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Development of an Innovative Media Design Assessment Model in Junior High School Chemistry Learning

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Abstract: An innovative assessment model comprises a set of procedures aimed at gathering information regarding both teacher-led learning and the learning outcomes delivered through technology, such as Quizizz and Google Forms. This research aims to develop an assessment model for junior high school chemistry courses and focus on designing innovative learning materials. This research uses the R&D method with a design thinking approach, this research employed three questionnaires. The questionnaire was dedicated to assessing the validity of the assessment model framework, the validity of the assessment design, and to conduct field trials involving both educators and students. The analysis outcomes demonstrated a notably high level of validity. The assessment model framework achieved an average CVI score of 0.99, "highly valid" grade. Similarly, the assessment design exhibited a high level of validity, securing a score of 0.918, "highly valid" grade. Teachers and students responded favorably to this assessment model, with satisfaction levels exceeding 90%, thus confirming its validity and practicality. Consequently, this assessment model can be readily adopted by junior high school chemistry lecturers for a comprehensive assessment of student performance in chemistry classes. This is especially beneficial in the context of creating innovative learning materials, ultimately enhancing the effectiveness of chemistry education in junior high schools and aligning it with the demands of the 21st century.

Keywords: Junior high school chemistry learning; The assessment model; 21st century learning

Introduction

The advancement of science and technology underscores the growing importance of educators in preparing students to thrive in the age of globalization. As such, educators must design their teaching methods to foster the development of a wide range of 21st century skills in their students. One essential component for attaining optimal success in 21st century education is the utilization of assessments (Rosidah et al., 2021). These assessments offer valuable insights to both educators and students, aiding them in fine-tuning their learning objectives and strategies (Wiliam & Thompson, 2017). Assessments serve as a means to gauge what is expected from students and what they have actually achieved in their learning journey, providing valuable feedback on their progress (Mardhiyah et al., 2021). Proficiency in conducting assessments can be attained when educators grasp the concept of assessment and its practical application in the teaching and learning process (Arifah, 2020). Effective assessments also serve as catalysts for teachers to craft appropriate teaching strategies, ultimately bolstering student motivation and engagement (Subekti et al., 2022).

The junior high school chemistry course is one of the courses taught in the Chemistry Education Study Program. Within this course, prospective educators undergo training not only to comprehend junior high school chemistry content but also to effectively and engagingly teach this material using self-designed learning aids. The instructional activities encompass a wide range, including tutorials, content reviews, field

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excursions, group discussions, and the creation of innovative educational resources. The assessment methods employed encompass diverse aspects, such as cognitive, affective, and psychomotor domains. Assessing students' grasp of knowledge necessitates measuring their performance both individually and in groups. Teachers can gauge students' competencies by closely monitoring the entire learning process (Irfandi et al., 2022). However, a comprehensive evaluation of a student's mastery of the subject matter cannot solely rely on multiple-choice and limited description questions, which predominantly assess memorization (Meriana & Murniarti, 2021). Thus, educators must develop varied assessments tailored to the learning model chosen.

The preliminary study's findings reveal a notable absence of a comprehensive assessment model employed by junior high school chemistry teachers to evaluate all activities of students in chemistry education programs. In practice, assessments tend to be carried out more after the learning process, with a little ongoing process assessment conducted by educators. In addressing the demands of the 21st century, educators are now expected to incorporate assessments that align with essential 21st century skills (Hairida et al., 2021). Critical thinking, creativity, innovation, problem-solving, communication, and collaboration are the 21st century skills that students need (Yani & Ruhimat, 2018).

Educators have various challenges when it comes to conducting assessments. The research results of Ulfah et al. (2021) show that educators have difficulty developing non-test assessments, especially assessing skills and attitudes. Presently, there are still educators whose understanding and mastery of learning assessment remains low even though they meet academic qualifications and have attended training (Nurhayati & Rakhman, 2017). Time constraints, a large number of students in one class making it difficult to carry out attitude assessments, and difficulties in compiling frameworks, rubrics, and assessment instruments are reasons why educators ignore attitude and skills assessments (Hairida & Ramlawati, 2019; Nabilah et al., 2021; Nuriana, 2018; Ulfah et al., 2021). The educators infrequently employ assessments using many measures, methods, and criteria (Handayani & Sholikhah, 2021). The impediments faced by teachers during the assessment process often result in assessments that inadequately align with the desired competencies.

