

Emotional Dimorphism in Pedagogy: Assessing Gender Response to Active Methodologies

Pablo Rosser^{1*} and Seila Soler²

¹Universidad Internacional de la Rioja (España)

²Universidad Isabel I (España)

*Corresponding Author

Pablo Rosser, Universidad Internacional de la Rioja (España).

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Abstract

This study investigated the interplay between gender, emotions, and active methodologies in education. It was found that women had a higher average of affective responses before activities (2.874 compared to 2.607 in men). Subsequently, men experienced an increase in their affect average, while it remained stable for women.

The analysis showed an increase in positive emotions such as "Interested" and "Excited" across both genders. The Wilcoxon tests indicated significant differences in specific emotions before and after the activities. The Mann-Whitney Test revealed significant gender differences in emotional responses.

The hypothesis analysis demonstrated notable gender-based differences in affective changes, particularly more pronounced in women. This underscores the importance of considering gender-specific emotional differences in teaching.

From a pedagogical perspective, the findings highlight the necessity of tailoring teaching to these emotional differences and emphasize the effectiveness of active methodologies and critical pedagogy in enhancing engagement and participation. Educator training in gender emotional differences is crucial, along with ongoing reflection on teaching practices to effectively meet students' emotional needs and prioritize their emotional well-being and mental health.

Keywords: Active Methodology, Student Emotions, Critical Pedagogy, Educational Research, Outcomes and Analysis.

Summary on Population Type and Sample Size

This study examines the impact of active methodologies and critical pedagogy on the emotional spectrum of students through a quasi-experimental approach with repeated measures. The Positive and Negative Affect Schedule (PANAS) was administered via Google Forms to assess emotional changes pre- and post-intervention. Data analysis was conducted using SPSS Statistics software version 29.0.1.0, within a qualitative analytical framework.

The sample consisted of 48 third-year Primary Education students (7 males and 41 females) specializing in the Didactics of History in the year 2023. All enrolled students were included in the sample without any exclusion criteria. Over a period of 4 months, 7 pedagogical activities were implemented, designed to promote critical analysis and active participation, including text analysis, archaeological investigations, and simulations of historical trials.

The study adhered to relevant ethical principles, including obtaining informed consent and ensuring the confidentiality of participant data. Nonetheless, the limited size and gender disproportion in the sample are acknowledged as limitations,

suggesting the need for future research with larger and more representative samples.

The procedure was structured in distinct phases: sample selection and assignment, implementation of educational activities, and data collection through emotional questionnaires. The statistical tests applied included Eta/Eta squared association measures, frequency analysis, and paired sample statistics, as well as the Wilcoxon Signed-Rank Test, all aimed at discerning gender-related emotional variations. The findings are anticipated to contribute to a profound understanding of affective dynamics in response to innovative pedagogical methodologies.

1. Introduction

In contemporary pedagogy, integrating active methodologies and critique represents a transformation in the direction of the teaching-learning process, centring on the student and participation as fundamental pillars for knowledge construction. These methodologies, by promoting greater interaction and critical reflection, influence not only cognitive outcomes but also the emotional sphere of participants. In this context, the study of emotions in educational settings has gained relevance, given their crucial role in student performance and motivation.

Emotion, as a psychological construct, plays an intrinsic role in learning, influencing both attention and memory, essential components for the acquisition of new knowledge. Moreover, positive emotions are correlated with greater engagement and satisfaction in the learning process, while negative ones can represent significant barriers. Therefore, understanding how active methodologies affect students' emotions becomes a crucial axis for optimizing educational processes. Thus, Rodríguez et al. (2020) highlight the importance of integrating emotions and ethical values into active methodologies for effective education, demonstrating that their inclusion is pivotal for meaningful learning and the promotion of values [1]. Research on the implementation of SEL (Social and Emotional Learning) in English primary schools revealed a higher prevalence than previously reported, while Scott Loinaz (2019) highlighted significant cultural differences in the integration of SEE (Social and Emotional Education) in pedagogical practices in various European countries [2,3].

In this respect, Akamatsu and Gherghel (2021) argued the importance of emotional intelligence and empathy in educational interventions, highlighting the dual nature of EI (Emotional Intelligence) in promoting both prosocial and antisocial behaviors. Engelmann and Bannert (2019) identified the need for interventions to improve emotional regulation in university students, given its correlation with academic performance [4,5].

