

Article

Comics as a Tool for Advancing Inclusivity in the Physical Education Classroom

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Abstract

Background: The study's purpose was to determine the impact of a workshop using comics as an inclusive tool on the perception of fifth-grade students regarding teaching practices applied ("learning for all students", "classroom climate", "collaborative learning", and "participation" dimensions) by physical education teachers, because there is little scientific evidence. Particularly in this subject, a high level of cooperation, commitment, and teamwork is required among class participants to promote inclusion. **Methods:** A quantitative methodology was employed, utilizing a quasi-experimental, transversal design with pre- and post-test control group. The sample comprised 56 fifth-grade students in Chile (37.5% boys and 62.5% girls) and experimental group participated in an inclusive workshop using a comic. **Results:** The results show statistical differences between the control and experimental groups in "Participation" ($p = 0.00$) and in the total score ($p = 0.001$) after the intervention, favoring the experimental group. This group also showed statistical differences in the dimensions "Learning for all students" ($p = 0.007$), "Classroom climate" ($p = 0.001$), and "Total score" ($p = 0.002$) in pre and posttests. **Conclusions:** Comic had a positive effect on students in terms of overall results, learning for all students, and classroom climate.

Keywords: comics; inclusion; physical education; Chilean students

1. Introduction

Although comics became popular more than 50 years ago (in the 1960s and 1970s), it was only a little over two decades ago that they began to be seen as a useful educational resource, driven by their popularity and visual appeal. Thus, Krashen (2005) considers comics a tool that can motivate students in the classroom, and Elices (2006) adds that they are artistic creations with their own rules and meanings.

For his part, Peña (2014) argues that the importance of comics lies in the fact that the interpretation that students give to the images and text of this type of literary resource allows them to be active participants in the teaching and learning process, leaving the teacher with the role of facilitator of the educational process. However, the usefulness of comics in the classroom also depends on teachers' interest in using this resource, and it must be planned with well-defined educational purposes, used appropriately, and in a way that encourages reflection among students (Guzmán-López, 2011).

Recent studies emphasize that comics are a pedagogical tool that fosters awareness and responsibility in children (Derkachova et al., 2022), capable of mastering today's society and achieving a global understanding of a text beyond concepts (Del Rey, 2013). Therefore,



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they cannot be considered solely as a means of entertainment, but also as a resource that promotes communication, encourages collaboration and teamwork, and allows students to share ideas (Miravalles, 1999). Thus, comics have proven to be effective in interdisciplinary work (Guzmán-López, 2011), at different academic levels such as primary, secondary, and higher education (Sempere-Palomares et al., 2018), in different language skills (Fernández & Díaz, 1990), and in different areas of knowledge, such as the environment (Çiçek & Selvi, 2023), languages (Soto, 2019), and physical education (Martínez & Pastor, 2019), among others.

In the latter discipline, comics are considered a way of laying the foundations for cognitive and motor development. In this sense, the subject of physical education promotes the development of expressive and perceptive skills, as well as social awareness through bodily expressions (da Silva & Prats, 2019). In addition, physical activities facilitate an improved classroom environment, as it has been shown that collaborative physical challenges, together with gamification, are considered an appropriate plan for school coexistence (Dólera-Montoya et al., 2021). Studies such as Martínez and Pastor's (2019) explored the use of comics in Physical Education (PE) classes to find innovative and motivating strategies for promoting physical activity and voluntary participation. In this subject, within the curriculum's developmental guidelines, motor activities are key to fostering the development of expression and perception skills in childhood. To achieve these skills, motor stories are commonly used, narrated to encourage students to play and experience activities collectively. For this reason, R. Ortiz (2009) considers the use of comics in PE an appropriate mechanism for laying the foundation for motor and cognitive development.

On the other hand, da Silva and Prats (2019), through a study incorporating superhero comics into PE classes in Primary Education, addressing topics such as social differences, women's participation, social values, technology, and body image standards to encourage students to express emotions through their bodies, concluded that this pedagogical practice allowed students to recognize their physical and social differences, resulting in a reduction in classroom problems due to the opportunity to express emotions. Furthermore, the students were motivated, demonstrating effective participation during the sessions. The results indicated that the students gained awareness of the influence of media on beauty standards.

Furthermore, a study by Trevisan et al. (2021), which aimed to describe the implementation of teaching units using comics as a pedagogical resource in physical education classes focused on sports and health practices, demonstrated that the use of comics was highly productive. Students showed learning about the newly incorporated units; moreover, they stated that comics were an interesting and even stimulating resource for studying. In the process, students highlighted comics as a learning resource beyond the conceptual realm, recognizing them as a playful tool rather than a tedious one. The authors emphasize the study's contribution, indicating that conceptual learning can also be achieved in physical education classes using comics, which necessitates a continuous search for innovative teaching methods from the initial teacher training stage onward. However, comics have not only been useful in promoting the development of physical and social expressions in PE classes, but also in promoting the development of language skills (García et al., 2012; García-Cedillo et al., 2015).

Thanks to the proven benefits of using comics in education, studies such as López-Prados and Saez-de-Adana's investigation (2023) have attempted to bring together two fundamental elements in education: educational inclusion and the use of visual methodologies in the classroom. The authors demonstrated that this teaching tool tends to engage students in discussions and social reflections on diversity, as well as promoting tolerance,

empathy, solidarity, and commitment in interpersonal relationships. However, its use is far from normalized.