Assessment is a series of procedures to obtain information about the learning that has been carried out by teachers and the learning outcomes that have been taught, both quantitatively and qualitatively, so that assessments developed by educators should adapt to the learning activities carried out. For instance, the Course Learning Outcomes (CLO) for a junior high school chemistry course, "Students can design innovative learning media on mixed separation materials", so the assessment used does not emphasize enough understanding of the material, but creativity competence, design skills, collaboration skills, and communication are necessary to be assessed.

Innovative assessment entails employing novel techniques or adopting alternative approaches to evaluate learning outcomes (Zacharis, 2010). This methodology advocates for a more adaptable and inventive approach to assessment, which can be customized to align with educators' strategies and seamlessly integrated into instructional methods to enhance students' abilities (Kapsalis et al., 2019). Consequently, technology-based assessment emerges as a pertinent solution for education in the 21st century. Research conducted by Lock et al. (2018) suggests that incorporating game-based assessments can enhance students' critical thinking skills as these games challenge students to solve complex problems. This enhancement in students' competencies facilitates the attainment of predefined learning objectives.

The learning outcomes to be achieved in a course should be of concern to educators if they want to develop an assessment model. Thus, the learning outcomes that will be achieved are a concern if you want to develop an assessment model. Adjusting the assessment model to the competencies to be measured has an impact on the development of various learning assessment models (Arifah, 2020). For this reason, the assessments carried out by teachers should be adjusted to the student competencies they want to achieve in learning activities. It is urgent to research the development of assessment models for designing innovative media in junior high school chemistry learning. Through this assessment model research, it is hoped that a suitable assessment model product can be produced in junior high school chemistry courses, so that it can be used by junior high school chemistry educators in assessing students' overall level of achievement in taking junior high school chemistry courses, especially in designing learning media for junior high school chemistry material.

Method

In order to address the research objectives, research and development (R&D) methods and a Design Thinking research model were used. Design thinking is an innovative problem-solving skill that aims to develop a new product as a human-centered problem-solving tool (Kasri et al., 2021). The Design Thinking Method (DTM) is a product development method that begins with efforts to answer problems that exist in society (Baskoro & Haq, 2020). The product developed in this research is an assessment model for designing innovative media in junior high school chemistry learning.

This development research aims to develop an assessment model product to measure all student activities in junior high school chemistry lectures in the FKIP UNTAN Chemistry Education Study Program. To attain the aim of this research, a Design Thinking development model comprising five sequential stages is employed. These stages are Empathize, Define, Ideate, Prototype, and Test (Arifah, 2020). The research development procedure based on the design thinking model is depicted in detail in Figure 1.

