

# The Implementation of Cooperative Problem-Solving Rubric Towards Turkish Fourth Grade Students

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**Abstract.** This study aimed to develop an analytical rubric for teachers to observe and evaluate students' performance in showcasing the cooperative problem-solving process. Thus, a rubric was prepared. Angles to evaluate the student performance were included and a quad rank scale was used in the rubric. Dimensions used in the rubric were based on the PISA 2015 cooperative problem-solving dimensions. The weighted kappa coefficient was calculated for reliability. The validity of the rubric was provided by taking into the opinions of experts. The dimensions used were; common understanding, communication, respect, solving problems together, discussion, and finding common solutions. The weighted kappa coefficient of the rubric was 660 on common understanding; 644 on communication; 835 on respect; 829 on solving problems together; 825 on discussion, and 822 on finding common solutions. Additionally, the rubric was validated by controlling the content, structure, and validity criteria. The results showed that the cooperative problem-solving rubric was reliable and valid to evaluate cooperative problem-solving skills. The rubric presented a comprehensive assessment and scoring for cooperative problem-solving skills.

**Keywords:** cooperative learning, cooperative problem-solving, performance evaluation, problem-solving, rubric

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**INTRODUCTION** ~ In response to the demand for new technological and social changes in today's society, students should be innovative and adaptable individuals and have problem-solving skills in business life. This requirement also stipulates that each individual should be interconnected and solidary. Cooperative problem-solving (CPS) skills are essential to finding solutions to group problems in modern societies (Kagan & Kagan, 2009). There are two basic elements of CPS; collaborative work and problem-solving. In CPS, the problem is complex that a student cannot solve it alone, hence, cooperative efforts from a group of students are needed. Students' knowledge, interests, and experiences are different, therefore, each student can bring a different perspective in solving a problem during the CPS process (Fiore et al., 2017).

PISA collects and evaluates data on CPS skills of fifteen-year-old students at regular intervals worldwide. The purpose of this assessment is to prepare students for the difficulties they may encounter in life. The participation of students in the practices of CPS will support the development of this skill. Consequently, the curriculum should be arranged to include this

requirement. With the collaborative problem-solving practices included in the curriculum, students' problem-solving practices in the social environment will develop this skill (Mulrey, 2016).

PISA, regulated by the Organisation for Economic Co-operation and Development (OECD), is the most comprehensive and most detailed international exam collecting data on student and school characteristics to explain differences. The data obtained with PISA are used to determine the factors associated with student success around the world and to develop standards to improve the quality of education systems (OECD, 2017). The Ministry of National Education (MoNE) in Turkey has been participating in all PISA applications since 2003 to determine the achievement levels of students in Turkey and to compare the strengths and areas of improvement of the Turkish education system with the data of other countries (MoNE, 2007). Problem-solving skills, which were determined as an innovative measurement area in PISA 2003, were transformed into individual (creative) problem-solving skills in PISA 2012 and collaborative problem-solving (CPS) skills in PISA 2015. Evaluating different dimensions of problem-solving skills is an indication of the increasing importance given to this skill (Arici, 2019). Since collaborative problem-solving was a new field in PISA 2015, the OECD average was determined at 500 points and the standard deviation at 100 points. This score was used as a benchmark for comparing the average achievement of countries participating in the PISA 2015 CPS assessment. The highest average scores in this area belong to Singapore with 561 points, Japan with 552 points, Hong Kong-China with 541 points, South Korea with 538 points, Canada and Estonia with 535 points, and Finland with 534 points. The average score of Turkey is 422 points, and this score does not show a statistically significant difference from the average scores of Colombia, Peru, and Montenegro.

The lowest average scores in the CPS area belong to Peru with 418 points, Montenegro with 416 points, Brazil with 412 points, and Tunisia with 382 points. Among OECD countries, there is a difference of 129 points between Japan, which has the highest average score, and Turkey, which has the lowest average score, and this difference is over one standard deviation. Less than 10% of students in Japan performed lower than the Turkish average. About 5% of the students in Turkey performed at the same or higher level than the Japanese average score (Arici, 2019).

