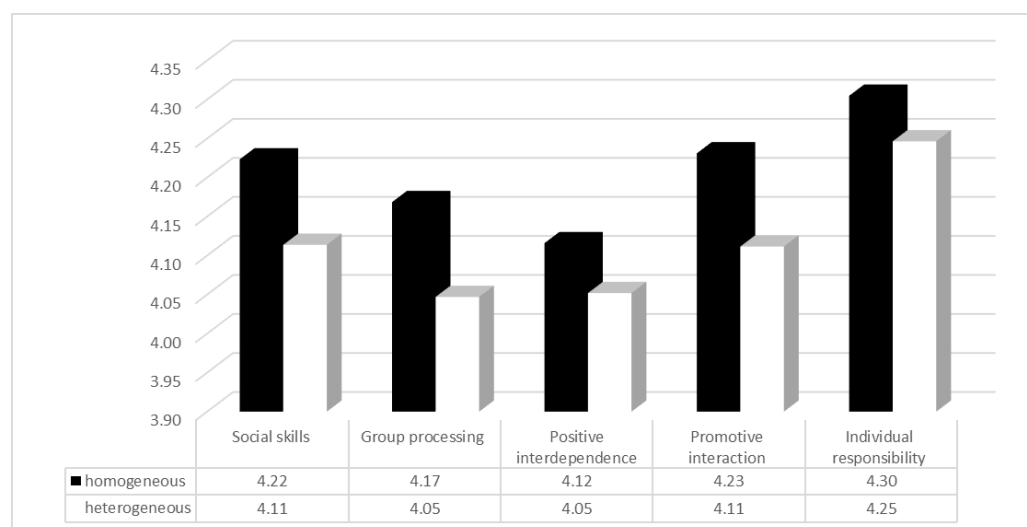
Before analyzing the data, data screening was carried out and no multivariate atypical cases were detected. The normality of the variables was also verified using the Kolmogorov–Smirnov test (for factors that had more than 50 cases) and in all of them the significance turned out to be less than 0.01, which indicated that they did not have a normal distribution. Therefore, the non-parametric Kruskal–Wallis test was used in the inferential analyses to relate a quantitative variable to a categorized variable, and the Spearman correlation to relate two quantitative variables. An analysis of the internal consistency of the instrument (Cronbach’s Alpha) was also carried out: the consistency of the ratings of both the homogeneous and the heterogeneous groups was very high (0.977 and 0.973, respectively). In both the homogeneous and heterogeneous cooperative groups, the internal consistency of all the subscales was greater than 0.800 (Table 2). As indicated by George and Mallery [46], this is a good level of consistency.

Table 2. Internal consistency of the subscales of the instrument (Cronbach's Alpha).

Homogeneous Groups		Heterogeneous Groups
Social skills	89	86
Group processing	90	88
Positive interdependence	86	85
Promotional interaction	90	88
Individual responsibility	93	93

3. Results

The pre-service teachers valued work in homogeneous groups more in than in heterogeneous groups, for all the factor subscales (see Figure 1). In both homogeneous and heterogeneous groups, the subscale with the highest value was individual responsibility. The lowest value in homogeneous groups was positive interdependence. In heterogeneous groups, group processing and positive interdependence both had the same lowest value. The inferential analysis, by means of the Spearman correlation, indicated that there were significant differences between all the subscales with respect to the type of cooperative group (homogeneous or heterogeneous). All of them had higher values in homogeneous groups: social skills ($r = 0.850, p < 0.01$); group processing ($r = 0.850, p < 0.01$); positive interdependence ($r = 0.880, p < 0.01$); promotional interaction ($r = 0.879, p < 0.01$); individual responsibility ($r = 0.931, p < 0.01$).

**Figure 1.** Comparison of ratings given to homogeneous and heterogeneous cooperative groups.

In the assessment of the homogeneous cooperative groups by gender (Figure 2), women scored the highest for all the subscales, followed by non-binary individuals and then men. All the genders agreed that the subscale with the highest value was individual responsibility and the lowest was positive interdependence. The inferential analysis of the subscales with respect to gender (Kruskal–Wallis test) indicated that there were significant differences in all the subscales ($p < 0.01$). Women scored the highest, followed by non-binary individuals, except for promotional interaction, where men had the second highest value.

In the heterogeneous groups (Figure 3), the individual responsibility subscale was valued most highly by both men and women, while the subscale non-binary individuals valued most highly was group processing. For women, the subscale with the lowest value was positive interdependence, but with very little difference compared to the other subscales, while for men, group processing had the lowest value, but also with little

difference compared to the other subscales. Non-binary individuals valued individual responsibility the least.

