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# Pre-Service Teachers' Reflections on Cooperative Learning: Instructional Approaches and Identity Construction

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**Abstract:** This paper focusses on university pre-service teachers developing cooperative physical challenges within reflective and cooperative learning frameworks. The pre-service teachers were involved in reflection-in-action and reflection-on-action and contemplated their professional identity in both reflective narratives and focus group discussions. The students' reflections were scored using two rubrics. The first elements scored from the pre-service teacher's reflective narratives included the focus of the reflection, awareness of previous beliefs, knowledge, and experiences, inquiring and focusing on possible actions through questions and hypotheses, and arguing for concrete learning objectives. The second rubric scored elements of the pre-service teachers' professional identity, including self-esteem, task perception, job motivation, and expectations about future jobs. The results from the instructional cooperative approaches based on the reflections on the in-practice at a primary school disclosed the differences between them, with the non-structured approach scoring higher than the structured one. The cooperative challenges, when embedded in the reflection process, profoundly helped pre-service teachers to identify aspects of their professional identity that would ensure an effective intake of sustainable competences.

**Keywords:** cooperative learning; reflective learning; higher education; instructional approaches; professional identity

## 1. Introduction

### 1.1. Students' Cooperative Learning and Sustainable Development

Providing future generations of professionals with the skills for sustainable development relies mainly on integrating approaches and strategies into Higher Education Institutions and their systems [1–6]. Education for sustainable development, when developed in Higher Education, should enhance students to understand how their professional activity interacts with society and the environment in order to identify possible challenges, risks, and impacts [2]. Therefore, Higher Education Institutions should transfer sustainability competences to the teaching profession by developing curricula competences in education for sustainability, linking sustainability to both student learning and in-practice teaching [2,5]. It entails promoting student interaction and fostering relationships in socialization and learning [7–9]. Education for Sustainable Development is directed towards promoting the development of critical thinking, strategic action, and interpersonal relationships

as well as collaboration, personal involvement, and tolerance for ambiguity [1,3], in which students accept uncertainty and acknowledge dilemmas [10]. It empowers students to change their way of thinking and to work towards a sustainable future [2,3]. How students understand what they know and how they are progressing as they develop their knowledge through reconsidering what they learn in practice [11] is a fundamental element of sustainable education.

Education for Sustainable Development concerns sustainable actions at all educational levels, favoring the development of competences that allow people to think about their actions [2,3]. Competences integrate knowledge, skills, values, and attitudes [10,12–14], and a competence-based education is a type of education that focuses on the implementation, development, and assessment of competences [13,15–17]. Both cooperative and reflective learning are instructional practices that can activate and promote sustainable-oriented competences. For example, reflecting on beliefs, actions, and goals are the foundations of critical thinking and analysis. Sustainable-oriented competences also promote developing ideas and applying strategies, planning and executing projects, reflecting on risks, taking responsibility for motivating others; all of which form the basic principles of strategic action [13,18].

Cooperative learning is an educational methodology based on small (usually heterogeneous) groups of students working together. In cooperative learning, students join forces and share ideas and resources to learn something themselves and encourage other team members to learn as well. Cooperative learning activates peer-to-peer learning, which is defined as building both sustainable knowledge and skills through interaction. The five variables that mediate the effectiveness of cooperative learning are positive interdependence, individual accountability, promotive interaction, the appropriate use of social skills, and group processing [8]. Cooperative learning relies mainly on the interdependence of the students among each other, with the roles of the team members being clearly mapped out, although they can be negotiated. The students submit the complete group task at the end of the lesson and during the final group processing. In contrast, in collaborative learning, if this method is properly directed by the teacher, the students themselves can learn to manage the task with no further instruction. Most important, in collaborative learning, each student is responsible for their own individual work, separately. In general, authors see collaborative learning as a broader, more general concept covering multiple approaches on peer collaboration, among which, for example, is cooperative learning [14,16,18,19].

Cooperative physical challenges are cooperative learning activities that have a clearly defined objective and are posed as a collective (team) challenge in which the group, in the first stage, must resolve a specific problem by using multiple solutions and, in the second stage, reflect on the whole process. To do so, each team needs not only to agree on their actions as a group but, more importantly, to consider and value the individual characteristics of each and every one of its members to resolve the problem posed. While a specific response to completing the challenge may be valid for one team, it may not be for another. Cooperative physical challenges maximize the acquisition of competences through individual cooperation in teamwork, the intrapersonal construction of professional identity, and the definition of strategic decision actions [8,19].

Cooperation is the reciprocal relationship between people or groups, which are characterized by being heterogeneous, aimed at achieving a goal through a common effort [19]. Cooperation is also a principle that can guarantee a more creative and sound teaching process, provided the teacher and the student are involved in the construction of knowledge. Cooperative learning is an educational strategy in which students work together in groups to achieve a common goal that is characterized by a structure that promotes positive interdependence between the group members [8]. Students gain both academically and socially when they have opportunities to interact with others to accomplish shared goals [8,20–22]. In the process, students learn to communicate effectively by explaining the experiences in which they have been involved, and the language they learn to use to explain the experiences, in turn, helps them to construct new ways of thinking [23]. In addition, if students are encouraged to participate in group discussions, they demonstrate a more sophisticated level of discourse and intellectually valuable contributions [23,24].

The basic characteristics and conditions for cooperative learning were defined by Johnson and Johnson [8]. First is positive interdependence. This occurs when the learning of the different members of the group depends on the actions carried out by all the members of the group. There is positive interdependence when the team members can achieve a goal, but only when the other team members also reach it [19]. Second is individual accountability. This refers to the members of a group having to work together (face to face) at some point during the process. In doing so, not only are students encouraged to strive for more committed relationships within the group, but they also improve their adaptation and social competences. To do this, all the team members' contributions must be made possible and necessary and, thus, render learning visible [25]. Third, is promotive interaction. The members of the group cannot be successful based solely on the success of others. Therefore, each student is responsible for a part of the work, and the success of the other members depends on the participation of all the members. Fourth is the appropriate use of social skills in a small group. Students have to learn some abilities in order to achieve common goals, such as getting to know the other members in the group, communicating effectively, supporting each other, and constructively resolving conflicts. Fifth is group processing. For a cooperative group to function properly, the students need to reflect on how it works. Thus, in group processing, the members of the group discuss the achievement of the objectives, the effectiveness of their work methodology, and the relationships between themselves. This allows them to analyze what went well and what did not, strengthen their bonds, and improve their work.

