Article

Co-Teaching with High School Students for Music Teaching

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Abstract: This article presents a didactic proposal for teaching musical notation and solfège sight-singing through co-teaching with secondary school students. The goal was to explore the advantages and limitations of using a form of peer learning where students play the role of co-teachers alongside the teacher. We wanted to find out whether this proposal would lead to significant improvements among both co-teachers and tutees, identifying the actions responsible for this progress, and paying particular attention to how students learn in the role of co-teachers. This study was based on a mixed-method explanatory sequential design, where the quantitative data were analyzed first and then the qualitative data. The quantitative results showed statistically significant improvements when comparing the pre-test and post-test results of all the students participating in the didactic proposal. These improvements can be attributed to the personalized support provided by the co-teachers, the opportunities for peer assessment that enabled progress to be monitored and provided feedback, and the possibilities of learning by teaching. In conclusion, the results of this study endorse the viability of student co-teaching in secondary school music education.

Keywords: peer learning; learning by teaching; student co-teaching; music education; music literacy

1. Introduction

One of the main characteristics of traditional teaching is that pedagogical support is provided exclusively by the teacher. With this approach, it is difficult to set up situations where students are given opportunities to learn from each other [1]. "Change in education is a slow process. Old convictions die hard, and teachers whose work points in new directions often find themselves part of a vulnerable minority. Nonetheless, something happens from time to time that brings together the different efforts in favour of change and gives it formal approval" [2]. Although the teacher–student model is the most widely used approach to music teaching in the Western world, it does not favor student autonomy or help them to regulate their own learning [3]. Furthermore, it does not promote independent, reflective, critical thinking, which provides essential skills in the ambit of music [4]. Various studies in the fields of the educational sciences, music psychology, and music education have highlighted the need for a change in the educational model in order to strengthen the role played by students in decision-making about their education, thereby enabling them to take control of their own processes [3,5].

The mediator plays a fundamental part in the learning process when it comes to facilitating the link between learning and new information. There are studies that show that in certain school contexts, in conventional classrooms where it is always the teacher who acts in front of many students, the mediation of a peer may be more effective than that of an adult [1]. Peer mediation can have advantages over teacher mediation, when taking advantage of certain characteristics of the student tutor, such as a greater ability to use age-appropriate vocabulary and examples, the fact of having recently learned the content, the fact of being familiar with the new learners' potential frustrations and problems, and a

tendency to take a more direct approach than adults when resolving doubts [6]. All this has given rise to what is generically referred to as peer learning, which consists of a more competent student in a certain skill acting as a mediator for another student [7].

1.1. Peer Learning

The authors Damon and Phelps (1989) [8] distinguish three dimensions in peer learning based on the parity of roles and mutual interaction. These dimensions are peer tutoring, cooperative learning, and collaborative learning. In these three scenarios, the differences between peer tutoring and cooperative learning seem very clear. On the other hand, the teaching community does not always understand the difference between cooperative and collaborative learning in the same way. This research adopts the distinction made by Topping et al. (2017) [7], which basically considers that in cooperative learning and peer tutoring, it is necessary to structure the interactions of the external groups set up by the teacher as a form of support. This is especially useful in the school environment where the students are still developing the social skills needed for teamwork.

Three waves of research have been identified in the field of cooperative learning [9–11]. The first wave compared the effectiveness of cooperation with other learning strategies based on individual work and competition. The second examined the impact of the different cooperative learning methods (didactic designs of varying complexity aimed at promoting cooperation within the team). Finally, the third focused on analyzing the interaction in order to identify the causes and mechanisms underlying cooperative learning [12]. A review of these three waves of research shows that peer learning promotes mutual pedagogical support among classmates and that students are able to learn better thanks to the help received. However, if peer learning is to be considered an effective methodology, it needs to be shown that students also learn by teaching their classmates [11]. This is what is reviewed below.

1.2. Learning by Teaching

One explanation of how one can learn by teaching is offered by the theory of generative learning, which is a process that contemplates the construction of new knowledge [13]. From this perspective, teaching others may trigger a series of cognitive processes when it is necessary to select relevant information, organize it into coherent structures, and integrate it with prior knowledge [14]. If we argue that student tutors benefit from helping their partners, then when does learning actually take place? While preparing the activity and the content? When the information is presented? Or when the explanations are given? In addition, when are the questions answered? In this respect, Duran (2023) [15] presents an explanatory scheme with four learning-by-teaching levels: (a) expecting to teach, (b) presenting information, (c) explaining the knowledge, and (d) questioning the understanding.

The preparation of didactic material that enables other students to learn is a way of learning by teaching [16] and may be considered part of this first level of "expectations": learning with the expectation that someone else will use the material to learn too. Here, the students participate as co-creators of learning resources, not only because they contribute to other students' learning, but also because they may learn what they teach on being involved in the preparation of the material [17].