Currently, evidence shows that comics can promote inclusive education by addressing issues associated with problems faced by minority groups, but which concern complete society. According to Yusuf et al. (2025), comics are a structured pedagogical tool with high motivational value, effective in supporting reading through visual storytelling, art, and interactive design. In turn, they are considered a powerful promoter of inclusive practices, but they require greater incorporation of digital resources, specialized instruction, and support materials for teachers.

There are a variety of inclusive topics where comics can be a good tool. Among them is sex education. On the one hand, there are the studies by Parrinello (2025), who emphasizes that graphic novels are far from being just entertainment resources, but also promote inclusive education by narrating the experiences of trans characters in heteronormative communities. On the other hand, Boer (2020) highlights the usefulness of comics in addressing sexual experiences to educate the population, according to the attractive characteristics of this resource. Regarding racism, Lindo (2025) addresses racial issues through strategies that allow for a more inclusive and comprehensive view of the subject, incorporating humor and racial comedy, which is particularly novel, powerful, and effective in promoting anti-racist education. Within this same issue, comics can be a good resource, even outside the classroom, as demonstrated by Guo et al. (2025) in their study, which involved the creation of a comic that made it possible to recognize the emotional responses of those who suffer racial microaggressions in dental clinics, through reflection on one's own behavior and that of others to foster a more inclusive and just community. In relation to disability, Chetan (2025) worked with comics among young people with learning difficulties in India, demonstrating their usefulness in raising awareness of the rights of people with disabilities. Among other inclusive uses of comics, Pomares (2021) demonstrates that comics incorporating characters with hearing difficulties sensitized the educational community to hearing impairment, which led to the promotion of emotional education, improved self-esteem, and fostered the comprehensive development of students. Similarly, researchers such as Pomares and López (2022) promoted the inclusion of students with visual impairments (VI) through comic use, which raised awareness in the community about the needs of these students.

However, evidence of the usefulness of comics is mainly found in the school stage, such as in the studies by López-Prados and Saez-de-Adana (2023), who argue that comics are a dynamic and interesting tool in primary education for addressing socially relevant issues to understand diversity, with a special emphasis on visual literacy for the development of students' multimodal skills, or those of Botton et al. (2019), who used comics to provide analysis and policy tools in the teaching practice of history in basic education in Brazil, or those of Komariyatiningsih et al. (2025), who efficiently and effectively incorporated comics to integrate the concept of "probability" and develop logical reasoning in tenth-grade students. There is also interest in developing research that contributes to pedagogical practices that include comics in higher education. Among these studies, the one by Mompeán-Mejías and Juliá-Sanchís (2025) stands out, which consisted of research with health science students on topics of psychiatry and mental health through graphic pathologies. The results showed that their use improves reflection and learning; however, the authors caution that well-designed activities, learning facilitators, and prior knowledge of the subject matter on the part of the students are required. Of particular interest is its potential use in the training of future teachers; for example, Belda-Medina (2024), through research conducted with English education students, demonstrated that the incorporation of technology is often seen as a transformative strategy in teacher training, which translates

into the creation of inclusive materials incorporated into the classroom, particularly for learning a foreign language. [Menescardi et al. \(2020\)](#) argue that education students value teaching practices that include comics, describing them as innovative, sustainable, useful, and transferable to their future professional work; therefore, they suggest using them to promote inclusion.

In other educational contexts, comics have been linked to Artificial Intelligence (AI). Thus, in a study by [Sachyani and Gal \(2025\)](#), the usefulness of comics created using AI was investigated in fifth-year students. The results indicated that students improved their creativity, critical thinking, collaboration, and communication skills. For their part, [Nascimento et al. \(2025\)](#) developed a technological tool for the automatic translation of comics using optical character recognition. This resource has proven to be a tool that promotes assisted reading in educational and inclusive environments, which is necessary to reduce inequalities among students. [Smith \(2020\)](#) investigated the integration of comics as an inclusive resource for teaching regular expressions (character patterns that describe certain texts) to improve learning, while [Tsene \(2022\)](#) emphasizes the use of comics as a resource that contributes to more inclusive media literacy.

The literature shows that comics have a wide range of uses and can promote learning and the development of skills and abilities in different students and in different subjects. For [Mariyam and Karthika \(2024\)](#), for example, graphic assemblages are considered tools that serve to enhance students' oral and cognitive skills, along with promoting autonomy, affectivity, motivation, and creativity. Furthermore, they are resources that can create new and productive dialogs in an effective and alternative way for the development of a more inclusive social awareness ([Howell, 2015](#)), especially in adolescents, as they allow them to identify, understand, and confront injustices to promote a better world ([Baumeister & Carabine, 2024](#)). This is because, according to [Huda et al. \(2025\)](#), learning experiences that result from the combination of visual, auditory, and interactive tools are often perceived by students as attractive, flexible, and impactful resources.

Authors such as [Hines and Alexander \(2023\)](#) invite professionals to develop curricular content aimed especially at adolescents, to address issues relevant to young people through visual narratives. Therefore, it is important to renew educational provisions to promote literary and inclusive education ([Ibarra-Rius, 2021](#)). In this regard, for the use of comics to be effective, [Bayona and Ruiz \(2025\)](#) emphasize that teachers must take responsibility for generating inclusive teaching practices in the classroom and should not be blinded by identifying the classroom as an optimal space for the teaching and learning process. Therefore, the constant challenges in inclusive educational practices translate into the ongoing search for conditions and opportunities for students with different learning abilities and interests, especially in vulnerable groups.