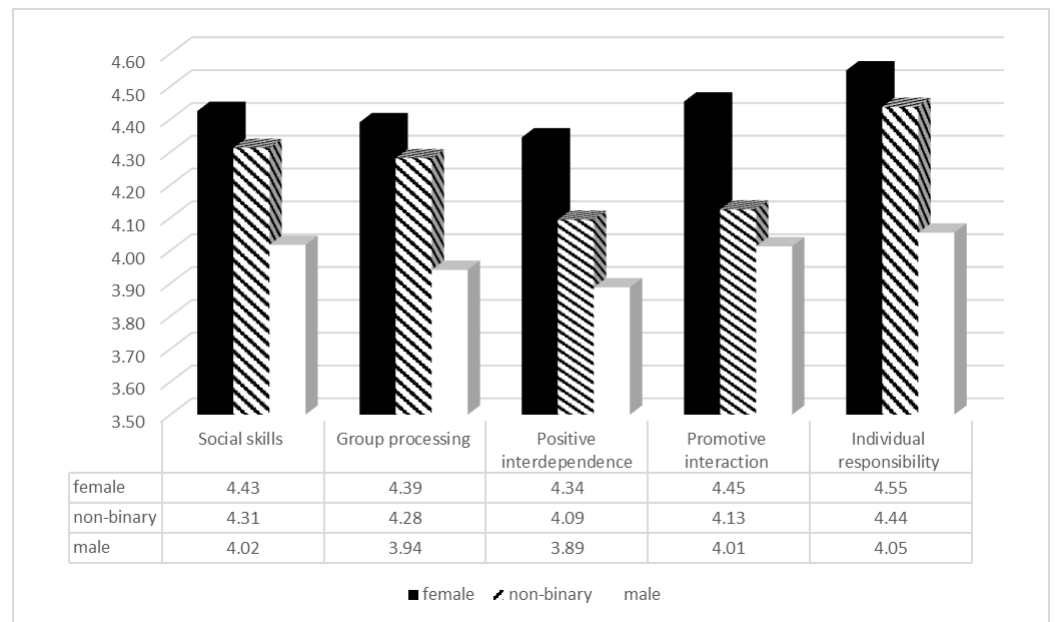


Figure 2. Ratings of the subscales in the homogeneous cooperative groups with respect to gender.

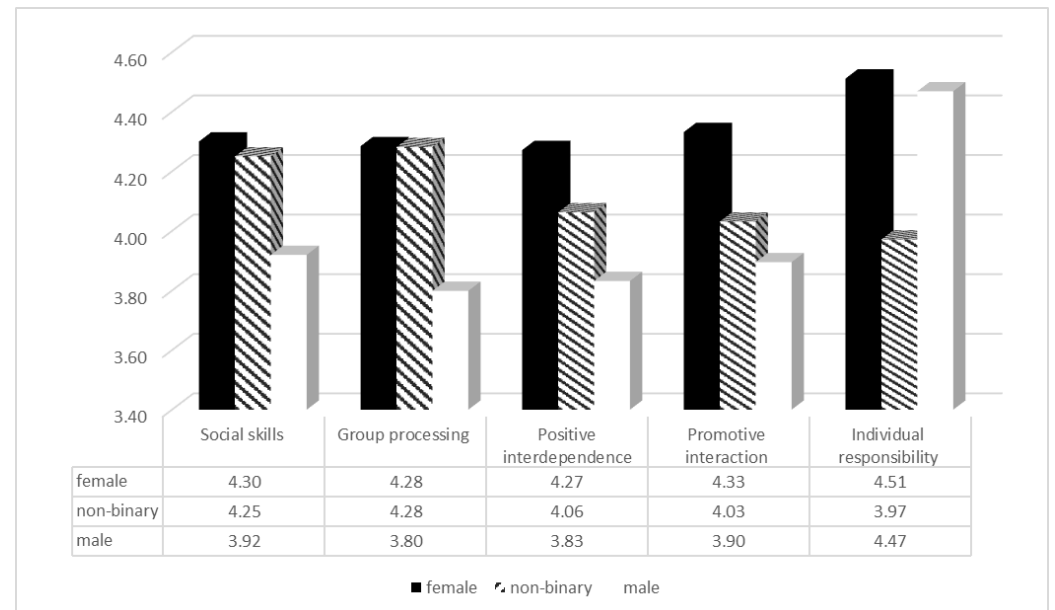


Figure 3. Ratings of the subscales in heterogeneous cooperative groups with respect to gender.