### *1.2. Students' Identity Construction and Sustainable Education*

Shaping pre-service teachers' professional identities is at the base of sustainable education. Professional identity is promoted in higher education through the delivery of pedagogical approaches and strategies by teachers [3] and through the understanding that the approaches must guide students to examine and mediate themselves in relation to context, for effective decision-making and action [3,26] and for acquisition of sustainability competences for sustainable development to perform personal actions as well as to bring about changes in society [2]. For pre-service teachers, reflection calls for critical evaluation of their teaching practice in schools, which may refine their self-understanding as future teachers [20]. Reflection encompasses pre-existing beliefs and examines students' practices for further actions and improvement [27]. Pre-service teachers can construct their identities in practice (in-action), discourse, and activity in the schools when developing instructional practices, actively. But, their emerging identities as reflective practitioners and adaptive experts should further be enriched and extended through reflective thinking and engagements [20]. Therefore, reflection after the action (on-action) is needed to gradually broaden and deepen a primarily descriptive reflective narrative [9–12].

Frameworks for reflective learning and reflective practice, guide personal and professional mediation. For instance, there are reflective approaches and methodologies in which individuals manage competing influences and deliberate about action [7,28]. Individual professionalism or scholarship of teaching is characterized by commitment and vulnerability, which may determine the degree to which pre-service teachers reflect and self-understand as future teachers [29]. The components of professional self-understanding that fuel teachers' identity construction are self-image, self-esteem, commitment, task perception, job motivation, and future perspectives. For pre-service teachers, however, the dimensions are reduced to self-esteem, task perception, job motivation, and future perspectives [29]. Self-esteem or the evaluative component of self-understanding may refer to students' appreciation of their job performance. Task perception encompasses students' ideas on what tasks and duties are required to do a good job. It deals with students' responsibilities in order to induce justice in learning outcomes. Job motivation refers to motives that turn students into professionals, and future perspectives reveal the students' expectations about their future in teaching.

This study proposes then, applying the rationality of cooperation and identity construction through structured, semi-structured, and non-structured instructional cooperative physical challenges that progressively and effectively favor the essential components of cooperative learning and the

intrapersonal construction of professional identity for pre-service physical education teachers. The study also proposes applying the logic of reflection-on-practice through the process of constructing reflective narratives on the results of implementing instructional approaches in the schools where the pre-service teachers had their teaching practice [29,30]. We formulate the characteristics that define the structured, semi-structured, and non-structured cooperative physical challenge approaches and the dimensions for students' reflections concerning both cooperative approaches and identity construction. Based on this multi-approach formulation, we construct three hypotheses:

**H1:** *Activating cooperative learning based on no-to-structured instructional approaches produces professional identity.*

**H2:** *Pre-service teachers can construct and transform their professional identities through reflective practice.*

**H3:** *Pre-service teachers, when engaged in individual and community reflection, may activate interpretation and critical competence evaluation of their teaching practice at schools.*

We consider community reflection to be the reflection resulting from dialogues between pre-service teachers or dialogues between pre-service teachers and students at the schools [20].

Although some effort has been made to understand the potential of designing curricula based on the delivery of sustainable-oriented competences, little is known about pre-service teachers' perceptions of the joint delivery of pedagogical approaches and sustainable competences, and the impact that such delivery has on their own construction of professional identity. Therefore, this manuscript aims to provide knowledge on the strategy of connecting cooperative and reflective learning through different pedagogical approaches and the pre-service teachers' resulting transformation in terms of construction of professional identity. The goals of the present study are (1) identify the ways in which pre-service teachers represented their professional learning through reflection on instructional teaching approaches, (2) ascertain whether and how pre-service teachers were reflective in their written narratives of on-school practices experiences, and (3) identify in which ways reflection by pre-service teachers fostered personal critical professional competence.

## 2. Methods

### 2.1. Context

The experiment was carried out with a group of fourth-year students taking the four-year bachelor's degree in Primary School Teacher Education at the University of Girona. This experimental study was carried out during a 75-h module in the Department of Specific Didactics at the University of Girona, Spain.

### 2.2. Participants

The study comprised two sets of students. The first set was made up of sixty-three fourth-year pre-service primary school teachers taking a bachelor's degree in Primary School Education (specializing in physical education) at the University of Girona. For the purposes of this study, the participants were divided into twenty-four PreServ groups: from PreServ1 to PreServ24. Thus, each PreServ group comprised two to three pre-service teachers. The pre-service teachers were randomly assigned to each group.

The second set of students comprised two hundred and eighty-eight students from six primary schools selected from the list of schools held by the Faculty of Education at the University of Girona. For the study, the forty-eight primary-school students in each school were divided into eight groups, each group comprising six randomly distributed students. In each school, the resulting groups were then labeled PrimSc1 through to PrimSc8. When the instructional cooperative tasks were implemented in the schools, each pre-service teacher group, composed of two to three individuals, was randomly assigned to two PrimSc groups, composed of six individuals each. Consequently, each PreServ group

carried out the activities associated with a specific approach with two PrimSc, at the same time, i.e., with twelve students.

### 2.3. Definition of Instructional Approaches: Structured Versus Non-Structured Cooperative Activities

The pre-service teachers had been informed that they would be participating in a study incorporating both collaborative and reflective methods. They attended eight seminars, six on collaborative learning and two on reflective learning, where they learned about the methodologies. Seminars were given by the members of the research group, and each seminar lasted two hours.

Each pre-service group came up with a cooperative activity to be implemented in a school. From a total of twelve activities proposed during one of the seminars, these were whittled down to eight once the class had evaluated the activities as a group. At the schools, each pre-service teacher group implemented, firstly, a collaborative activity designed by the group members themselves and, secondly, the eight collaborative activities chosen by the whole group. Therefore, each pre-service teacher group implemented a total of nine cooperative physical challenges for each group and school where they had their teaching practice.