On the other hand, [Urquizo-Esparza and Orihuela-Ticona \(2025\)](#) recommend strengthening the skills acquired in social environments in the classroom, as these have a positive impact on the classroom, promoting harmonious coexistence that leads to better opportunities for academic performance. In this sense, the role of the teacher in the classroom must be active and fundamental in planning and monitoring the teaching-learning process to achieve educational success in the classroom ([Urquizo-Esparza & Orihuela-Ticona, 2025](#)). Authors such as [Torres-Farias and Triviño-Sabando \(2024\)](#) also recommend the design of methodological strategies that incorporate activities requiring collaborative work to promote inclusion in the classroom.

According to [Muñoz et al. \(2014\)](#), it is also necessary for teachers to be trained to develop strategies that encourage the participation of all members of the educational community in the inclusion process. Similarly, educational centers must have a cul-

ture associated with inclusion, since school culture is often an obstacle to its promotion (M. Ortiz & Lobato, 2003).

Based on the above, the general objective is to determine the impact of the workshop “Comics as a step towards inclusivity in the classroom” on the perception of fifth-grade students regarding inclusive teaching practices in physical education. According to this proposal, these are the specific objectives:

1. To determine the inclusive teaching practices used by physical education teachers in classes according to fifth-grade students.
2. To determine the differences in students’ perceptions about inclusive pedagogical strategies used in PE classes before and after the workshop “Comics as a step towards inclusivity in the classroom’s implementation in control and experimental groups (inter-group s and intra-group).

As a result, it is hypothesized that students in the experimental group perceive a greater degree of inclusive teaching practices in physical education classes after the implementation of the workshop “Comics as a step towards inclusivity in the classroom.”

This research contributes an innovative, dynamic, and easy-to-implement pedagogical tool: comics. It includes a brief, reflective intervention designed to promote inclusive teaching practices in the physical education classroom. Using comics in inclusive workshops could increase student motivation and, consequently, participation in sports activities. Furthermore, collaborative work among students could be significantly enhanced, particularly for those with less physical ability.

2. Materials and Methods

The study has a quantitative approach with a quasi-experimental-cross-sectional pre- and post-test design with a control group, and a descriptive scope. The formation of the study groups was random.

2.1. Participants

The sample consists of 56 students (average age = 10.8 years old) from the fifth-grade physical education class at four educational establishments in Bío-Bío Region (Chile): Cerro Cornou School, Santa Cecilia School, Padre Pedro Campos Mechaca School, and Gabriela Mistral School. These schools have similar characteristics because they are subsidized private schools in the Chilean educational system, meaning they receive both private and state funding. Students who did not participate in one or both pre- and post-tests were excluded, as well as those whose parents and/or guardians did not sign the informed consent form. In the case of the experimental group, students who did not attend 75% of the workshop sessions promoting inclusion through comics were also excluded. Table 1 shows the characteristics of the sample.

Table 1. Characteristics of the participating sample according to gender.

Gender ¹	Control Group		Experimental Group	
	N	%	N	%
Boys	9	37.5	17	53.1
Girls	15	62.5	15	46.9
Total	24	100	32	100

¹ Gender distribution of the control group, the experimental group, and the total sample.

2.2. Research Tools

The instrument used to measure students’ perceptions of the inclusive teaching practices is “Cuestionario de valoración de Prácticas Pedagógicas inclusivas en el aula de Educación

Física” (Questionnaire for assessing inclusive teaching practices in the physical education classroom, in English) (Nuñez et al., 2018), consisting of 20 items divided into four assessment dimensions: Learning of all students, Classroom climate, Collaborative learning, and Participation. Participants’ responses are assessed using the following scoring system: 1 = Strongly disagree; 2 = Disagree; 3 = Agree; and 4 = Strongly agree. This instrument has an internal validity of $\alpha = 0.783$ (Nuñez et al., 2018). The analysis carried out in this study shows lower scores than those reported by Nuñez et al. (2018), especially in the pretest. Likewise, they show lower levels than those accepted in the social sciences, so the subsequent results will have to be taken into consideration.

The workshop applied to the experimental group, called “Comics as a step towards inclusivity in the classroom” and validated by five experts, lasted 12 sessions of 30 min before physical activities during six weeks. Half of the sessions consisted mainly of recreational activities based on reading a chapter of a comic book with inclusive content, followed by activities related to reading; while the other sessions, interspersed with the previous ones, consisted of open-ended questions related to the inclusive topic addressed in the previous session. Meanwhile, the control group only carried out the planned activities of the subject, mainly physical activity.

2.3. Procedures, Data Analysis, and Ethical Considerations

In terms of procedures, once authorization had been obtained from the schools’ authorities to collect data, a meeting was held with the parents and/or guardians of the participating classes to provide information about the project, clarify any doubts, and emphasize the importance of participation. Parents and guardians who expressed interest in participating signed the informed consent form; in addition, the students signed the informed assent form. Both documents, along with the whole project, were reviewed and approved by the Scientific Ethics Committee of Universidad Adventista de Chile.

In each group (control and experimental) in the different establishments, two sessions were held corresponding to the pre- and post-treatment tests, which consisted of the application of the questionnaire created by Nuñez et al. (2018).

The intervention consisted of implementing the workshop “Comics as a Step Towards Inclusivity in the Classroom” in the experimental groups of the four educational institutions. The comic used in the workshop was created by the research team and addressed topics such as disability, human rights, discrimination, integration, social movements and activists, equality, the Teleton in Chile, and social inclusion, among others.