On the other hand, Gatsakou et al. (2022) have explored "The Theatre of Mind" as an educational tool to foster emotional intelligence through ICT and distance learning, providing a holistic cultural experience that can be particularly valuable in remote learning [6].

Addressing other areas of interest, Alberth (2022) pointed out the scant attention paid to the role of anxiety and enjoyment in classroom community perception, despite their impact on learning outcomes, while Tharaldsen (2019) developed an intervention to improve the social and emotional competence of students in Norway. Meanwhile, Stoliker and Lafreniere (2015) have investigated how perceived stress, loneliness, and learning burnout affect the educational experience of university students, finding that loneliness and burnout negatively impact the overall academic experience and the perception of stress [7-9]. Zhang et al. (2022) have also contributed to the understanding of the context of design-based learning and the associated emotional experience [10].

In their cross-sectional study, Gunasekara et al. (2022) found that teachers' emotional intelligence significantly impacts student engagement and learning in remote learning contexts, though the effects may be influenced by cultural differences [11]. This suggests that educators should consider employing online education practices based on the theory of emotional intelligence.

This research also addresses the interaction between gender and emotions in response to the implementation of active methodologies and critical pedagogy. It considers the influence

of gender as a variable that could moderate the emotional experience of students, given that previous research has identified significant differences in the way men and women process and express their emotions.

The literature suggests that these gender differences in emotional experience can have important implications in the educational context, where emotions play a decisive role in learning. Significantly, Atwa et al. (2020) report that in a gender-segregated private medical college, male and female students' perceptions of their educational environment varied greatly [12]. Notably, female students had a more positive perception, which was directly linked to improved academic performance.

In the context of programming and the use of serious games, Zhao et al. (2021) have discovered that such pedagogical tools can significantly improve student learning outcomes, especially for those with a previous good educational performance or a favorable attitude towards STEM subjects and school, although results may vary by gender [13].

This study conducts a comprehensive analysis of gender-emotion interactions within active pedagogical settings, assessing emotional variations pre and post-intervention, to refine educational theory and practice, aiming for an emotionally equitable learning environment.

1.2 Objectives

This study is designed to systematically investigate gender dynamics in emotional responses within educational contexts, with a focus on the impact of active methodologies and critical pedagogy. The objectives are:

- Assess the impact of active methodologies and critical pedagogy on student emotions, comparing changes before and after their implementation.
- Examine how critical pedagogy and active methodologies influence students' emotional responses, with a particular focus on gender differences.
- Conduct an analysis of significant differences in emotional shifts, assessing whether these differences are more pronounced in women or men following participation in active methodologies and critical pedagogy.
- Investigate the variability in emotional responses based on the gender of students, determining if the direction of change differs between men and women.
- Ascertain whether the differences in the change of affective variables between men and women are consistent across various emotions and affects.

1.3 Research Hypothesis

In this research, our primary objective is to not only ascertain the presence of significant affective changes following the utilization of active methodologies and critical pedagogy, as previously observed in other studies, but also to investigate potential gender differences within these alterations [14-17]. To check for changes in affect variables before and after based on gender (male and female), we conducted an interaction analysis between the "Gender" and "Condition" variables (Before or After). This allowed us to assess whether the effect of the

activity on affect variables differs significantly between men and women. For this purpose, we formulated the following research hypotheses.

The hypotheses proposed examine gender differences in the change of affective variables following the application of active and critical pedagogical methodologies:

- H0: Absence of gender differences in affective change.
- H1: Presence of gender differences in affective change.
- H2: More significant post-intervention affective changes in women.
- H3: More significant post-intervention affective changes in men.
- H4: Diversity in the direction of affective change between genders.
- H5: Variability in affective change between genders based on specific affective variables.

These hypotheses provide a logical progression that starts from the absence of differences (H0) and advances towards more specific hypotheses that detail the type of differences that may exist between men and women in response to educational interventions.