An experiment carried out by Bargh and Schul (1980) [18] compared students who were learning without going further with students who were learning with the expectation that they would teach, but without actually doing so. The results showed that students in the "expectant" group applied greater cognitive effort when selecting and organizing relevant information, which resulted in better learning outcomes. Benware and Deci (1984) [19] repeated this experiment in a school setting and obtained similar results. Subsequent studies by Fiorella and Mayer (2013) [20] and Nestojko et al. (2014) [21] corroborated these findings.

The research done by Annis (1983) [22] went a step beyond the scenario of expectations by giving the participants the possibility of learning by presenting information to an

audience. The results showed that the students who made preparations to teach and then presented the information scored higher than students who only made preparations but did not present anything. It is also important to take into account the audience effect because, even if the recipient is not present, the fact of being aware that an audience exists may prompt the belief that one's own actions can affect someone else [23]. In this respect, Ribosa and Duran (2023) [24] carried out a study focused on the concept of audience and its role in learning by teaching. The research focused on a group of 44 students aged from eleven to twelve who cooperated in pairs to create video tutorials. The results showed that the amount of attention paid to the audience can vary across non-interactive learning–teaching situations, and that feelings of social presence have the potential to foster content creation, even if students do not take full advantage of these opportunities.

Other research has shown that apart from its presentation, explaining information is a powerful learning strategy [23]. Some studies have focused on giving others explanations through tutorials or interactions [25], while others explored the effects of explaining something to oneself [25–27]. Roscoe and Chi (2007) [28] underscore the importance of initially training peer tutors in how to develop knowledge so that they can activate metacognitive processes that enable them to assess the level of understanding of the information, rather than simply imparting it and repeating it. In this way, student tutors obtain greater benefit when teaching their classmates, because while it is true that they can learn by teaching when they have to explain content or information to their classmates, the possibilities of learning are ultimately determined by how the explanation is given. This means that they can take advantage of or may miss out on the learning opportunities offered by their real teacher.

When the participants are involved in a two-way interaction, in addition to giving explanations, a questioning attitude emerges [11], which includes both asking and answering detailed questions [28]. Regarding the action of questioning the understanding, Webb (1989) [29] claims that the elucidations, confrontations, and different points of view expressed by the students receiving the explanation give the explaining student the opportunity to gain a deeper knowledge of the subject. The reason for this is that when answering the questions and giving new explanations, they have to look for new information, thereby initiating an interactive relationship with the learner, which previously only consisted of presenting information to a passive listener. The results of Roscoe's research (2014) [30] showed that tutors who more frequently monitored their comprehension, and who were asked detailed questions by their tutees, were more likely to build knowledge while tutoring. Roscoe and Chi (2007) [28], when discussing student tutors' learning in relation to giving explanations and questioning, affirm that when the tutees formulate useful questions, tutors benefit from giving explanations through the integration of concepts and principles, generating new ideas through inference and reasoning, and questioning knowledge by asking and answering questions. Nonetheless, this demands a high degree of reflection on the part of the tutor, with the integration of prior and new knowledge and the reorganization of mental models.

1.3. Student Co-Teaching

A specific way of learning by teaching was presented by Duran and Topping (2017) [31] and consists of giving teachers the opportunity to co-teach with their own students. In other words, providing opportunities for students to act as co-teachers [32] and thus favoring an improvement in their academic and social skills [33]. This approach broadened the concept of co-teaching, which was previously limited to cooperation among teachers, support teachers, and other educators [34]. As well as providing opportunities for student co-teachers to learn by teaching their peers, it circumvents situations where students lack communication with their teachers, in detriment of their motivation and productiveness, because of the different frames of reference existing in the classroom [35]. However, co-teaching involving students is still a little explored issue of educational practice. Thousand et al. (2015) [33] presented three cases with student co-teachers that illustrate the five elements of collab-

orative teaching and learning in action, showing the versatility of their use. Described below is more recent work where teachers of different subjects have co-taught alongside their students.

Murphy and Scantlebury (2010) [36] explored student co-teaching in a wide variety of contexts in schools in Europe, America, and Australia, with students in primary, secondary, and higher education. The authors presented different experiences of teachers co-teaching with their students when imparting mathematics and science subjects [37–39].

Student co-teaching provides both students and teachers with transformative tools for use inside the classroom. It enables them to work more as equals, results in a learning environment where the learners are more active, increases their control of what and how they learn, and creates a more adaptable environment that is well suited to teaching and learning in the multifarious classroom scenarios of the 21st century (Murphy & Scantlebury, 2010 [36]).

1.4. Peer Learning and Music Literacy

Music is a social activity that takes place in a variety of settings, where cooperation between performers, between composers and performers, and between audiences and performers is encouraged [40]. Students naturally take the lead in music classes by getting involved in helping their teachers and peers in a number of ways. If this support is appropriate, it may result in very significant benefits [41]. Although a good number of musical activities are team-oriented, music teaching continues to be chiefly individual, all be it in the learning of instruments at music academies or in large groups in master classes; this is the case in the school setting too [42]. There are interesting works that address musical practices through digital spaces [43]. However, this study has opted for activities with face-to-face interactions.