The data were analyzed using Statistical Product and Service Solutions (SPSS version 25), and the T-Student and the U Mann–Whitney test were used to determine statistical differences between the groups in parametric and non-parametric samples, respectively. It should be noted that only the total score of the questionnaire on inclusive teaching practices before the implementation of the workshop was parametric, according to the Kolmogorov–Smirnov normality test, while the rest of the variables associated with the four dimensions evaluated (Learning for all students, Classroom climate, Collaborative learning, and Participation) and the total score after the intervention were non-parametric.

3. Results

First, the analysis realized was descriptive, and Table 2 shows the average of each group in the four dimensions and in the total score on the questionnaire assessing inclusive practices. Table 2 proves that the experimental group improved each dimension’s score and the total score after the inclusive workshop’s implementation. Instead, the control group’s score decreased in some dimension (“Learning for all students” and “Participation”). In these four dimensions that the questionnaire evaluated, the median fluctuates between

12 and 18 points in the control group in the pretest and between 13 and 18 points in the posttest. Meanwhile, in the experimental group, the median varies between 13.5 and 18 points before the application of the Inclusive Workshop (pretest) and between 14 and 19 after its implementation. It should be noted that the maximum score in each dimension is 20 points; therefore, this score is mainly achieved in Dimension 1 (“Learning for all students”) after the intervention in this study group.

Table 2. Median score and standard deviation of the Dimensions of the inclusive teaching practices assessment questionnaire in the Control Group and Experimental Group before (pretest) and after (posttest) the Inclusive Workshop.

	Minimum Score	Maximum Score	Control Group		Experimental Group	
			Pre	Post	Pre	Post
D1. Learning for all students	5	20	17.38	17.13	17.50	18.31
Standard deviation			2.22	2.86	2	1.83
D2. Classroom climate	5	20	14.71	15.50	14.91	16.09
Standard deviation			2.15	1.74	2.05	1.53
D3. Collaborative Learning	5	20	12.75	13.17	14.06	14.38
Standard deviation			2.73	3.52	2.42	2.69
D4. Participation	5	20	15.04	14.42	16.44	16.81
Standard deviation			1.82	3.93	2.22	2.17
Total median score	20	80	59.87	60.21	62.91	65.59
Standard deviation			5.60	8.81	5.31	5.44

On the other hand, regarding the total instrument score, the control group increased by only 0.34 points in the post-test, while the experimental group increased by 2.68 points. However, to attribute this change to the effect of the workshop in this last group, these differences must be subjected to statistical tests such as the T Student test, the U Mann–Whitney test to determine differences between both groups, and the Wilcoxon test to establish differences between the score obtains before and after the workshop in each group. These comparisons will be explained later.

Likewise, the difference between the groups in these total scores corresponds to 3.04 before the intervention and 5.38 after the intervention, always in favor of the experimental group. Regarding the differences by group in the pre- and post-intervention assessments, it can be noted that the control group shows an increase of 0.34 points, while the experimental group shows an increase of 2.68 points in the total score.

The data from the inferential analysis are shown below. Table 3 shows statistically significant differences between the control group and the experimental group in the total questionnaire score before the intervention. Therefore, there were already statistical differences between the groups before the intervention with the Inclusive Workshop, since the control group shows a total median score before the implementation of the workshop of 59.87 points and 60.21 after the workshop, while the experimental group shows scores of 62.91 and 65.59, respectively.

The same analysis was performed with the scores for each of the dimensions evaluated before and after the implementation of the workshop between both groups, together with the analysis of the total post-intervention score. According to Table 4, in the pretest, there are statistical differences between the control and experimental groups in Dimension 3 (Collaborative Learning) and Dimension 4 (Participation). On the other hand, in the post-test, there are statistical differences in the experimental group in Dimension 4 and in the Total Score of the questionnaire. It is important to note that the differences in median score between the groups can be seen in Table 2.

Table 3. Statistical differences between control and experimental groups in the Total Score before the implementation of the Inclusive Workshop using the T-Student test.

		t	gl	Sig. (Two-Tailed)
PRE total score	Equal variances assumed	−2.063	54	0.044
	Equal variances not assumed	−2.047	48.229	0.046
	Control group		Experimental group	
Median score	59.87		62.91	
Standard deviation	5.60		5.31	

Total score's statistical differences between the control group and the experimental group with the T-Student test.

Table 4. Statistical differences between control and experimental groups in the dimensions (pre and post) and Total Score after implementation of the Workshop using the U Mann–Whitney test.

	Pre D1	Pre D2	Pre D3	Pre D4	Post D1	Post D2	Post D3	Post D4
U Mann Whitney Asymptotic Sig. (two-tailed)	374.5	378	243.5	226.5	288.5	334.5	318.5	192.5
	0.87	0.91	0.01	0.00	0.10	0.39	0.27	0.001

Given the controversy surrounding the results, the data were reanalyzed using the Wilcoxon test to determine statistical differences between two measurements in a related sample, that is, to establish statistical differences between the initial and final assessments of the four dimensions and the Total Score of the questionnaire in the experimental group and the control group.

Table 5 shows statistically significant differences in the pretest and posttest of the experimental group in Dimensions 1 (Learning for all students), Dimension 2 (Classroom climate), and the Total Score of the questionnaire that assesses inclusive practices in Physical Education classes.