2. Methodology

The study, using a quasi-experimental repeated measures design, investigated the impact of active methodologies and critical pedagogy on the emotions of students in History Didactics. The Positive and Negative Affect Schedule (PANAS, Watson et al., 1988; Zawadzki et al., 2013) was administered through a Google form. The data were qualitatively analyzed using SPSS Statistics version 29.0.1.0. The sample included 48 students (7 males and 41 females) in their third year of Primary Education in 2023. Seven activities were conducted, adhering to ethical principles, informed consent, and data confidentiality. Limitations were noted due to the sample size and gender and age disproportion, with recommendations for future research with more representative groups.

2.1 Procedure

The study adhered to a structured protocol consisting of multiple phases. Initially, student groups were meticulously selected and allocated within a course spanning four months.

This comprehensive course encompassed seven activities, each centred around active methodologies and critical pedagogy. These activities ranged from textual analysis and archaeological research to simulations of trials involving historical figures, the creation of exhibition posters, and engagements with historical narratives featuring empowered women.

Throughout the data collection process, pedagogical strategies included problem-based learning and collaborative approaches, complemented by the integration of critical pedagogy. These strategies were employed to foster critical analysis and encourage reflection on issues related to inequalities and power structures.

To assess the robustness of the findings, an emotions questionnaire was administered both at the commencement and conclusion of the course. Strict confidentiality measures were upheld to facilitate meaningful comparisons between the two time points.

Statistical analyses applied to the collected responses encompassed measures of association, Eta/Eta squared values, frequency analysis, paired-sample statistics, and non-parametric tests (Wilcoxon Signed-Rank Test). These analytical tools were utilized to scrutinize discrepancies in affective responses and their correlation with gender before and after the educational intervention.

3. Results

3.1 The Measures of Association, Eta Values, and Eta Squared Values

Table I displays the Eta and Eta squared (η^2) values, revealing the relationship between gender and emotions before and after the application of active methodologies and critical pedagogy. Initially, gender significantly influences certain emotions, albeit with low η^2 . The affected emotions with $\eta^2 > 0.01$ are: "Before Enthusiastic" ($\eta^2 = 0.063$), "Before Inspired" ($\eta^2 = 0.091$), "Before Attentive" ($\eta^2 = 0.093$), suggesting gender differences in these affects.

After the activities, similar gender influences are observed, with low η^2 , in "After Guilty" ($\eta^2 = 0.149$), "After Interested" ($\eta^2 = 0.110$), "After Attentive" ($\eta^2 = 0.073$), indicating potential gender differences in these emotions.

Variables with significant influence before the activity		Variables with significant influence after the activity	
Variable	Eta squared	Variable	Eta squared
Before Interested	0.003	After Guilty	0.149
Before Irritable	0.011	After Interested	0.110
Before Enthusiastic	0.063	After Attentive	0.073
Before Tense	0.011	After Irritable	0.025
Before Disgusted	0.022	After Enthusiastic	0.034
Before Strong	0.029	After Disgusted	0.022
Before Proud	0.009	After Hostile	0.008
Before Fearful	0.001	After Fearful	0.007
Before Ashamed	0.016	After Stimulated	0.006

Before Inspired	0.091	After Alert	0.017
Before Nervous	0.020	After Strong; Energetic	0.000
Before Aroused	0.001	After Active	0.000
Before Determined	0.000	After Ashamed	0.000
Before Attentive	0.093	After Determined	0.001
Before Scared	0.013	After Fearful	0.003
Before Active	0.001	After Nervous	0.000
Before Afraid	0.016	After Scared	0.010
Before Guilty	0.026	After Proud	0.005
Before Alert	0.027	After Inspired	0.035
Before Hostile	0.039	After Tense; Anxious	0,004

Note: Authored by the researcher

Table I: Categorizations based on Eta squared values for which gender appears to have a significant influence before and after the activity:

In conclusion, although gender has a significant influence on some emotions, these are generally moderate or low, implying the importance of other factors in emotional responses to these educational activities.

3.2 Statistical Measures Before and After the Activities for Both Men and Women

Table II compares the emotional responses of 'Men' and 'Women'

groups before and after educational activities. Before the activities, men showed less variability in their responses (lower standard deviations) and tended to report stronger emotions such as 'strong,' 'determined,' and 'interested,' while women excelled in 'stimulated,' 'alert,' and 'enthusiastic.' Both groups reported low levels of negative emotions such as 'guilt,' 'hostility,' and 'fear.'