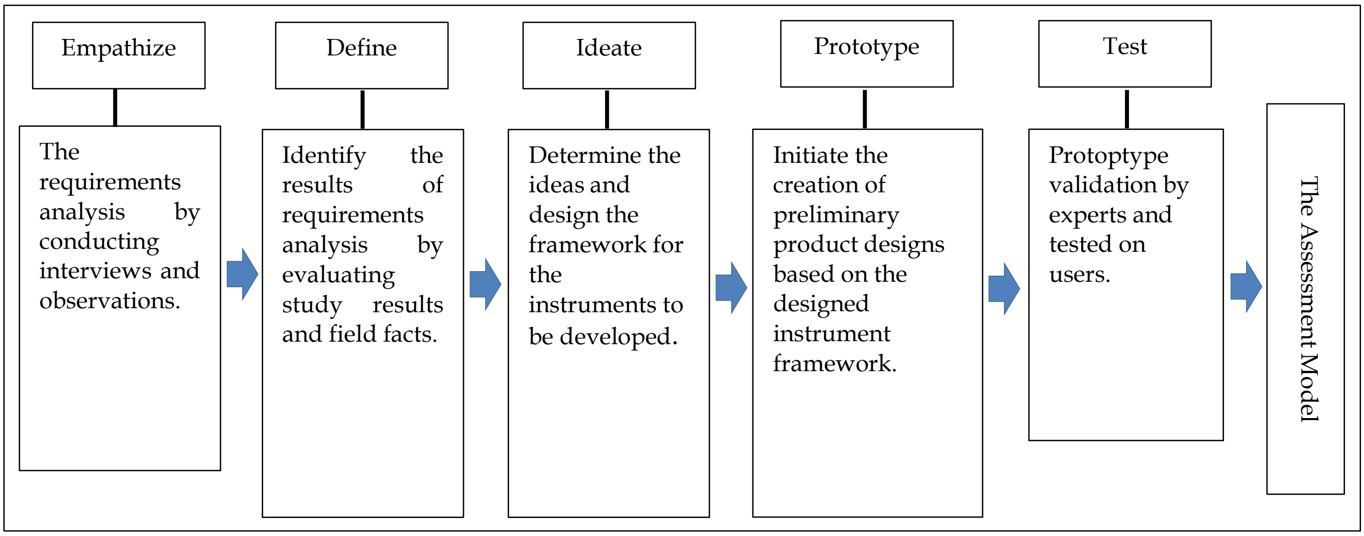

Figure 1. Research procedure

The research subject is an assessment model for designing innovative media in junior high school chemistry learning. The test subjects in this research consisted of lecturers who taught junior high school chemistry courses at FKIP Untan Chemistry and chemistry education students at FKIP Untan who took junior high school chemistry courses. Subsequently, research data analysis refers to the research objectives.

Result and Discussion

Results

The Design Thinking model used to develop an assessment model for innovative media design in junior high school chemistry courses can be explained according to the development stages. The empathetic stage was conducted through interviews and observations. The interviews and observations were carried out with lecturers and students who enrolled in junior high school chemistry courses. The interviews with four lecturers were related to the learning models, media, and assessments used by lecturers, while students were related to responses to the learning carried out by lecturers of junior high school chemistry courses. The observations were conducted by students directly engaging with 28 students in class A1 and 23 students in class A2. The results of the empathic stage activities obtained complete data as shown in Table 1.

Table 1. The Result of Emphatic Stage on Lecturers and Student

	Lecturers	Students
Interviews	a. Using a project-based learning model in lectures on elements, compounds, and mixtures. b. Exemplify real problems through video. c. Ask the students to design projects as solutions to real problems. d.T Attitude assessments are rarely done when students collaborate in class, work on project designs, and present project designs (skills assessment). That is because of concerns that conducting process assessments may consume excessive time. Consequently, assessments typically focus on evaluating the final products generated by students. Besides that, lecturers not be accustomed to implementing and designing diverse assessment processes	The students feel less enthusiastic about discussing and working on assignments/projects because the lecture does not do assessments. And then, when there are exams, the students often feel strained.

		Lecturers	Students
Observations	a.	9th Meeting, The lecture gives an initial test in the form of a descriptive quiz based on material that has been discussed at previous meetings. Following this, distribute Student Worksheets and present examples of real-life cases/problems via video and invite students to discuss in groups to determine the topic of the problem and design a simple project as a solution. The projects are centered around topics such as polluting materials, household chemicals, physical and chemical changes, and acids and bases. Students are tasked to research and review literature that is appropriate to the chosen topic to find solutions. It's important to note that this particular activity is not subject to formal assessment by the teacher.	Students looked tense when taking the test, and then in group discussions, only 2-3 people were active.
	b.	10th Meeting, Each group students must present a simple design project, but the lecturers do not grade the presentations. During the 11th and 12th meetings, project completion activities are assigned as homework. Each group is asked to create a video of their group discussion on project completion.	The students actively ask and answer only 1-2 people/group.
	c.	13th and 14th meetings, Each group presents a video presentation of the results of the discussion and project products. The lecturers assess the project products presented. However, the group discussions recorded by each group aren't assessed by the lecturer.	Students feel enthusiastic about presenting products because they are assessed by the teacher.
	d	15th Meeting, the teacher analyzes the results of the discussion by providing further guidance to groups whose product results are not satisfactory.	The students fixed their product if it was necessary.

The defined stage concludes the most cucial problems based on the empathic stage data. For this purpose, an identification of the obtained information was conducted, and the results are displayed in Table 2.