Table 5. Statistical differences between the assessment of inclusive teaching practices in the dimensions and the Total Score before and after the implementation of the Workshop in the experimental group (Wilcoxon test).

	D1	D2	D3	D4	PT
Z	−2.719	−3.304	−0.652	−1.133	−3.118
Asymptotic Sig. (two-tailed)	0.007	0.001	0.515	0.257	0.002

To complement the results, this same analysis was performed on the control group. Table 6 shows that there are no statistically significant differences between the pretest and posttest of the control group in either the four dimensions or the Total Score.

Table 6. Statistical differences between the assessment of inclusive teaching practices in the dimensions and the Total Score between the pretest and posttest in the control group (Wilcoxon test).

	D1	D2	D3	D4	Total Score
Z	−0.630	−1.276	−1.487	−0.427	−0.798
Asymptotic Sig. (two-tailed)	0.529	0.202	0.137	0.670	0.425

These latest analyses show that the comic-based workshop, as a tool for promoting inclusive practices in physical education classrooms, has a positive effect, according to the perception of fifth-year primary school students in schools in Concepción, 8th Region, Chile.

Independent samples t-tests were performed to analyze intergroup differences in post-intervention scores (see Table 7). Homogeneity of variances was verified using Levene's test, and no violation of this assumption was observed for any of the variables analyzed (all $p > 0.05$). Therefore, equality of variances was assumed in all comparisons.

These results were complemented by an effect size analysis (Cohen's d):

$$d = \frac{t}{\sqrt{n_1^{-1} + n_2^{-1}}}$$

In this regard, no statistically significant differences were detected in Dimension 1 "Learning for all students" ($t(54) = -1.89$, $p = 0.065$, 95% CI $[-1.03, 0.03]$), Dimension 2 "Classroom climate" ($t(54) = -1.35$, $p = 0.182$, 95% CI $[-0.90, 0.17]$) or Dimension 3 "Collaborative learning" ($t(54) = -1.46$, $p = 0.151$, 95% CI $[-0.92, 0.15]$). However, the associated effect sizes were moderate in Dimension 1 ($d = 0.50$) and small-to-moderate in Dimensions 2 and 3 ($d = 0.36$ – 0.39), suggesting possible under-detected effects due to limitations in statistical power. Statistically significant differences were observed in Dimension 4 "Participation", $t(54) = -2.91$, $p = 0.005$, 95% CI $[-1.24, -0.23]$, with a large effect size ($d = 0.78$), as well as in the total post-intervention score, $t(54) = -2.82$, $p = 0.007$, 95% CI $[-1.23, -0.21]$, with a moderate-to-large effect size ($d = 0.75$).

Post hoc power analysis indicated adequate power to detect large effects ($1 - \beta \approx 0.85$ – 0.88), but insufficient power to detect moderate effects ($1 - \beta \approx 0.58$ for $d = 0.50$), suggesting that the lack of significance in some dimensions could be due to a type II error.

Following the ANCOVA statistical analysis, the resulting Tables A1–A5 are included in Appendix A. Based on these tables, it can be stated that in Dimension 1: "Learning for all students", the overall model is statistically significant ($F(2,53) = 24.724$; $p < 0.001$), explaining 48.3% of the variance in the post-test score ($R^2 = 0.483$; adjusted $R^2 = 0.463$). This represents a large effect size. Furthermore, the covariate (PRET D1) is significant ($F = 43,114$; $p < 0.001$; partial $\eta^2 = 0.449$), with a large effect size. This indicates that baseline scores strongly predict final scores, confirming the relevance of controlling for the pretest in the analysis. The group effect is also significant ($F = 5375$; $p = 0.024$; partial $\eta^2 = 0.092$). Although the effect size is moderate, it demonstrates that, once baseline differences are controlled for, there are significant differences between groups in Dimension 1 after the intervention. This suggests a treatment effect on "Learning for all students."

Regarding Dimension 2 "Classroom climate," the overall model is significant ($F(2,53) = 3.452$; $p = 0.039$), but it explains a small percentage of the variance ($R^2 = 0.115$; adjusted $R^2 = 0.082$), indicating a small overall effect. The covariate is significant ($F = 4.941$; $p = 0.031$; partial $\eta^2 = 0.085$), with a small-to-moderate effect size. Initial scores influence final scores. However, the group effect is not significant ($F = 1.674$; $p = 0.201$; partial $\eta^2 = 0.031$). This implies that, controlling for the pretest, no statistically significant differences were observed between the groups in the "Classroom climate" variable. Therefore, it cannot be concluded that the intervention had a differential effect on this dimension.

Regarding Dimension 3: "Collaborative learning", the model is highly significant ($F(2,53) = 23.239$; $p < 0.001$), with 46.7% of the variance explained ($R^2 = 0.467$; adjusted $R^2 = 0.447$), indicating a large effect size. The covariate is significant with a large effect size ($F = 42.725$; $p < 0.001$; partial $\eta^2 = 0.446$), indicating a strong influence of initial scores on final scores. However, the group effect is not significant ($F = 0.058$; $p = 0.810$; partial $\eta^2 = 0.001$), being practically nonexistent. This indicates that the post-test differences in "Collaborative learning" are essentially explained by initial differences and not by group membership.

Table 7. Effect size using Cohen’s statistical test.