A knowledge of music notation is a basic part of music training in Western cultures, which naturalizes the fact that the development of performance, vocal, and instrumental techniques require complete music literacy—where the components and modalities of the theoretical system of notation have been given priority for many centuries [44]. Music notation plays a basic role in music literacy and its role in this respect has been widely researched from the standpoint of music education and music theory. Galera and Tejada (2012) [45] argue that music notation is one of the essential components of music literacy and that a proper understanding is essential for the performance of a score. The authors underscore the importance of accurately performing the musical lengths expressed by the corresponding notation.

One of the most popular strategies for the development of sight-singing skills is solfège, which involves intoning melodies according to the indications provided by a score derived from the study of practical music theory. The purpose of solfège is to become progressively more familiar with music notation with the goal of automating the decoding processes needed for performance at first sight, in real-time, of the score [44]. Solfège focuses on two main aspects of notation: musical pitches and lengths [44], and the teaching methods can range from a very individualistic approach to learning, as done traditionally, to a sociocultural conception where interaction and discourse in the classroom are the keys to the acquisition of musical language [46]. Studies have been published that relate peer learning to music literacy. Altimires and Duran (2011) [42] presented an innovation that uses peer tutoring as an instructional strategy for learning to read the notes, thereby facilitating both the learning of the subject matter and social skills. Duran and Sánchez (2012) [47] presented a proposal based on peer tutoring that aims at better comprehension and more fluent reading of rhythm in music. The results of these initiatives showed a considerable improvement in the fluency of the tutors' reading skills, as well as advances in reading comprehension.

2. Materials and Methods

This study is part of a larger project that addresses five subject areas of music included on the Chilean national curriculum, through co-teaching with secondary school students. In this article, we present the quantitative and qualitative results derived from the two theory subject areas in this project related to music literacy: music notation and solfège sight-singing.

In the didactic proposal, the students were organised into groups where they acted as co-teachers of each of the thematic units, so that everyone had carried out this activity on concluding the study of the subject area. In this respect, the students received instruction in effective communication strategies and knowledge building during the first phase of the proposal. This action was intended to make the most of the opportunities to learn while teaching. Subsequently, the co-teachers received training in their respective subject areas and they planned the activities to be carried out during the session, preparing didactic material to accompany the presentation so that the tutees could do practical exercises. In the following phase, the co-teachers taught the content to a group of four students, using different formats and methods, presenting the information, giving explanations, and answering questions. In the final phase, the co-teachers evaluated what the tutees had learnt.

The purpose of this research was to explore the potential and limitations of a form of peer learning where students play the role of co-teachers alongside the teacher during their teaching–learning process, while tackling the subject areas of music notation and solfège sight-singing.

The first goal was to find out if the implementation of the didactic proposal resulted in a significant improvement in learning outcomes among the co-teaching students and the tutees. According to our hypothesis, all the students who participated in the didactic proposal, both co-teachers and tutees, would show a significant improvement in the learning of the two subject areas under study. This would become clear when comparing the pre- and post-test results, where it was expected to find a statistically significant difference between the two assessments.

The second goal was to identify those actions that did or did not facilitate learning in the sessions involving student co-teachers. Assuming that any possible improvement among the tutees could be explained by the more personalized support provided by the co-teachers, the research focused on identifying which actions carried out by the co-teachers might account for their own learning.

This research used a mixed-method sequential explanatory design [48]. First, the quantitative data were analyzed, and then the qualitative, in order to explain the results quantitatively.

The participants in this research came from a school in an urban area of the Maule region of Chile, in a formal context. Their main characteristics are described below:

- About the students: in total, there were 85 secondary school students (a class of 43 students and another class of 42) consisting of 52 boys and 33 girls aged between 14 and 15.
- About the teacher: He was a graduate from the University of Talca, an opera singer and popular music performer, with experience in conducting, choral singing and musical theatre. He had one year's secondary school teaching experience at the time of the research.
- About the school: It was a polytechnic secondary school with a tradition of academic excellence. It had 900 students. It boasts a specially designed and equipped space for teamwork.

Various data collection instruments and techniques were used to implement the quantitative and qualitative side of this research.

Quantitative dimension:

- Pre-test: At the beginning of the session, each co-teacher set the members of their team a pre-test in order to assess their musical knowledge and skills. Furthermore, the teacher applied the same instrument to the co-teachers before they began to prepare the teaching activities.
- Post-test: At the end of the teaching activity, each co-teacher set the members of their team a post-test to assess their learning outcomes. Furthermore, the teacher applied the instrument to the co-teachers at the end of the sessions.

Qualitative dimension:

- Audiovisual recordings: Recordings were made of a sample of four teams selected from among the eight teams that took part in the session. The choice of the teams to be recorded was based on the co-teachers' pre-test scores. Thus, the two co-teachers with the highest pre-test scores were recorded, plus one with an intermediate pre-test score and the co-teacher with the lowest pre-test score.

The results obtained from the quantitative and qualitative dimensions were subjected to the following analytical procedures in order to respond to the research questions, goals, and hypothesis.