The ideate stage determines effective solutions to crucial problems in the previous stage by designing the necessary solutions. At this ideate stage, brainstorming is carried out involving teachers, students, experts, and researchers to produce the best ideas from crucial problems in the previous stage. Through this activity, the best solution was produced as seen in Table 3.

Table 2 Crucial Problems

Code	Issues	%
M1	The Assessment model applied in learning does not match the learning model.	100
M2	Skills in developing 21st century assessment models are still lacking.	100
M3	The assessment related to the Pancasila Student Profile have not been implemented in learning.	100
M4	Student involvement in group discussions is still lacking.	75

Table 3 The Best Solution to the Crucial Problems

Code	Issues	Solutions
M1	The Assessment model applied in learning does not match the learning model.	Develop assessment models to improve teacher understanding and skills.
M2	Skills in developing 21st century assessment models are still lacking.	
M3	The assessment related to the Pancasila Student Profile have not been implemented in learning.	
M4	Student involvement in group discussions is still lacking.	The assessment model must be diverse to allow educators to evaluate student performance in various activities.

The prototype stage takes concrete action from the best solution to the problems of the previous stage. This stage aims to concretize the solution in the previous stage. In this activity, a draft framework design for developing the assessment model was prepared, and the assessment was accompanied by an assessment rubric by the learning model used to achieve CLO. The assessment model developed adapts to curriculum developments in universities and schools as well as the demands of 21st century skills. A complete draft of the assessment model development framework can be seen in Table 4.

Table 4. Draft Framework for Assessment Model for Innovative Media Design in Junior High School Chemistry Learning

CLO	Sub- CLO	Method	Project Activity	Type of Assessment	Instrument
3. Students can find solutions to real problems based on the concepts studied	Students can explain the concept of prerequsites.	Test	-	Assessment 1: Cognitive Diagnostic Assessment Assessment 2: Non-cognitive Diagnostic Assessment	*Quizziz* *Google Form* Assessment Rubric
	Case study: The students are given a real problem, and they can analyze the problem according to the concepts studied.	Case Study	-	Assessment 3: Problem-Solving Assessment (Cognitive)	*Quizziz*
4. Students can design media based on real problems according to junior high school chemistry material.	Given a real problem, students can design a solution according to chemistry material in junior high school.	1. Project design 2. Presentation	1. Designing learning media for elements, compounds, and mixtures material 2. Designing learning media for environmental pollution material 3. Designing learning media for household chemicals material 4. Designing learning media for physical and chemical changes material 5. Designing learning media for acidic and basic material	Assessment 4: Literature Review Assessment Assessment 5: Project design assessment Assessment 6: Group discussions assessment Assessment 7: Affective assessment: independent, mutual cooperation, creative, critical reasoning, global diversity (Pancasila Student Profile) Assessment 8: Presentation skills assessment Assessment 9: Product assessment	*Google Form* Literature review assessment rubric Project design assessment rubric: Planning, implementation and reporting Group discussion assessment rubric Rubric for assessing independence, mutual cooperation, creativity, critical reasoning, and global diversity. Persentation assessment rubric Product assessment rubric according to the project being designed

The final stage is the testing stage, which involves the validation of the instrument design by experts or validators, as well as limited and extensive testing with users. In detail, the activities conducted in the testing phase include:

a. Validating the assessment model framework.
b. Validating the assessment design (comprising cognitive and non-cognitive diagnostic assessments, knowledge assessments, literature review assessments, project design assessments, process assessments encompassing attitude and skills assessments, and product assessments).
c. Conducting field trials.

The validation of the assessment framework was conducted with 20 validators, comprising 10 teachers from junior high schools and 10 lecturers from universities. The results of the validation of the assessment framework for designing innovative media in junior high school chemistry education with 20 (twenty) validators indicate that the assessment framework is highly valid (SV) with an average CVI (Content Validity Index) of 0.99. This implies that the assessment framework for designing innovative media in junior high school chemistry courses can be effectively used in assessment design. Subsequently, the next step involved the development of assessments and rubrics. For a comprehensive overview of the validation results, please refer to Table 5.

