rEFLections
Vol 31, No 3, September - December 2024

The Validity and Practicality of Discovery-Group Learning Models to Improve 21st Century Skills of High School Students

TRISNA HELDA*
Doctor of Language Teaching Science, Padang State University, Indonesia
ATMAZAKI
Faculty of Languages and Arts, Padang State University, Indonesia
ERIZAL GANI
Faculty of Languages and Arts, Padang State University, Indonesia
Corresponding author email: trisnahelda4@gmail.com

Article information
Article history:
Received: 15 Oct 2023
Accepted: 24 Dec 2024
Available online: 26 Dec 2024

Keywords:
Validity
Practicality
Learning model
21st century skills
Educational researcher development

Abstract
This study aims to evaluate the validity and practicality of a discovery-group learning model designed to enhance 21st century skills. The model includes a guidebook, teacher's book, student's book, and assessment sheet. The study involved three main stages: a preliminary study, prototype design, and evaluation. At the time of this article, the study had just reached the initial phases of prototype design. Before testing the model's effectiveness, the research materials underwent validation by reviewers (colleagues), experts (lecturers), and practitioners. Validation results indicated that the guidebook, teacher's book, student's book, and assessment sheet achieved an average validity score of 0.85, signifying very high validity. Practicality evaluations based on teacher feedback yielded scores of 91.7 for the teacher's book and 90.6 for the student's book. Similarly, student feedback for the student's book resulted in an average practicality score of 86.8. These findings demonstrate that the discovery-group-group learning model is highly effective for improving 21st-century skills among high school students, particularly in the context of Indonesian language learning. The research products, including the guidebook, teacher's book, student's book, and assessment sheet, exhibit both high validity and practicality, making them well-suited for classroom implementation.

INTRODUCTION

In the 21st century, language has become an essential tool for communication, playing a pivotal role in enhancing the quality and effectiveness of the educational process. To achieve the highest goals in student language learning, activities must be organized systematically and contextually, fostering meaningful interactions and stimulating critical thinking (Menggo et al., 2019). Students are thus required to develop the ability to comprehend, manage, and produce effective communication across various formats, including oral, written, and multimodal mediums. Only through language can they effectively express and exchange ideas, whether interacting with peers or addressing problems in the classroom setting (Nurjanah, 2019).

One of the essential skills students must develop is communication, a hallmark of 21st-century education. To communicate effectively, efficiently, and harmoniously in today's world, students need strong communication skills. This aligns with the perspective of (Trilling & Fadel, 2009), who emphasized that every school should equip students with 21st century skills through instructional practices that promote the development of communication abilities. Alongside critical thinking, collaborative teamwork, creativity and innovation, and digital literacy, communication skills are vital for adapting to the evolving paradigms of life in the 21st century (Chiong & Jovanovic, 2012; Nurjanah, 2019; Trilling & Fadel, 2009; Wrahatnolo & Munoto, 2018). Proficient communicators can effectively source reliable information, classify it as new knowledge, and apply it to expand their understanding and foster personal growth. Learning Indonesian hence provides an excellent opportunity to cultivate these essential communication skills.

School-based Indonesian language instruction aims to enhance students' written and verbal communication skills. The objective is to enable students to construct ideas, articulate thoughts, present scientific arguments in a responsible and academically ethical manner, and sharing them through various media with both academic communities and the general public. Argaw et al. (2017) assert that students learning Indonesian must develop themselves into becoming proficient communicators. Among the key components of communication, speaking skills stand out as particularly crucial, they added. While students, especially Indonesian children, often speak fluently in casual conversations outside school, their fluency tends to diminish when speaking in front of the class. This challenge stems from a lack of practice in articulating thoughts clearly and comprehensively in both oral and written forms. Furthermore, the training of speaking skills has not been adequately emphasized in learning activities, leaving students without a full grasp of the essential components of effective speaking. As a result, many students lack confidence when speaking publicly, feel anxious while expressing their thoughts, fear making mistakes, and experience feelings of embarrassment (Permana, 2015).

Indonesian language studies for sciences offer valuable opportunities for students to appreciate the significance of education. Indonesian language instruction is, after all, designed to help students develop strong communication skills, particularly in the scientific domain (Hapsari & Fitria, 2020). Students are expected to achieve proficiency in both scientific Indonesian speech and writing. Majid et al. (2012), who support this perspective, also emphasize that in addition to honing their communication skills, Indonesian language students should learn to acquire language skills from their surroundings as well. This integration of environmental learning further enriches students' abilities to communicate effectively and adaptively.

In order to develop their 21st-century skills, students must be prepared to compete in the era of Industrial Revolution 4.0. However, Indonesian education faces challenges in fostering these competencies effectively. Evidence from assessment reports have highlighted this issue. According to the 2018 Program for International Student Assessment (PISA) results published by the OECD, Indonesian students scored an average of 371 in reading proficiency, significantly below the OECD average of 487. These findings indicate that Indonesian students' reading literacy is limited to recognizing basic factual information about a concept. They struggle to

think critically, communicate effectively, and apply their understanding to other concepts to solve complex problems (Sälzer & Roczen, 2018).

Indonesian students often struggle with comprehending multiple texts, excelling only in understanding individual texts. While they demonstrate proficiency in gathering, analyzing, and reflecting on information, they face difficulties in fully comprehending the insights provided (Grønmo et al., 2016). According to PISA, the application of 21st-century skills such as critical thinking, analysis, problem-solving, collaboration, information literacy, media literacy, and ICT (Information and Communication Technology) literacy remains insufficient in the educational process (Saadati et al., 2014). In response to these challenges, the government reintroduced the 2013 Curriculum in 2016 to enhance students' competencies and better prepare them for the demands of the 21st century (Alberida, 2019).

LITERATURE REVIEW

To achieve 21st-century skills, it is essential to implement an engaging, learner-centered learning model. One approach that addresses these challenges is discovery learning, a model that emphasizes students' ability to uncover knowledge through a structured and well-organized inquiry process. Discovery learning is a process where students actively discover new concepts during teaching and learning activities (Risnawati et al., 2016). For this approach to be effective, teachers must prepare diverse and relevant materials in advance, enabling students to explore and independently address their learning challenges. Discovery learning often involves exposing students to questions and experiences (or provocations) that lead them to "discover" predetermined concepts on their own (Schunk, 2012). This method is designed to guide students in developing critical 21st-century skills, making it a promising foundation where it may evolve into a more refined learning model that addresses its existing limitations. While discovery learning offers significant advantages, it also has its limitations, which must be addressed to optimize its effectiveness.

A key weakness of the discovery learning model is that students often struggle to adopt a comprehensive way of thinking based on the discovery process to fully understand the learning material. While educators aim for students to achieve a thorough understanding of the material, the reality is that not all content can easily be grasped or mastered by all learners. Educators must recognize that students possess diverse characteristics in terms of interests, potential, intelligence levels, and learning efforts. As a result, not all students can effectively engage with discovery-based learning (Jones et al., 2017). To address these limitations, the discovery learning model can be enhanced by incorporating the group investigation learning model. Group investigation is a cooperative learning approach that emphasizes active student participation and collaboration. Students work in groups to explore and gather information about the material being studied using available resources (Slavin, 2015). This method helps train students to develop critical thinking skills while promoting active involvement throughout the learning process, from the initial stages to its conclusion. By combining discovery learning with group investigation, educators can create a more inclusive and possibly more effective learning environment.