As stated in the PISA 2017 collaborative problem-solving report, Singapore ranks first with 561 points, while Turkey ranks last among 35 OECD countries with 422 points (OECD, 2017). Among the 51 countries that participated in the exam, Turkey ranked fifth from the last, ahead of only Peru, Brazil, Montenegro, and Tunisia. It is clear from these results that Turkey needs to take serious steps in the field of resolution for CPS. In order to adapt to the suggestions of education researchers and the changing nature of international exams, there is a need to increase the

quality of real-life problems in schools and evaluate the results from classroom practices (Gür, 2019).

In Turkey, more emphasis is placed on studies aimed to determine students' problem-solving skills. Although learning environments and assessments that can develop students' problem-solving skills are common in the world, such studies are not common in Turkey (Karataş, 2008). In addition, activities aimed at improving students' CPS skills are not included in the curriculum in Turkey. On the other hand, in-class practices in which students use their problem-solving skills and work collaboratively are only occasionally included.

CPS skills cannot be evaluated with traditional evaluation methods due to students exchanging their ideas with friends in a group environment and making joint decisions together. In the CPS process, students' performance cannot be established as right or wrong. Therefore, collaborative problem-solving skills should be evaluated with alternative assessment tools. Thus, each student can be evaluated according to individual performance.

As of 2007, with the questioning of student assessment criteria worldwide, significant changes have started to be observed in this context in Turkey (MoNE, 2007). Performance evaluation started to take place in the educational environment as an alternative evaluation tool in light of these radical changes. Moreover, it is suitable in classroom activities such as students writing articles, using information, internalizing information, completing a task in a social environment, criticizing a text, or presenting it verbally. Students are expected to perform their ability, not information. Thus, the task given to the student should be based on the application and there should be clear and understandable dimensions that can measure how well the student does this application.

Performance evaluation is different from traditional evaluation methods as it includes a practical demonstration of a particular skill or competence (Jayasinghe et al., 2015). In traditional assessment methods (such as multiple-choice, short answer, filling in the blank, right, wrong, etc.), the student chooses an answer or remembers information in the answer (Madaus & O'Dwyer, 1999). However, in performance evaluation, the student applies what he knows under the guidance of a teacher (Arhin, 2015). In addition, if the student knows beforehand what dimensions to be evaluated in the performance evaluation process, they can show due diligence in this direction (Andrade, 2005). In performance evaluation, the student is evaluated based on the process and result, but the focus is mainly on the process. The process includes focusing on the process that enables errors to be seen more clearly, comparing the student in the social environment, and establishing a performance-oriented environment (Ames, 1992; Anderman & Young, 1994; Turner et al., 1998).

Performance evaluation is an alternative assessment method recommended to be used in the educational environment to evaluate whether the student has gained higher-level thinking

skills and knowledge in the 21st-century educational environment. In performance evaluation, the student completes a task closer to the real-life (Birel & Albuz, 2014) and, while completing this task, creates something new, evaluates the existing, analyses the whole, and the student applies the knowledge. In this context, performance evaluation is student-centered and provides direct evidence of learning (Wren, 2009).

In the performance evaluation process, a rubric is used to examine whether the student shows the expected skill. The rubric is divided into two as holistic and analytical. A holistic rubric refers to the evaluation made by giving the total score for the product as a whole, while an analytical rubric refers to the performance evaluation in stages (Ghalib & Al-Hattami, 2015; Jackson & Larkin, 2002). Previous research has also reported decisive educational aftereffects of rubrics, such as approving students' progress towards autonomous learners and advanced student performance. These come from the fact that rubrics make dimensions clear and understandable, which then promote other cases, such as explaining and using as an assessment tool (Jönsson & Panadero, 2017; Wolf & Stevens, 2007). Based on the literature review, it is found that rubrics are previously prepared for the cooperative learning environment (Aslanoğlu, 2017; González-Fernández et al., 2014; Law & Wong, 2003; Yücel, 2013), for peer assessment in a collaborative environment (Gömleksiz & Ayhan, 2012; Yurdabakan & Olğun, 2011) or group assessment (Önder, 2012), for problem-solving (Docktor & Heller, 2009; Docktor et al., 2016; Egodawatte, 2010; Ev Çimen, 2008; Henderson et al., 2004; Malloy & Jones, 1998; Sefer, 2006) and for creating a problem (Şengül & Kantarcı, 2014). However, there are limited studies on rubrics to evaluate CPS skills. Therefore, it can be stated that developing a rubric to evaluate CPS skills is a process that will contribute to the literature, which is the aim of this study.

