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# Coding learning model in speaking courses as an innovation to improve 21st century skills

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**ABSTRACT**

Integrating coding into learning is one of the opportunities afforded by technology in education. However, the use of coding in tertiary institutions is still underutilized in the field of language learning. The purpose of this research is to develop a coding learning model for the speaking course that suits the needs of lecturers and students in the teaching and learning process. This research involves Research and Development using the ADDIE model. The subjects in this study consisted of three lecturers and seventy-eight students from five universities in Bengkulu Province, as well as three experts in the fields of materials, media, and language. The results of the study reveal that this model has three main activities: pre-learning, learning, and post-learning, which have five main phases: perception, exploration, collaboration, coding, and publication. The validation test results obtained 'very good' qualifications from material experts and were appropriated by linguists and media experts. The validation results indicate that this model is considered feasible to use so that it meets the standardization of product development testing.

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The development of information technology in the era of the Industrial Revolution 4.0 should create a more effective and efficient learning system. In this regard, the government has made several policies to improve technology-based learning systems in the era of the Industrial Revolution 4.0 through a reorientation of computer programming (coding)-based curricula to realize 21st-century skills and computational thinking. Coding is considered one of the 21st-century skills as it embraces several points in the 4C, including: (1)

Communication; (2) Collaboration; (3) Critical Thinking and Problem solving; and (4) Creativity and Innovation (Korb, Hambrusch, Mayfield, Yadav, & Zhou, 2014; Zubaidah, 2016; Henderson, Cortina, and Wing, 2007). Furthermore, it has been recommended that the government incorporate coding learning into the curriculum. It aims to help Indonesia become an equal nation with other countries by following the trends in the world of education in the era of the Industrial Revolution 4.0.

Coding refers to the procedural transformation of computer instructions into a format that is comprehensible to a computer system (Koyuncu, A.G., & Koyuncu, B., 2019). Coding in school has garnered global attention, with studies showing that students should learn to code or to program in kindergarten for educational and social benefits. Numerous research projects show that learning to code allows children to use digital technology to develop their creativity as well as create a pool of skilled programmers for the job market. Additionally, it helps students in our technology-based society transition from 'consumer' to 'creator.' Students also learn algorithmic thinking to better understand, interpret, and assess its effects on their lives. Some will contribute to the future development and guidance of algorithms. Coding helps kids become independent in a tech-driven world. Finally, learning to code helps students understand and prepare for one aspect of the digital world. Coding in school is important because of this. In a digital world, learning coding basics at school seems necessary.

Integrating coding learning into the curriculum is highly practical and possible. So far, developed nations around the world have included coding learning integration into school curricula (Haseski, Ilic, & Tugtekin, 2018). In the Indonesian context, this trend has just begun to gain attention; among the instances is the policy by the Ministry of Religion to include coding as part of extracurricular activities and the development of online coding schools. Unfortunately, the great potential of coding as the key to the success of the Industrial Revolution 4.0 has not been fully integrated into learning. Instead of being optimally used to develop 21st-century skills and computational thinking, it remains considered a subject for computer experts, making coding exclusive. For many students, coding is considered difficult because they have to integrate several skills when solving problems (Maryono, 2016).

This situation implies the pivotal role of the stakeholders in education in solving emerging problems. Coding learning must be integrated into learning, especially in universities where teacher students are prepared to be teachers. This situation is a reminder that prospective teacher students are agents of change, responsible for solving the challenges in the education system in the era of the Industrial Revolution. 4.0. They need to be equipped with mastery of 21st-century competencies to prepare them for highly

competitive workplaces. One of the viable ways of integrating coding with learning is through the development of coding models in speaking courses, which should be mastered by student teachers. Zuhair et al. (2021) and Nurhopipah et al. (2021) said that coding is very useful for training human creative thinking. In addition, coding can be used to train reasoning, logic, and the concept of human thinking, especially in systematic problem-solving (computational thinking). Through the development of teaching materials and videos about coding, teachers can learn to make teaching media through various platforms, such as games, animations, or stories, and familiarize themselves with technology in this digital era.

UK company Bucksmore Education offers summer coding classes for 13-16-year-olds who can take 15 hours of English and 7.5 of coding (Stevens, V., & Verschoor, J., 2017). Teacher Alan (2017) coded short conversations from scratch. He has his students code dialogue for cartoon-like characters in speech bubbles using Scratch, which is easy to learn and doesn't create spelling and syntax barriers. He listens to the groups and corrects their pronunciation as they plan their story. Students tell the class their story and run their program. He said this activity lets the class and teacher correct spelling and grammar. Coding exercises help students build problem-solving skills and logical thinking, open new avenues for creativity, prepare them for 21st-century careers, reinforce the curriculum through a different lens, and understand how their own technology works.

