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Development of assessment instruments 4C skills (critical thinking, collaboration, communication, and creativity) on parabolic motion materials

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Abstract

4C skills are one of the abilities in life that can produce knowledge personally and be used in society. This study aimed to develop an instrument for assessing students' 4C skills (Critical Thinking, Collaboration, Communication, and Creativity) on parabolic motion material. The model used in developing this research is the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. Data collection methods were interviews, questionnaires, tests, and documentation with a population of 120 students and a sample of 60 students. The sample selection technique uses cluster random sampling. Based on the study results, the percentage of critical thinking criteria was 21.7 %, low critical thinking was 28.3%, and poor critical thinking was 50%. The percentages with creative thinking criteria are 25%, 40% moderately creative, and 35% less creative. The percentage of collaboration skills that meet excellent criteria is 65%, and high collaboration skills are 35%. While the percentage of people with excellent communication skills was 8.3%, high communication skill was 83.3%, and fairly high communication skill was 8.3%. Based on these data, it concluded that the instruments developed were valid and feasible to use.

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INTRODUCTION

In the 21st century, technology and information are very influential in every aspect of life. This century is known as transforming industrial society into a knowledgeable one (Widya et al., 2021). The 21st century is called the "century of knowledge," which requires a person to have higher-order thinking skills. High-quality human resources are needed in the 21st century or the century of knowledge (Makhrus, 2019; Susilowati, 2022). Science and technology will always evolve in accordance with the times so that the quality of education will always be higher than before. Starting with revolutions 1.0, 2.0, and 3.0, we are now in the era of industrial revolution 4.0, with a very rapid acceleration of science (Mukhlis & Tohir, 2019).

21st-century learning skills are an important component that students must be taught. Based on the competencies that students must achieve, competence consists of skillful ways of thinking, how to work, work tools, and life in the world (Cahyana et al., 2020). Education in the 21st century has no easy responsibilities; one of these responsibilities is to produce quality output or skills to compete, especially in education (Partono et al., 2021). Students are expected to have a much better attitude, skill, and knowledge balance in this learning than previously. Learning outcomes are also expected to make students more productive, creative, innovative, and effective by strengthening the integrated realm of attitudes, skills, and knowledge (Partono et al., 2021).

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In 21st-century learning, apart from having the responsibility of developing character and literacy, it is also responsible for developing 4C Skills (Pertiwi & Rizal, 2020). Therefore, 21st-century learning is also called learning the 4C skills, namely critical thinking, collaboration, communication, and creativity (Wijaya, 2020). The 4C skills are a requirement to enter world competition which is getting tougher every day, so it is very important to provide meaningful learning education (Kurniawan, 2020). The application of 4C skills will provide great benefits for students in everyday life, one of which is when students are involved in society (Fitriana, 2021) because 4C skills are one of the assets in life that can generate knowledge personally and socially (Setiawan, 2019). Improving thinking 4C skills is very important in classroom learning, and thinking 4C skills can improve the learning process (Hery, 2020). Besides that, improving 4C skills can foster and increase cooperation within a group to solve certain problems, increase tolerance for differences of opinion, and strive to think critically and creatively to solve problems (Resti, 2018).

Critical thinking skills are mental abilities that can be trusted after synthesizing cognitive abilities and dispositions (Cui et al., 2021; Putri & Rusmini, 2021). Critical thinking is the reflective component of an active, persistent thinking process that employs caution in weighing beliefs, constructing related knowledge, and drawing conclusions (Selman & Jaedun, 2020). This skill is critical for students to identify the source of a problem and find the appropriate solution (Siti, 2018). Critical thinking is grouped into five aspects, namely: (1) providing explanations, (2) building basic skills, (3) making inferences, (4) making further explanations, and (5) organizing strategies and tactics.

One of the 4C skills needed in the 21st century is the "way of working," which includes communication, collaboration, and teamwork (Nurhaifa et al., 2020). Collaboration skills are a form of cooperation to achieve the goals as a group (Fitriyanti et al., 2021; Hamida & Desnita, 2021; Susanti et al., 2017). Collaborative abortion is carried out by prioritizing the benefits of both parties. All parties involved have clear responsibilities, and each role is clearly described (Slamet, 2020).