The Wilcoxon rank test was used in the analysis of the quantitative dimension to compare the mean range of the two related samples and determine if there were any differences between them. First, it was applied to find out whether there were significant differences between co-teachers and tutees when comparing the pre-test scores. The results showed that the two groups were comparable. Second, the same Wilcoxon test was applied to find out whether there was a general improvement in learning outcomes among the participating students, whether there was a significant improvement in the learning outcomes among the students who took the role of co-teachers, and whether there was a significant improvement among the tutees. This analysis was applied to both the subject areas worked on.

Throughout this research, we sustained that co-teachers ought to benefit by helping their tutored classmates. For this reason, when analyzing the qualitative dimension of the research, specifically the actions taken by the co-teachers during the interactions that occurred in the course of the teamwork, it was considered important to verify when learning actually took place: While the activity and content was being prepared? When presenting the information? When giving explanations? When the questions were being answered? To this end, we developed an observational framework based on the explanatory scheme proposed by Duran (2023) [15]. Four categories of analysis were included in this framework: expecting to teach, presenting information, explaining the knowledge, and questioning the understanding. Subcategories were added to these four categories, which went into greater detail about the actions that co-teachers should carry out to achieve better learning outcomes.

This observational framework made use of the Likert scale, which determines the perception of a qualitative variable and has been widely used to collect non-quantitative perceptions in social studies [49]. The scale used ranged from 1 to 5 to identify the frequency with which the actions were performed (1, never; 2, rarely; 3, occasionally; 4, frequently; and 5, very frequently). The purpose of this framework was to identify those actions taken by the co-teachers that influenced learning outcomes, both positively and negatively. The categories and subcategories are described in Table 1.

Table 1. Categories and subcategories for observing the actions carried out by the co-teachers.

Categories	Subcategories
1. Expecting to teach	1.1 Preparation of material to support the presentation.
	1.2 Preparation of didactic material for the tutees.
	1.3 Organization of the actions to be taken during the teaching activity.
2. Presenting information	2.1 Organized presentation of information.
	2.2 Information presented clearly.
	2.3 Self-correction of mistakes and impressions.
	2.4 Proven command of what is being taught.
3. Explaining the knowledge	3.1 Explanations given using different formats and adapted to different learning styles (auditory, visual, or kinaesthetic).
	3.2 Explanations given in different ways, giving examples, modelling learning, making gestures, using body language.
	3.3 Adaptation of the explanations, activities, and examples to the students' needs and context.
	3.4 Clues given to help the students build their knowledge.
4. Questioning the understanding	4.1 Detailed questions asked (theoretical and practical) to introduce topics, to connect up information with students' knowledge and experiences, and to guide and monitor the tutees' thinking.
	4.2 Actions taken to prompt students to formulate questions by linking information with prior knowledge, reorganizing, inferring, and reflecting.
	4.3 Detailed questions asked about what is being taught (theoretical and practical).
	4.4 Active listening to students' contributions.
	4.5 Co-teachers demonstrate through their verbal and body language that they are reflecting on their own knowledge, the quality of what they are teaching, and the pedagogical help they are providing, modifying their explanations if necessary.
	4.6 Reflective knowledge construction using the expressions, questions and contributions of the students in the team.

3. Results

This section presents the research results for the goals and hypotheses proposed in the quasi-experimental study and for the qualitative research questions. The results for each subject area are presented in two parts. First, improvements in the learning outcomes for each subject area are explained to achieve the first goal (to find out if the implementation of the didactic proposal led to a significant improvement in the learning outcomes of co-teaching students and those who received their support). And second, the analysis of the activities carried out by the co-teachers during the teamwork is presented, which explains the perceived changes in the quantitative dimension and achieves the second goal (to identify which actions did or did not promote learning in the student co-teaching sessions).

3.1. Results of the Work on Music Notation

Thanks to the results of the work on music notation with regard to the differences between the independent samples in the pre-test results, we were able to verify that there were no significant differences between co-teachers and tutees when comparing the pre-test scores, as shown in Table 2. Therefore, the two groups were comparable.

Table 2. Differences between co-teachers and tutors in the music notation pre-test.

Co-Teachers			Tutees			P	W
N	M	SD	N	M	SD		
12	59.833	9.340	62	56.839	15.766	0.970	375.000

Was there a significant improvement in the learning outcomes of the students participating in the didactic proposal? The results reported in Table 3 show that there was a significant overall improvement ($p < 0.001$), with a large effect size (rrb = 0.970); that there was a significant improvement among the co-teachers ($p = 0.009$), with a large effect size (rrb = 1.000); and that there was a significant improvement among the tutees ($p < 0.001$), also with a large effect size (rrb = 0.963).

Table 3. Results of the music notation pre- and post-tests.

Results	N	Pre-Test		Post-Test		Stat	P	Effect
		M	SD	M	SD			
Overall	74	57.324	14.903	68.230	4.251	1357.000	<0.001	0.970
Co-teachers	12	59.833	9.340	67.750	4.475	45.000	0.009	1.000
Tutees	62	56.839	15.766	68.323	4.238	928.500	<0.001	0.963

The post-pre variable (difference between the two scores) was created to find out whether one of the groups improved more than another. The difference between roles was not significant, as can be observed in the results presented in Table 4.