Fiore et al. (2017) expressed that the in CPS process individuals use their own resources and strategies through a number of communication processes to achieve a common result. CPS is also important for establishing a link between the cognitive and affective dimensions of learning. Problem-solving is one of the cognitive dimensions of learning, while social skills and collaboration (communication, empathy, etc.) are the affective dimensions of learning. CPS enables the connection between these dimensions to be established (Fiore et al., 2017; Jolliffe, 2007). According to Steiner et al. (1999), collaborative problem-solving is the work of structured groups of students to maximize individual and group learning. In this context, a student actively participates in the teaching process and takes responsibility for their own learning rather than passively receiving the information.

Collaborative thinking is a skill that every individual working in different sectors will need. However, cooperative approaches in current education programs have not met this need. Collaborative approaches can be included in the existing curriculum in education and training, so that the lessons have a structure that supports collaborative approaches. The fact that the skills required by today's workforce are changing significantly increases the need for

individuals to have the ability to be creative, solve complex problems, communicate effectively in written and verbal communication, and work collaboratively. The CPS skills allow these needs to be met and are defined as an important and necessary skill in 21st-century education and business environments. However, these skills cannot be expected to develop spontaneously. Educational environments should be arranged in a way that requires students to communicate effectively, manage conflicts, form teams and agree on issues necessary for coexistence. In this sense, it is important to evaluate CPS skills in the Programme for International Student Assessment (PISA) (Gür, 2019).

CPS is like the intersection of social and cognitive skills that can be taught and measured, where every step of the problem-solving process is observable. In CPS, students should have several features such as the readiness to participate, mutual understanding, and the ability to manage interpersonal relationships. They should also have various interaction skills such as expressing their thoughts, sharing, supporting the thoughts of others, coordinating their thoughts with other people's thoughts, and being involved in the problem-solving stages to achieve a mutually agreed goal (Luckin et al., 2017).

In recent years, problem-solving processes based on CPS have been intensively included in the field of educational research and its benefits have been emphasized. This research aims to raise individuals who can solve daily life problems that are getting more and more complex day by day (Gür, 2019). In the literature, positive effects of CPS on students' learning (Açıkgöz, 1992; Carbonaro et al., 2020; Care et al., 2016; Heller et al., 1992; Johnson et al., 1998), its affective impact (Johnston et al., 2000), its relation with the cultural difference (Jin, 2018), and its social impact (Hamann et al., 2012; Klang et al., 2021) were expressed. Additionally, Bergin et al. (2018) indicated that CPS resulted in a deeper understanding, in terms of gender. Similarly, Harskamp et al. (2008) stated that female students spent less time in CPS. CPS is a continuous problem-solving process in which group members support each other, a common understanding should prevail, aiming to develop individual relationships. Students who have different views on how to solve a problem should evaluate these views within the scope of their common interests. In CPS, students come together as a group, listen to each other's views, and identify common concerns, fears, hopes, and interests. They work to create a solution that will meet as many ideas as possible (Dunne, 2014). Considering all these positive effects and the results it reflects on the educational environment, the importance of the CPS skill is obvious. Therefore, the aim of this study is to develop a rubric to evaluate students' CPS skills.

## **METHOD**

### **Design**

A mixed-method was used in this study. This study was carried out in two stages. In the first stage, as the qualitative part of the study, literature was reviewed to develop a collaborative problem-solving rubric. In the second stage, as the quantitative part of the study, reliability was

checked by applying statistical procedures on the results obtained from a task. This way, the data obtained numerically were interpreted (Dey, 1993). The study has mixed features within the scope of using qualitative and quantitative methods together (Harwell, 2014).