Table 5. Lawshe Formula Calculation Results Validation of Innovative Media Design Assessment Model Frameworks for Junior High School Chemistry Courses

Indicator	Rater																				CVI	Category
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Compatibility of sub- CLOs with CLOs	4	4	3	3	3	4	4	3	4	4	4	4	4	4	4	3	4	4	4	4	0.9	Very Valid
Compatibility of assessment type with sub-CLOs	4	4	4	4	4	4	4	4	3	3	4	4	4	3	4	3	4	4	4	4	0.9	Very Valid
Compatibility of assessment type with method	4	4	4	3	4	4	4	4	4	4	3	4	4	4	4	4	3	4	3	4	0.9	Very Valid
Compability of instrument with assessment type	4	3	4	3	3	4	4	4	4	4	4	3	4	4	4	3	4	4	3	4	0.9	Very Valid
Average																					0.9	Very Valid

Validation of assessments (cognitive and non-cognitive diagnostic assessments, knowledge assessments, literature review assessments, project design assessments, process assessments, and product assessments) was carried out by 20 validators, consisting of 10 teachers from junior high schools and 10 lecturers from universities. The complete results can be seen in Table 6.

Table 6. Validation of Assessment Design and Rubrics

Indicator	Rater																				CVR	Category
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
1. Cognitive Diagnostic Assessment (Quizziz)																						
Compatibility of indicators with sub-CLOs	3	4	4	4	4	3	4	4	3	4	4	4	4	4	3	3	4	4	4	4	0.92	Valid
Compatibility of test items with indicator	4	4	4	4	4	3	3	4	4	3	4	3	4	4	3	4	4	3	4	4	0.90	Valid
Clarity of the language used.	4	4	4	3	4	4	4	3	3	4	3	4	3	4	4	4	4	4	3	4	0.90	Valid
The Quizizz is easy to use.	4	3	4	4	3	4	3	3	4	4	4	4	4	4	4	4	3	4	4	4	0.92	Valid
2. Non-cognitive Diagnostic Assessment (Google Form)																						
Compatibility of indicators with sub-CLOs.	4	3	3	4	4	3	4	3	4	4	3	4	4	3	4	4	4	4	4	4	0.90	Valid
Compatibility of test items with indicator.	3	4	4	3	3	4	4	4	3	4	4	4	4	4	3	4	4	3	4	4	0.90	Valid
Clarity of the language used.	3	4	3	3	4	4	4	4	4	4	4	4	3	4	4	4	4	3	4	3	0.90	Valid
The Google Form is easy to use.	4	4	3	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0.97	Valid
3. Problem-solving Assessment (Quizziz)																						
Compatibility of indicators with sub-CLOs.	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0.98	Valid
Compatibility of test items with indicator.	3	4	4	4	4	4	3	4	4	4	4	3	4	4	4	4	3	3	3	4	0.90	Valid
Clarity of the language used.	4	4	4	4	4	4	4	3	4	3	4	4	4	4	4	4	4	4	4	4	0.9	Valid
The Quizizz is easy to use.	4	4	4	4	4	4	4	3	4	4	4	4	3	4	4	4	4	4	4	4	0.9	Valid
4. Review Literature Assessment (Google Form)																						
Compatibility of indicators with sub-CLOs.	3	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	0.97	Valid
Compatibility of test items with indicator.	4	4	3	4	4	4	4	3	4	4	4	4	4	3	4	4	4	4	4	4	0.95	Valid