The discovery learning model offers the advantage of helping students retain knowledge for a longer period. It is particularly effective when teachers aim to develop students' higher-order thinking skills, scientific reasoning, and independence in problem-solving (Hardianti, 2013). However, the model also has its drawbacks. One notable limitation is that students often work individually, as the discovery process is conducted independently. This can result in high-ability students being unwilling to collaborate or share their findings with lower-ability peers, potentially leading to gaps and disparities within the classroom (Balim, 2009; Saab et al., 2005; Svinicki, 1998).

The advantages and disadvantages of discovery learning and group investigation can complement each other, leading to the development of the discovery-group learning model. This model engages students in actively seeking information related to a concept and learning collaboratively. Through this process, students can uncover broad principles and apply them in their language learning by posing questions on relevant themes. By working collectively, students develop greater confidence in the concepts they explore and validate together. Moreover, diverse sources of knowledge, such as the Internet, can be utilized to access readings and resources on the subject. This aligns with previous research indicating that internet access helps students feel more comfortable and confident in understanding complex ideas (Arif et al., 2018; Saadati et al., 2014). Integrating the internet into the learning process is crucial for staying connected with societal developments and delivering engaging lessons that capture students' attention (Alwan, 2018; Syahputra & Alvindi, 2022).

The discovery learning model is highly effective for teaching Indonesian and fostering 21st-century skills. However, it is most impactful when combined with the group investigation learning model. This combination enhances the learning process by addressing behavioral, emotional, cognitive, and social engagement within groups, while also leveraging technology to improve communication and comprehension between teachers and students. By integrating these approaches, learning objectives can be more effectively achieved, and students are likely to become more actively engaged in their education.

The novelty of this research lies in addressing the gaps in previous studies by combining two learning models: discovery learning and group investigation, resulting in the discovery-group learning model. This model aims to explore and enhance the following: (1) students critical thinking, problem-solving, and creativity skills through the process of discovery; and (2) students' collaboration and communication skills through group performance, both among peers and with teachers. The discovery-group learning model is an extension of discovery learning, which is rooted in cognitive learning theory and constructivism. Additionally, the model incorporates principles of cybernetic learning theory, as students actively communicate and manage information from technological sources while completing assignments during the learning process (Noviansyah, 2015). To further refine this innovative learning model, future research and development are essential. Such efforts will enable the creation of more effective and innovative educational practices.

Based on this concept, the discovery-group learning model was developed to meet the criteria of a quality and effective learning model, which include validity and practicality. The

validity of a developed product (intervention) is assessed based on its content relevance to the subject matter (content validity) and the consistency and suitability of its structure (Haynes et al., 1995). Content validity is one of the most frequently used types of validity to evaluate the reliability of instruments created by researchers during the early stages of development. Its purpose is to minimize errors in instrument creation and improve the likelihood of obtaining a strong construct validity index in subsequent studies. The process of establishing content validity involves several key steps such as (1) conducting a thorough literature review to extract the essence of relevant items, (2) assessing each item using three scales: "unnecessary", "useful but not important", and "important", (3) reviewing content validity by sending the items to experts in the relevant field, (4) calculating the Content Validity Ratio (CVR) for each item, and (5) eliminating items that do not meet a critical significance level (Taherdoost & Group, 2017). This systematic approach ensures the development of reliable and effective instruments that contribute to the validity of the discovery-group learning model.

Practicality refers to the ease with which a product can be used effectively in its intended context. It is typically evaluated through tests involving both teachers and students, with the results serving as key variables for analysis. These outcomes are then aligned with the research objectives to assess the product's suitability. In research-based product development, practicality testing is essential as it evaluates the usability of the product from the perspectives of both teachers and students. Data collected during practicality testing is analyzed in two dimensions: (1) teacher practicality evaluates how effectively teachers can utilize the materials; while (2) student practicality assesses how well students engage with and benefit from the materials. The data for these evaluations would be collected using validity and practicality questionnaires. The validity questionnaire evaluates the quality of the developed model books, teacher guides, and student books, while the practicality questionnaire assesses how effectively these materials can be used in real educational settings. While the validity and practicality tests are crucial for understanding the discovery-group learning model's potential, the results regarding its effectiveness in enhancing high school students' 21st-century skills remain undetermined. Given this background, the research question can be formulated as follows: What are the validity and practicality of the discovery-group learning model in improving high school students' 21st-century skills? Based on this question, the primary aim of this research is thus to evaluate the validity and practicality of the developed research products, including the discovery-group learning model books, teacher guides, and student books for high school education.

METHODOLOGY

The advancement of educational practices can often be achieved through development research, which focuses on creating and validating educational products for use in the learning process. This type of research aims to design and ensure the validity of educational tools and methods. Research and Development (R&D) is a systematic approach used to develop and validate these learning products. Once developed, these products are tested for their practicality and effectiveness in real educational settings (Fauzan et al., 2013; Pardjono et al., 2015). In this context, the discovery-group learning model was developed and refined through

a structured R&D process, ensuring that it aligns with educational goals and is suitable for enhancing learning outcomes.

At the time of writing, the development study was in the prototype design stage, focusing on evaluating the validity and practicality of the product. The validity instrument is based on three key assessment indicators, namely, content validity, construct validity and language validity. Content validity is to ensure that the material is aligned with the subject matter, construct validity is to verify the logical structure and consistency of the product, and language validity is to ensure that the language used is clear, appropriate, and correct. Validity assessments are conducted by experts with extensive experience in the relevant field. For the practicality instrument, two main components are involved: a teacher response questionnaire and a student response questionnairediscovery-group. The assessment criteria include: the ease of application of the discovery-group learning model, the benefits of using the discovery-group learning model, the usability of the teacher's guidebook, and the model's alignment with time allocation during the learning process (Fauzan et al., 2013). Further details can be found in the following stages.

1. Level design and develop prototype

This stage aimed to develop the discovery-group learning model and its associated assessment instruments, as well as conduct formative evaluations (Fauzan et al., 2013). The evaluation methods used at this stage include self-evaluation, expert review, one-to-one evaluation, small group evaluation, and a field test.

1.1 Prototype 1 (initial stage design results)

Based on the preliminary research analysis, the discovery-group learning model was designed, resulting in the creation of an initial prototype, Prototype 1. The next step involved validating the instruments used to collect data on validity, practicality, and effectiveness by experts. Once the instruments were validated, a self-evaluation was conducted on Prototype 1 using the same questions as the validation instrument. This self-evaluation aimed to identify design errors and was carried out by peer reviewers. The purpose of the evaluation was also to ensure that the product met criteria that are both relevant and science-based, as well as being consistent and practical. Following this evaluation, Prototype 1 was revised to create Prototype 2, which was then proceeded to the next phase of evaluation.

1.2 Prototype 2 (results of initial stage design revisions)

The validation of the discovery-group learning model was carried out through the assessment of the model books, student books, teacher books, and 21st-century skills instruments. Three types of validation were measured in the process, i.e., content validation, construct validation and language validation.. The entire validation process was conducted by experts in their respective fields, who provided feedback on all the validity aspects of Prototype 2. Of the five experts that were involved in the validation, one of them was a lecturer from the S3 Language Teaching Science Faculty of Languages and Arts, Padang State University, and one was a lecturer from Universiti PGRI Sumatera Barat.