In a second stage, and together with the research team of this study, the nine cooperative challenges were divided into three sets (Table 1). As such, the first three challenges were designed to be implemented in the schools using a structured instructional approach, challenges four to six were designed to be implemented using a semi-structured instructional approach and the last three a non-structured instructional approach. Thus, the study consisted of each pre-service teacher group organizing the nine cooperative activities (CA1 to CA9) for their corresponding groups from the primary schools. CA1 to CA3 were organized using a defined structure, including fixed materials and student roles (Table 1), whereas CA4–CA6 used a defined semi-structure, which included free-to-choose materials from the supplies provided but fixed student roles (Table 1). Finally, CA7–CA9 were non-structured activities where neither material nor student roles were defined (Table 1).

**Table 1.** Defining elements for each type of instructional approach.

<b>CA1-CA3: Structured approach</b>	Fixed provided material	Fixed Student Role
<b>CA4-CA6: Semi-structured approach</b>	Freely provided material	Fixed Student Role
<b>CA7-CA9: Non-structured approach</b>	Freely available material	Non-Student Role

Cooperative challenges are a structured technique that form part of cooperative learning in education and are carried out in small groups that demand the participation of all the components—a fundamental characteristic of cooperative learning. The teacher proposes the cooperative challenge, and it is the students who, in a consensual way, must share ideas, plan, question themselves, and propose the action required to solve the cooperative challenge.

In the first group of activities (composing the structured instructional approach to cooperative learning), the cooperative challenges were presented by the pre-service teachers to the primary-school students in a structured manner. That is, the material with which to carry out the cooperative challenge had already been arranged by the pre-service teachers in the space where the cooperative challenge was to take place. All the groups were asked to complete the same cooperative challenge at the same time, and the pre-service teachers set the limitations for the time taken and space used. Finally, the pre-service teachers defined the primary-school students' roles. In the semi-structured activities (CA4–CA6), the cooperative challenges were again to be presented to the primary-school students by the pre-service teachers, and they also defined the roles of the members in the groups. In this case, however, the materials and the temporal distribution order of each cooperative challenge, the space where it would be carried out, and the duration of each cooperative challenge were all defined by the primary-school students themselves. Finally, in the non-structured activities (CA7–CA9) the temporal distribution order of each cooperative challenge, the space where it would be carried out, and the

duration of each cooperative challenge, as well as the roles within the groups, were managed by the primary-school students themselves (i.e., not by the pre-service teachers).

#### *2.4. Development of Cooperative Challenges*

The cooperative challenges were held (one approach per week) once a week for three consecutive weeks. All the school groups were given 20 min to complete the cooperative challenge. The four pre-service groups assigned to the schools carried out the challenges proposed with two PrimSc groups at the same time. It was estimated that after discounting the travel times between the classroom and the playground, the cooperative challenge sessions (presentation of the challenge and definition of material and roles), the group reflections, and the clean-up time, the sessions lasted ninety minutes.

In each session, each PrimSc group encountered three cooperative challenges. A plastic sheet placed next to each challenge explained what had to be solved, what rules had to be followed, that the possible solution had to be agreed upon, and was then executed according to the rules. If the challenge was not initially overcome, the students could try again as many times as they wanted to solve it. If they were successful, the students would go on to the second challenge. The groups also had the option of surrendering if they understood that, for whatever reason, they could not overcome the challenge they were dealing with. During the challenge, the pre-service teachers observed the development, took notes, encouraged and ensured equal participation in the groups, introduced security rules before certain solutions were attempted, resolved any doubts at the time of understanding the approach to each challenge, and regulated any conflict or negative situations in the groups. (NB: the pre-service teachers never intervened to offer solutions or impose their criteria in the case of a conflict). At the end of each session, the students came together to reflect as a group. In the group reflection with four to six students, each PreServ teacher facilitated the session by introducing process questions and then took notes on the comments made by the primary-school students.

#### *2.5. Reflective Narratives on Cooperative Activities and Identity Construction, Analysis, and Coding*

Once the pre-service teachers had finished CA1–CA3, CA4–CA6, and CA7–CA9, they were asked to produce individual reflective narratives. This resulted in a final total of one-hundred and eighty-nine narratives.

The content of these narratives was analyzed using the Rubric for Narrative Reflection Assessment [30] (Table 2). This rubric is based on four elements of analysis, distributed into ten indicators. The degree of reflection for each indicator varied on a scale from 1 to 5, where 1 indicates absence or a low weighting, and 5 indicates the highest level of performance. The four elements corresponded to: (1) identifying the situation, activity, or experience that triggered reflection, (2) identifying prior conceptions and beliefs and, therefore, awareness of one's own previous beliefs, knowledge, and experiences, (3) focusing on and probing the focus of reflection, context, and professional context and (4) understanding the process of transformation; firstly through setting, arguing, and transferring students' concrete learning objectives, and then by implementing new action plans (Table 2).

The content of the narratives was also analyzed using a constructed Rubric for Identity Construction [29]. This rubric is based on four elements of analysis matching the categories of professional identity (Table 3). The degree of reflection for each indicator varied from levels 1 to 5, with 1 being the lowest score corresponding to not related: the student did not mention the component, or the content of reflection was not related to this component. Level 2 corresponded to descriptive writing: the student formulated the professional identity component and established it as their focus of reflection. Level 3 corresponded to a descriptive reflection/thoughtful action: the student reframed the professional identity component into their previous knowledge. Level 4 corresponded to reflection: the student evaluated different alternatives and integrated them into new settings and reviewed perspectives about their professionalism. Finally, level 5 corresponded to critical reflection: the students transformed the new social, cultural, and political reflections into ongoing professionalism.

The scoring of the one-hundred and eighty-nine narratives based on the two rubrics of students' assessment was completed independently by the members of the research team. Previously, and to obtain sufficient inter-rater reliability, sixteen narratives per approach (25% of the total) were evaluated together by the members of the research team. The assessment was openly compared and discussed. When the assessment created controversy between two members of the research group, the rating was adapted to the full agreement of the four members.