Indicator	Rater																				CVR	Category
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Clarity of language use in test items.	4	4	4	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0.95	Valid
Clarity of assessment rubric.	4	4	4	4	3	4	4	3	4	4	4	4	4	3	4	4	4	3	3	3	0.90	Valid
5. Project Design Assessment																						
Compatibility of indicators with sub-CLOs.	4	4	3	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	4	3	0.93	Valid
Compatibility of test items with indicator.	4	4	4	3	3	4	3	4	3	4	4	4	4	4	3	4	4	3	4	4	0.90	Valid
Clarity of language use in test items.	4	4	3	3	4	4	4	4	4	4	4	4	3	4	4	4	4	3	4	3	0.92	Valid
Clarity of assessment rubric.	4	4	3	4	4	4	4	3	4	4	4	4	4	3	4	4	4	4	4	4	0.95	Valid
6. Group Discussion Assessment																						
Compatibility of indicators with sub-CLOs.	4	4	4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	3	4	0.95	Valid
Compatibility of test items with indicator.	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	3	4	0.97	Valid
Clarity of language use in test items.	4	4	4	3	4	4	4	3	3	4	4	4	4	4	3	4	3	4	3	4	0.90	Valid
Clarity of assessment rubric.	4	4	3	4	4	4	4	3	4	4	4	4	3	4	4	4	3	4	4	3	0.92	Valid
7. Affective Assessment																						
Compatibility of indicators with sub-CLOs.	4	4	3	4	4	4	3	4	4	4	4	3	4	4	4	4	4	4	4	4	0.95	Valid
Compatibility of test items with indicator.	4	4	4	4	4	3	3	4	4	3	4	4	4	4	3	4	4	3	4	4	0.92	Valid
Clarity of language use in test items.	4	4	4	3	4	4	4	3	3	4	3	4	3	4	4	4	4	4	3	4	0.90	Valid
Clarity of assessment rubric.	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	4	3	4	4	0.95	Valid
8. Presentation Skills Assessment																						
Compatibility of indicators with sub-CLOs.	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0.98	Valid
Compatibility of test items with indicator.	4	4	4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	3	4	0.95	Valid
Clarity of language use in test items.	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	0.97	Valid
Clarity of assessment rubric.																						
9. Product Assessment																						
Compatibility of indicators with sub-CLOs.	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0.98	Valid
Compatibility of test items with indicator.	4	4	4	3	4	4	4	4	4	4	4	4	3	4	4	4	3	4	3	4	0.93	Valid
Clarity of language use in test items.	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	0.98	Valid
Clarity of assessment rubric.	4	4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	0.97	Valid

The validation results using the Aiken validity formula showed that all indicators for each type of assessment were valid. Thus, all types of assessments in the innovative media design assessment model for junior high school chemistry courses are suitable for use for field testing. In this case, field tests were carried out on chemistry education students taking junior high school chemistry courses.

Field trial activities carried out response tests on 30 students for assessments 1, 2, and 3 and response tests on 10 teachers for all types of assessments. During this response test, students and lecturers were given response questionnaires after completing Course Learning Outcomes (CLO) 1 and 2. The complete results can be seen in Table 7.

The results of the response test on students showed that students responded very well to cognitive, non-cognitive, and cognitive problem-solving diagnostic assessments. This is shown from the results of the response test for each aspect of the assessment which is in the very good category with a percentage of more than 90%. Next, a response test was carried out on 10 teachers, the results of which can be seen in Table 8.

The results in Table 8 also show that the educator's response to various types of assessments from the assessment model developed was very good.

Table 7. Student Responses to Assessment Models

Aspect	Very Agree (people/amount) 5	Agree (people/amount) 4	Disagree (people/amount) 3	Don't Agree (people/ amount) 2	Very Don't Agree (people/amount) 1	%	Category
1. Cognitive Diagnostic Assessment (Quizziz)							
The Quizizz feature is easy to understand	23 /115	7/28	0	0	0	95.33	Very Good
Interesting	27/135	3/12	0	0	0	98.00	Very Good
The value is instantly known.	25/125	5/20	0	0	0	96.67	Very Good
The test is not stressful	27/135	3/12	0	0	0	98.00	Very Good
The Quizizz is easy to access	25/125	5/20	0	0	0	96.67	Very Good
The language is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
2. Non-cognitive Diagnostic Assessment (Google Form)							
The Google Form is easy to open	25/125	5/20	0	0	0	96.67	Very Good
Interesting	27/135	3/12	0	0	0	98.00	Very Good
The test is not stressful	27/135	3/12	0	0	0	98.00	Very Good
The language is easy to understand	22/110	8/32	0	0	0	94.67	Very Good
3. Problem-solving Assessment (Quizziz)							
The Quizizz feature is easy to understand	22/110	8/32	0	0	0	94.67	Very Good
Interesting	27/135	3/12	0	0	0	98.00	Very Good
The value is instantly known.	25/125	5/20	0	0	0	96.67	Very Good
The test is not stressful	27/135	3/12	0	0	0	98.00	Very Good
The Quizizz is easy to access	22/110	8/32	0	0	0	94.67	Very Good
The language is easy to understand	24/120	6/24	0	0	0	96.00	Very Good