Based on the opinions and suggestions from the experts, Prototype 2 was revised. The validation activities were conducted through written feedback and discussions, which continued until the experts had reached a consensus regarding the validation of the discovery-group learning model. Prototype 3 was borne as a result of this rigorous assessment.

1.3 Prototype 3 (results of second phase design revisions)

Similar to its predecessors, Prototype 3 was further evaluated through the following methods:

a) one-to-one evaluation, where one student was selected from each of the high-, medium-, and low- ability groups to provide feedback on the developed student book. Additionally, teachers were asked to give their opinions on the model book, student books, and teacher books; and

b) small group evaluation, which included eight students of whom were divided into two groups of four and whom tested the revised model book, teacher book, and student book, providing feedback on the materials. Additionally, four teachers provided their opinions on these books. Based on the feedback from both students and teachers, the product was revised again. After this evaluation, further revisions were made to finalize the prototype for field testing.

1.4 Final prototype

The final phase of the formative evaluation is the field test. During this stage, the final prototype was implemented in real classroom settings to assess the effectiveness of the discovery-group learning model in enhancing students' 21st-century skills. The trial was conducted in senior high schools that were implementing the independent curriculum. The test subjects were Class XI Natural Science students enrolled in the July-December 2022 semester. Control and experimental classes were selected through purposive sampling, based on the highest average class performances.

2. Validity and practicality assessment instruments

All materials used in this study underwent initial validation using a validation instrument rating sheet. The results from the validation and subsequent revisions indicated that both the validation and practicality instruments were suitable for product development validation. The validation instruments aimed to gather data on the validity of the model books, teacher books, student books, and the 21st-century skills assessment instruments. The validation instruments were developed based on three key assessment indicators: content validity, construct validity, and language validity. The validation instruments used for data collection are summarized in Table 1 below.

Table 1
Validation instruments

No	Material	Instrument	Assessment Aspect
1	Rational Model Book Validation	Questionnaire	Supporting concepts Model components Book construction language
2	Teacher Book Validation	Questionnaire	Construction of books language Rational supporting concept
3	Student Books Validation	Questionnaire	Construction of books language Rational supporting concept

The practicality instruments were used to collect data regarding the practical application of the developed model. These instruments includes a teacher's response questionnaire and a student response questionnaire, both focused on evaluating the practicality of the model. The instruments used to gather data on practicality are presented in Table 2 below.

Table 2
Practicality instruments

Material	Instrument	Assessment Aspect
Teacher's Book Practicality	Questionnaire	1. Ease of application of the discovery-group learning model in Indonesian language subjects 2. Benefits of the discovery-group learning model in Indonesian language subjects 3. The use of teacher books in Indonesian language subjects 4. Compliance with time allocation
Student Book Practicality	Questionnaire	1. Ease of application of the discovery-group learning model in Indonesian language subjects 2. Benefits of the discovery-group learning model in Indonesian language subjects 3. The use of teacher books in Indonesian language subjects 4. Compliance with time allocation

3. Validity analysis

After collection, the data on validity were subjected to expert judgment, where experts provided input and suggestions on improving the discovery-group learning model and its associated tools. Their analysis employed a scale, with the following conditions in Table 3 below.

Table 3

Criteria for scoring validity

Score	Category	Percentage of Achievement Indicators
1	Strongly Disagree	0-24
2	Disagree	25-49
3	Agree	50-74
4	Strongly Agree	75-100

Source: (Arikunto Suharsimi, 2013)

Overall, the validity of the developed product is based on the following criteria in Table 4 below.

Table 4

Validity criteria

Category	Description
0,801-1,00	Very high validity
0,601- 0,800	High validity
0,401-0,600	Moderate validity
0,201-4,400	Low validity
0,001-0,200	Very low validity
0,000	Invalid

Source: (Arikunto Suharsimi, 2013)

4. Practicality analysis

The analysis of the data on practicality is derived from the teacher and student response questionnaires that were administeredDiscovery-group. Practicality analysis is conducted using a scale with the following conditions, as outlined in Table 5 below.

Table 5

Scoring criteria of practicality

No	Category	Percentage of Indicator Achievement
1	Strongly Disagree	0-24
2	Disagree	25-49
3	Agree	50-74
4	Strongly Agree	75-100

Source: (Arikunto Suharsimi, 2013)

The calculation and final score of the practicality results analyzed on a scale (0-100) is carried out by using the following formula:

$$P = \frac{Q}{R} x\ 100$$

Information:
P = Practicality Value
Q = Score obtained
R = Highest Score

As for determining the overall practicality of the model, the following criteria in Table 6 below were used.

Table 6
Practicality criteria

Percentage	Information
0 - 20%	Impractical
21 - 40%	Less Practical
41 - 60%	Quite Practical
61 - 80%	Practical
81 - 100%	Very Practical

Source: (Arikunto Suharsimi, 2013)

RESULTS AND DISCUSSION

The validation of the discovery-group learning model prototype was carried out by a group of peer reviewers and experts, which included university lecturers. These reviewers and experts were tasked with evaluating the prototype and offering suggestions for improvement to ensure it met the first quality intervention criterion: validity. Additionally, the practicality of the model was assessed via feedback from teachers and students at State Senior High School 7 Padang and State Senior High School 8 Padang.

1. Results of the validity of the discovery-group-group learning model by reviewers

discovery-groupThe assessment of the model's validity mainly focused on the suitability of its content, construct, and language. Based on the reviewers' suggestions and the results of the validity calculations, revisions were made to the prototype to obtain a more valid product. Data analysis was conducted using the values provided by the validators. The validity of the product was then calculated using a formula outlined by (Arikunto Suharsimi, 2013). The results of the analysis are as follows:

Table 7

Validation results by reviewers (peers) of research products

Product	Component	Validity	
		Score (V)	Description
Model Book	Construct:		
	1. Serving	0.85	Very High
	2. Graphic	0.80	Very High
	Content:		
	1. Rational learning model	0.86	Very High
	2. The theoretical basis of the learning model	0.87	Very High
		0.85	Very High
	3. Learning model syntax	0.84	Very High
	4. Social system	0.85	Very High
	5. The principle of the reaction	0.86	Very High
	6. Support system	0.87	Very High
	7. Instructional and accompaniment impact		
	Language	0.87	Very High
	Average	0.85	Very High
Teacher Book	Construct:		
	1. Serving	0.85	Very High
	2. Graphic	0.80	Very High
	Content:		
	1. General instructions	0.87	Very High
	2. Special instructions	0.84	Very High
	Language	0.86	Very High
	Average	0.84	Very High
Student Book	Construct:		
	1. Serving	0.85	Very High
	2. Graphic	0.85	Very High
	Book eligibility	0.85	Very High
	Language	0.84	Very High
	Average	0.84	Very High
Assessment	Construct	0.87	Very High
	Content/ Content Eligibility	0.85	Very High
	Language	0.84	Very High
	Average	0.85	Very High

The validation results, as shown in Table 7, indicate that the discovery-group-group learning model, presented as a learning model book accompanied by teacher and student books, as well as a 21st-century skills assessment instrument, falls into the "Very High Validity" category. Specifically, the model books achieved an average validity score of 0.85 (Very High), while the teacher and student books both received an average validity score of 0.84 (Very High). The 21st Century Skills assessment instrument also obtained an average validity score of 0.85 (Very High). These results confirm that the prototype of the discovery-group learning model is now finally valid and feasible for implementation in Indonesian language learning at the senior high school level, at least according to these reviewers.