Table 4. Differences between co-teachers and tutees in the subject area of music notation.

Co-Teachers			Tutees			P	W
N	M	SD	N	M	SD		
12	7.917	6.721	62	11.484	14.633	0.929	365.500

Although the difference was not significant, the co-teachers of this subject area showed an improvement with a larger effect size (rrb = 1.000) than the tutees (rrb = 0.963).

Table 5 displays the results obtained for the different categories and subcategories, including each co-teacher's overall mean in the session, each co-teacher's mean in each category, the mean of all the co-teachers in each subcategory, the mean of all the co-teachers in each category, and the overall mean of all the co-teachers in the session. The results shown in this table identify the actions taken by the co-teachers that resulted in better or worse learning outcomes.

After analyzing the co-teachers' actions, we identified those that were carried out most frequently, those that were carried out occasionally, and those that were not carried out at all. This information is classified in Table 6.

As shown in Table 6, the co-teachers disregarded only two actions while carrying out most of others frequently. This may explain the good results in this subject area.

3.2. Results of the Work on Solfège Sight-Singing

Thanks to the results of the work on solfège sight-singing with regard to the differences between the independent samples in the pre-test results, we were able to verify that there were no significant differences between co-teachers and tutees when comparing the pre-test scores, as shown in Table 7. Therefore, the two groups were comparable.

Table 5. Co-teachers' results for music notation.

Categories	Subcategories	Co1	Co2	Co3	Co4	Co5	Co6	Co7	Co8	Mean of the Subcategory
Expecting to teach	Preparation of material to support the presentation.	5	5	3	5	5	5	4	5	4.6
	Preparation of didactic material for the tutees.	3	1	3	5	5	1	3	1	2.8
	Organization of the actions to be taken during the teaching activity.	5	5	5	5	5	1	3	3	4.0
	Mean of the category	4.3	3.7	3.7	5.0	5.0	2.3	3.3	3.0	3.8
Presenting information	Organized presentation of information.	5	5	5	5	5	5	5	3	4.8
	Information presented clearly.	5	5	5	5	4	3	3	3	4,1
	Self-correction of mistakes and impressions.	5	5	4	5	3	4	1	1	3.5
	Proven command of what is being taught.	4	5	4	5	4	3	3	3	3.9
	Mean of the category	4.8	5.0	4.5	5.0	4.0	3.8	3.0	2.5	4.1
Explaining the knowledge	Explanations given using different formats and adapted to different learning styles (auditory, visual or kinaesthetic).	5	5	5	5	5	5	4	5	4.9
	Explanations given in different ways, giving examples, modelling learning, making gestures, using body language.	5	5	5	5	5	5	4	3	4.6
	Adaptation of the explanations, activities and examples to the students' needs and context.	5	3	5	5	5	5	3	5	4.5
	Clues given to help the students build their knowledge.	1	5	5	5	1	3	1	3	3.0
	Mean of the category	4.0	4.5	5.0	5.0	4.0	4.5	3.0	4.0	4.3
Questioning the understanding	Detailed questions asked (theoretical and practical) to introduce topics, to connect up information with students' knowledge and experiences, and to guide and monitor the tutees' thinking.	5	3	3	5	5	3	1	1	3.3
	Actions taken to prompt students to formulate questions by linking information with prior knowledge, reorganizing, inferring and reflecting.	1	1	1	1	1	5	1	1	1.5
	Detailed questions asked about what is being taught (theoretical and practical).	5	5	5	5	5	5	3	3	4.5
	Active listening to students' contributions.	5	5	5	5	5	5	5	1	4.5
	Co-teachers demonstrate through their verbal and body language that they are reflecting on their own knowledge, the quality of what they are teaching and the pedagogical help they are providing, modifying their explanations if necessary.	1	5	5	5	5	5	3	1	3.8
	Reflective knowledge construction using the expressions, questions and contributions of the students in the team.	5	5	5	5	5	5	3	1	4.3
	Mean of the category	3.7	4.0	4.0	4.3	4.3	4.7	2.7	1.3	3.6
	General mean	4.1	4.3	4.3	4.8	4.3	4.0	3.0	2.6	3.9

Was there a significant improvement in the learning outcomes of students participating in the didactic proposal? The results reported in Table 8 show that there was a significant overall improvement ($p < 0.001$), with a large effect size (rrb = 0.992); that there was a significant improvement among the co-teachers ($p = 0.004$), with a large effect size (rrb = 1.000); and that there was a significant improvement among the tutees ($p < 0.001$), also with a large effect size (rrb = 0.991).

Table 6. Summary of the actions carried out by the co-teachers in the subject area of musical notation.