### Participants

This study was carried out with 18 students (10 females and 8 males) in the fourth grade in a public school in the west part of Turkey in the 2017-2018 academic fall semester. Students are at a medium academic achievement level and have a structure that reflects the general student profile of the region. Moreover, three academicians participated in the study within the scope of expert opinion on the compatibility of rubric dimensions with PISA.

### Procedure

In the process of developing a rubric, the authors firstly reviewed the previous studies by Adeyemi (2008), Chiu (2000), Fiore et al. (2017), Graesser et al. (2017), Green (2002), Griffin (2017), Heller et al. (1992), Hickman and Wigginton (2008), as well as Hoang (2006) to determine the basic components of collaborative problem-solving skills. These dimensions are classified as a cooperative learning skill, a problem-solving skill, and a CPS skill. By comparing the skills within the scope of PISA 2015 dimensions with the dimensions obtained from the literature, similarities and differences were evaluated to finalize the rubric. In creating the rubric, different levels of students' collaborative problem-solving skills were taken into consideration. Therefore, the sample activity used in data collection was designed to measure different skills. In other words, the student doing this sample activity can use more than one collaborative problem-solving skill. The dimensions obtained were reduced as much as possible after the experts suggested that scoring would be difficult, and the rubric was intended to be useful. The matrix of CPS in PISA 2015 is presented in Table 1.

**Table 1.** Matrix of CPS skills for PISA 2015

	(1) Establishing and maintaining shared understanding	(2) Taking appropriate action to solve the problem	(3) Establishing and maintaining team organization
(A) Exploring and understanding	(A1) Discovering perspectives and abilities of team members	(A2) Discovering the type of collaborative interaction to solve the problem, along with goals	(A3) Understanding roles to solve the problem

(B) Representing and formulating	(B1) Building a shared representation and negotiating the meaning of the problem (common ground)	(B2) Identifying and describing tasks to be completed	(B3) Describing roles and team organization (communication protocol/rules of engagement)
(C) Planning and executing	(C1) Communicating with team members about the actions to be/being performed	(C2) Enacting plans	(C3) Following rules of engagement, (e.g., prompting other team members to perform their tasks)
(D) Monitoring and reflecting	(D1) Monitoring and repairing the shared understanding	(D2) Monitoring results of actions and evaluating success in solving the problem	(D3) Monitoring, providing feedback, and adapting the team organization and roles

Table 1 shows that the first line refers mostly to collaborative skills, and the left column refers to problem-solving skills. The intersection points of collaboration and problem-solving skills reflect the evaluation dimensions.

Students received informative training on CPS for a total of 160 minutes for two weeks. CPS examples were introduced during this training. Students were allowed to do CPS activities. Then a sample activity was implemented in a CPS environment where the rubric was used. The activity adopted the Marva's Vegetable Garden activity prepared by Hickman and Wigginton (2008) to Turkish. The name Marva was adapted as Merve in the Turkish activity. In the translation process, the Turkish meanings and comprehensibility of the short instructions stating the places of vegetables in the garden were reviewed together with a language expert. The names of the vegetables included in the original activity have been replaced by the more frequently used vegetable names as it is difficult for students to understand. The activity, created from the original activity, was organized by taking cultural elements into account. The sample activity was implemented in the classroom of the participants. The application took 30 minutes. Before the application, the desks in the classroom were arranged following the CPS. In the study, the locations of the vegetables were given to the students and they were asked to write the appropriate vegetables in the appropriate order (Appendix 1).

In order to determine whether the rubric was appropriate or not, by which student performance will be observed, the lowest level of 1 and the highest level of 4 were expressed in the rubric. Student performance to be observed is specified in the categories of common understanding, communication, respect, solving problems together, discussion, and finding common solutions. The dimensions are intended to measure only one performance and two items will not measure the same performance. In order to ensure validity, the opinions of three academicians were taken into account regarding the dimensions in the rubric.