2. Results of the validity of discovery-group-group learning model by experts

The validation process involving experts followed a similar procedure. Each expert conducted their evaluations based on specific criteria outlined in the model book, teacher book, student

book, and assessment guidelines. The validity of the product was then analyzed using a formula described by Suharsimi (2013). The results of the validation process are summarized in Table 8 below.

Table 8
Validation results by experts (lecturers) of research products

Product	Component	Validity	
		Score (V)	Description
Model Book	Construct:		
	1. Serving	0.83	Very High
	2. Graphic	0.80	Very High
	Content:		
	1. Rational learning model	0.88	Very High
	2. The theoretical basis of the learning model	0.87 0.88	Very High Very High
	3. Learning model syntax	0.84	Very High
	4. Social system	0.82	Very High
	5. The principle of the reaction	0.86	Very High
	6. Support system	0.87	Very High
	7. Instructional and accompaniment impact		
	Language	0.88	Very High
	Average	0.86	Very High
Teacher Book	Construct:		
	1. Serving	0.85	Very High
	2. Graphic	0.80	Very High
	Content:		
	1. General instructions	0.86	Very High
	2. Special instructions	0.84	Very High
	Language	0.86	Very High
	Average	0.84	Very High
Student Book	Construct:		
	1. Serving	0.85	Very High
	2. Graphic	0.75	High
	Book eligibility	0.85	Very High
	Language	0.85	Very High
	Average	0.82	Very High
Assessment	Construct	0.88	Very High
	Content/ Content Eligibility	0.84	Very High
	Language	0.84	Very High
	Average	0.85	Very High

The validation results, as shown in Table 8, indicate that the discovery-group learning model, presented in the form of a learning model book, along with accompanying teacher and student books and a 21st-century skills assessment instrument, falls into the "Very High Validity" category. Specifically, the results for each component are as follows: the learning model book achieved an average validity score of 0.86 (Very High), the teacher book scored an average validity value of 0.84 (Very High), the student book obtained an average validity score of 0.82 (Very High), while the assessment instrument recorded an average validity score of 0.85 (Very High). These results demonstrate that the prototype of the discovery-group learning model is highly valid and once again, now suitable for application in Indonesian language learning at the senior high school level according to these experts.

3. Practicality results of the discovery-group learning model

The assessment was based on practical feedback from both teachers and students, using criteria outlined in the model book, teacher's book, and student's book. Additionally, both teachers and students evaluated several aspects of the discovery-group learning model to judge their applicability to Indonesian language subjects. These aspects include the ease of implementation, the benefits of the model in Indonesian lessons, the usability of the teacher's book, and its alignment with the allocated time for the subject. The results of this assessment are presented in Table 9 below.

Table 9

Practicality results of research products according to teachers

Assessment Aspects	SMAN 7 Padang	SMAN 8 Padang
Teacher's Book		
The ease of applying the teacher's book in learning Indonesian	4.0	3.8
The benefits of teacher's books in learning Indonesian	3.7	3.7
The use of teacher's books in learning Indonesian	3.5	3.7
Average (%)	93.9	91.6
Overall Average (%)	92.8	
Category	Very Practical	
Student Book		
Ease of following student books in learning Indonesian	4.0	3.9
The benefits of student books in learning Indonesian	3.9	3.7
The use of student books in learning Indonesian	3.7	3.7
Allocation of the application of student books in learning Indonesian	3.7	3.2
Average (%)	95.8	94.6
Overall Average (%)	95.2	
Category	Very Practical	

Based on Table 9, it is evident that the discovery-group-group learning model, implemented through teacher and student books, is highly practical and facilitates the teaching of Indonesian language materials. The average ratings for both the teacher and student books fall within the 80-100% range, with an overall average score of 95.2, placing them in the "Very Practical" category. Respondents indicated that the discovery-group-group learning model enhances the practicality of learning activities for both teachers and students. The students' evaluation of the model also reflects similar results as can be seen in Table 10 below.

Table 10

Results of practicality of model data analysis according to students

Assessment Aspects	SMAN 7 Padang	SMAN 8 Padang
Ease of following student books in learning Indonesian	3.4	3.4
The benefits of student books in learning Indonesian	3.3	3.5
The use of student books in learning Indonesian	3.4	3.5
Allocation of the application of student books in learning Indonesian	3.5	3.4
Average (%)	84.6	86.5
Overall Average (%)	85.6	
Category	Very Practical	

The table above illustrates that the discovery-group-group learning model effectively supports and facilitates students in the learning process. The overall average score is 85.6, with the assessment percentages ranging from 80% to 100%, placing it in the "Very Practical" category. Respondents also indicated that the discovery-group learning model makes learning activities more practical and effective for students.

4. Discussion of the results of discovery-group-group learning models

The findings regarding the validity of the discovery-group-group learning model indicate that the products meet the required validity standards. This conclusion is based on statistical calculations and feedback from the validators. In this section, the validators were asked to assess and provide suggestions for improving the products, which is a crucial step in meeting the first quality criterion of the intervention, validity. The assessment covers the feasibility of each product's content, construct, and language. The suggestions provided by the validators have also been used to revise and enhance the products' validity. These suggestions are outlined in Table 11 below.

Table 11

Summary of validators' suggestions

Code Validator/ Expertise	Improvement	Revision
AG/ Indonesian language and literature education	Model Book: 1. Pay attention to the color selection and size of the writing on the cover. 2. Correspondence of bibliography and citations needs to be checked. 3. Pay attention to the cover that must be on the book. 4. Reviewing the steps in the Group Discovery Learning Model. 5. Updating old quotes.	Model Book: 1. Fix the color selection and size of the writing on the cover. 2. Improve the suitability between citations and bibliography. 3. Improve the closing section by adding conclusions and expectations to what is conveyed in the book. 4. Fix about the steps in the Discovery-Group Learning model which showed novelty. 5. Fix old quotes from recent references.

Code Validator/ Expertise	Improvement	Revision
	Teacher's Book: 1. Pay attention to the structure of the book. 2. Writing a teacher's book adapted to the structure of the book. 3. Pay attention to the introductory sections of the book. 4. Pay attention to the cover of the book. 5. The core or body parts of the book are not yet representative to describe a book.	Teacher's Book: 1. Improve the structure of the book. 2. Improve the teacher's book according to the structure of the book. 3. Fix the introduction section. 4. Fix the cover of the book. 5. Improve the core or body of the book so that it is representative.
	Student Book: 1. Pay attention to student books according to the structure of the book. 2. Pay attention to the introduction to the book. 3. Pay attention to the cover of the book. 4. The main parts of the book are further explained so that it describes the student book. 5. Pay attention to consistent and balanced numbering.	Student Book: 1. Improve the structure of the book. 2. Improve the teacher's book according to the structure of the book. 3. Fix the introduction section 4. Fix the cover of the book. 5. Improve the core or body of the book so that it is representative.
	21st Century Skills Assessment Instruments: 1. Clarify the indicator derivatives of each component of 21st Century skills. 2. Assess the indicators of each component, not just the components. 3. Distinguish between performance appraisal and observation sheets in assessing student attitudes.	21st Century Skills Assessment Instruments: 1. Deriving indicators of each component of 21st Century skills. 2. Conduct an assessment of the indicators of each component. 3. Revising the performance appraisal and observation sheet.
SL/Education Science	Model book 1. Model construction needs to be added according to the notes in the model book. 2. As a learning model, describe the components of the model. 3. Write down the main idea of each paragraph so that it becomes an effective sentence/paragraph. Clarify each stage in the model syntax.	Model Book: 1. Add model construction. 2. Improve the description of the components of the learning model. 3. Improve sentences/paragraphs to be effective. 4. Clarify each step in the model syntax again.