Table 8. Teacher Responses to Assessment Models

Aspect	Very Agree (people/amount) 5	Agree (people/ amount) 4	Disagree (people/amount) 3	Don't Agree (people/ amount) 2	Very Don't Agree (people/amount) 1	%	Category
1. Cognitive Diagnostic Assessment (Quizziz)							
Feedback can be provided quickly	23 /115	7/28	0	0	0	95.33	Very Good
Processing time can be set automatically	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	25/125	5/20	0	0	0	96.67	Very Good
The Quizizz feature is easy to understand	25/125	5/20	0	0	0	96.67	Very Good

Aspect	Very Agree (people/amount) 5	Agree (people/amount) 4	Disagree (people/amount) 3	Don't Agree (people/amount) 2	Very Don't Agree (people/amount) 1	%	Category
Interesting	20/100	10/40	0	0	0	93.33	Very Good
The Quizizz is easy to access	20/100	10/40	0	0	0	93.33	Very Good
The language is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
2. Non-cognitive Diagnostic Assessment (Google Form)							
Feedback can be provided quickly	25/125	5/20	0	0	0	96.67	Very Good
The Google Form is easy to open	22/110	8/32	0	0	0	94.67	Very Good
Describes students true abilites quickly	24/120	6/24	0	0	0	96.00	Very Good
Interesting	22/110	8/32	0	0	0	94.67	Very Good
The language is easy to understand	20/100	10/40	0	0	0	93.33	Very Good
3. Problem-solving Assessment (Quizziz)							
Feedback can be provided quickly	22/110	8/32	0	0	0	94.67	Very Good
Processing time can be set automatically	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	24/120	6/24	0	0	0	96.00	Very Good
The Quizizz feature is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
The Quizizz is easy to access	22/110	8/32	0	0	0	94.67	Very Good
The language is easy to understand	24/120	6/24	0	0	0	96.00	Very Good
4. Review Literature Assessment (Google Form)							
Feedback can be provided quickly	25/125	5/20	0	0	0	96.67	Very Good
The Google Form is easy to open	23 /115	7/28	0	0	0	95.33	Very Good
Describes students true abilites quickly	24/120	6/24	0	0	0	96.00	Very Good
Interesting	25/125	5/20	0	0	0	96.67	Very Good
The language is easy to understand	22/110	8/32	0	0	0	94.67	Very Good
5. Project Design Assessment							
The scoring rubric is easy to use	21/105	9/36	0	0	0	94.00	Very Good
The rubric make it easier to correct student work	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	25/125	5/20	0	0	0	96.67	Very Good
The language is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
6. Group Discussion Assessment							
The scoring rubric is easy to use	20/100	10/40	0	0	0	93.33	Very Good
The rubric make it easier to correct student work	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	23 /115	7/28	0	0	0	95.33	Very Good
The language is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
7. Affective Assessment							

Aspect	Very Agree (people/amount) 5	Agree (people/ amount) 4	Disagree (people/amount) 3	Don't Agree (people/ amount) 2	Very Don't Agree (people/amount) 1	%	Category
The scoring rubric is easy to use	25/125	5/20	0	0	0	96.67	Very Good
The rubric make it easier to correct student work	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	23 /115	7/28	0	0	0	95.33	Very Good
The language is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
8. Presentation Skills Assessment							
The scoring rubric is easy to use	23 /115	7/28	0	0	0	95.33	Very Good
The rubric make it easier to correct student work	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	23 /115	7/28	0	0	0	95.33	Very Good
The language is easy to understand	25/125	5/20	0	0	0	96.67	Very Good
9. Product Assessment							
The scoring rubric is easy to use	20/100	10/40	0	0	0	93.33	Very Good
The rubric make it easier to correct student work	25/125	5/20	0	0	0	96.67	Very Good
Describes students true abilites quickly	25/125	5/20	0	0	0	96.67	Very Good
The language is easy to understand	21/105	9/36	0	0	0	94.00	Very Good

Discussion

The results of research on the development of an assessment model for innovative media design in junior high school chemistry courses at the Chemistry Education Study Program, FKIP, Tanjungpura University through design thinking show that the assessment model is suitable for use in teaching junior high school chemistry courses. It is shown from the results of the validation of the assessment model framework and the validation of the assessment design that it is valid. Validation is carried out by experts according to the required field. The expertise of these experts is utilized, as one of the ways, to assess the alignment of products being developed with the applicable measurement provisions (Hairida et al., 2023). Product development is based on needs analysis first at the empathetic and defined stages before determining effective solutions to important problems in the field (ideate stage) and concreting these solutions (prototype stage).