Experts were asked to evaluate the dimensions as appropriate, not appropriate, and must be improved. The appropriate category states that the rubric dimensions are fully compatible with the CPS skills for PISA 2015. The not suitable category indicates that rubric dimensions are not suitable for CPS skills for PISA 2015. The must be improved category states that the rubric dimensions are partially compatible with CPS skills for PISA 2015. The rubric, originally designed with five stages, was structured in four stages, suggesting that close intervals may make it difficult to evaluate CPS performance. The reliability of the rubric depends on the fact that it is an analytical rubric, it is specific to the subject, and the evaluation is independent of the evaluator, the place, and the time of the evaluation (Jonsson & Svingby, 2007). In order to determine the reliability of the rubric, two observers examined the students during the activity and gave them points. In this context, it was decided to determine the weighted kappa value of the rubric. The weighted kappa coefficient of the rubric is 660 on the common understanding dimension; 644 on the communication dimension; 835 on the respect dimension; 829 on the solving problems together dimension; 825 on the discussion dimension; and 822 on the finding common solutions dimension. Kappa value of 0.70 and above indicates an acceptable agreement among the observers (MacArthur et al., 2008).

Ethics committee approval was obtained from MoNE and the school administration for the research's purposes. In the school where the study was conducted, the class with participants was chosen randomly among the four classes.

## **RESULTS**

In this part of the study, the kappa coefficient results between the observers and sample activity evaluation results are presented according to the dimensions of the rubric prepared to evaluate the collaborative problem-solving skill in Table 2.

**Table 2.** Weighted Kappa Coefficient Results Regarding Agreement Between Observers According to the Dimensions of CPS Rubric

	Common understanding	Communication	Respect	Solving problems together	Discussion	Finding common solutions
Weighted kappa coefficient	0.660	0.644	0.835	0.829	0.825	0.822
Number of students	18	18	18	18	18	18

Table 2 presents the results obtained from the weighted kappa coefficient regarding the agreement between observers. The weighted kappa coefficient of the rubric is 660 on the common understanding dimension; 644 on the communication dimension; 835 on the respect dimension; 829 on the solving problems together dimension; 825 on the discussion dimension; and 822 on the finding common solutions dimension. These results are significant at the 0.01 level. The data obtained from the kappa coefficient are "weak agreement = < 0.20; acceptable agreement = 0.20-0.40; moderate agreement = 0.40-0.60; good agreement = 0.60-0.80; and very good agreement = 0.80-1.00" (Şencan, 2005). This finding shows that the agreement for the dimensions of solving problems together, discussion, respect, and finding common solutions have a very good agreement, while the other dimensions have good agreement. A sample activity evaluation is presented in Table 3.

**Table 3.** Sample Activity Evaluation

	Common understanding		Communication		Respect		Solving problems together		Discussion		Finding common solutions	
	X	SS	X	SS	X	SS	X	SS	X	SS	X	SS
Observer (1)	3.11	0.90	3.22	1.00	3.11	1.02	3.22	0.87	3.27	0.89	3.27	0.89

Observer (2)	3.22	0.87	3.33	0.97	3.11	0.90	3.22	0.94	3.05	1.05	3.27	0.89
Total	3.16	0.85	3.27	0.95	3.11	0.94	3.22	0.89	3.22	0.98	3.27	0.87
Percentage	66.7		50		61.1		55.6		50		56.5	
Number of Students	18	18	18	18	18	18	18	18	18	18	18	18

The means, standard deviations, and percentages of the students whose collaborative problem-solving skills were examined according to 6 different dimensions with the CPS rubric were presented in Table 3. Accordingly, the highest means belong to the communication and finding common solutions dimensions with the value of 3.27, while the dimensions of discussion and solving problems together have a 3.22 mean. Additionally, the common understanding dimension has a 3.16 mean, and finally, the respect dimension has a 3.11 mean.