Code Validator/ Expertise	Improvement	Revision
	Teacher's Book: 1. The syntax of the learning model needs to be explained. 2. The teacher's role in summarizing the social system in the Discovery-Group Learning model needs to be explained more simply. 3. Paying attention to the use of effective sentences and punctuation marks can lead to double meanings. Student Book: 1. The role of students is more clarified in learning activities. 2. Paying attention to the use of effective sentences and punctuation marks can lead to double meanings. 3. Don't use too many colors in student books. 21st Century Skills Assessment Instruments: 1. Clarify the indicator derivatives of each component of 21st Century skills. 2. Differentiate the performance appraisal with the observation sheet on the assessment of each component. 3. Appraise the performance and observation sheets according to the indicators. 4. Pay attention to the correct grammar.	Teacher's Book: 1. Clarifying the syntax of the learning model. 2. Improving the teacher's role in the social system summary in the Discovery-Group Learning model. 3. Improving the use of effective sentences and punctuation, can cause double meanings. Student Book: 1. Improving the role of students in learning activities. 2. Improving the use of effective sentences and punctuation, can cause double meanings. 3. Improve the use of colors in the teacher's book. 21st Century Skills Assessment Instruments: 1. Deriving indicator derivatives of each component of 21st Century skills. 2. Conduct an assessment of the indicators of each component. 3. Revise the performance appraisal and observation sheet. 4. Fix the correct grammar.
FR/ Education Technology	Model Book: 1. Make an appropriate and attractive book cover. 2. Pay attention to the colors in each part needed in the book. 3. Pay attention to the information on each image/graph/table. Teacher's Book: 1. Pay attention to the cover design which is even more attractive. 2. Make a description of each image/graph/table. 3. Pay attention to the size of the letters that are not the same in the book.	Model Book: 1. Make an appropriate and attractive book cover. 2. Fix the colors in every part needed in the book. 3. Make a description of each image/graph/table. Teacher's Book: 1. Improve the cover design to make it even more attractive. 2. Make a description of each image/graph/table. 3. Pay attention to the size of the letters that are not the same in the book.

Code Validator/ Expertise	Improvement	Revision
	Student Book: 1. Pay attention to the cover design which is even more attractive. 2. Bring up pictures that match the learning material. 3. Make tables/graphs that attract the attention of both students and teachers. 4. Make a description of each image/graph/table. 5. Suggest that the pictures in each book use suitable and attractive colors. 21st Century Skills Assessment Instruments: -	Student Book: 1. Pay attention to the cover design which is even more attractive. 2. Bring up pictures that match the learning material. 3. Make tables/graphs that attract the attention of both students and teachers. 4. Make a description of each image/graph/table. 5. Suggest that the pictures in each book use suitable and attractive colors. 21st Century Skills Assessment Instruments: -
ABR/ Learning Indonesian Language and Literature	Model Book: 1. The syntax for the Discovery-group Learning model needs to be simplified. 2. The role of teachers and students in the summary of the social system (operational steps) in the Discovery-Group Learning model needs to be explained more simply. 3. Paying attention to the use of diction and punctuation can lead to double meanings. Teacher's Book: 1. There needs to be a list of figures and a list of tables. 2. Every table and figure appears suddenly without an introductory sentence/explanation. 3. Each table and figure must be accompanied by the number and title of the table or figure. 4. Assessment of student skills is more explained. Student Book: 1. There needs to be a list of figures and a list of tables. 2. The concept map is improved, so that it looks like they have a relationship between concepts. 3. Some tables and figures have not been accompanied by a number.	Model Book: 1. Simplify the syntax of the Group Discovery Learning model. 2. Clarify and simplify the role of teachers and students in the social summary (operational steps) in the Discovery-Group Learning model. 3. Correct the use of diction and punctuation which creates double meanings. Teacher's Book: 1. Add figure list and table list. 2. Add an introductory sentence to each table and figure. 3. Add numbers and titles to tables and figures. 4. Improve the assessment of student skills. Student Book: 1. Add figure list and table list. 2. Improve the concept map, so that it looks like they have a relationship between concepts. 3. Add table numbers and numbers.

Code Validator/ Expertise	Improvement	Revision
	21st Century Skills Assessment Instruments: 1. Clarify the indicator derivatives of each component of 21st Century skills. 2. Explain the performance sheet on student attitude assessment. 3. Explain the observation sheet on the assessment of student attitudes. 4. Develop a scoring rubric for each indicator of the 21st Century skills component.	21st Century Skills Assessment Instruments: 1. Deriving indicators of each component of 21st Century skills. 2. Revising the performance sheet and observation sheet. 3. Revising the observation sheet on the assessment of student attitudes. 4. Developing a scoring rubric for each indicator of the 21st Century skills component.
SM/ Linguistics	Model Book: 1. Several sentences are not yet effective. 2. Pay attention again to each paragraph written whether it meets the criteria for a good paragraph. 3. We recommend that you use terms that are already known in Indonesian and written in Indonesian. 4. There are still errors in typing. Teacher's Book: 1. There are still some that are not effective. 2. Pay attention to writing the numbering of both chapters and sub-chapters in the book. 3. Pay attention to the writing of paragraphs that are not in accordance with the criteria for good and correct paragraphs. 4. Watch for inappropriate use of terms. Student Book: 1. There are still some that are not effective. 2. Pay attention to writing the numbering of both chapters and sub-chapters in the book. 3. Pay attention to the writing of paragraphs that are not in accordance with the criteria for good and correct paragraphs.	Model Book: 1. Fix sentences that are not yet effective. 2. Correct the paragraphs written so that they fit the criteria of a good paragraph. 3. Improve the use of terms that are better known in Indonesian. 4. Correct typing errors. Teacher's Book: 1. Fix sentences that have no effect. 2. Improve the writing of the numbering method for book chapters and subchapters. 3. Correct paragraphs that do not meet the criteria for good and correct paragraphs. 4. Correct the use of inaccurate terms. Student Book: 1. Fix sentences that have no effect. 2. Improve the writing of the numbering method for book chapters and subchapters. 3. Correct paragraphs that do not meet the criteria for good and correct paragraphs.

Code Validator/ Expertise	Improvement	Revision
	21st Century Skills Assessment Instruments: 1. There are still sentences that are not yet effective. 2. Pay attention to the use of foreign terms that have not been italicized. 3. Pay attention to the correct numbering method.	21st Century Skills Assessment Instruments: 1. Fix sentences that are not yet effective. 2. Correct the use of foreign terms that have not been italicized. 3. Fix the correct numbering method.