The theory of dual coding shows that the use of multimedia can facilitate learners in aspects of memory and understanding (Barron, 2014; Pajriah & Budiman, 2017; Putri et al., 2021). The coding model is suitable because humans have separate working memory systems for verbal and visual information that have a limited capacity to process information that can be coded, stored, or retrieved (Paivio, 2006; Solso, 2008; Mayer, 2009). The coding learning model helps students in the process of connecting events, making it easier for them to arrange words to guide them to higher-order thinking.

The theories above serve as the basis for the researchers' efforts to integrate speaking skills into the learning model. Commonly, speaking skills are taught through audio media (radio and tape recorders), visual media (images, text, flashcards, posters, and diagrams, among others), or a combination of the two (video and film). However, the incorporation of simple programming languages, i.e., coding, to hone students' critical thinking skills has not been widely conducted. Understanding how to make coding-based learning media will help teachers create more authentic, creative, and interactive media. The knowledge in this area is useful once they carry out teaching in real-life classrooms. The reason is that teachers who are adaptive, dynamic, and innovative are the key factors to the success of the

learning process in the disruptive era. Therefore, teachers should be able to apply coding learning in the classroom to help students improve their speaking and writing skills in both Indonesian and foreign language classes. Some of the results of previous research also found that the process of acquiring knowledge through text and images, supported by animation, can improve student learning outcomes better compared to only the auditory and visual channels (Pajriah & Budiman, 2017; Aryanto et al., 2020).

The following are some relevant studies that have been conducted previously: The first study was done by Firmansyah et al. (2020). His research aimed to introduce the basics of coding based on the SHINIBIK application, which would be later developed to further students' mastery of coding. Research on learning coding for elementary students has also attracted the attention of researchers (Zuhair, Rachmani, Sri, & Asih, 2021). This research is based on the fact that many teachers and students are not familiar with computers, so it is necessary to provide understanding and practice of Computational Thinking through community service. The teacher is provided with the equipment to implement Coding Stretches and carry out the practice under guidance. Follow-up is provided in case problems arise after the implementation. These previous studies serve as the basis of the current research regarding software coding that was later adapted and also serve as a guideline to determine computational thinking that fits the needs of students.

Coding Scratch serves as the basis for research conducted by Putri, Anisa, Ardiyano, Louis, & Apriyanti (2021). They develop ICT teaching materials for the elementary level by focusing on coding. The result shows that through the technology, the students can learn the basics of programming in a fun way and express their creativity through games and animations they create themselves. The research by Ramadhan, Rosyada, Marliza, Kasatri, and Yuliana (2020) revealed that coding learning is included in school extracurriculars. By coding, students are expected to have skills in computational thinking, complex problem-solving, limitless imagination, and creativity. The efforts to introduce coding learning are also the basis for research conducted by Sinaga, Sitio, and Sijuang (2020). They provided materials related to Computing Skills essential in the industrial era of 4.0. The results showed that students taught MatLab coding had increased creativity in utilizing technology-based learning media.

However, in the context of higher education, there has been insufficient research conducted on coding learning, which has led to a dearth of coding-specific instructional materials and learning modules. The accessibility and abundance of coding applications have made learning this valuable skill more attainable and straightforward. An emerging challenge has arisen due to the discrepancy in coding education accessibility between school and university students. Coding basics as part of digital literacy at school age is starting to

become a concern. Suarmika (2018) suggests that there is a need for innovation, implementation, development, and evaluation of coding at the basic level, followed by training in coding skills to be able to stimulate thinking like a child. Therefore, it can be implied that elementary school students have more computational knowledge than students at universities. Based on the provided information, our objective is to develop a comprehensive coding learning model designed for university students. To ensure effective knowledge learning, the researchers will incorporate the dual-coding approach, which combines verbal and visual elements in speaking skills. In the rapidly evolving era of information technology 4.0, it is crucial for students to possess proficient language skills and strong computational abilities. Hence, it is possible to enhance students' comprehension of speaking skills and equip them with computational thinking abilities by conducting research on developing coding learning models.