Men (7)	Women (41)			
	Mean	Standard Deviation	Mean	Standard Deviation
Before Interested	3,86	,690	3,68	1,234
Before Irritable	1,43	,535	1,73	1,073
Before Enthusiastic	3,43	,535	3,98	,790
Before Tense	1,43	,535	1,76	1,200
Before Disgusted	1,14	,378	1,51	,952
Before Strong	4,14	,690	3,68	,986
Before Proud	3,29	,756	3,56	1,097
Before Fearful	2,00	,577	2,10	1,068
Before Ashamed	1,43	,787	1,83	1,181
Before Inspired	2,86	1,069	3,71	,955
Before Nervous	2,43	1,813	2,93	1,170
Before Stimulated	3,86	1,069	3,76	1,090
Before Decisive	3,86	,690	3,80	1,005
Before Attentive	4,00	1,000	4,59	,591
Before Afraid	1,71	,756	2,05	1,094
Before Active	4,14	,900	4,07	,848
Before Scared	1,57	,535	1,98	1,214
Before Guilty	1,00	,000	1,32	,756
Before Alert	3,57	,535	3,90	,735
Before Hostile	1,00	,000	1,54	1,027
After Interested	4,57	,535	4,90	,300
After Irritable	1,00	,000	1,22	,525
After Enthusiastic	4,29	,756	4,59	,547

After Tense, uneasy	1,14	,378	1,22	,475
After Disgusted, upset	1,00	,000	1,17	,442
After Strong, energetic	4,29	,756	4,32	,756
After Proud	4,29	,756	4,46	,977
After Fearful, frightened	1,14	,378	1,22	,525
After Ashamed	1,29	,488	1,29	,782
After Inspired	4,14	,690	4,46	,596
After Nervous	1,86	,900	1,83	1,093
After Stimulated	4,43	,535	4,24	,888
After Decisive	4,00	,816	4,10	,995
After Attentive	4,14	,690	4,61	,586
After Afraid	1,29	,756	1,17	,442
After Active	4,43	,787	4,41	,774
After Scared	1,14	,378	1,37	,859
After Guilty	1,71	1,113	1,10	,374
After Alert, awake	3,43	1,512	3,90	1,281
After Hostile	1,14	,378	1,32	,756

Note: Authored by the researcher

Table II: Statistical Measures Before and After the Activities for Men and Women

After the activities, an increase in positive emotions ('interest,' 'stimulated,' 'enthusiasm,' 'attentive') and a decrease in negative ones ('irritability,' 'disgust') were observed in both sexes, indicating an overall positive impact of the activities. However, the initial differences between men and women persisted, suggesting distinct experiences of the intervention and highlighting the need for further exploration of gender factors in these emotional responses.

3.3 Frequency Analysis for Men

A descriptive frequency analysis for men reveals changes in emotions before and after activities with active methodologies and critical pedagogy. The medians for "Before Interested," "Before Strong; energetic," "Before Attentive," and "Before Alert, awake" are 4.0000, indicating high proactivity responses in these emotions. In contrast, emotions like "Before Irritable," "Before Tense, discomfort," among others, have medians of 1.0000, suggesting low responses before the activities. The medians for "Before Enthusiastic," "Before Fearful," among others, are 3.0000, showing moderate values.

After the activities, the medians for "After Interested," "After Strong; energetic," "After Attentive," and "After Hostile" are 4.0000, reflecting an increase in these emotions. The median for "Guilty" also significantly increases.

These findings suggest that the activities influence men's emotional states variably, with some emotions increasing significantly while others remain stable or decreasing. The variability in emotional responses indicates differentiated impacts of the activities based on initial emotional state and individual responses. The overall post-activity median is 2.0000, which will be used as a reference in subsequent statistical analyses.

3.4 Paired-Sample Statistics Men

Table III displays the results of a paired T-test comparing men's emotional responses before and after activities. The results indicate an overall positive impact of the activities, with increases in interest, enthusiasm, strength, and energy, and decreases in irritability and tension. These changes are based on the means of the data, not on confidence intervals.