Based on the validators' suggestions, revisions were made to the prototype to ensure the products' validity. To support the claim that the discovery-group-group learning model is well-established, it is important to emphasize that it is internally consistent and grounded in sound theoretical principles. The validation findings are based on the key components of the learning model, which include its syntax, social system, reaction principle, support system, instructional impact, and accompanying impact.

The syntax of the discovery-group-group learning model outlines the following learning steps: planning, presenting problems, generating hypotheses, testing hypotheses, making presentations, and conducting evaluations. The validation results indicate that the model's syntax validity has an average score of 0.88, which falls within the "very high validity" category. This validation confirms that each stage of the discovery-group learning model follows a logical sequence, has clear objectives, specifies distinct teacher and student activities, is easy to implement, supports the achievement of learning objectives, and facilitates the development of 21st century skills.

Building students' initial knowledge before learning begins is essential for their academic success. When students engage in discussions and exchange ideas, they activate their prior knowledge, which prepares them to tackle new concepts in class more effectively. Students who possess prior knowledge are better equipped for upcoming lessons and tend to perform better than those who lack this foundational understanding (Zambrano et al., 2019). Prior knowledge significantly influences the effectiveness of collaborative learning, helping students achieve their learning goals more efficiently (Ahmed et al., 2006; Liu et al., 2014). Fostering the activation of prior knowledge before introducing new material, educators can help students build confidence, connect new ideas to what they already know, and set the stage for deeper learning. This foundational process not only enhances individual learning but also strengthens collaborative efforts within the classroom.

The validation results indicate that the social system model has an average validity value of 0.84, placing it in the "Very High Validity" category. A social system is a learning tool that outlines the interactions between teachers and students, as well as between students themselves. For the social system within a learning model to be effective, it must establish a clear, well-structured pattern of relationships between the teacher's role and student activities (Gerhana et al., 2017). This ensures that the system is both easy to implement and capable of supporting the achievement of learning objectives.

The validation results show that the principle reaction model has an average validity value of 0.82, also placing it in the “Very High Validity” category. The discovery-group learning model is designed to enhance students' 21st century skills, with a focus on authentic and scientific inquiry processes through collaboration. This approach aligns with the principles of discovery learning, as discussed previously (Akhras, 2000; Artama et al., 2023; Erdogan & Bozeman, 2015; Gerhana et al., 2017). In the discovery-group learning model, the teacher’s role in the process of scientific and authentic inquiry is thus to guide students in making their own discoveries and working collaboratively, rather than conducting the investigations for them.

The validation results indicate that the model support system has an average validity value of 0.86, placing it in the “Very High Validity” category as well. Primary support in the discovery-group learning model refers to a series of problems that are designed to invoke confusion in students, encouraging deeper thinking. Similarly, in the discovery-group learning model, which relies on a variety of teaching materials, the support system that facilitates and accommodates the discovery process is primarily in the form of these materials (Van Boxtel et al., 2000), the. One key resource is the student book, which has a positive impact on enhancing students' higher-order thinking skills. In addition to student books, the teacher books and 21st century skills assessment instrument are also essential. These tools serve as guides for teachers to effectively apply the discovery-group learning model and assess students' 21st century skills.

The validation results indicate that the average validity value of the instructional impact and accompanying impact model is 0.87, placing it in the “Very High Validity” category. The instructional impact of the discovery-group learning model is its ability to enhance students' 21st century skills. Students engage in activities such as observing problems, gathering information, analyzing data, discussing, collaborating, and presenting findings. For the accompanying effects of the discovery-group learning model, they include fostering qualities such as curiosity, thoroughness, honesty, sincerity, discipline, politeness, confidence, and respect for others' opinions. The accompanying impact of self-discovery models is also otherwise the positive attitude developed through habituation to the scientific process (Van Boxtel et al., 2000).

The overall validation results of the discovery-group learning model, based on expert assessments and comments, reveal several similarities and differences. The general similarity across the suggestions is that improvements are needed in the discovery-group learning model to address existing weaknesses. In terms of content suitability, experts recommend paying attention to the clarity of the stages and descriptions within the syntax of the learning model. They also suggest enhancing the visual appeal of the product by using attractive cover colors, images, and appropriate font sizes. For construct indicators, experts noted that some quotations did not match the bibliography and required updating. They also suggested adjusting the book’s structure, providing more engaging reference materials, and adding more detailed information to figures or tables. Regarding language indicators, experts pointed out the presence of ineffective sentences and emphasized the importance of correct spelling, punctuation, diction, and the use of appropriate terms. Clear, precise language is necessary to improve the model's readability and effectiveness. The differences in expert feedback were specific to their areas

of expertise. Content experts focused primarily on the accuracy of the concepts and ideas presented in the discovery-group learning model. They emphasized the importance of concept clarity and relevance. Construct experts concentrated on ensuring that the measurement results adequately reflected the constructs being measured, advocating for more robust evidence to support the model's validity. Language experts, on the other hand, focused on improving grammar, sentence structure, and overall coherence of the written content, ensuring that the language was both effective and accessible.

The practicality of the developed products was assessed based on their ease of use (Fauzan et al., 2013). The practicality of the discovery-group learning model is demonstrated by the alignment between the expected typology and the actual assessments, as well as the consistency between expectations and implementation. This indicates that the practicality of the model is determined by expert evaluations, which show that the product can be effectively applied and through real-world observations, be confirmed of its applicability. The teachers' response to the teacher's book is evaluated based on several factors: the ease of application, its usefulness in teaching Indonesian, and its effectiveness in the learning process. As a research product, it is evident that teacher books categorized as being very practical are those that significantly assist teachers in fulfilling their roles as comprehensively as possible. These books serve as valuable tools in enhancing teaching practices and ensuring the success of the discovery-group learning model in the classroom. The teacher's book in the discovery-group learning model indeed provides comprehensive guidance on the preparation and implementation of systematic learning. It offers detailed instructions for teachers on how to prepare for the learning model, as well as clear guidelines on how to effectively use the student books. As a result, the teacher's book proves to be a valuable resource, helping teachers select appropriate learning materials, techniques, and assessment instruments for each session. Additionally, the high level of utilization of the teacher's book can be attributed to the thoroughness of its content. This is reflected in the inclusion of relevant Indonesian language content, easily accessible learning materials, and clear, observable assessment indicators. These features ensure that teachers can easily apply the model in their classrooms, enhancing the overall effectiveness of the learning process.

Student responses to the student books were evaluated based on several factors: ease of application, benefits in learning Indonesian, students' ability to learn the language, and time efficiency in using the books. According to student feedback, the student books are very user-friendly, with an average rating of 86.1 for ease of use. In terms of usefulness in learning Indonesian, students reported that the books provided significant benefits, with an average rating of 83.3. Additionally, students indicated a high level of usability in the learning process, with an average rating of 86.0, highlighting that the books are effective tools for enhancing their Indonesian language skills. Furthermore, students appreciated the time efficiency of using the student books, with an exceptionally high rating of 91.7, suggesting that the books are not only easy to use but also allow students to maximize their learning within a short period. The practicality of the student books stems from their design, which is aligned with student characteristics and includes guided activities. Similar to previous research findings, practical student books are those that cater to the specific needs and characteristics of students, while also featuring engaging and attractive graphics. This student book is equipped

with activities that guide students through the steps of the discovery-group learning model, making it easier for them to follow the learning process. Moreover, the graphic design of the student book is carefully crafted with an appealing layout, enhancing the overall learning experience. This thoughtful design not only supports the learning process but also makes learning Indonesian more enjoyable for students, encouraging active participation and engagement.