**Table 2.** Elements of the rubric for students' reflective narrative assessment.

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<b>Dimension 1: The focus of reflection</b>
Situation, activity, or experience that triggers the reflective process.
1.1. Identifies and describes the focus of reflection in a contextualized manner.
1.2. Makes judgements about the focus of reflection.
<b>Dimension 2: Prior conceptions and beliefs</b>
Prior conceptions and beliefs: awareness of one's own previous beliefs, knowledge, and experiences.
2.1. Specifies, analyses, and elaborates on beliefs or ideas about themselves.
2.2. Specifies, analyses, and elaborates on prior beliefs or ideas about the context.
2.3. Specifies, analyses, and elaborates on beliefs or ideas about the discipline/profession.
<b>Dimension 3: Inquiring</b>
Inquiring and/or focusing: investigating possible actions of the students through focusing on questions and hypotheses.
3.1. Focuses on questions and hypotheses and makes inquiries about the focus of reflection.
3.2. Focuses on questions and hypotheses and makes inquiries about the context.
3.3. Focuses on questions and hypotheses about the professional action.
<b>Dimension 4: Transformation</b>
Transformation: set concrete learning objectives and future action plans and approaches to initiate a new reflective cycle. Argumentation of these changes or the need for them.
4.1. Specifies, argues, and transfers new learning goals.
4.2. Implements new action plans and supports them with arguments.

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**Table 3.** Elements of the rubric for students' identity construction assessment.

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<b>Dimension 1': Self-esteem</b>
Specifies professional appreciation of job performance and received feedback.
Specifies emotions, fulfilment, and job satisfaction.
<b>Dimension 2': Task perception</b>
Specifies, analyses, and elaborates on ideas, beliefs, and moral considerations regarding professional tasks and duties.
<b>Dimension 3': Job motivation</b>
Specifies, analyses, and elaborates on motivation or driving forces in the profession.
<b>Dimension 4': Future perspective</b>
Specifies, argues, and transfers expectations about future jobs.

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### 2.6. Reflective Focus Group on Cooperative Learning

A focus group was formed from the pre-service teachers participating in the experiment. All those who had participated in the activities and the collaborative and reflective learning seminars were invited to join the focus group. Sixteen students responded positively to the invitation. In general, a focus group should have between six and twelve participants, and so, from among those who had agreed to participate, seven students were randomly chosen. These seven focus group participants then received information about the aims of the focus group and signed an informed consent guaranteeing anonymity of information.

Two members from the research team participated in the discussion; one directed it while the other acted as support. The procedure was as follows: a script was prepared, adapting a sequence of questions concerning the professional experience each pre-service teacher had in the schools. The focus

group met fifteen days after having completed the experience, and the session lasted approximately 90 min. The session was recorded on video and audio and then fully transcribed.

### 2.7. Statistical Analysis

Students' answers to the elements of both the rubric for students' reflective narrative assessment (Table 2) and the rubric for students' identity construction assessment (Table 3) were analyzed in terms of mean, standard deviation, two-way ANOVA analysis (Table 4), and items correlation (Table 7) and were carried out with SPSS Statistics 19.0. The reliability analysis was conducted to ensure the dependability of the answers as good development procedures may result in a reasonably reliable survey instrument.

## 3. Results

This section includes the results from both the quantitative and qualitative analysis. The quantitative is derived by analyzing the narratives from the three stages of the collaborative activity implementation (i.e., structured, semi-structured, and non-structured), as well as from the analysis from the focus group discussions.

### 3.1. Quantitative Analysis of Narratives on Cooperative Learning

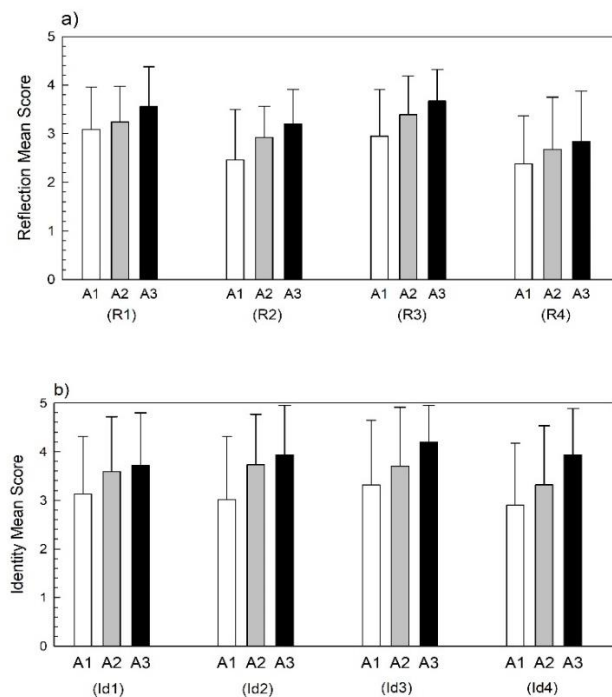
Both the mean scores of the assessment on reflection (Figure 1a) and identity (Figure 1b) increased with the instructional approach (from A1 to A3) regardless of the four dimensions of the reflective narratives' assessment (Table 2) or the four dimensions of identity construction assessment (Table 3). The mean score for the reflective narratives' assessment was higher for dimensions 1 (R1—Focus of reflection) and 3 (R3—Inquiring) and decreased for dimension 2 (R2—Prior conceptions and beliefs) and for dimension 4 (R4—Transformation). Although not shown, the scale demonstrated fair internal reliability with the present sample,  $\alpha$  varied from 0.895 for the whole reflection dimension for A1 to 0.834 for A3 and  $\alpha$  varied from 0.915 for the whole identity dimension for A1 to 0.836 for A3.