Communication is a process of transmitting information, ideas, emotions, and skills through symbols, words, pictures, graphics, or numbers (Susanti 2017; Tyaningsih et al., 2022), communication is a process of transmitting information, ideas, emotions, and skills using symbols, words, pictures, graphics, or numbers (Maulidah, 2021). This skill has several sub-skills, such as language skills, understanding context, and reading listeners to ensure the message is conveyed properly (Tigas & Santoso, 2021). Through communication, students can convey ideas, messages, understanding, and income to educators, friends, groups, or the entire class (Purnawirawan et al., 2019). Communication skills are typically combined with collaboration skills so that the target has practical communication skills, both verbally and in writing, which improves teamwork skills and the ability to communicate effectively between groups (Susanti & Arista, 2019).

Creativity is an activity that involves analyzing existing knowledge to discover new innovative products or innovations (Farhan et al., 2021). The creativity of students is expected to be able to develop, implement, and convey new ideas to others and be open and responsive to new things and different perspectives in terms of being attractive, more practical, functional, expediting, solving problems, reducing obstacles, overcoming difficulties, and bringing better results (Fitriani et al., 2017; Rasnawati et al., 2019).

Student assessment activities are an essential component of school teaching and learning activities. Assessment instruments are used to measure the results of learning. To obtain information regarding the achievement of results from students' learning process following predetermined goals (Imania & Bariah, 2019), research on 4C skills has been carried out, including on 4C skills with digital literacy (Sriyanto, 2021), PjBL learning for analysis of 4C skills (Firda &

Sunarti, 2022), and analysis of 4C skills with moodle (Nalantha et al., 2021). There is also research on the development of instruments to determine 4C skills, namely the development of HOTS assessment instruments containing 4C skills (Lamhatin et al., 2022) and work assessment instruments to measure 4C skills in online learning (Maryuningsih et al., 2020). However, in this study, there were differences in the development of the 4C skills instrument. The development of the 4C skills instrument is implemented through offline learning in physics subjects that have never been studied before. Based on this explanation, this study aims to develop 4C skills instruments to fill the gaps in similar research so that they can contribute to the world of education. The developed instruments can be useful in advancing science, especially for measuring 4C skills in physics subjects.

METHODS

This study was carried out at one of East Lampung's junior high schools from October 16 to 26, 2021. The total population is 120, the sample is 60 students, and the sample is taken using random cluster sampling. The development design is described using diagrams, and the research stages are presented in Figure 1.