As was the case for the homogeneous cooperative groups, the inferential analysis (Kruskal–Wallis test) indicated that all the differences were significant ($p < 0.01$) and that women valued all the subscales the most, followed non-binary individuals, except promotional interaction, which was valued second highest by men.

The next step was to qualitatively assess each of the five introductory items that were added to the CAC instrument to determine whether the students had participated in the various cooperative groups and to observe any changes that may have happened depending on whether the gender composition of the group was homogeneous or heterogeneous (Table 3). The scenarios chosen were those that best reflected the remarks of the majority of the participants.

Table 3. Introductory items added to the CAC instrument.

	Yes	No
Did your role in a cooperative group change depending on whether it was homogeneous or heterogeneous in terms of gender?	19.4%	80.6%
Did you think your coworkers' behavior changed depending on whether the group was homogeneous or heterogeneous?	40.4%	59.6%
Was your personal responsibility the same whether you worked in one kind of group or another?	86.0%	14.0%
Do you think that your contributions were heard and valued equally in heterogeneous groups and homogeneous groups?	77.5%	22.5%
Do you think that your gender affected the relationships that were established in the cooperative group?	22.2%	77.8%

Did your role in a cooperative group change depending on whether it was homogeneous or heterogeneous in terms of gender?

The majority of the sample responded “No” when asked whether their role changed depending on whether they were part of a homogenous or heterogeneous group. Fisher’s test revealed that of those students who did believe their position changed, the majority were female ($p = .01$). Depending on the make-up of the group, most participants who believed that their job had truly changed gave the following explanations:

Gender affected their role.

Some men said: “We shared tasks between men and women without thinking” (case 7); “Sometimes men tended to want to take a more prominent or leadership role” (case 3); “I had the feeling that in homogenous groups I was given more shared responsibility with respect to other members” (case 77). Women’s explanations included: “Sometimes, leadership roles were defined according to gender” (case 46); “When I was with men, my role wasn’t so important, I felt more secondary, but when I was with women, we all had more or less the same skill level, I participated more and I felt more comfortable and safe” (case 108); or “With the men I had a more passive role” (case 144); “In the homogenous groups, maybe I had more of a leadership role and in the heterogeneous ones, I did more of what they asked me to do” (case 119).

The roles were different because they felt more secure in homogenous groups and more threatened in those that were heterogeneous.

This explanation was only given by women: “I felt more or less self-conscious depending on what activity we were doing”; “I sometimes felt inferior in heterogeneous groups, perhaps because of my personality” (both instance 101); “I was often more nervous if I worked together with other males and especially if I had never worked with them before” (instance 145); “I felt more at ease and liberated when I was in homogenous groups; I felt more understood and I was able to give more of my opinion” (case 110).

A lack of initiative on the part of some group members.

Some female participants revealed that: “I sensed a lack of initiative from my colleagues when working in female homogeneous groups. When I worked in heterogeneous groups with a significant male presence, this wasn’t a problem; we worked more dynamically to promote a positive climate” (case 155).

Did you think your coworkers' behavior changed depending on whether the group was homogeneous or heterogeneous?

The majority of the participants did not observe changes in the behavior of their peers depending on whether the group was homogeneous or heterogeneous. The inferential analysis by gender (Fisher’s correlation) showed that of those who did consider that there were changes, the majority were men ($p = 0.010$). We have grouped the changes most noticed by individuals of different genders into the following categories:

Greater restraint in heterogeneous groups.

Some men said: “I saw that some female colleagues were more passive when there were more men in the group” (case 139); “Perhaps, in general, there was more shyness

(it depends on the person) when you were in a heterogeneous group. I think this happened because if a man or a woman has always had a group of colleagues of the same gender, working in a heterogeneous group can cause insecurity" (case 161). Women stated: "Changes were observed in some people's behavior, especially self-restraint (for example, not expressing opinions so easily), or even a tendency to act more independently, without the cooperation of their peers" (instance 11); "There were women who didn't give their opinion when there were men in the group" (instance 150).

Performance variations among diverse populations.

Women claimed that: "The men were lazier" and "They did just enough work to pass; they didn't aim for the highest grade". The men argued that: "The women were the ones in charge, and I understand that men can also be in charge"; "Women usually choose to work in groups with no men" (cases 3 and 26); "Women tended to be more predisposed to working" (instance 63); "Men showed less dedication and the women were usually more dedicated and constant" (case 94).

A wider range of viewpoints in groups with diverse backgrounds.

"There was greater diversity in heterogeneous groups" (case 73, female) and "In heterogeneous groups there was always a more varied discussion" (case 151, male). These claims were true for both genders.