Two-way ANOVA with replication tests for the reflective dimensions R1, R2, R3, and R4 provided F values above the critical  $F_{cr}$ , rejecting the null hypothesis (Table 4), and therefore, indicating that the means between the instructional approaches were significantly different (with a 99% level of significance) among them. The identity mean score also increased with the instructional approach (from the approach A1 to A3), with  $F > F_{cr}$  in all cases (Table 4). These results indicated that the mean score between instructional approaches were significantly different (with a 99% level of significance) for each identity (Table 4). Differences were found between the mean scores for the identity construction assessment (Table 4), but in this case, with a 95% level of significance. The interaction between the instructional approaches and the reflective dimensions were not significant (Table 4) and, thus, indicate that there is no relationship between them.

**Table 4.** Summaries of the two-way ANOVA with replication tests for the four reflection assessment dimensions and the for the four identity assessments. Df represents the degrees of freedom, F is the variability coefficient,  $F_{cr}$  is the critical variability coefficient, and P is the level of significance.

Reflection	Df	F	P	$F_{cr}$
Instructional approach	2	32.87	$2.09 \times 10^{-14}$	4.63
Reflection	3	176.83	$1.55 \times 10^{-86}$	3.81
Approach $\times$ Reflection (interaction)	6	1.91	0.08	2.83
Identity	Df	F	P	$F_{cr}$
Instructional approach	2	31.71	$9.04 \times 10^{-14}$	3.01
Identity	3	4.35	0.013	3.01
Approach $\times$ Reflection (interaction)	6	0.68	0.61	2.83





**Figure 1.** Mean and standard deviations for each instructional approach for the four dimensions of the reflection (a) and identity (b) assessment.

### 3.2. Qualitative Analysis on Reflection on Cooperative Learning

In support of the quantitative analysis, the analysis of both the written narratives and the discussions from the focus group provided insights into using the collaborative activities at the schools. As in the work of Colomer et al. [9], the first step in analyzing the contents of the written narratives of each student was to identify complete units of information understood, as a simple idea/concept or thought, about a particular learning process. Among the 63 narratives per approach describing the nine cooperative activities, in the structured approach corresponding to the first narrative, there were 480 units, while for the second narrative corresponding to the semi-structured approach, there were 531 units, and for the non-structured approach, there were 363. In addition, 58 units were obtained from the analysis of the transcribed focus group on cooperative learning. The corresponding assessment was undertaken by two members of the research team, and then they agreed on the information units to code [9,31]. The work was subsequently revised by the rest of the authors, who agreed on the approach analysis (92% for first narrative analysis, 96% for the second, and 93% for the third). For the five dimensions of cooperative learning, Table 5 presents the most significant comments extracted from the analysis of the students' narratives.

**Table 5.** Students' reflections on cooperative learning: dimensions, approaches, and associated explanations extracted from the students' narratives.

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**Dimension 1: Positive Interdependence**

Approach 1: Structured approach.

*'In some of the cooperative challenges, the groups competed to see who would finish first.'*

*'Some students got very cross when another student didn't assume their role well. For example, when the Speaker didn't read or explain the challenge clearly.'*

*'At the start of the activity, each one gave their own ideas without listening to the others, but they quickly understood that they all had to work together to solve the challenge and that they wouldn't find the solution unless everyone worked together.'*

Approach 2: Semi-structured approach.

*'At times there was a competition to grab the materials first. Some of the students didn't understand that they wouldn't need all the materials to solve their cooperative challenge.'*

*'Some students just did their own thing when it came to picking up the materials. I had to step in to help them reach a consensus on how to respond to the cooperative challenge.'*

Approach 3: Non-structured approach.

*'If you don't define the roles, the students quickly organise themselves and tackle the challenge head on.'*

*'The students organised themselves incredibly well, there was a lot of cohesion in the group and they dealt with the challenges really well.'*

*'I saw that the students clearly understood that achieving the challenge was the goal the whole group had in common.'*

**Dimension 2: Individual Accountability**

Approach 1: Structured approach.

*'I had to control some of the students because they were doing more than they had been assigned to do in their specific role.'*

*'I tried to encourage some students to value and encourage their groupmates.'*

*'The roles helped the students to organise themselves and understand that everyone had an important and vital part to play and that they were all responsible for tackling the challenge.'*

Approach 2: Semi-structured approach.

*'Some students were very proactive in their roles, while others tended to respond reactively to their groupmates' suggestions and ideas.'*

*'The students with fewer or weaker leadership skills in the group tended to take a back seat, while those with greater initiative took on the different roles themselves in order to solve the challenge.'*

Approach 3: Non-structured approach.

*'Some of the students argued vehemently over a particular role they wanted to play, which meant they wasted a lot of the other group members' time.'*

*'I noticed that there were students who wanted to be in control of the group's materials, which meant that, sometimes, the other students just didn't bother using the material that the first student was hoarding.'*

**Dimension 3: Promotive interaction**

Approach 1: Structured approach.

*'I noticed that there were some very motivated students, often with a very specific role, who encouraged and motivated their less active groupmates.'*

*'The more the students solved the challenges, the more involved and the more active they became as a group.'*

Approach 2: Semi-structured approach.

*'In the first challenge, I had to step in, especially when roles were being defined. In doing so, I was able to help guide the group members to reach a consensus over who would get which role.'*

*'I noticed that some groups needed to stop and rethink their actions and strategies. I encouraged them more than once to do so.'*

Approach 3: Non-structured approach.

*'When the students have had a meeting prior to tackling the challenge, they end up resolving it in a much more efficient way.'*

*'I had to intervene when I noticed that one of the group members was becoming very anxious and upset.'*

*'I was very pleased to see that some groups tried various alternatives to resolve the challenge.'*

*'The students realised that they had to encourage, talk to and help their teammates in order to resolve the challenge.'*

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Table 5. Cont.