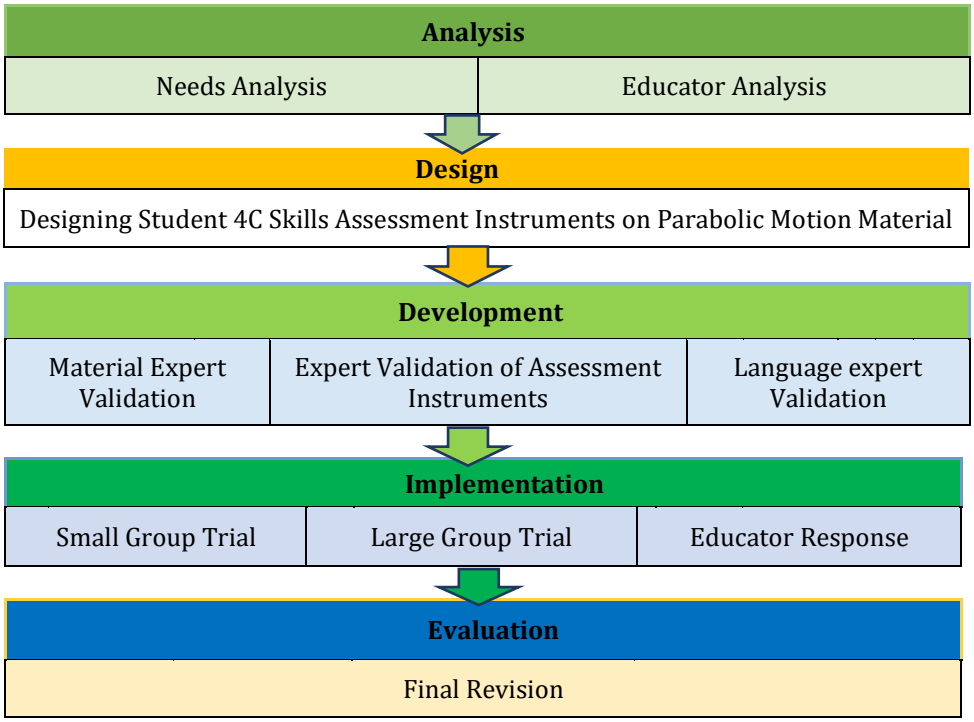

Figure 1. Stages of Developing the 4C Skill Assessment Instrument

Data collection methods used in this study were interviews, questionnaires, tests, and documentation. The data analysis technique used to determine the feasibility category of an assessment instrument is the Likert scale measurement. The Likert scale is a scale used to measure the perceptions, attitudes, or opinions of a person or group regarding an event or social phenomenon (Pranatawijaya et al., 2019).

The model used in developing this research is the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation (Latifah et al., 2020). The development design is described using the development procedure presented in Table 1.

Table1. Development Procedure

ADDIE Development Stages	Development Procedure
	Analyze
Needs analysis	This analysis seeks to identify and define problems in assessing 4C skills in schools to address all current issues.
Educator analysis	This educator analysis aims to determine educators' initial knowledge and experience as initial description material for product development.
	Design
Create a question grid	The components of the developed assessment instrument grid consist of four parts: basic competencies, indicators, categories, and question numbers.
Create work instructions	Procedures for filling out answer sheets and answering questions are based on instructions for working on questions or tests.
Create questions	First, the researcher developed 20 four-level multiple-choice questions to create a critical thinking assessment instrument in a four-tier multiple-choice test. Second, in creating an assessment instrument for creative thinking in the form of essay questions, the researcher developed five essay questions. Third, create an assessment instrument for collaboration and communication skills in the form of an observation sheet.
Create an answer key	Make an answer key to correct the results for their student's answers.
Make scoring	
Create a 4C Skills assessment instrument	At this stage, the researcher made a product in the form of a 4C skills assessment instrument in the form of a test and nos test following the design that had been made.
Expert reviews	At this stage, it aims to consider the quality of the product to be developed. The researcher asked for considerations, criticisms, and suggestions from instrument experts, material experts, language experts, and practitioners regarding the feasibility of the realized instruments. In this activity, the researcher submitted validation sheets and 4C skills assessment instruments to the validator.
	Implementation
Small group test	At this point, the researcher had created a product in the form of a 4C skills assessment instrument in the form of a test and NOS test based on the design.
Large group test	If the product being developed meets the desired criteria, the next stage is the large group trial stage. At this stage, the revised product trials were tested on class X MIPA students, with a total sample size of 60 students.
	Evaluation
Final Revision	At this stage, a final revision of the product was carried out based on suggestions and input (responses) from educators during the implementation phase that had been carried out.

Data from instrument experts, material experts, and language experts were analyzed qualitatively as input for improving the product being developed. Product feasibility is analyzed by transforming the average score of all aspects into the criteria interpretation table. Aspects of the interpretation of criteria (Diani et al., 2018) are presented in Table 2.

Table 2. Criteria Interpretation

Intervals	Criteria
0% - 20%	Extremely not Feasible
21% - 40%	Not feasible
41% - 60%	Moderately Feasible Enough
61% - 80%	Feasible
81% - 100%	Highly Feasible

In addition, data from the results of the 4C Skills scoring analysis were also analyzed by transforming the average scores of all aspects into the criteria interpretation table.

Critical Thinking Skills Test Analysis

The analysis result of critical thinking skills was then divided into four categories. The criteria for critical thinking skills (Ihsan et al., 2019) are presented in Table 3.

Table 3. Criteria for Critical Thinking Skills

Score	Information
81.25 - 100	Very Critical
62.50 - 81.24	Critical
43.75 - 62.49	Less Critical
25.00 - 43.74	Not Critical

Collaboration Skills Analysis

The obtained collaboration skills assessment data was analyzed in five categories to determine the level of student collaboration (Fitriyani et al., 2019). The criteria for collaboration skills are presented in Table 4.