		Levene’s Test for Equality of Variances		T-Test for Equality of Median			Median Difference	Standard Error Difference	95% Confidence Interval of the Difference	
		F	Sig.	t	gl	Sig. (Bilateral)			Lower	Upper
Z-score: POST D1 “Learning for all students”	Equal variances are assumed	3.675	0.061	−1.886	54	0.065	−0.497	0.263	−1.027	0.031
	Equal variances are not assumed			−1.775	36.819	0.084	−0.497	0.280	−1.066	0.070
Z-score: POST D2 “Classroom climate”	Equal variances are assumed	0.070	0.792	−1.353	54	0.182	−0.362	0.268	−0.899	0.174
	Equal variances are not assumed			−1.327	45.897	0.191	−0.362	0.273	−0.912	0.187
Z-score: POST D3 “Collaborative Learning”	Equal variances are assumed	0.010	0.920	−1.455	54	0.151	−0.388	0.267	−0.924	0.147
	Equal variances are not assumed			−1.401	41.695	0.169	−0.388	0.277	−0.949	0.171
Z-score: POST D4 “Participation”	Equal variances are assumed	3.265	0.076	−2.908	54	0.005	−0.736	0.253	−1.244	−0.228
	Equal variances are not assumed			−2.691	33.469	0.011	−0.736	0.273	−1.293	−0.180
Z-score: Total post-intervention score	Equal variances are assumed	1.888	0.175	−2.818	54	0.007	−0.716	0.254	−1.227	−0.206
	Equal variances are not assumed			−2.640	35.884	0.012	−0.716	0.271	−1.267	−0.166

Regarding Dimension 4: “Participation,” the model is significant ($F(2,53) = 17.616$; $p < 0.001$), explaining 39.9% of the variance ($R^2 = 0.399$; adjusted $R^2 = 0.377$), representing a considerable effect. The covariate is significant ($F = 23.287$; $p < 0.001$; partial $\eta^2 = 0.305$), with a moderate-to-large effect size. The group effect does not reach statistical significance ($F = 2.951$; $p = 0.092$; partial $\eta^2 = 0.053$), although it approaches the conventional significance level of 0.05 and presents a small-to-moderate effect size. This suggests a possible trend, but not sufficient evidence to confirm a clear effect of the intervention in this dimension.

Finally, in the total post-intervention score, the overall model is significant ($F(2,53) = 18.957$; $p < 0.001$), explaining 41.7% of the variance ($R^2 = 0.417$; adjusted $R^2 = 0.395$), indicating substantial explanatory power. The covariate is significant ($F = 26.262$; $p < 0.001$; partial $\eta^2 = 0.331$), with a moderate-to-large effect size, again confirming the importance of controlling for baseline scores. The group effect does not reach statistical significance ($F = 3.616$; $p = 0.063$; partial $\eta^2 = 0.064$), although it is close to the 0.05 threshold and shows a small-to-moderate effect size. This suggests a trend toward group differences, but without conclusive evidence.

In conclusion, the intervention appears to have had a clear and statistically significant effect only on Dimension 1 (“Learning for all students”). In the other dimensions and in the total score, the post-test differences are mainly explained by the initial scores, with no solid evidence of a differential group effect. In some cases, trends were observed that could be explored with larger samples.

4. Discussion

Based on the results, it was possible to determine that the workshop “Comics as a step toward advancing inclusivity in the classroom” has a positive effect on promoting inclusion in physical education classes, as students who receive this intervention show statistically significant differences in their assessments of these practices, developed by the teacher, before and after the implementation of the workshop, mainly first dimension of the questionnaire created by Nuñez et al. (2018): Learning for all students. These results are consistent with authors such as López-Prados and Saez-de-Adana (2023), who argue that the use of visual methodologies in the classroom, mainly images, are real and timely resource for achieving educational inclusion. According to the data obtained in this study, it is possible to agree with the same authors, who indicate that these resources (comics) are useful for discussing, generating criticism, and reflecting on inclusive aspects. Thus, based on the data analyzed, it is possible to determine that the use of comics as a tool to promote inclusive practices in physical education classrooms has a positive impact, according to the perception of fifth-grade students in primary schools in Concepción, 8th Region, Chile.

A comic that addresses issues of inclusion, as indicated by Derkachova et al. (2022), allows the creation of welcoming spaces available to the great diversity of humanity, which is indispensable nowadays, along with contributing to the development of positive personality traits, including tolerance and understanding of diversity in people. In this sense, those who participated in the experimental group, in the present study, seem developed awareness in concepts like inclusion and discrimination, since a large number of participants in this group refer (in response to an open question in the last session about the usefulness of the workshop) that discrimination occur today, and they reflected on and identified types of discrimination such as discrimination based on religion, physical appearance, economic status, disability, nationality, gender, and way of dressing, among others. Furthermore, after the workshop sessions implemented in this study, they were able to explain the concept of “social inclusion” and defined it “as the integration of all types of people with disabilities”.