Actions Carried Out	Actions Carried Out Occasionally	Actions Not Carried Out
1. Preparation of didactic material to support the presentation. 2. Organization of the activities. 3. Structured presentation of the information. 4. Clear presentation. 5. Demonstration of knowledge of what is taught. 6. Explanations given in different formats. 7. Explanations given in different ways, by providing examples, modelling the learning, and guiding individual and group practice. 8. Adaptation of explanation and activities to the students' needs and context 9. Theoretical or practical answers given to detailed questions. 10. Active listening to students' contributions. 11. Reflection about their own knowledge, the quality of their teaching and the pedagogical help they provide. 12. Reflective knowledge construction using contributions made by the students in the team.	1. Self-correction of mistakes. 2. Clues given to help the students build their knowledge. 3. Activation of prior knowledge with detailed questions.	1. Preparation of didactic material for tutees. 2. Actions carried out that motivate students to formulate questions connecting the information with prior knowledge, reorganising, inferring and reflecting.

Table 7. Differences between co-teachers and tutees in the solfège sight-singing pre-test.

Co-Teachers			Tutees			P	W
N	M	SD	N	M	SD		
13	32.538	23.006	63	31.063	17.614	0.945	404.000

Table 8. Results of the solfège sight-singing pre- and post-tests.

Results	N	Pre-Test		Post-Test		Stat	P	Effect
		M	SD	M	SD			
Overall	76	31.316	18.479	64.079	10.676	2405.500	<0.001	0.992
Co-teachers	13	32.538	23.006	69.077	1.754	66.000	0.004	1.000
Tutees	63	31.063	17.614	63.048	11.443	1703.000	<0.001	0.991

The post-pre variable (difference between the two scores) was created to find out whether one of the groups improved more than the other. The difference between roles was not significant, as can be observed in the results presented in Table 9. However, even though the difference did not become significant, the co-teachers of this subject area showed an improvement with a larger effect size (rrb = 1.000) than the tutees (rrb = 0.991).

Table 9. Differences between co-teachers and tutees in the subject area of solfège sight-singing.

Co-Teachers			Tutees			P	W
N	M	SD	N	M	SD		
12	36.538	22.329	63	31.984	19.366	0.369	475.000

Table 10 displays the results obtained for the different categories and subcategories, including each co-teacher's overall mean in the session, each co-teacher's mean in each

category, the mean of all the co-teachers in each subcategory, the mean of all the co-teachers in each category, and the overall mean of all the co-teachers in the session.

Table 10. Co-teachers' results for solfège sight-singing.

Categories	Subcategories	Co9	Co10	Co11	Co12	Co13	Co14	Co15	Co16	Mean of the Subcategory
Expecting to teach	Preparation of material to support the presentation.	5	3	5	5	3	5	5	5	4.5
	Preparation of didactic material for the tutees.	5	3	5	3	3	3	5	1	3.5
	Organization of the actions to be taken during the teaching activity.	5	3	5	3	3	5	5	5	4.3
	Mean of the category	5.0	3.0	5.0	3.7	3.0	4.3	5.0	3.7	4.1
Presenting information	Organized presentation of information.	5	3	5	3	3	5	5	5	4.3
	Information presented clearly.	5	5	5	5	3	5	5	5	4.8
	Self-correction of mistakes and impressions.	5	5	5	5	5	5	5	5	5.0
	Proven command of what is being taught.	5	5	5	5	5	5	5	5	5.0
	Mean of the category	5.0	4.5	5.0	4.5	4.0	5.0	5.0	5.0	4.8
Explaining the knowledge	Explanations given using different formats and adapted to different learning styles (auditory, visual or kinaesthetic).	5	5	5	5	5	5	5	5	5.0
	Explanations given in different ways, giving examples, modelling learning, making gestures, using body language.	5	5	5	5	5	5	5	5	5.0
	Adaptation of the explanations, activities and examples to the students' needs and context.	5	5	5	5	5	5	5	5	5.0
	Clues given to help the students build their knowledge.	5	3	5	5	5	3	5	5	4.5
	Mean of the category	5.0	4.5	5.0	5.0	5.0	4.5	5.0	5.0	4.9
Questioning the understanding	Detailed questions asked (theoretical and practical) to introduce topics, to connect up information with students' knowledge and experiences, and to guide and monitor the tutees' thinking.	5	5	5	3	5	5	5	5	4.8
	Actions taken to prompt students to formulate questions by linking information with prior knowledge, reorganizing, inferring and reflecting.	1	1	5	1	1	1	1	5	2.0
	Detailed questions asked about what is being taught (theoretical and practical).	5	5	5	5	5	5	5	5	5.0
	Active listening to students' contributions.	5	5	5	5	5	5	5	5	5.0
	Co-teachers demonstrate through their verbal and body language that they are reflecting on their own knowledge, the quality of what they are teaching and the pedagogical help they are providing, modifying their explanations if necessary.	5	5	5	5	5	5	5	5	5.0
	Reflective knowledge construction using the expressions, questions and contributions of the students in the team.	5	5	5	5	5	5	5	5	5.0
	Mean of the category	4.3	4.3	5.0	4.0	4.3	4.3	4.3	5.0	4.5
	General mean	4.8	4.2	5.0	4.3	4.2	4.5	4.8	4.7	4.6

After analyzing the co-teachers' actions, we identified those that were carried out most frequently, those that were carried out occasionally, and those that were not carried out at all. This information is classified in Table 11.