Table 4. Criteria for Collaboration Skills

Score	Information
81- 100	Excellent
61–80	High
41–60	Moderate
21–40	Low
0 – 20	Poor

Communication Skills Analysis

Data on the percentage results from the students' communication skills are categorized into five criteria (Fadhelina, 2021). The criteria for communication skills are presented in Table 5.

Table 5. Criteria for Communication Skills

Score	Information
$80 \leq NP \leq 100$	Excellent
$60 \leq NP < 80$	High
$40 \leq NP < 60$	Moderate
$20 \leq NP < 40$	Low
$0 \leq Np < 20$	Poor

Creative Thinking Skills Test Analysis

Data on the results of the creative thinking skills test were analyzed, then it was determined how high the students' creative thinking skills were (Arini, 2017). Criteria for creative thinking skills are presented in Table 6.

Table 6. Criteria for Creative Thinking Skills

Criteria for Creative Thinking Skills	Information
80 <Np ≤ 100	Very creative
60 <Np ≤ 80	Creative
40 <Np ≤ 60	Creative Enough
20 < Np ≤ 40	Less Creative
Np ≤ 20	Not Creative

RESULTS AND DISCUSSION

Researchers produce products in the form of assessment instruments in the form of test and non-test questions to know the level of achievement of student learning outcomes in the form of students' 4C skills on parabolic motion material. One of the steps in developing the 4C skills assessment instrument is to design an assessment instrument in terms of design, material, and language. The design for making the 4C skills assessment instrument is as follows:

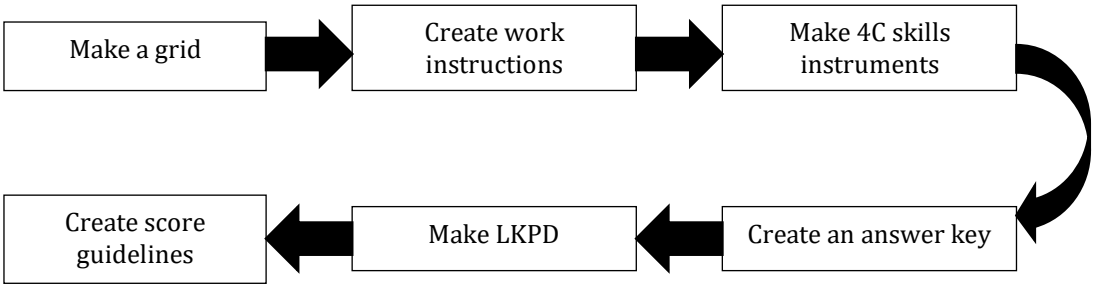

Figure 2. Product Design Flow Chart

After the product design and manufacturing activities have been completed, the next step is to enter the validation and revision stages following the directions or suggestions from assessment instrument experts, material experts, language experts, and supervisors. The results of the validation and validator are as follows:

Assessment Instrument Expert

Instrument experts carried out the validation to evaluate the product using a questionnaire sheet. The instrument experts were Sri Latifah, M.Sc., and Antomi Saregar, M.Pd., M.Sc. The results of the validation test data carried out by instrument experts are shown in Figure 3.