**Dimension 4: Appropriate use of skills**

## Approach 1: Structured approach.

*'I think it was a good idea that I distributed the roles consecutively because it forced some students to have a clearer and more active discourse.'*

*'It's clear that knowing how to actively listen and respect your groupmates' contributions, exercise self-control and be responsible within the group etc., are fundamental attributes. The roles have helped develop interpersonal skills.'*

## Approach 2: Semi-structured approach.

*'The cooperative challenges have undoubtedly helped students in the first year develop motor skills and communication skills. Carrying out the challenges helped the students develop social skills that cannot be monitored in class. The space, which is outside the typical classroom setting, where they resolved the challenges, has helped to ensure success with the challenges.'*

## Approach 3: Non-structured approach.

*'The decisions the groups made about the materials they would use to tackle the cooperative challenge, helped bind the group together.'*

*'Discussing the roles each student in the group would take on helped promote interpersonal relationships within the group.'*

*'The students helped each other within the group and constructively resolved any conflicts they had.'*

**Dimension 5: Group processing**

## Approach 1: Structured approach.

*'It was a mistake for me not to do an individual reflection first, as it prevents group members from discussing their work and that of the group members, and so they do it in a generic way, without taking into account group processing or self-evaluation.'*

*'I had to intervene because everything was positive, everything worked well. And they needed to see the aspects they could improve.'*

## Approach 2: Semi-structured approach.

*'They defended their decisions to use some materials and not others very well.'*

*'One child said there should be less talking and more doing . . . that too much time was spent arguing and so they wouldn't be able to complete the challenge.'*

*'At first, it was a little bit difficult for them to reflect on the work they'd done and the results, as they felt it wasn't necessary to talk about what had happened and what needed to be improved.'*

## Approach 3: Non-structured approach.

*'The children said that it was important to reflect first, talk, and suggest different ways to meet the challenge and to defend choices made, to think and then think again.'*

*'I asked them what reflecting meant and they told me, 'reflecting involves thinking and making joint decisions together.'*

*'During the joint reflection, they said that now they understood that reflecting and giving your own opinion is not the same as fighting or getting angry with each other.'*

**3.3. Qualitative Analysis on Identity Construction**

We conducted an additional analysis of the sixty-three narratives per instructional approach to obtain information on the perceptions the pre-service teachers had on professional identity construction while describing the nine cooperative activities in the three approaches. The analysis of the first narrative on professional identity provided 73 units. Meanwhile, the second narrative, corresponding to the semi-structured approach, provided 67 units, and for the non-structured approach, the analysis provided 89 units. In addition, 43 units were obtained from the analysis of the transcribed focus group on professional identity. The corresponding assessment was also undertaken by two members of the research team, and then they came to an agreement on the information. The work was subsequently revised by the rest of the authors, who were in agreement with the approach analysis (88% for first narrative analysis and 90% for the second and third narrative analyses). Table 6 presents the most significant comments extracted from the analysis of the students' narratives for the four dimensions of identity construction.

**Table 6.** Student reflections on identity construction: dimensions, approaches, and associated explanations extracted from the students' narratives.

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**Dimension 1': Self-esteem**

Approach 1: Structured approach.

*"In the development of the challenges, the feedback I gave was well received. It improved kids' performance."*

*"I helped some kids in defining their role within a group. That interaction also helped me to increase my learning about cooperative learning."*

*"Watching the kids working together and being motivated because they had defined roles, really made me think that a good teacher should incorporate this type of approach."*

Approach 2: Semi-structured approach.

*"I was really happy with implementing the cooperative challenges. My self-esteem increased in the second week when I saw kids solving the challenges I had proposed in an organized way."*

Approach 3: Non-structured approach.

*"The kids loved working together without restrictions. I think I was as surprised as they were with what they could come up with in the short time they did the challenges. I was very engaged in the group processing, watching kids not hesitating before speaking and reflecting on the experience. That was the best moment for me."*

**Dimension 2': Task perception**

Approach 1: Structured approach.

*"If the primary students liked the tasks they were doing, I also felt enthused. The kids needed to be prepared to or taught how to work cooperatively together. Once the roles were formulated and put into practice in the first challenge, cooperation was highly activated in the following challenges."*

*"I found that the kids got involved in democratic decision-making when they perceived a specific role as being necessary for the group. Some kids approached me to ask if they were doing well in the development of the task."*

Approach 2: Semi-structured approach.

*"Challenges were accomplished in shorter time spans when kids managed themselves. This is similar to what happened when we designed a challenge in terms of materials and roles. In my case, I performed better being an encourager. I think this role is inherent when teaching a real class."*

*"Some kids felt uncomfortable about choosing the material without really knowing the capabilities of using each item. There was no trial and error in terms of choosing the material".*

Approach 3: Non-structured approach.

*"I proposed the challenges with enough open-ended variables for the kids to put in their own organization, ideas, and solutions. Some groups came up with more than one solution."*

*"One group didn't come up with any solution. To avoid any anxiety on their part, I asked the kids to reflect on the problems they had encountered, and I guided them towards some new proposals."*

**Dimension 3': Job motivation**

Approach 1: Structured approach.

*"After applying the cooperative challenges, I do think my competence as a teacher has increased through this gained experience."*

*"In my teaching practice at the school, I felt motivated since I discovered that a teacher is not a teacher. I found myself being a supporter, a listener, an assistant, a provider of solutions."*

Approach 2: Semi-structured approach.

*"I think we should have done better at choosing the material and to analyse the relationships with the roles. The success of the teams depended on the teamwork and the intelligence of the members of the team as a single unit."*

*"Those teams that learned from the failures had very strong one-to-one relationships. This was crucial in solving some of the most difficult challenges."*

Approach 3: Non-structured approach.

*"In using such an open approach, I discovered that I was never absolutely prepared for being a teacher. I doubted myself all the time and I keep self-assessing my degree of implication. The implementation of any approach needs a solid base of preparation, analysis and discussion with other pre-service teachers."*

*"It is clear to me that to become a good teacher I need to know my limits, to reshape my beliefs and also, and most importantly, to understand my feelings."*

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Table 6. Cont.