		Mean	N	Standard Deviation	Mean Standard Error
Pair 1	1. Before Interested	3,8571	7	,69007	,26082
	1. After Interested	4,5714	7	,53452	,20203
Pair 2	2. Before Irritable	1,4286	7	,53452	,20203
	2. After Irritable	1,0000	7	,00000	,00000
Pair 3	3. Before Enthusiastic	3,4286	7	,53452	,20203
	3. After Enthusiastic	4,2857	7	,75593	,28571

Pair 4	4. Before Tense, uneasy	1,4286	7	,53452	,20203
	4. After Tense, uneasy	1,1429	7	,37796	,14286
Pair 5	5. Before Disgusted, Upset.	1,1429	7	,37796	,14286
	5. After Disgusted, Upset	1,0000	7	,00000	,00000
Pair 6	6. Before Strong, Energetic.	4,1429	7	,69007	,26082
	6. After Strong, Energetic.	4,2857	7	,75593	,28571
Pair 7	7. Before Proud.	3,2857	7	,75593	,28571
	7. After Proud.	4,2857	7	,75593	,28571
Pair 8	8. Before Fearful, Terrified.	2,0000	7	,57735	,21822
	8. After Fearful, Terrified.	1,1429	7	,37796	,14286
Pair 9	9. Before Ashamed.	1,4286	7	,78680	,29738
	9. After Ashamed.	1,2857	7	,48795	,18443
Pair 10	10. Before Inspired.	2,8571	7	1,06904	,40406
	10. After Inspired.	4,1429	7	,69007	,26082
Pair 11	11. Before Nervous.	2,4286	7	1,81265	,68512
	11. After Nervous.	1,8571	7	,89974	,34007
Pair 12	12. Before Stimulated.	3,8571	7	1,06904	,40406
	12. After Stimulated.	4,4286	7	,53452	,20203
Pair 13	13. Before Determined.	3,8571	7	,69007	,26082
	13. After Determined.	4,0000	7	,81650	,30861
Pair 14	14. Before Attentive.	4,0000	7	1,00000	,37796
	14. After Attentive.	4,1429	7	,69007	,26082
Pair 15	15. Before Fearful.	1,7143	7	,75593	,28571
	15. After Fearful.	1,2857	7	,75593	,28571
Pair 16	16. Before Active.	4,1429	7	,89974	,34007
	16. After Active.	4,4286	7	,78680	,29738
Pair 17	17. Before Scared.	1,5714	7	,53452	,20203
	17. After Scared.	1,1429	7	,37796	,14286
Pair 18	18. Before Guilty.	1,0000	7	,00000	,00000
	18. After Guilty.	1,7143	7	1,11270	,42056
Pair 19	19. Before Alert, Awake.	3,5714	7	,53452	,20203
	19. After Alert, Awake.	3,4286	7	1,51186	,57143
Pair 20	20. Before Hostile.	1,0000	7	,00000	,00000
	20. After Hostile.	1,1429	7	,37796	,14286

Note: Authored by the researcher

Table III: Paired Sample T-Test Statistics for Men

3.5 Frequency Analysis for Women

Table II reveals how women felt in different emotional states before an activity. Mostly, they expressed interest (73.2% with a score ≥ 4) and enthusiasm (39% with a score = 4, 29.3% with a score = 5), while tension and disgust were low (58.5% with a score = 1 in both variables). Feelings of strength and pride were also common (46.3% and 43.9% with a score = 4, respectively), as was inspiration (39% with a score = 4). In contrast, negative feelings such as irritability, fear, shame, and hostility were low

(mostly scores of 1 or 2)

The medians of the variables before and after the activities are similar, indicating that, on average, there were no substantial changes in post-activity affects. High medians in "Interested," "Enthusiastic," among others, suggest consistent positive feelings, while low medians in "Irritable," "Tense," among others, indicate consistent negative or less intense emotions.

The overall median for the "After_" variables is 3.0000, which will serve as the reference in subsequent statistical analyses. These results, though general, show individual variability in emotional responses and will be complemented with statistical analyses to examine the significance and gender variations of these changes.

3.6 T-Test for Women

Paired-sample analysis for 20 pairs of "Before" and "After" variables related to women's emotions showed that Positive Affects increased significantly post-activity, while Negative Affects decreased. Neutral Affects, such as "Attentive" and "Alert, awake," did not show significant changes. Overall, active methodologies and critical pedagogy improved positive affects

and reduced negative affects in female students.