The practicality results gathered from both teachers and students highlight several key strengths of the teacher and student books. Both the teacher books and student books, for instance, have attractive designs and are easy to implement. For the student books, the connectivity within them facilitates students in obtaining the information they need to study the learning material, as well as in communicating and collaborating with peers. The learning steps outlined in the student books also help students build a strong understanding of the material being studied while the teacher's book provides a clear framework for the learning targets that need to be achieved, making it easier for teachers to plan and execute lessons. Lastly, the teacher's book also aids teachers in managing the learning process and carrying out necessary assessments.

In general, both the teacher books and student books are easy to implement. However, there are several areas that need improvement. To start, some sentences in the teacher's book are ambiguous and difficult even for teachers to understand. Some discrepancies in the assessment rubric could be found, where some indicators did not align with the learning activities described in the teacher's book. There are also still typographical, punctuation, and diction errors present in the teacher's book, student's book, and the discovery-group learning model book. Addressing these issues is crucial as it will help further improve the effectiveness and clarity of the learning materials.

The results of the teachers' and students' assessment of the discovery-group learning model, as implemented through the teacher's book and student's book, demonstrate an alignment between the typology of expectations, assessments, and operational expectations. This indicates that the model is consistent with its intended design and application. Based on this feedback, it can be concluded that the discovery-group learning model meets the second intervention quality criterion, practicality. This suggests that the model is not only effective but also feasible and easy to implement in real classroom settings.

CONCLUSION

Based on the development and trials conducted, it can be concluded that the discovery-group learning model meets the criteria for both validity and practicality, establishing it as an effective learning model. Validation results from reviewers (colleagues) and experts (lecturers) indicate that the average validity values for the discovery-group learning model book were 0.83 and 0.86, respectively. The teacher's book received an impressive average validity score of 0.84 from both groups. The student's book also earned very high average validity values of 0.84 and 0.82, respectively. Additionally, the 21st Century skills assessment sheet achieved a high

average validity score of 0.84 from both groups. Overall, the combined average validity value from both reviewers and experts was 0.85, placing the discovery-group learning model in the "Very High Validity" category. Consequently, the prototype of this discovery-group learning model, which includes the model book, teacher's book, student's book, and assessment sheet, can be considered highly feasible for implementation in Indonesian language learning classrooms at senior high schools. The discovery-group learning model also meets the practicality criteria for effective implementation. The practicality of the model, as evidenced by the results from the teacher's and student's books, is placed in the "Very Practical" category. Teacher responses reported average practicality scores of 91.7 for the teacher's book and 90.6 for the student's book. Student responses, on the other hand, resulted in an average practicality score of 86.8 for the student's book only.

The research findings regarding the validity and practicality of the discovery-group learning model, especially with regards to enhancing 21st century skills for high school students, demonstrate significant benefits for both students and teachers, particularly in the context of Indonesian language instruction. While this model has proven to be effective in teaching Indonesian, it is adaptable to other subjects as well. Therefore, further validation and adaptation of the discovery-group learning model would be essential to ensure its alignment with the specific needs and benefits of various educational contexts.

THE AUTHORS

Trisna Helda is a doctoral student in the Language Teaching Science Program at the Faculty of Languages and Arts at Padang State University, Indonesia. Her research interests include Indonesian language teaching, 21st century learning, evaluation of assessments in independent curricula, development of Indonesian language learning models, and classroom action research.
trisnahelda4@gmail.com

Atmazaki is a professor who teaches in the Postgraduate Program and at the Faculty of Languages and Arts at Padang State University, Indonesia. Her research mainly focuses on language education, scientific literacy literature studies, project-based learning, and assessment evaluation.
atmazaki@fbs.unp.ac.id

Erizal Gani is a lecturer who teaches in the Language Teaching Doctoral Program at the Faculty of Languages and Arts, Padang State University, Indonesia. His research primarily focuses on language education, literature studies, group learning, and assessment evaluation.
erizal.gani@gmail.com

REFERENCES

Ahmed, A., Rich, M. W., Fleg, J. L., Zile, M. R., Young, J. B., Kitzman, D. W., Love, T. E., Aronow, W. S., Adams, K. F., & Gheorghiade, M. (2006). Effects of digoxin on morbidity and mortality in diastolic heart failure: The ancillary digitalis investigation group trial. *Circulation, 114(*5), 397–403. https://doi.org/10.1161/CIRCULATIONAHA.106.628347

Akhras, G. (2000). Smart materials and smartsystems for the future. *Canadian Military Journal, Autumn 2000*, 25–32.

Alberida. (2019). *Pengembangan model problem solving untuk meningkatkan proses sains siswa pada pembelajaran IPA SMP*. Postgraduate Program of Padang State University, Pengembangan.

Alwan, M. (2018). Pengembangan multimedia E-book 3D berbasis mobile learning untuk mata pelajaran geografi SMA guna mendukung pembelajaran jarak jauh. *At-Tadbir: Jurnal Manajemen Pendidikan Islam, 1*(2), 26–40.

Argaw, A. S., Haile, B. B., Ayalew, B. T., & Kuma, S. G. (2017). The effect of problem based learning (PBL) instruction on students' motivation and problem solving skills of physics. *Eurasia Journal of Mathematics, Science and Technology Education, 13*(3), 857–871. https://doi.org/10.12973/eurasia.2017.00647a

Arif, A., Wang, Z., Wang, J., Mather, B., Bashualdo, H., & Zhao, D. (2018). Load modeling - A review. *IEEE Transactions on Smart Grid, 9*(6), 5986–5999. https://doi.org/10.1109/TSG.2017.2700436

Arikunto Suharsimi. (2013). *Prosedur penelitian: Suatu pendekatan praktik* (4th ed.). Rineka Cipta. http://r2kn.litbang.kemkes.go.id:8080/handle/123456789/62880

Artama, K. K. J., Budasi, I. G., & Ratminingsih, N. M. (2023). Promoting the 21st century skills using project-based learning. *Language Circle: Journal of Language and Literature, 17*(2), 325–332. https://doi.org/10.15294/lc.v17i2.39096

Balim, A. G. (2009). The effects of discovery learning on students' success and inquiry learning skills. *Eurasian Journal of Educational Research, 9*(35), 1–17.

Chiong, R., & Jovanovic, J. (2012). Collaborative learning in online study groups: An evolutionary game theory perspective. *Journal of Information Technology Education: Research, 11*, 81–101. https://doi.org/10.28945/1574

Erdogan, N., & Bozeman, T. D. (2015). Models of project-based learning for the 21st century. In A. Sahin (Ed.), *A practice-based model of STEM teaching: STEM students on the stage (SOS)* (pp. 31–42). Sense Publishers.