Increased involvement in homogenous groups.

Men and women agreed: "In the homogenous group there was more confidence, we were able to talk about things more calmly" (case 90, male); "If the group was homogenous, individuals were more active, comfortable, and felt that the majority of participants would respect their opinions and ideas" (case 117, female).

A different attitude and/or overperformance of men in heterogenous groups.

Men and women agreed that there was a difference in attitude: "The men underestimated the women" (case 108, female); "Perhaps yes, trying to impress people of the other gender or acting as, supposedly, is expected" (case 8, male); "I saw masculine attitudes of superiority" (case 114, female); "The men typically had a more dominant role" (case 107, female).

Was your personal responsibility the same whether you worked in one kind of group or another?

The majority thought that individual responsibility did not alter in relation to the type of group and that there were no appreciable differences between the genders ($p = 0.642$). It should be emphasized that no explanation was asked for in this question.

Do you think that your contributions were heard and valued equally in heterogeneous groups and homogeneous groups?

Most people thought that their contributions were valued and heard equally in heterogenous and homogeneous groups. There were noticeable differences between the genders (Fisher's correlation), with women being more likely than men to believe that their contributions were recognized equally in both groups ($p = 0.003$). The majority of students' explanations for thinking their contributions were not taken seriously and valued equally can be categorized as follows:

Differences in how contributions were evaluated in heterogenous groups based on gender.

Women stated: "Normally if there were men present, you thought that your comments were despised" (case 72); "The women wanted to make everything better, but the men tended to make everything the same" (case 103); "The men disconnected much more, so I don't think they listened much" (instance 17); "Men, being lazier, I feel that they "shared" their opinions because they didn't have to struggle to argue a contrary idea" (case 3); "In a homogenous group, I felt more supported and understood" (instance 114). There were several exceptions, for example: "In a heterogeneous group my opinion was much more respected" (case 155). Men, on the other hand, made the opposite observation: "I felt as though my opinion was more respected in a group where there were more women" (case 12).

The members of the group, not their gender, determined how the group performed.

Men, women, and non-binary individuals agreed on this common opinion: “It didn’t matter if it was a man or a woman; everything depended on the role of each person” (instance 96, male); “It varied depending on the characters of the people in the group and the roles they adopted, regardless of their gender” (case 117, female); “It depended on the group’s members and their personalities” (case 31, non-binary).

How and why do you think mutual aid differed between homogenous and heterogenous groups?

Most of the time, men did not see a difference in mutual aid depending on the type of group and gender, and women did. The explanations given by the students who said there were variations in mutual aid fell into one of the following categories:

In homogeneous groups, the members assisted each other more.

For example: “Normally, in homogenous groups, whether men or women, there was usually more complicity” (case 5, male); “Perhaps within a heterogeneous group, as there was more diversity of opinion, people didn’t feel as close to each other, which affected trust and, therefore, the quality of the product being worked on” (case 12, female).

Gender influenced how and why participants helped each other.

“The women helped each other” (instance 16, female); “Women tended to be more disciplined and take people’s emotions into account” (case 68, male).

The group members’ personalities affected mutual aid.

“I think it didn’t depend on gender, it depended on the character of each person” (instance 32, female); “Personally, I don’t think it had anything to do with whether a group was homogenous or heterogeneous, but rather with the trust among the members of the group” (case 160, male).

Do you think that gender affected the relationships that were established in the cooperative group?

Most people thought that the relationships created in a group were not influenced by gender. According to the inferential analysis (Fisher’s correlation), men thought this considerably more often than women ($p = 0.004$). The qualitative investigation suggested that different levels of involvement in work depending on the individual’s gender was given as an explanation by those who thought that gender influenced relationships.

Women especially suggested that men were less involved: “I think in this case men tried to be in groups with women so that they didn’t have to work so hard” (case 3); “The women worked more, the men worked less and they did it at the last minute” (instance 29).

Variations in how the groups were set up.

Finally, some students made the following observation: “Generally, groups were formed that tended to be of the same gender” (case 13, male). This observation shows that the influence of gender resulted in more homogeneous groups being formed.

4. Discussion

Some studies have postulated that gender does not influence the academic performance of students participating in cooperative learning groups [47–51]. However, they did not analyze the influence of gender on the composition of these groups. Other studies have shown that individual characteristics (competencies, personality traits, and gender) often influence team performance [52–55], demonstrating that to enhance team performance, the members of a group should have heterogeneous individual characteristics.