Regarding the different dimensions assessed by the questionnaire used in this study to evaluate inclusive teaching practices, the implementation of comics as a teaching tool to promote inclusion had positive effects on the learning for all students and the classroom climate in physical education classes, corresponding to dimensions 1 and 2 of the questionnaire. According to [Bayona and Ruiz \(2025\)](#), this equity in student learning is achieved by eliminating attitudinal, infrastructural, and communicative barriers, which only occurs when educational institutions view pedagogical practices as inclusive elements that are permanently, progressively, and participatively present. The same authors emphasize the importance of perceiving students not only as thinking and feeling beings, but also as actors who can develop their own pedagogical strategies that encourage everyone to participate in each of the activities organized in the classroom. Along with this, the permanent assessment and explicit manifestation of students' learning progress reduce dropout rates and demotivation. Although these considerations are viewed by the authors as strategies that can have long-term effects, because they lead to an educational community that promotes inclusive education on an ongoing basis, small changes or actions generated in the classroom in the very short term, such as those developed in physical education classes with the implementation of the workshop in this study, can significantly change students' perceptions of the development of inclusive practices in the classroom. It is important to remember that the intervention in this study lasted only one month, with activities associated with the comic book that promotes social inclusion. If these strategies are relevant and become everyday elements in the classroom, it will undoubtedly be possible to develop an educational community and an institution that promotes inclusivity in education in all its forms. In this sense, families, teachers, and all levels of the educational system will become responsible for ensuring an inclusive culture throughout the educational process, which entails adopting different perspectives and actions that allow for interaction ([Bayona & Ruiz, 2025](#)).

Regarding Dimension 2 (Classroom Climate), [Urquizo-Esparza and Orihuela-Ticona \(2025\)](#) argue that a favorable climate promotes motivating teaching, which facilitates the teaching-learning process. In this sense, the teacher's vocation is fundamental for the construction of emotionally positive environments, considering not only the acquisition of content but also the strengthening of bonds. To this end, it is necessary to recognize strengths and weaknesses to plan actions that promote a climate that makes the environment suitable for the comprehensive development of students. For their part, [M. Ortiz and Lobato \(2003\)](#) affirm that an inclusive and participatory educational model influences positive experiences and coexistence from the point of view of both teachers and students; in turn, this environment is conducive to the development of greater autonomy from students to generate their own learning ([Muñoz et al., 2014](#)). Regarding the classroom climate in physical activities, specifically, [Dólera-Montoya et al. \(2021\)](#) assert that the implementation of physical and collaborative challenges is essential for improving coexistence, according to teachers and students, as it reduces violence and demotivation, along with the acquisition of teamwork skills and improving the classroom climate. Thus, the implementation of comics as an inclusive tool developed in subjects involving physical activity can become a strategic model for promoting inclusion, a good classroom climate, and coexistence, and collaborative work. However, these premises are not entirely consistent with the results of the present study.

The dimensions that value inclusive teaching practices that show no statistical differences between measurements taken before and after the intervention in the experimental group correspond precisely to collaborative work and participation, which involve the actions of both the subject teacher and the students themselves. However, these dimensions are considered fundamental to promoting inclusion.

For [Torres-Farias and Triviño-Sabando \(2024\)](#), for example, in inclusive processes, students must learn to coexist with their peers with disabilities; in particular, those with moderate intellectual disabilities, who have difficulties associated with social interaction. This context makes collaboration in the classroom very complex. Nevertheless, the authors add that the interaction that can occur between typical students and those with intellectual disabilities promotes collaboration in learning, which is achieved through the implementation of inclusive education with pedagogical practices in the classroom. Thus, the incorporation of an inclusive workshop would have a greater positive effect on students in terms of collaborative work, but a big error that may have influenced this workshop design is not having considered the individual learning needs of the students, because, as [Torres-Farias and Triviño-Sabando \(2024\)](#) indicate, each student should feel part of a learning community through their participation in classroom activities. The authors emphasize that one of the reasons for the successful implementation of an inclusive classroom is this collaborative learning, and to this end, it is essential to carry out pedagogical actions that allow for the development of this type of learning through activities that encourage interaction between peers with and without disabilities in an appropriate manner, which will also contribute to the practice of social skills, which develop naturally in groups that work collaboratively, as actions such as asking for help, sharing roles, and politely agreeing or disagreeing, among other social practices, arise.

The present study had limitations, such as the timeframe for implementing the workshop. A longer intervention period could have had a greater positive impact on all dimensions associated with implementing inclusive teaching practices. In other words, implementing a workshop with a greater number of sessions (this workshop consisted of only 12 sessions) could also have demonstrated its effectiveness in Dimensions 3 (Collaborative Work) and 4 (Participation). Furthermore, the statistically significant score differences between the groups in Dimensions 3 and 4 before the intervention could be due to variables that could not be controlled. Variables such as motivation, mood, predisposition, and emotion could have influenced the initial results. It should be noted that, although assignment to the study group was random, the subjects formed intact groups because they were classmates. For this reason, it was not possible to redistribute the subjects to the control and experimental groups after the initial results to homogenize the sample. These covariates (such as initial differences between the groups in some dimensions) also influenced the effect's size, according to d of Cohen and ANCOVA analysis. In other words, despite initial differences between groups in the Learning for all students' dimension, it can also be determined that the effect of the workshop is reflected in the statistical differences that the groups present after the intervention, but it does not occur in the other dimensions analyzed ("Classroom Climate", "Collaborative learning", "Participation", and The Final questionnaire's score).

On the other hand, this workshop focused on using comics as a dynamic and playful teaching resource to address issues related to inclusion, but did not consider the individual needs or interests of the workshop participants. This may have limited the effect of Inclusive Workshops in the areas mentioned (Collaborative Work and Participation). The reduction in the sample size was another limiting factor due to the exclusion criteria, mainly those students in the experimental group who were not considered in the data analysis because they did not attend at least 75% of the workshop sessions, or those who did not have the initial or final questionnaire that assessed inclusive teaching practices in physical education classes.