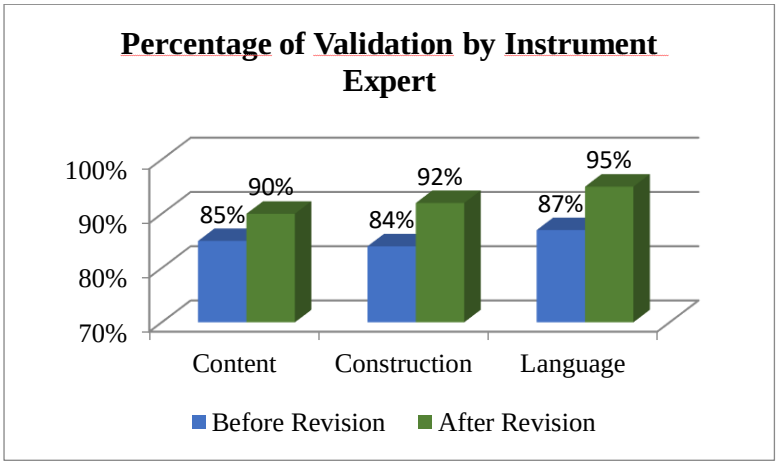

Figure 3. The Before and After Validation by Instrument Experts

After obtaining an assessment of the validation results provided by the two valuation instrument validators, several positive inputs were obtained. Then the suggestions given by the validator will be used as input to improve the initial product design. The revision of the 4C skills assessment instrument aims to solve validator problems in the questions posed by researchers. Based on the percentage of expert opinions on the revision stage of the assessment instrument, it can be concluded that validation by two assessment instrument experts was categorized as very feasible at the initial stage with an average score of 82.3 %. However, there were still several things that needed to be revised. After the revision, the results were categorized as very feasible and even experienced an increase with an average score of 92%. Thus the instrument was feasible to use.

Material Expert

Material validation is an assessment of the content of the material presented in the instrument, namely parabolic motion material. Material validation is carried out by material physics experts, where expert validation evaluates the content of the material contained in the product in the form of a 4C Skills assessment instrument for students on the parabolic motion material that has been developed and includes it on a questionnaire sheet. There are two material expert validators: Ajo Dian Yusandika, M.Si., and Happy Komikesari, M.Si. The results of the validation test data carried out by instrument experts are shown in Figure 4.

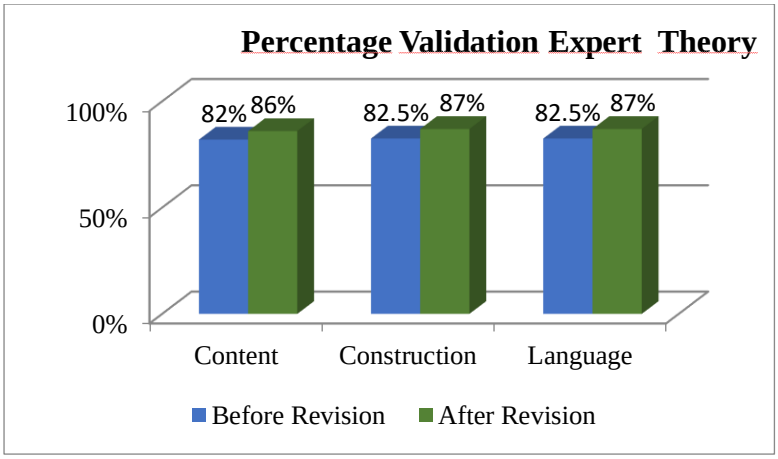

Figure 4. Graph of validation of two material experts at the initial stage and revision

After assessing the validation results of two material expert validators, some positive input was obtained. Then the suggestions given by the validator will be used as input to improve the initial product design. After revising the material in the 4C skills instrument product, the researcher then analyzed the suggestions and input from the material expert validator to improve the parts that needed improvement. Afterward, the researcher returned the improvement results to the material expert validator. Based on the graphical results of the percentage of material expert opinion at the revision stage, it can be concluded that validation by material experts is categorized as very feasible in the early stages with an average score of 82.3 %. However, there are still several things that need to be revised. After the revision, the results were categorized as very feasible and even experienced an increase with an average score of 87%. Thus the instrument was feasible to use.

Language expert

Validation is carried out by language experts, whose evaluation of the product in the form of a 4C Skills assessment instrument for students on parabolic motion material that has been

developed is entered on a questionnaire sheet. One validator carried out language validation, Nurul Hidayah, M.Pd. The results of the validation test data carried out by language experts are shown in Figure 5.