## DISCUSSION

The aim of this study is to develop an analytical rubric that teachers can use to observe and evaluate the performance of students in the CPS process. CPS skills should be developed in the educational environment and its development should be observed. The purpose of the developed rubric is to determine how much students have CPS skills and how much attention they pay to the basic elements of this process. During the observation, the reflection of the students' specific characteristics in the group work was analyzed. It is found that the social communication skills of the students who develop CPS skills also develop among their friends. In this context, the social communication of the students is evaluated as a priority during the observation process of the rubric. Within the observation, it is also taken into account how the students exhibit democratic behaviors in the group environment, respect each other, and reach common conclusions. These skills will facilitate the formation of citizenship awareness in students as a member of society. In today's world, especially when lifelong learning is crucial, it is clear that learning environments should offer a regular and well-structured CPS environment for students. Thus, this study is considered to be important. When previous studies are reviewed, it is understood that some studies focus on measuring cooperative learning skills, while some others focus on measuring problem-solving skills. However, it is implied that there is a need for a rubric to measure the CPS skill, which is gaining importance day by day.

Expert opinions expressed in the study contributed to making the rubric more understandable and useful. The rubric, which originally had five stages, was designed in four stages in line with the experts' opinions to facilitate the scoring. The suggestions that guided the rubric specified that the CPS skill dimensions are not detailed but reflect the basic features, the expressions are written clearly and in plain language, and they measure a single skill. At the same time, experts stated that the rubric should not be too long in terms of the number of pages, providing ease of use.

The reliability analysis showed that the weighted kappa coefficients of observers' agreement were generally high for the dimensions of the CPS rubric. This indicated that the dimensions of the rubric were reliable. However, there was a slight difference among some agreements of the dimensions. The reason for the different levels of coherence in the study may be that the common understanding and communication categories cannot be observed as concretely and distinctly as the other categories. Students will be able to talk while solving problems in groups within the scope of communication skills. However, it may not have been determined by the observer how accurately these conversations aided the communication purpose. In respect, solving problems together, and discussion dimensions are considered as features that can be observed more clearly, the high level of agreement supports this finding. The score that can be obtained from the developed CPS rubric is a minimum of 1 and a maximum of 4. In this context, it is demonstrated that the sample activity scores are high in general and the highest scores are in the communication and finding common solutions dimensions.

The literary review indicated that there are some studies for cooperative learning environments. The rubric developed by Yücel and Usluel (2013) aimed to evaluate the quality of interaction and participation in the information structuring process that took place in online collaborative learning environments. Similarly, the rubric for cooperative learning was developed by Önder (2012) and Razali et al. (2018). Kaya (2013) also prepared a peer assessment form in a collaborative learning environment. Smith (1998), on the other hand, examined the points to be considered in the preparation of the collaborative learning rubric. However, these studies were for only cooperative learning environments. Some other studies were for only problem-solving such as, Heppner and Petersen (1982) who developed the problem-solving inventory and Uysal (2010) who developed the problem-solving skill rubric. Similarly, a rubric for problem-solving skills was developed in the studies by Kourmoussi et al. (2016), Tadeu et al. (2013), and Cankoy and Özder (2017). As can be seen, there is a need for a study in the literature to measure both cooperative learning and problem-solving skills.

## CONCLUSION

In conclusion, no rubric was found for evaluating collaborative problem-solving skills in literature. Therefore, this study is considered to be important and will contribute to the literature. A collaborative problem-solving rubric can be used as an alternative measurement tool to evaluate students' CPS skills in the classroom environment. It is thought that the scores obtained from the rubric can provide an insight into the CPS skills of the students and contribute to the literature. Researchers and teachers can use the CPS rubric to detect students' CPS skills.

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**APPENDICES**

**Appendix 1.** Marva's Vegetable Garden

Marva's vegetable garden consists of 12 sections. A different vegetable is grown in each department. Vegetables are placed in the garden sections as follows.