Table 11. Summary of the actions carried out by the co-teachers in the subject area of solfège sight-singing.

Actions Carried Out	Actions Carried Out Occasionally	Actions Not Carried Out
1. Preparation of didactic material to support the presentation. 2. Organization of the activities carried out during the teaching activity. 3. Structured presentation of the information. 4. Clear presentation of information. 5. Demonstration of knowledge of what is taught. 6. Explanations given in different formats. 7. Explanations given in different ways, by providing examples and modelling the learning. 8. Adaptation of explanations, activities and examples to the students' needs and context. 9. Theoretical or practical answers given to detailed questions about what was being taught. 10. Active listening to students' contributions. 11. Reflection about their own knowledge, the quality of their teaching and the pedagogical help they provide. 12. Reflective knowledge construction using the expressions, questions, and contributions provided by the students in the team. 13. Self-correction of mistakes. 14. Clues given to help students build their knowledge. 15. Activation of prior knowledge through detailed questions.	1. Preparation of didactic material for tutees.	1. Actions intended to motivate students to formulate questions connecting the information with prior knowledge, reorganizing, inferring, and reflecting.

As shown in Table 11, the actions that most influenced the co-teachers' learning and that were carried out without exception are located in the "presenting information" and "explaining the knowledge" categories. On the other hand, only one action was carried out from the "expecting to teach" and "questioning the understanding" categories. The co-teachers of solfège sight-singing carried out almost all the actions in all the categories.

4. Discussion

The quantitative results revealed statistically significant improvements when comparing the pre- and post-test results for all the students who took part in the didactic proposal. These improvements can be attributed, in the case of the tutees, to the individualized support provided by co-teachers, the possibility of monitoring progress and offering feedback, and also the possibility of learning by teaching in the case of the co-teachers.

Within the framework of this research, reference has been made to the learning outcomes of both the students who received pedagogical help and those who provided it. However, there is little research that has attempted to explore the learning opportunities of the students who provide the help. Consequently, this study focused on the aforesaid students, who delivered the necessary support and involved themselves in the exploratory

work that enabled them to increase their experience and knowledge to achieve a certain level of expertise, as enunciated by Engeström and Sannino (2010) [50].

The co-teachers' initial training in how to build knowledge and activate metacognitive processes was one of the issues given particular consideration from the beginning of this research. The reason being that then, instead of merely transmitting and repeating the information, they would be able to assess how well the tutees understood it, given that learning potential is determined by the way in which the explanations are presented [28]. Even so, although initial training was carried out, which not only focused on how to build up knowledge but also on the theoretical and practical aspects of each subject area, on repeated occasions, the co-teachers limited themselves to transmitting the information. Consequently, it is crucial to develop strategies to prevent this from happening and to make the most of the potential offered by the action of explanation. Two specific alternatives should be given consideration if co-teachers' training is to be improved in this respect. First, more time could be devoted to initial training, thereby giving greater depth to the skills development needed to build knowledge. Second, teaching and learning activities could be geared towards actions that demand the transformation of information. One possible alternative is to provide co-teachers with information that they have to turn into a teaching and learning activity. This might well be a more effective action and it might help to transform the action of transmitting and repeating information.

It was observed that, regardless of the subject area, those co-teachers who had prepared material for its presentation were clearly more relaxed and confident when presenting and carrying out their work. In addition, when they had any doubts or felt insecure, the support material helped them to sustain the session. This finding suggests that it would be very positive and beneficial to include, by way of tasks set within the session, all those actions supported by scientific evidence that have proven their effectiveness in learning by teaching: the preparation of material, activation of prior knowledge, asking and answering detailed questions, active listening, self-correction of mistakes, and adapting the explanation and activities to different contexts. Thus, all the co-teachers would be equally favoured or would at least start off on an equal footing.

Thanks to the interaction in small groups, the co-teachers were able to observe the performance of the students in the team and speedily correct their mistakes. This peer assessment during sessions is one of the strategies that most favors self-regulation [51], because the co-teachers make conscious decisions about the strategies needed to achieve the goals, monitoring progress, and assessing their degree of achievement. This paves the way for feedback, by means of which the tutees receive useful information to help them improve their work [31].

The results reinforced the idea that students who prepare themselves to carry out the session and answer their classmates' questions achieve better results than the tutees, as affirmed by Fiorella and Mayer (2013) [20]. In this research, we did not observe any negative aspects associated with a loss of intrinsic motivation or a certain increase in anxiety, such as were detected by Renkl (1995) [52], since, in general, the students were seen to be interested and the majority did their co-teaching work well.

As pointed out by Annis (1983) [22], the preparation and appropriation of new content linked to prior knowledge in order to teach it means co-teachers have to make a special effort and pay greater attention, given the need to prepare the material to be presented to the tutees. Following the presentations, the explanations served as a potent learning strategy when explaining the different subject areas worked on with their teammates [23], in different interactive situations [25]. Something else that also favored the co-teachers was the fact that many of their explanations emerged through due reflection, generating inferences, developing, and monitoring the degree of comprehension [23].