Before developing a product, researchers conduct a requirements analysis using research and development (R&D) methods to identify potential factors contributing to the gap between theory and reality. Preliminary analysis through field studies and theoretical studies was carried out by researchers to study facts about science learning, curriculum, LKPD (Learner Worksheets), assessments, teaching materials, and the needs of educators or students or the community, either at school or in universities before product development (Benhadj et al., 2023; Hairida et al., 2023, 2022; Martania et al., 2023). This analysis aims to ensure that the product meets the needs of its users. Innovative media design assessment models for junior high school chemistry courses have been researched and implemented with good validity, and students and educators have responded well during the testing phase. The assessment model considers the learning needs of the 21st century.

In the 21st century, educators need to create diverse and thorough assessment methods. These assessments can provide valuable feedback to achieve learning objectives. A comprehensive assessment technique can make it easier for both students and teachers to reach the set goals (Rahmawati et al., 2015). Educators can use these assessments to measure the effectiveness of learning devices and make effective decisions to improve future learning experiences.

In general, the development of an assessment model for designing innovative media in junior high school chemistry learning produces two types of assessment, namely test assessments and non-test assessments. Test assessments are carried out to measure cognitive abilities, while non-test assessments are generally used to measure attitudes and skills or the products produced (Sidik et al., 2021). Non-test assessments use assessment tools in the form of assessment rubrics. Rubrics were developed to make it easier for educators to correct students' work results and the resulting scores explain the participants' actual abilities (Mutiara et al., 2017).

The learning process develops along with the development of science and technology. The Lecturers must improve their ability to package learning and assessment, including competencies in attitudes, knowledge, and skills. These domains are interrelated and crucial aspects of learning. With the rapid growth of technology-based learning in the 21st century, educators should consider adaptive assessment methods. Technological advances have led to innovative and active learning approaches. By using technology in assessment, educators can facilitate a more effective process.

One type of technology-based assessment developed in the assessment model is assessment using the Quizizz and Google form applications. The results of the assessment model response questionnaire given to students showed that as many as 98% of students strongly agreed to choose Quizizz and Google Forms as interesting and non-stressful test tools. This is due to the results of the needs analysis that the evaluations carried out by educators have been less interesting and stressful so far because the dominant assessments carried out are in the form of paper-based tests. Kuncahyono & Annadia (2020) research shows that evaluation media using paper can psychologically cause anxiety for students. Carrying out assessments using Quizizz for students will be fun and interesting (Safitri et al., 2023). An interesting learning experience that is flexible in use and reduces boredom is obtained from Quizizz (Amri & Shobri, 2020). Utilizing Quizizz for assessments simplifies the process of accurately analyzing student performance data, enabling educators to assess the administered tests effectively (Handoko et al., 2021).

The use of an independent curriculum in schools is a consideration in developing the type of diagnostic assessment in the assessment model because students who take chemistry science lessons are prospective educators. This means that it is important for students to be introduced to the various types of assessments used in school. Cognitive diagnostic assessments focus on measuring knowledge structures (Sun & Suzuki, 2013). Non-cognitive assessments aim to determine students' emotional and psychological readiness to receive learning (Hati, 2021). The development assessment model developed a diagnostic assessment in the form of a cognitive test which aims to determine students' initial abilities in chemistry concepts in junior high school, while a non-cognitive assessment developed a learning interest assessment which aims to measure students' interest before taking part in learning.

Conclusion

After conducting research, it was concluded that the assessment model for designing innovative media in junior high school chemistry learning met practical and valid requirements. The model includes nine types of assessments suitable for chemistry science learning, particularly in CLO 3 and CLO 4. The assessments can measure the achievements of CLO in learning chemistry science at FKIP Tanjungpura University as they meet the valid and practical elements.

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Author Contributions

Conceptualization, methodology, formal analysis, resources, writing-original draft preparatin, and writing- review and editing until published, H.

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Conflicts of Interest

The authors declare no conflict of interest.

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