**Dimension 4: Future perspective**

## Approach 1: Structured approach.

*“I would like to comment that it is very important that the teacher believes in and is confident about what he does, because if the teacher believes in it, the students believe in him and the chances of success multiply.”*

*“For me, and as a future teacher, it is very important that students feel committed to the challenge as a group, I think that is what grabs them and motivates them to overcome it no matter how. That is why a good teacher must know how to provide the right information and feedback, understand what motivates them and that the students believe in the success of the challenge.”*

## Approach 2: Semi-structured approach.

*“As a future teacher, I have to keep in mind that each cooperative group has its characteristics, some groups want to get more attention from me than others, but I cannot let myself be absorbed by just one group. I need strategies to manage my attention for all the groups according to their needs. I have to help the more dependent groups to be more self-reliant.”*

## Approach 3: Non-structured approach.

*“I enjoyed seeing children take the initiative for their learning. I have seen them as protagonists who enjoyed the freedom they had when it came to making decisions about the challenges. But I have to look for strategies to accompany them in their learning, sometimes I felt that I did not know what to do or that the students did not need me. I am sure that is simply due to my lack of experience. I must learn how to motivate, guide and give feedback so that students feel that they are accompanied by me, that I am interested in and value what they are doing.”*

*“A positive aspect of the unstructured session was that since the groups worked alone, I had more freedom to intervene when I saw that I could help, and especially to be with those students who were more motivated. This type of task, I think, is more suited to my profile as a future teacher”.*

*“I think that this format demands more from the students, stimulates them more and therefore their learning will go beyond the driving force. I think that I see myself as the future teacher choosing this type of activity when it comes to presenting the challenges.”*

### 3.4. Correlation Analysis between Reflection and the Dimensions of Professional Identity

For the three cooperative instructional approaches, the whole assessment of the narrative reflection (added scores of the ten reflective dimensions) was correlated with the students' assessment of the four identity dimensions: self-esteem (Id1), task perception (Id2), job motivation (Id3), and future perspectives (Id4) (Table 7). When considering all the correlation slopes and the corresponding confidence interval of reflection assessment with identity reflection, similar correlations were obtained between the reflection on the instructional approaches (A1, A2, and A3) and the categories of students' reflection on professional identity (Table 7).

**Table 7.** Results of the linear regression analysis between the sum of the scores of the reflective narratives on the instructional approaches (A1,A2,A3) and the four categories of professional identity (Id1 to Id4). Note. \*\*  $p < 0.01$ .

	<b>Id1 (Self-Esteem)</b>	<b>Id2 (Task Perception)</b>	<b>Id3 (Job Motivation)</b>	<b>Id4 (future Perspectives)</b>
Reflections/A1	0.072** (0.039–0.106)	0.112** (0.082–0.143)	0.074** (0.036–0.113)	0.098** (0.066–0.130)
Reflections/A2	0.132** (0.103–0.161)	0.098** (0.066–0.130)	0.127** (0.092–0.162)	0.129** (0.082–0.156)
Reflections/A3	0.114** (0.079–0.150)	0.083** (0.046–0.121)	0.088** (0.065–0.111)	0.107** (0.069–0.146)

## 4. Discussion and Conclusions

### 4.1. Activating Cooperative Learning Based on Non- to Structured Instructional Approaches Produced Identity in Practice

The pre-service students were generally motivated towards implementing cooperative physical challenges in physical education classes in the schools, especially in the creative aspect of designing and implementing the physical challenges, since this implied considering others and coordinating the skills of group members to overcome individual limitations. This finding has also been documented in other studies promoting cooperative learning where the composition of the groups, the task the group was to undertake, the social skills training needs, and the assessment of both the learning and the instructional practice [32–34] (especially when studies focus on primary school children [3]) have been reported.

Regardless of the reflective dimensions, there were significant differences between approaches, with the assessment scores of the R1 (The focus of reflection) and R3 (Inquiring) to be higher than R2 (Prior conceptions and beliefs) and R4 (Transformation), as shown in Figure 1. Results also showed that the non-structured instructional approach was scored higher than the structured and semi-structured instructional approaches (Figure 1). Therefore, the pre-service students' scores were higher when they reflected on identifying cooperative teaching challenges and on focusing on questions and hypotheses about professional action. This was highly scored when they carried out the cooperative challenges with no established materials or student roles in the group.

Qualitative analysis of reflective narratives indicated that, while the pre-service teachers had positive experiences with cooperative challenges (there were only six dropouts), a number encountered difficulties with implementing them in the classrooms. Issues identified included students socializing during group activities, individuals' poor awareness of being a member of a group, and poor regulation of roles. Similarly, Gillies and Boyle [23] reported that teachers found some difficulties in the classroom when implementing cooperative learning. These included time management, the organization required to implement cooperative learning, and a reported concern with socializing in the groups.

The qualitative analysis of the reflective narratives also helped the pre-service teachers' perceptions of cooperative learning. All concurred that they, as well as the children, had had positive experiences. They talked about the children confronting new experiences, distributing roles themselves in the non-structured approach, learning how to communicate, and managing to interact with each other more effectively. As pointed out by Slavin [21], when cooperative learning is well structured, students understand how they are to work together to achieve their group's goal, which benefits students socially and academically. When implementing the non-structured approach, in particular, positive interdependence was enhanced when dual responsibility was achieved, that is, when students understood that they were not only required to complete their part of the challenge but to ensure others did likewise [23]. Other key elements that were critical to the effective implementation of the cooperative physical challenges included the pre-service teachers facilitating promotive interaction for the whole group, promoting responsibility for contributing to the groups' challenge, and demonstrating that dialogical intrapersonal bonds helped the groups to progress.

### 4.2. Pre-Service Teachers Can Construct and Transform Their Professional Identities through Reflective Practice

Regardless of the instructional approach, there was a significant association between reflection and professional identity. Reflective practices offer opportunities for pre-service teachers to engage in active and meaningful problem identification, evaluation, and innovation, through which they can hone and develop their identities [20]. Activating cooperative physical challenges in the three instructional approaches and the associated reflection was positively correlated with the four dimensions of professional identity defined by Kelchtermans [29], that is, self-esteem, task perception, job motivation, and future perspectives. Students' reflections primarily broadened and deepened perspectives on professional identity and impacted positively in the latter stages of implementing the cooperative

challenges in the schools. Key elements that were critical in transforming the pre-service teachers' professional identity were: promoting feedback, motivation, and engagement with the members of the teams, which, in turn, increased pre-service teachers' self-esteem, demonstrating that being implicated in democratic decisions helped students in the task perception, and proving that continuous practice at schools is needed to gain job motivation, i.e., their subjective feeling of competence increased because they gained experience with collaborative learning in educational practice [32].