Fauzan, A., Plomp, T., & Gravemeijer, K. P. E. (2013). The development of an RME-based geometry course for Indonesian Primary schools. In T. Plomp & N. Nieveen (Eds.), *Educational design research - Part B. Illustrative cases* (pp. 159-178). Netherlands Institute for Curriculum Development. https://research.tue.nl/files/3900348/23590380570408.pdf

Gerhana, M. T. C., Mardiyana, M., & Pramudya, I. (2017). The effectiveness of project based learning in trigonometry. *Journal of Physics: Conference Series, 895*(1), Article 012027. https://doi.org/10.1088/1742-6596/895/1/012027

Grønmo, L. S., Lindquist, M., Arora, A., & Mullis, I. V. S. (2016). TIMMS 2015 mathematics framework. In I. V. S. Mullis & M. O. Martin (Eds.), *TIMSS 2015 assessment frameworks* (pp. 11–27). TIMSS & PIRLS International Study Center. https://timssandpirls.bc.edu/timss2015/downloads/T15_Frameworks_Full_Book.pdf

Hapsari, T. P. R. N., & Fitria, A. S. (2020). Efektivitas pembelajaran daring mata kuliah evaluasi pengajaran bahasa dan sastra Indonesia masa pandemi Covid-19. *Jurnal Ilmiah SEMANTIKA, 2*(1), 11–20. https://doi.org/10.46772/semantika.v2i01.259

Hardianti, R. D. (2013). Hubungan antara aktivitas belajar dengan menggunakan Metode group investigation terhadap hasil belajar kognitif kelas VIII SMP Negeri I Cawas. *Tugas Akhir, 66*(1997), 37–39.

Haynes, S. N., Richard, D. C. S., & Kubany, E. S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment, 7*(3), 238–247. https://doi.org/10.1037/1040-3590.7.3.238

Jones, G. T., Tromp, G., Kuivaniemi, H., Gretarsdottir, S., Baas, A. F., Giusti, B., Strauss, E., Van'T Hof, F. N. G., Webb, T. R., Erdman, R., Ritchie, M. D., Elmore, J. R., Verma, A., Pendergrass, S., Kullo, I. J., Ye, Z., Peissig, P. L., Gottesman, O., Verma, S. S., … Bown, M. J. (2017). Meta-analysis of genome-wide association studies for abdominal aortic aneurysm identifies four new disease-specific risk loci. *Circulation Research, 120*(2), 341–353. https://doi.org/10.1161/CIRCRESAHA.116.308765

Liu, T. C., Lin, Y. C., & Paas, F. (2014). Effects of prior knowledge on learning from different compositions of representations in a mobile learning environment. *Computers and Education, 72*, 328–338. https://doi.org/10.1016/j.compedu.2013.10.019

Majid, S., Liming, Z., Tong, S., & Raihana, S. (2012). Importance of soft skills for education and career success. *International Journal for Cross-Disciplinary Subjects in Education, 2*(Special 2), 1036–1042. https://doi.org/10.20533/ijcdse.2042.6364.2012.0147

Menggo, S., Suastra, I. M., Budiarsa, M., & Padmadewi, N. N. (2019). Needs analysis of academic-English speaking material in promoting 21st century skills. *International Journal of Instruction, 12*(2), 739–754. https://doi.org/10.29333/iji.2019.12247a

Noviansyah, N. (2015). Pembelajaran bauran blended learning: Terampil memadukan keunggulan pembelajaran face-to-face, e-learning offline-online dan mobil learning. *At-Turats, 9*(2), 75. https://doi.org/10.24260/at-turats.v9i2.318

Nurjanah, S. A. (2019). Analisis kompetensi abad-21 dalam bidang komunikasi pendidikan. *Gunahumas, 2*(2), 387–402. https://doi.org/10.17509/ghm.v2i2.23027

Pardjono, P., Sugiyono, S., & Budiyono, A. (2015). Developing a model of competency and expertise certification tests for vocational high school students. *Research and Evaluation in Education, 1*(2), 129–145. https://doi.org/10.21831/reid.v1i2.6517

Permana, E. P. (2015). Pengembangan media pembejaran boneka kaus kaki untuk meningkatkan keterampilan berbicara siswa kelas II sekolah dasar. *Profesi Pendidikan Dasar, 2*(2), 133–140. https://doi.org/10.23917/ppd.v2i2.1648

Risnawati, G., Sudin, A., & Sujana, A. (2016). Penerapan model discovery learning untuk meningkatkan hasil belajar siswa pada materi perubahan wujud benda. *Jurnal Pena Ilmiah, 1*(1), 371–380. https://ejournal.unsap.ac.id/index.php/jesa/article/view/230%0Ahttps://ejournal.unsap.ac.id/index.php/jesa/article/download/230/152

Saab, N., Van Joolingen, W. R., & Van Hout-Wolters, B. H. A. M. (2005). Communication in collaborative discovery learning. *British Journal of Educational Psychology, 75*(4), 603–621. https://doi.org/10.1348/000709905X42905

Saadati, M., Forquin, P., Weddfelt, K., Larsson, P. L., & Hild, F. (2014). Granite rock fragmentation at percussive drilling - Experimental and numerical investigation. *International Journal for Numerical and Analytical Methods in Geomechanics, 38*(8), 828–843. https://doi.org/10.1002/nag.2235

Sälzer, C., & Roczen, N. (2018). Assessing global competence in PISA 2018: Challenges and approaches to capturing a complex construct. *International Journal of Development Education and Global Learning, 10*(1), 5–20. https://doi.org/10.18546/ijdegl.10.1.02

Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th ed.). Pearson Education Inc.

Slavin, R. E. (2015). Instruction based on cooperative learning. In R. E. Mayer & P. A. Alexander (Eds.), *Handbook of research on learning and instruction* (pp. 388–404). https://doi.org/10.4324/9780203839089.ch17

Svinicki, M. D. (1998). A theoretical foundation for discovery learning. *The American Journal of Physiology, 275*(6), 4–7. https://doi.org/10.1152/advances.1998.275.6.s4

Syahputra, E., & Alvindi, A. (2022). Berlakunya perubahan ejaan yang disempurnakan (EYD) menjadi pedoman umum ejaan bahasa Indonesia (PUEBI). *Mahaguru: Jurnal Pendidikan Guru Sekolah Dasar, 3*(1), 160–166. https://doi.org/10.33487/mgr.v3i1.3923

Taherdoost, H. (2017). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in a research. *International Journal of Academic Research in Management (IJARM), 5*(3), 27–36.

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. John Wiley & Sons.

Van Boxtel, C., Van der Linden, J., & Kanselaar, G. (2000). Collaborative learning tasks and the elaboration of conceptual knowledge. *Learning and Instruction, 10*(4), 311–330. https://doi.org/10.1016/S0959-4752(00)00002-5

Wrahatnolo, T., & Munoto. (2018). 21st centuries skill implication on educational system. *IOP Conference Series: Materials Science and Engineering, 296*(1), Article 012036. https://doi.org/10.1088/1757-899X/296/1/012036

Zambrano, M. V., Dutta, B., Mercer, D. G., MacLean, H. L., & Touchie, M. F. (2019). Assessment of moisture content measurement methods of dried food products in small-scale operations in developing countries: A review. *Trends in Food Science and Technology, 88*, 484–496. https://doi.org/10.1016/j.tifs.2019.04.006