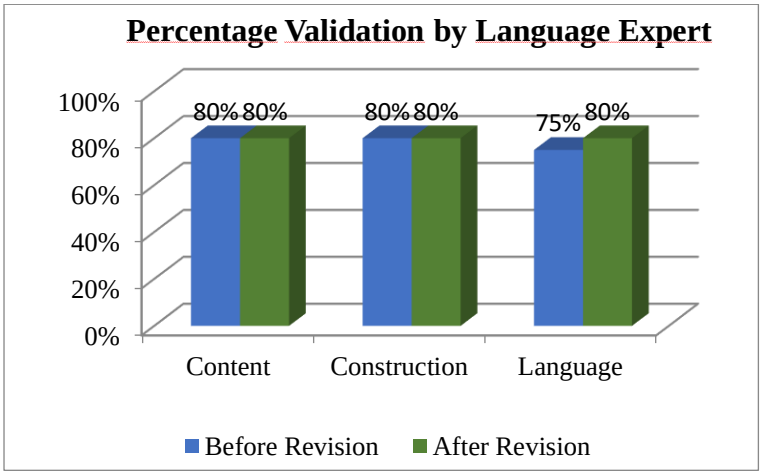

Figure 5. The Before and After Validation by Language Experts

Based on the results of the percentage of opinions of language experts, it can be concluded that the validation by language experts indicated that the results were categorized as feasible in the early stages with an average score of 78.33 %. However, there are still some things that need to be revised. After the revision, the results were categorized as feasible and even experienced an increase with an average score of 80%. Thus the instrument was feasible to use.

After the validation stage is complete, the next stage is implementing the product that has been developed in the form of a 4C skills assessment instrument after the learning process at school takes place. By conducting small and large group trials involving students and educators to determine educators' responses to the 4C skills assessment instrument that has been developed. After implementing the product in the form of a 4C skills assessment instrument for students on parabolic motion material that has been developed, the following results are obtained:

Small-Group Trial

This small group trial was conducted to determine the test item validity, reliability, difficulty level, and discriminating power in the four-tier multiple-choice critical thinking questions and creative thinking description questions. Validation tests were only carried out for collaboration and communication skill assessment instruments.

After getting the results, the researcher conducted a statistical test using the IBM SPSS Statistics Software. Then the researcher analyzed the result data from the statistical test.

a) Test item validity, reliability, difficulty level, and discriminating power on the four-tier multiple-choice critical thinking questions and creative thinking essay questions.

1) Validation Test of Four-Tier Multiple Choice Questions and Description Questions.

Calculating the validity of the researcher's questions using the product moment correlation formula. The result of this analysis is that the $r_{xytable\ value\ is}$ calculated using a sig level of 0.05 (5%), so the $r_{xytable}$ results the researcher used were 0.3494 because the number of samples in the test consisted of 30 samples. In this study, the researchers identified students' critical thinking using an objective test of 20 questions to find out critical thinking skills tested on 30 students. Out of 20 questions, there were 15 valid questions, namely questions numbers 1, 2, 5, 6, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, and 20.

Meanwhile, the $r_{xytable\ value}$ for creative thinking questions is the same as that used for the $r_{xytable\ value}$ for the four-Tier Multiple Choice questions, which is calculated using a sig

level of 0.05 (5%) so that the $r_{xytable\ results}$ in the researcher used 0.3493 because the number of samples in the test consisted of 30 samples. Identifying students' creative thinking in this study using objective tests. A total of 5 essay questions to determine creative thinking skills were tested on 30 students. Out of the five questions tested, there were four valid questions, namely questions contained in numbers 1, 3, 4, 5

2) Reliability Test of Four-Tier Multiple Choice Questions and Description Questions.

Calculate the researchers' reliability using the Kuder and Richardson methods, namely the Alpha Cronbach formula. Based on the results of the student's answers in answering the four-tier multiple-choice critical thinking questions and the creative thinking description questions, the reliability level of the questions is presented in Table 7.

Table 7 Results of the Reliability Test of Four-Tier Multiple Choice Critical Thinking Questions

R_{11}	Criteria
0.7620	High

Based on the analysis by testing statistical data using IBM SPSS Statistics Software, the reliability results in this study were obtained for r_{xy} several 0.7620; thus, it can be concluded that $r_{xycount} > r_{xytable}$ with high-reliability criteria. After getting the results of the reliability test four-Tier Multiple Choice critical thinking questions, then conducting a reliability test on creative thinking questions, the data is presented in Table 8.