3.7 Non-Parametric Tests: Wilcoxon Signed-Rank Test for Men

Using the Wilcoxon Signed-Rank Test, we assessed whether the medians of emotional variables in men were equal to 2.00, our hypothesized median. According to Table IV, in most cases, the null hypothesis was rejected, indicating medians different from 2.00. However, for some variables such as "Fearful," "Ashamed," "Inspired," among others, the medians were approximately equal to 2.00. This suggests significant changes in certain affective dimensions post-activity, with an increase in positive affects and a decrease in negative ones.

	N total	Test Statistic	Standard Error	Standardized Test Statistic	Asymptotic Significance (Two-Tailed)
Interested	7	28	5,799	2,414	0,016
Irritable	7	0	2,5	-2	0,046
Enthusiastic	7	28	5,766	2,428	0,015
Tense	7	0	2,5	-2	0,046
Disgusted	7	0	4,287	-2,449	0,014
Strong	7	28	5,799	2,414	0,016
Proud	7	21	4,664	2,251	0,024
Fearful	7	1,5	1,061	0	1
Ashamed	7	3,5	4,287	-1,633	0,102
Inspired	7	18,5	4,623	1,73	0,084
Nervous	7	9	3,623	0,414	0,679
Stimulated	7	21	4,704	2,232	0,026
Determined	7	28	5,799	2,414	0,016
Attentive	7	21	4,623	2,271	0,023
Afraid	7	2,5	2,5	-1	0,317
Active	7	28	5,852	2,392	0,017
Scared	7	0	1,732	-1,732	0,083
Guilty	7	0	5,292	-2,646	0,008
Alert	7	28	5,766	2,428	0,015
Hostile	7	0	5,292	-2,646	0,008
TOTAL	7	13,3	4,32345	0,3641	0,12775

Note: Authored by the researcher

Table IV: Wilcoxon Signed-Rank Test for One Sample – Men

3.8 Non-Parametric Tests: Wilcoxon Signed-Rank Test for Women

The Wilcoxon Signed-Rank Test reveals that, in most cases, the mean of the differences between 'Before' and 'After' scores

significantly differs from 3.00, rejecting the null hypothesis for the majority of variables (Table V). However, in the case of 'Nervous' (case 11), the null hypothesis holds, indicating that the median of the differences is not significantly different from 3.00.

	N total	Test Statistic	Standard Error	Standardized Test Statistic	Asymptotic Significance (Two-Tailed)
Interested	41	486,5	59,087	2,903	0,004
Irritable	41	44,5	63,506	-4,834	<,001
Enthusiastic	41	406	42,518	4,774	<,001
Tense	41	95	71,274	-4,42	<,001
Disgusted	41	12	61,846	-5,489	<,001
Strong	41	500,5	55,183	3,679	<,001
Proud	41	383,5	48,897	2,771	0,006
Fearful	41	40	49,487	-4,203	<,001
Ashamed	41	57,5	63,506	-4,629	<,001
Inspired	41	410	46,435	3,823	<,001
Nervous	41	178	42,083	-0,594	0,552
Stimulated	41	528,5	58,641	3,641	<,001
Determined	41	523	56,042	4,024	<,001
Attentive	41	780	68,73	5,674	<,001
Afraid	41	41	49,37	-4,142	<,001
Active	41	567,5	56,552	4,774	<,001
Scared	41	81	61,427	-4,102	<,001
Guilty	41	24	69,138	-5,583	<,001
Alert	41	484	48,379	4,878	<,001
Hostile	41	44	61,395	-5,009	<,001
TOTAL	41	284,325	56,6748	-0,1032	0,18733333

Note: Authored by the researcher

Table V: Wilcoxon signed-rank test for a sample of women

"Nervousness" should not necessarily be interpreted negatively. It can be a natural response to novelty, interpreted as positive anticipation or excitement about new activities [18]. In education, nervousness often indicates interest and readiness to engage in new methodologies [19]. Therefore, "Nervousness" in this context may reflect a positive emotional response to changes in the educational environment, suggesting engagement with the new activities and methodologies.