Pre-service teachers were positioned in relation to both reflecting on cooperative teaching and personal consideration about professional identity. Research has shown that the transformation of professional identity becomes a powerful learning experience when it is articulated through reflective narratives [26,35], and particularly when it is shared and discussed in the process of dialogical and collaborative reflection. Indeed, our results showed the need to mix quantitative and qualitative methods to reduce misunderstandings of purpose [35] and that professional practice can indeed improve the knowledge of the discipline and the contexts in which we work, but are also about the self-awareness of how we conduct ourselves to deliberate and take action as professionals [26]. Our findings suggest that pre-service teachers shaped their identities not only over practice at schools but also through individual and community dialogical structures. Körkkö et al. [34] and Yuan and Mak [20] posit the fact that in order to transform professional identity, the highest level of reflection is gained when pre-service teachers have viewed the matter of reflection in several ways and decided on a course of action. Engaging pre-service teachers in reflection in-action (during the action) and on-action (after the action) is a way for them to establish a renewed perspective of their professional identity.

#### *4.3. Pre-Service Teachers, When Engaged in Individual and Community Reflection, May Activate Interpretation and Critical Competences Evaluation of Their Practice*

By reflecting, the pre-service teachers reported the aspects that either helped or hindered them when carrying out the associated instructional activities in the schools. First, the relationship between the theory given in the seminars on collaborative and reflective learning and the professional teaching practice itself. Secondly, the role of using collaborative and reflective methodologies to improve their level of self-awareness as both individuals and future professionals. The usefulness of using collaborative and reflective methods in identifying strengths, weaknesses, or gaps in their training was evaluated highly as well as the need to formulate activities based on new methods not only in their training as individuals but also as future professionals. Aspects they highlighted as being positive were: the development of both inter- and intrapersonal skills and the need to organize and implement the collaborative activities in the semi- and non-structured approaches in which the non-assignment of student roles or materials were highly evaluated.

When the pre-service teachers carried out the cooperative challenges in the initial stage, they worked to learn and at the same time, were responsible for their peers. When the pre-service teachers oversaw teaching physical activity cooperative challenges at the school, they were responsible for the PE students' learning outcomes. Among other skills, when the pre-service teachers developed cooperative challenges in a group, each student co-constructed knowledge and skills that were based on mutual dialogue, respect, help, cooperation, thinking before acting, learning to reflect and share ideas, proposals, and doubts. When the pre-service teachers designed and developed a cooperative challenge, these were to develop cognitive, psychological, and motor skills. The cooperative physical challenges were designed taking into account that the participation of all the students had to be possible regardless of the motor capabilities of each student. There had to be positive interdependence to achieve the common goal, i.e., all the members of a team had to work together to overcome the cooperative challenge.

In the teaching execution of a cooperative challenge at the schools, the pre-service teachers always gave instructions to generate a positive interdependence among the PE students of a team, especially when they were aware of the differing motor skills some group members had. Furthermore, it was essential that the challenges could be solved in a number of ways, so that dialogue, creativity,

and trial-and-error could be promoted. The roles for the primary-school students were defined to fulfill the most efficient way to execute the cooperative challenge. The roles facilitated the group deploying both social skills and academic abilities. The roles also enabled the group to solve the cooperative challenge in a satisfactory way with regard to academic knowledge while practicing social skills such as conflict resolution, negotiating, effectively communicating ideas, respecting the views of others, reaching a consensus from collective responses, and taking advantage of time. The roles reduced the prospect of some students adopting passive or dominant attitudes within the group and created an interdependence among the members of the group.

The pre-service teachers were motivated by the cooperative educational proposal in the physical education classes, fundamentally valuing the fact that they could provide the primary-school students with enough resources to develop social competences. It is recognized that education should also include aspects such as encouraging others to participate, listening to others, encouraging and supporting all peers who participate in a group, criticizing ideas and not persons, and expressing satisfaction for the success of others. Self-regulated learning through the promotion of structure and motivation encourages students to increase the ability to control and influence one's learning processes positively [36]. Both cooperative and reflective learning, when embedded in the development of cooperative physical challenges, represent educational strategies in which the learner's competences are promoted. In this respect, both the pre-service teachers and the primary-school students were involved in structured and non-structured instructional approaches in which values, attitudes, and beliefs contributed to sustainable, effective, and grounded sustainable learning [2,9,37–40].

All in all, we have identified the ways in which pre-service teachers represented their professional identity through reflection on instructional teaching approaches by maximizing the intake of competences, such as solving cooperative challenges, critical thinking through continuous self-assessment of professional practice, and communication through providing didactic instructive approaches. The cooperative physical challenge approaches helped pre-service teachers to identify aspects of their professional identity that ensured not only an effective intake of the sustainable competences but how to develop, understand, and self-assess professional practice experiences that at a later state fostered personal critical professional competence [20,34,38–40].

#### *4.4. Limitations of the Study*

The data presented in this research are consistent with the analysis performed, although there are some limitations that should be taken into account in future studies to obtain more generalized results and conclusions. One aspect that we consider fundamental for later studies is to expand the number of physical challenges in relation to each of the planned instructional approaches (structured, semi-structured, and non-structured), in order to carry out a longitudinal study that would allow us to understand how the development of individual professional identities evolves. Another aspect to consider would be to provide feedback with each of the student's cooperative groups once each of the sessions at the school had finished, in order to help the pre-service teachers in their process of self-knowledge and reflection in relation to their professional identity. In relation to the research instruments used, it would be convenient that, in addition to using the narratives centered on the cooperative learning dimensions, associations between the dimensions of cooperative learning are considered quantitatively with each of the dimensions of professional identity for each of the pre-service teachers to establish individual professional identity profiles. In future studies, we also intend to develop other research instruments, such as rubrics and questionnaires, focused on each of the aspects that make up professional identity and to understand in greater depth how cooperative physical challenges influence pre-service teachers' personal and professional development.

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