Table 8. Reliability Test Results for Creative Thinking Description Questions

R_{11}	Criteria
0.7082	High

Based on the analysis by testing statistical data using IBM SPSS Statistics Software, the reliability results in this study were obtained for r_{xy} several 0.9885; thus, it can be concluded that $r_{xycount} > r_{xytable}$ with very high-reliability criteria.

3) Test the difficulty level of the four-tier multiple-choice and description questions.

The results of the analysis of the difficulty level test on the four-tier multiple choice questions showed that out of 20 items, 15 items were found to be in the medium category, namely numbers 1, 2, 5, 6, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20 and for the easy category, five questions are obtained, namely at numbers 3, 4, 7, 9, 16.

The results of the analysis of the difficulty level test on creative thinking description questions show that out of 5 items, four items are obtained which are in the difficult category, namely at number 1 (point "b"), 2 (point "a" and "b"), and 3 (point "b"). In comparison, there are four items in the medium category, namely at number 1 (point "a"), 3 (point "a"), 4 (points "a" and "b"), and 5 (points "a" and "b").

4) Discriminating Power Test of Four-Tier Multiple Choice Questions and Description Questions.

The analysis of the discriminating power test on the four-Tier Multiple Choice questions showed that out of 20 items, there were ten items with high criteria for discriminating power, five with sufficient criteria, and five with poor criteria.

In addition to the discriminating power analysis of the four-Tier Multiple Choice questions, the discriminating power test was also carried out on the creative thinking description questions. The results of the discriminating power analysis showed that in the

creative thinking description questions, out of the five items, the results obtained were 5 item points which were in a high category, namely number 1 (points "a" and "b"), and 3 (point "b"), and 5 (point "a" and "b"). There are four items in the sufficient category, namely at number 2 (point "b"), 3 (point "a"), and 4 (points "a" and "b"). Besides that, there is also a discriminating power in a bad category, namely number 2 (point "a").

b) Collaboration and Communication Skills Assessment Instrument Test

1. Collaboration Skill Level

The results of the collaboration skill level analysis test the researcher to make observations using observation sheets with assessment indicators, namely that participants were able to work productively with others, participate, contribute actively, share responsibility for completing assignments, and respect other people's ideas. So, by analyzing the scores of the assessment indicators, it is known that out of 30 students, there are 20 with excellent collaboration criteria and 10 with high criteria.

2. Communication Skill Level

The results of the analysis of the communication skill level test the researcher to make observations using observation sheets and assessment indicators that showed students' ability to explain ideas, present work results, voice intonation and respond to audience questions. So by analyzing the scores of the assessment indicators, it is known that out of 30 students, there are four with excellent communication skills criteria and 26 with high criteria.

c) Large Group Trial

The researcher first analyzed the 4C Skills assessment instrument for students on the parabolic motion material to be used before conducting large group trials or field trials. A small-scale trial was conducted to determine the validity of the 4C Skills assessment instrument. Based on the data from the small-scale trial results, the researcher determined that the critical thinking assessment instrument should be a multiple-choice, four-tier multiple-choice test (the researcher developed 20 four-level multiple-choice questions). Of the 20 questions, only 15 questions can be used. In the form of descriptive questions, the researcher developed five items for the creative thinking assessment instrument. Of the five questions, only four questions can be used. Communication and collaboration skills assessment instruments can be used in the form of observation sheets with several assessment indicators. In large group trials or field trials, researchers used a sample of 60 students.

d) Field Trial Instruments Four-Tier Multiple Choice Critical Thinking Questions and Creative Thinking Essay Questions.

After passing a small-scale trial, the researcher used a sample of 60 students in this test. The percentage of students' critical thinking skills is shown in Table 9.

Table 9. Results of Identification of Students' Critical Thinking Levels

No	Value Score	Number of Students	Percentage (%)
1	64.44 - 66.67	13	21.7%
2	44.44 - 62.22	17	28.3%
3	22.22 - 37.78	30	50%

Based on Table 9, after being analyzed, there were 13 students with critical criteria, 17 with less critical criteria, and 30 with very less critical criteria. The next stage is to conduct field trials on creative thinking description questions, with a maximum of four questions that can be used. The level of student's creative thinking skills is shown in Table 10.