3.9 Mann-Whitney Test: Comparison of Predictors by Gender

The results of this test (Table VI) reveal significant differences

in the variable 'Interested' with a higher inclination in the female gender ($p = 0.005$), as well as in 'Enthusiastic' and 'Inspired' with p-values of 0.077 and 0.088, respectively, both close to the significance threshold, suggesting greater enthusiasm and inspiration in women. Furthermore, 'Attentive' shows a notable difference ($p = 0.071$) between genders, indicating higher attention in the female gender. On the other hand, no significant differences were detected in variables such as 'Irritable,' 'Tense,' 'Disgusted,' among others, with p-values exceeding 0.05, indicating similarities in the emotional responses of men and women in these areas.

Ranks	Gender	N	Average Rank	Sum of Ranks
Interested	Men	9	17,33	156,00
	Women	39	26,15	1020,00
	Total	48		
Irritable	Men	9	23,56	212,00
	Women	39	24,72	964,00
	Total	48		
Enthusiastic	Men	9	18,06	162,50
	Women	39	25,99	1013,50

	Total	48		
Tense	Men	9	25,22	227,00
	Women	39	24,33	949,00
	Total	48		
Disgusted	Men	9	21,50	193,50
	Women	39	25,19	982,50
	Total	48		
Strong	Men	9	26,72	240,50
	Women	39	23,99	935,50
	Total	48		
Proud	Men	9	23,06	207,50
	Women	39	24,83	968,50
	Total	48		
Fearful	Men	9	25,61	230,50
	Women	39	24,24	945,50
	Total	48		
Ashamed	Men	9	25,00	225,00
	Women	39	24,38	951,00
	Total	48		
Inspired	Men	9	18,11	163,00
	Women	39	25,97	1013,00
	Total	48		
Nervous	Men	9	27,28	245,50
	Women	39	23,86	930,50
	Total	48		
Stimulated	Men	9	26,11	235,00
	Women	39	24,13	941,00
	Total	48		
Determined	Men	9	22,17	199,50
	Women	39	25,04	976,50
	Total	48		
Attentive	Men	9	17,94	161,50
	Women	39	26,01	1014,50
	Total	48		
Fearful	Men	9	23,94	215,50
	Women	39	24,63	960,50
	Total	48		
Active	Men	9	22,17	199,50
	Women	39	25,04	976,50
	Total	48		
Scared	Men	9	24,50	220,50
	Women	39	24,50	955,50
	Total	48		
Guilty	Men	9	29,56	266,00
	Women	39	23,33	910,00
	Total	48		

Alert	Men	9	18,83	169,50
	Women	39	25,81	1006,50
	Total	48		
Hostile	Men	9	25,67	231,00
	Women	39	24,23	945,00
	Total	48		

Note: Authored by the researcher

Table VI: Mann-Whitney test: Comparison between predictors by gender

These findings suggest that, while women exhibit higher interest, enthusiasm, inspiration, and attention, no significant differences are observed in other affective states such as irritability, tension, and disgust.

4. Discussion

Numerous studies have applied the Wilcoxon test in paired data analysis, including Woolson (2005), Petrovskaya & Shaposhnikov (2020) in the context of university students, and Gülen (2018) within a STEM-integrated learning framework. Additionally, Alonso-Tapia et al. (2020) adapted the EMSR-Q questionnaire in Colombia, establishing connections with academic performance. Meanwhile, Vergara et al. (2022) validated the structure of ACES in Spanish children. Hatchimonji et al. (2022) explored the relationship between character virtues and SEL (Social and Emotional Learning) and Positive Purpose. Koppe et al. (2019) assessed the effectiveness of an online IE (Emotional Intelligence) program. Lapidot-Lefler (2022) emphasized the significance of SEL in the context of online learning, and Staniec et al. (2022) delved into the emotional experiences associated with remote work [20-28].

Fischer et al. (2018) and Frenzel et al. (2009) investigated gender-related perceptions and emotional experiences, while Sanchis-Sanchis et al. (2020) and Bianchin & Angrilli (2012) focused on emotional regulation. Teodorović (2012) and van der Vegt and Kleinberg (2020) examined academic performance and COVID-19 concerns, respectively, in relation to gender. Rekha et al. (2023) and ul abdin Rind et al. (2023) assessed emotional climate in STEM classrooms and the influence of emotional intelligence on teacher stress and performance [29-36].