The results of this study show that most students have worked in cooperative groups that are both homogeneous and heterogeneous in terms of gender, and that gender mostly does not exert an influence but in some cases, it can influence the results achieved when working in cooperative groups. This shows the importance of continuing to work towards equality of conditions in education, thus strengthening equitable social relationships that reduce structural differences and negative behaviors towards others [4]. This study also highlights the importance of implementing active and participatory methodologies that provide feedback and reflection processes, and promote feelings of empathy and equality.

Students always valued working in homogeneous groups in terms of gender more than heterogeneous groups at all levels, but it is important to keep in mind that the

differences between the sum of the values of the two modalities was less than 2.5 percent. This difference results from the small percentage of students who preferred working in homogeneous groups and believe there are differences between homogeneous and heterogeneous groups. These results are consistent with those obtained by Fan et al. [7] and Veenman [56]. Women valued all the cooperative learning categories the highest, followed, usually, by non-binary individuals, except for the individual responsibility category in heterogeneous groups, which was valued higher by men than by non-binary individuals. These results are consistent with those reported by Fernández-Rio et al. [33], who concluded that women had higher levels in the five categories of cooperative learning [8].

An important finding was that, in both groups, women valued individual responsibility the highest, while non-binary individuals valued it the lowest, and men valued it more when working in heterogeneous groups.

Most of the participants in the study thought that their role did not change when performing tasks, but of those who did, the majority were female. For example, among women, those who indicated a change in their role stated that they had a more passive role and felt more inhibited in heterogeneous groups, preferring homogeneous groups. The few male students who said their role changed said they had more of a leadership role in heterogeneous groups, as was also found by McConlogue [57].

Various studies have previously shown behavioral changes in participation, language choice, and group well-being in homogeneous and heterogeneous cooperative groups in terms of gender [58,59]. This is confirmed by the current study, where men's behavior changed more, while both genders mentioned women being inhibited. Men said that women dominated more, which is a contradiction. Women stated that they worked harder and men were lazier. In general, a greater variety of opinions was seen in heterogeneous groups, so heterogeneous groups were more interesting than homogeneous ones. However, the participants indicated that group members participated more in homogeneous groups.

Individual responsibility was found not to change depending on the type of group, and there were no differences based on gender. This result is consistent with other studies that explain that responsibility in cooperative groups is linked to the intrinsic commitment of students to achieving specific outcomes [60].

The majority considered that contributions were equally listened to and valued in homogeneous and heterogeneous groups in terms of gender. This result is consistent with studies where all the participants who worked in cooperative groups agreed that they had positive experiences and felt that their opinions were heard during activities [4]. However, men predominantly did not find any difference in mutual interdependence based on the type of group, while the opposite was true for women. Studies that did not differentiate by gender concluded that cooperative learning included a reflective process [5] among the cooperative challenges, which allowed students to delve into how adjustments were made within the group. Differences were observed, for example, between homogeneous and heterogeneous groups in terms of instructional approaches and identity construction [5,43].

It is important to highlight that working in cooperative groups can sometimes cause various kinds of tension, due to different ways of working, diverse ways of thinking, etc. However, education should focus on non-discrimination [3,60] and ensure equality of opportunities in terms of gender, social status, language, etc. [61]. Moreover, diversity in educational systems should be considered as a source of growth and success in later life, as there are studies that have concluded that men and women are equally sociable but their sociability evolves differently [62].

As a concluding observation, it is noted that it will be crucial to develop educational models that promote a greater degree of cooperative learning, mutual comprehension, and cross-gender interaction throughout the training of pre-service teachers. Because each student has a role and a protagonism within the group, it is possible to place the student at the center of the many learning processes in cooperative learning groups. As a result, this methodology is optimal to address gender differences. In order to overcome gender differences, it is crucial to recognize inequality in the classroom, specifically in group

projects. As a result of this experience, it has become clear that through cooperative groups, it is possible to better understand the abilities of the various genders and to foster mutual aid through a teaching strategy that ensures the student's awareness of and control over their own non-conforming relationships.

This study's limitation is the small size of the studied sample, which makes it difficult to generalize the findings from the conclusions. As a result, one of the goals of this study is to expand the project to other universities. As a result, training for future teachers on the benefits of working in heterogeneous, cooperative groups is a necessary first step. In the future, it might be suggested to teachers to implement research projects with the goal of improving some aspect of their teaching practices, similar to the current work. They could then gather and analyze the data they had collected during their fieldwork, and apply the CAC with its additional questions to the cooperative group study participants so they could reflect on their actions in the local context and, at the same time, be able to compare the results with those of the current study.

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