Table 10. Results of Identification of Students' Creative Thinking Levels

No	Value Score	Number of Students	Percentage (%)
1	62.50 - 65.60	15	25%
2	40.62 - 53.12	24	40%
3	28.12 - 37.50	21	50%

Based on table 10, there were 15 students with creative criteria, 24 with quite creative criteria, and 21 with less creative criteria.

e) Instrument Field Trial Observation Sheet Collaboration and Communication Skills.

After passing small-scale trials, collaboration, and communication instruments tested for validation, these instruments can be tested in a large group or field tests. In this test, the researcher used a sample of 60 students. The percentage of students with "collaboration skills" is presented in Table 11.

Table 11. Results of Identification Level of Student Collaboration

No	Value Score	Number of Students	Percentage (%)
1	62.50 – 75	21	35%
2	81.25 - 93.75	39	65%

Based on Table 11, after being analyzed, there were 39 students with excellent criteria and 21 students with high criteria. The next stage is to conduct field trials on the communication skills instrument. In this test, the researcher used a sample of 60 students. The results of the student's communication skill levels are presented in Table 12.

Table 12. Identification Results of Student Communication Levels

No	Value Score	Number of Students	Percentage (%)
1	50 – 56	5	8.3%
2	62.5 – 75	50	83.3%
3	81.25 - 87.50	5	8.3%

Based on Table 12, after being analyzed, there were five students with excellent criteria, 50 with high criteria, and five with pretty high criteria.

Looking at the achievement of learning outcomes or the 4C skills possessed by students, there are differences in the instruments developed by researchers and previous researchers. In previous research, namely the assessment instrument that had been developed by (Nurhaifa et al., 2020) entitled " Performance Assessment Rubric in 4C Skills-Based STEM Learning," it was stated that the performance assessment instrument in the form of a rubric was said to be valid and reliable as a form of the assessment tool. However, this research was conducted to measure the 4C skills of elementary school-level students in thematic material using the STEM approach.

Developed an assessment instrument in the form of multiple-choice tests to measure cognitive domains, while non-tests or performance (performance tests) to measure affective and psychomotor domains (Purnairawan et al., 2019). This study was limited to analyzing indicators in aspects of the 4C characteristics that were causal in nature and only up to limited trials.

The update in this research lies in the product being developed in the form of a 4C Skills skills assessment instrument, a critical thinking assessment instrument in the form of a four-tier multiple choice test with multiple choice questions, with a total of 20 four-level multiple choice

questions developed by the researcher. The assessment instrument for creative thinking is in the form of essay questions, the number of questions developed by the researcher is five-item description questions, and the instrument for assessing collaboration and communication skills is in the form of an observation sheet equipped with a rubric and scoring according to achievement indicators.

CONCLUSION

Based on the research that has been carried out regarding the development of students' 4C skill assessment instruments on parabolic motion material, the validation of products developed by researchers has been tested for their feasibility based on the validation of the instrument, material, and language experts. The results of the three validations were obtained with very decent categories. Recapitulation of the questionnaire results on physics subject educators the assessment instrument developed was categorized as very feasible.

The results of the 4C Skills (critical thinking, collaboration, communication, creativity) test of students on parabolic motion material were known. Thirteen students are able to think critically with critical thinking criteria, 17 with less critical thinking criteria, and 30 with very less critical thinking criteria. Fifteen students obtained the ability to think creatively with creative thinking criteria, 24 with creative enough criteria, and 21 with less creative criteria. Thirty-nine students obtained collaboration skills with excellent criteria and 21 with high criteria. In communication skills, five students were in the excellent category, 50 were in the high category, and five were in the pretty high criteria. Based on the results of the data analysis that has been carried out, the instrument developed is declared valid and feasible to use.

AUTHOR CONTRIBUTIONS STATEMENT

RO : Ideas, designed research, data acquisition, and analyzing data
SB : Drafting the manuscript, assessment instrument, final approval, and publishing
NSA : Editing, reviewing, supervision, proofreading, technical support, and review

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