Furthermore, Arteaga-Cedeño et al. (2022) and Yeh et al. (2022) delved into the realm of emotional intelligence among teachers and culturally responsive teaching models in higher education. Zarra-Nezhad et al. (2023) introduced the POMPedasens framework in Finland, and Çenberci and Tufan (2023) investigated the impact of music education on SEL. Nandrino (2013) and Scheithauer et al. (2022) assessed emotional awareness and the Papilio-3to6 program in early childhood education. Lastly, Feng et al. (2022) explored gender disparities in emotional behavior in decision-making and management within the cultural contexts of China and the Philippines [37-43].

5. Conclusion

The research delved into the interplay of gender, emotions, and active teaching methodologies, highlighting the imperative need

for a more profound exploration of these intricate dynamics. A comprehensive analysis will be presented in the concluding section, amalgamating a concise summary of our findings with supplementary details. This will encompass specific variations in emotional responses, statistical significance, and their contextual relevance within the realm of active teaching methodologies and critical pedagogy.

In terms of gender's influence on emotional responses, the overarching values of Eta and Eta squared (pre-activity: 0.1338/0.0246, post-activity: 0.1195/0.02545) suggest a moderate correlation (Table I). Prior to engaging in the activities, women exhibited a higher average of emotional responses (2.874) compared to men (2.607), with a moderate degree of variability in emotional reactions for both genders (Table II). Following the activities, men experienced an increase in the average emotional responses (2.736), while women's averages remained relatively stable (2.845).

In-depth analyses unveiled that, on the whole, emotional responses increased after participating in the activities for both genders. Positive emotions, such as "Interested" and "Enthusiastic," displayed increments, while certain negative emotions decreased (Tables III and IV).

The Wilcoxon tests uncovered noteworthy differences in specific emotions before and after the activities. Among men, positive emotions like "Interested" and negative emotions like "Irritable" exhibited significant alterations (Table IV). Among women, there were substantial increases in positive emotions and reductions in negative emotions (Table V).

The Mann-Whitney Test (Table VI) elucidated significant gender-related disparities in the emotional domain. Women demonstrated a higher level of interest ($p = 0.005$), as well as elevated levels of enthusiasm and inspiration, although these findings approached statistical significance ($p = 0.077$ and $p = 0.088$). Additionally, women displayed a more pronounced level of attention ($p = 0.071$). Conversely, emotions like irritability, tension, and disgust did not exhibit significant gender differences in the data, suggesting parallel emotional responses.

Compliance with Research Hypotheses

The detailed analysis of the fulfilment of the hypotheses, using the Mann-Whitney Test, Paired-Sample T-Test, and Wilcoxon Signed-Rank Test, reveals that the hypothesis of the absence of gender differences in affective change is not fully sustained, as significant

changes were observed in several affective variables. The existence of gender-based differences in affective change is confirmed, with more significant post-intervention changes in women, especially in variables such as "Interested," "Enthusiastic," and "Attentive." Although men exhibited significant changes, these were not as pronounced as in women, weakening the hypothesis that post-intervention changes are more significant in men. There is diversity in the direction of affective change and variability depending on the specific affective variable, confirming the hypotheses of diversity and variability in affective change between genders.

The data support hypotheses H1, H2, H4, and H5. Hypothesis H3 does not receive as much support, and H0 is partially contradicted by the findings.

Future Research and Implications for Pedagogical Practice

The pedagogical implications of these findings are manifold. They underscore the importance of personalizing teaching to accommodate emotional and interest differences, recognizing and addressing emotional diversity in the classroom, and designing inclusive teaching strategies that take into account the emotional needs of all students. Teacher training and awareness regarding gender-related emotional differences are crucial for enhancing teaching effectiveness. Furthermore, continuous evaluation and reflection on pedagogical practices are essential for effectively addressing the emotional needs of students. The positive emotional changes, especially in women, suggest that active methodologies and critical pedagogy are effective in increasing engagement and participation, which should be promoted. Lastly, the results emphasize the importance of paying attention to the mental health and emotional well-being of students for their holistic development.

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