Apart from the explanations in the co-teaching sessions, two-way interactions took place between the participants, where questioning was brought into play [11]. On the other hand, although questions were asked and answered, most of the said questions were not very incisive, being rather superficial instead and intended to verify or confirm

information, for example. This limited the scope of the tutors' reflections and their learning outcomes, as similarly shown by the results of the meta-analysis carried out by Roscoe and Chi (2007) [28]. Nonetheless, it was possible to observe what was affirmed by Roscoe (2014) [30], which is that the transmission of knowledge is not necessarily detrimental to learning, since the fact of the teachers expressing the content in their own words or summarizing it can also help strengthen the teaching (by way of a review), bearing in mind that some explanations may combine aspects of both knowledge transmission and its transformation.

One of the actions most carried out by the co-teachers of both subject areas was active listening to the tutees' contributions. The educational dialogues that emerged from this interaction were a way of ensuring that everyone could express their point of view, activating the processes of observation, listening, and experimentation [53].

Wang et al. (2021) [54] point out that most of the research in the literature has been carried out with university students. However, this study, which documents a student co-teaching activity aimed at teaching musical skills and content, worked with a sample of secondary school students, thereby making it a novel contribution to the scientific literature.

5. Conclusions

The first goal of this research was to find out whether the implementation of the didactic proposal would lead to a significant improvement in learning outcomes, both among the students who acted as co-teachers, and among those who received their support, in the two subject areas they addressed. Our hypothesis was that all the participants would make statistically significant improvements, which would be confirmed by comparing the scores obtained in the pre- and post-tests of their knowledge in these subject areas. The results obtained confirm the proposed hypothesis and meet the first goal, since all the students involved in the didactic proposal made statistically significant improvements in the two subject areas. It seems probable that a good part of this progress was the fruit of the teaching imparted by the co-teachers and all the actions involved. With these findings, it is possible to infer that the better the co-teacher fulfils his or her role and the higher the quality of these actions, the better the learning outcomes. This research suggests that student co-teaching is an effective music teaching strategy, given that it promotes an enriching cooperative learning environment. By actively involving students in the teaching process and encouraging peer learning, significant advances can be made in music education and teaching in general. These favorable results suggest the possibility of using, within the framework of learning by teaching, this form of student co-teaching.

This research was particularly interested in finding out when learning among co-teachers takes place. This motivated the development of the second goal: to identify the actions that do or do not promote learning through student co-teaching. Furthermore, another research question emerged, which was to identify the actions that determine whether or not learning occurs during teamwork. By analyzing the videos, we identified those actions carried out by the co-teachers during the sessions that were crucial to their own learning, in support of the statements made throughout this article about the importance of preparing and reviewing the material, organizing activities, self-correcting errors, giving explanations in different formats and ways, adapting the explanation to the students' context, asking and answering detailed questions, listening actively to the students' contributions, and reflecting on the quality of what is taught and on the construction of knowledge.

Irrespective of the co-teachers' prior knowledge of musical notation and solfège, most of them fulfilled their role satisfactorily, so it may be reaffirmed that the degree of motivation and commitment expressed when taking this role is decisive when it comes to obtaining good results and improved learning outcomes. The fact of having to teach a subject area with very little prior knowledge can broaden learning opportunities of those who have to teach it. In other words, the ability to plan and adapt to the tutees' needs and characteristics may have a greater impact on a co-teacher's success than prior knowledge of the subject.

This research gave students an opportunity to learn by teaching, fostering a dynamic that promoted cooperation and enriched the learning environment. This phenomenon can contribute to that shift of paradigm that seeks to provide students with more participatory and meaningful educational experiences.

Nonetheless, there are some limitations that should be taken into consideration for future research. It is vitally important that teachers are capable of dealing with the possible barriers that limit student performance and that they use the appropriate tools to strengthen the co-teaching process It is also necessary to anticipate the existence of standardized tests, guidelines, and rubrics that serve to measure the study factors. The rather small sample of students who participated in this research is another important point that merits consideration. The restrictions imposed on Chilean educational centres during the pandemic were the reason for this limitation. It was only possible to work with two classes and the fieldwork had to be adjusted to the official timetables.

The lines of reasoning of this study, together with those presented by Thousand et al. (2015) [33] on the subject of teachers and students developing cooperative teaching roles, can serve as a guide for future research in this field. There are still many aspects that demand further in-depth study, both in these specific subject areas and in other aspects of the discipline, such as the analysis of the interactions between student co-teachers and tutees. This could focus on explicitly musical actions such as the type of musical practice, indications and corrections, ways of modelling, and the types of questions and answers. In other words, observing those actions that mainly focus on music.

Both in general education and music education, it is important to introduce new teaching practices where students play an active role in their learning process. Although there is proof of the effectiveness of peer learning in formal educational contexts, there is only scant emerging research on student co-teaching. Consequently, it is imperative to document these educational practices with students of different ages and from different backgrounds.

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