1. Beans are planted between tomatoes and potatoes.
2. Cucumbers are planted between lettuces and onions.
3. Broccolis and cauliflowers are in the first place.
4. Celeries are behind the peas.
5. Cucumbers are between beans and peppers.
6. Tomatoes are located to the right of celeries.
7. Tomatoes are behind the onions.
8. Onions are behind the carrots.
9. Carrots are behind broccolis and peppers.

Place the vegetables in the garden according to the above information.

3. Row				
2. Row				
1. Row				

**Appendix 2.** Cooperative Problem-solving Rubric

<b>Points of Cooperative Problem-solving</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Common understanding</b>	The student does not try to establish a common understanding in collaborative problem-solving. The student does not act in this direction.	The student establishes a partial common understanding in collaborative problem-solving and continues this understanding throughout the process. The student acts in line with the common understanding established from time to time.	The student establishes a sufficient common understanding in collaborative problem-solving and continues this understanding throughout the process. The student acts adequately in accordance with the established common understanding.	The student establishes a strong common understanding of collaborative problem-solving and continues this understanding throughout the process. The student acts in the most appropriate way in line with the common understanding established.
<b>Communication</b>	The student does not communicate well with his/her friends in the group during the collaborative problem-solving process. The student does not exchange ideas with his	In the collaborative problem-solving process, the student establishes healthy communication partly with his/her friends within the group. During the solution of	The student communicates with his/her friends in the group during the collaborative problem-solving process. The student communicates with his friends during the	The student establishes effective and healthy communication with his/her friends within the group in the collaborative problem-solving process. The student exchanges

	friends during the solution of the problem.	the problem, he exchanges ideas with his friends from time to time.	solution of the problem.	ideas with his friends in the solution process of the problem.
<b>Respect</b>	The student does not respect the different perspectives of his/her friends about problem-solving during the collaborative problem-solving process. The student does not care about and evaluate different perspectives in the cooperative problem-solving process.	During the collaborative problem-solving process, the student occasionally hears different perspectives of her friends' problem-solving. The student sometimes cares about different perspectives in the collaborative problem-solving process.	The student respects the different perspectives of his friends about problem-solving in the collaborative problem-solving process. The student takes into account different perspectives in the cooperative problem-solving process.	The student respects the different perspectives of his/her friends about problem-solving in the collaborative problem-solving process well. The student cares about the value of individual differences of different perspectives in the CPS process and evaluates these differences.
<b>Solving problems together</b>	The student does not solve the problem cooperatively. The student does not make any contribution to the process.	The student contributes partially to the solution of the problem in collaboration, tells his opinion. Considers the opinion of the student friend.	The student cooperatively contributes to the solution of the problem, establishes a link between cause and effect. The student tests the hypotheses	The student actively participates in the solution of the problem in collaboration, reports the opinion/solution proposal. The student

			established together.	establishes the cause-and-effect connection with his friends in the process. Tests the hypotheses established together. Shares the responsibility of the decisions taken together
<b>Discussion</b>	The student does not participate in the discussion environment during the collaborative problem-solving process. The student does not interact with the group.	The student expresses his/her idea for the solution of the problem in the cooperative problem-solving process. He listens to the idea of his student friends.	The student discusses the solutions offered to the group in the collaborative problem-solving process. The student evaluates alternative solutions.	The student discusses the ideas about the solution of the problem within the group in collaborative problem-solving with friends. The student evaluates the possible results of the different solutions presented with his/her friends. Indicates the deficiencies he noticed.
<b>Finding common solutions</b>	The student does not consider a solution that is approved by	The student is aware of a solution that everyone approves in the	The student specifies a solution that everyone approves in the	The student knows that all individuals in the group should participate in

	<p>everyone in the group. The student does not care to find the solution together.</p>	<p>group. The student knows the importance of finding a common solution in the collaborative problem-solving process.</p>	<p>group. In this direction, the student encourages everyone to participate and offer a solution.</p>	<p>the process, and a solution that everyone approves of will be the solution of the group. The student provides the most suitable solution for the group among the alternatives.</p>
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This study was based on a doctoral dissertation titled "Preparation and Implementation of the Cooperative Problem Solving Curriculum."