Another significant limitation of the study was the low reliability index of the questionnaire dimensions implemented, despite the adequate indices offered by the questionnaire in

its original study. The differences could be due to geographical issues or the final number of participants in the research. In this regard, the results offered should be taken with caution.

Given these limitations, it is suggested that further research be conducted on the subject, considering more extensive interventions, with a larger number of subjects and, above all, with actions that promote collaborative work and participation by all. It is also suggested that strategies and activities respond to the needs and interests of students who are part of the physical education classroom or other subjects. Furthermore, it is important to investigate students' perceptions in depth and not with a Likert-type questionnaire; therefore, it would be essential to consider future research with a qualitative approach, using focus group methods or in-depth interviews with students. Finally, given the scarcity of literature on this topic, future research is needed in Chilean schools to explore the use of comics as a useful teaching resource for promoting inclusion in physical education classes.

5. Conclusions

The results of this study reinforce the idea that comics, or other visual resources, can be an attractive and innovative tool for elementary school students, allowing them to reflect on inclusive issues and become aware that discrimination and exclusion still exist in social and educational environments, despite advances in knowledge and information available on various disabilities. However, teachers must receive ongoing training, as they are the ones who must encourage collaboration, commitment, and participation among students and their families. They also play a fundamental role as active mediators in ensuring that inclusion is addressed from a community, cultural, and political perspective. Finally, it is important to note that any inclusive implementation in the classroom must involve planning, ideally with sustained actions over time and the commitment of the institution and the community, to ensure equality and access to meaningful learning for all students, regardless of their condition and the great diversity that exists in the classroom.

The use of comics with inclusive themes could be a first innovative, motivating, practical, and easy teaching resource to promote inclusive practices among students, especially in sports activities where a high level of competitiveness is usually observed. This study has proven to be a valuable contribution, especially in Latin American educational communities, because many schools in this part of the world lack the resources and time to promote innovative, engaging, low-cost, and quick-to-implement inclusive strategies. Finally, given the scarcity of literature on this topic, future research is needed in Chilean schools to explore the use of comics as a useful teaching resource for promoting inclusion in physical education classes.

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Appendix A. ANCOVA Analysis in Each Dimension

Table A1. ANCOVA analysis of Dimension 1 “Learning for all students”.

Dependent Variable: POST Dimension 1 “Learning for All Students”						
Origin	Type III Sum of Squares	gl	Media Cuadrática	F	Sig.	Parcial Eta Squared
Corrected model	150.995 ^a	2	75.498	24.724	0.000	0.483
Intersection	17.306	1	17.306	5.667	0.021	0.097
Pre D1	131.656	1	131.656	43.114	0.000	0.449
Group	16.413	1	16.413	5.375	0.024	0.092
Error	161.844	53	3.054			
Total	18,063.000	56				
Corrected total	312.839	55				

^a. $R^2 = 0.483$ (Adjusted $R^2 = 0.463$).

Table A2. ANCOVA analysis of Dimension 2 “Classroom climate”.

Origin	Type III Sum of Squares	gl	Media Cuadrática	F	Sig.	Parcial Eta Squared
Corrected model	17.004 ^a	2	8.502	3.452	0.039	0.115
Intersection	164.671	1	164.671	66.853	0.000	0.558
Pre D2	12.170	1	12.170	4.941	0.031	0.085
Group	4.124	1	4.124	1.674	0.201	0.031
Error	130.549	53	2.463			
Total	14,197.000	56				
Corrected total	147.554	55				

^a. $R^2 = 0.115$ (Adjusted $R^2 = 0.082$).

Table A3. ANCOVA analysis of Dimension 3 “Collaborative Learning”.

Origin	Type III Sum of Squares	gl	Media Cuadrática	F	Sig.	Parcial Eta Squared
Corrected model	248.025 ^a	2	124.013	23.239	0.000	0.467
Intersection	17.330	1	17.330	3.247	0.077	0.058
Pre D3	228.002	1	228.002	42.725	0.000	0.446
Group	0.311	1	0.311	0.058	0.810	0.001
Error	282.832	53	5.336			
Total	11,284.000	56				
Corrected total	530.857	55				

^a. $R^2 = 0.467$ (Adjusted $R^2 = 0.447$).

Table A4. ANCOVA analysis of Dimension 4 “Participation”.

Origin	Type III Sum of Squares	gl	Media Cuadrática	F	Sig.	Parcial Eta Squared
Corrected model	232.175 ^a	2	116.087	17.616	0.000	0.399
Intersection	7.088	1	7.088	1.076	0.304	0.020
Pre D4	153.454	1	153.454	23.287	0.000	0.305
Group	19.444	1	19.444	2.951	0.092	0.053
Error	349.254	53	6.590			
Total	14,536.000	56				
Corrected total	581.429	55				

^a. $R^2 = 0.399$ (Adjusted $R^2 = 0.377$).

Table A5. ANCOVA analysis of total post-intervention score.

Origin	Type III Sum of Squares	gl	Media Cuadrática	F	Sig.	Parcial Eta Squared
Corrected model	1294.233 ^a	2	647.116	18.957	0.000	0.417
Intersection	120.824	1	120.824	3.540	0.065	0.063
Pre-intervention score	896.481	1	896.481	26.262	0.000	0.331
Group	123.430	1	123.430	3.616	0.063	0.064
Error	1809.196	53	34.136			
Total	227,388.000	56				
Corrected total	3103.429	55				

^a. $R^2 = 0.417$ (Adjusted $R^2 = 0.395$).

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