Based on the concept of the coding learning model, it is important to develop a learning model integrated with the course of speaking skills for teachers at universities in Bengkulu. It is an innovative attempt to increase 21st-century competence in the era of the Industrial Revolution 4.0. The researchers formulate the problems in this research as follows: 1) What are the results of the analysis of the needs of lecturers and students regarding the coding learning model for speaking course? 2) How is the product development of the coding learning model for the speaking course? 3) What are the results of the product feasibility validation test? Therefore, the purpose of this research is to describe the results of the analysis of the needs of lecturers and students for coding learning models for speaking course, to develop products in the form of coding learning models for Language Skills courses, and to describe the results of validation tests to determine product feasibility based on expert perceptions.

## METHOD

### Location and Time of Research

The research was conducted at five universities in Bengkulu Province from May to September 2022. The selection of research sites at five institutions in Bengkulu was influenced by a number of factors, including research objectives, representativeness, and accessibility, so the validity of this study was high. In addition to offering language education programs in English and Indonesian, the five universities share the same characteristics.

### Subject Development

The research subjects in this study were divided into three categories: participants in needs analysis, experts, and users. Participants in the study to

find out the need for learning models were students and lecturers from five universities in Bengkulu Province. Participants for the validation test were carried out by three experts, namely one learning model design (AR) expert with the qualification of a Professor in Indonesian Language Education, one coding learning design/media expert (WP) with the qualification of an informatics engineering lecturer, and one expert in learning speaking course (EY) with a Lecturer qualification in Indonesian Language Education. In the trial of the use and effectiveness of the participants involved, there were 3 lecturers and 78 students as users at tertiary institutions in Bengkulu Province.

**Model Development**

The research method used in this study is research and development (research and development). This research used the ADDIE model that Reiser and Mondella (1990) developed as a framework. The resulting product is a coding learning model for learning Speaking Skills. ADDIE has several stages, namely Analysis, Design, development, implementation, and evaluation. After conducting additional research on development research models, the ADDIE model was chosen due to its systematic and structured approach, as well as its excellent flexibility in terms of implementation. The ADDIE model is utilised because the evaluation phase is an integral part of the process, allowing the developed learning model to be more accountable prior to its widespread adoption.

**Development Procedure**

The analysis was carried out to determine the users, scope, strategy, and material to be applied through a needs analysis of the coding learning model design. Needs analysis was carried out through the distribution of questionnaires and interviews with lecturers and students as potential users. In this stage, an analysis of the features that must be available in the design model is also carried out through literature studies from various online learning services and scientific journals. With this analysis phase, it is expected to be able to analyze the needs of the model design.

Model design relates to the design of learning objects, learning plans, and the orientation of coding learning models based on the principles of development carried out. The pre-activity phase, the activity phase, and the post-activity phase are all components of this stage. At this stage, article developmental process is also carried out on other learning model elements, which include reaction principles, environmental systems, learning objectives, and accompanying objectives. At this stage, it is carried out specifically and systematically to be able to produce a coding learning model design that is in accordance with the objectives that have been set.

Development is the process of developing data that has been analyzed and previously designed into a coding learning model that can be used as a guide for implementing coding-based speaking learning for students. At this point, experts and users conducted validation tests using prepared questionnaires.

Implementation is the stage in the process of implementing the design of the coding learning model that has been produced directly for the user. In order for the product to be used effectively, at this stage, the developer must pay attention to the conditioning of the product through the learning scenarios that have been prepared.

Evaluation is the final stage in product development. At this stage, an evaluation of the content, materials, and syntax of the model design is carried out. This stage aims to be able to find out the problems encountered in the implementation process, product objectivity, product impact, and the needs needed in the development of the next program.

**Instruments and Data Collection Techniques**

The data were collected through observation, questionnaires, and interviews. The researchers carried out the observation stage to observe firsthand the learning process associated with speaking. Based on the results of initial observations, no speaking courses at universities in the Bengkulu Province area have utilized the coding model. The learning model uses only verbal language, so the learning situation is less challenging. In addition, learning in tertiary institutions also tends to be done independently, so if it is not facilitated with sufficient capital, it can make learning less optimal and more difficult. The data collection was conducted from May to September 2022.

The distribution of the questionnaire was distributed at the development stage and went through three stages: the needs analysis stage, the development stage, and the implementation stage. In the analysis phase, the questionnaires were distributed to the lecturers and students at the five tertiary institutions mentioned above. The indicators used to collect data on the needs of lecturers and students are the design of learning models, learning coding, and speaking skills.

The researchers were also helped by the experts in carrying out a validation test at this point. The validation tests were carried out on material media, and linguists. At the implementation stage, questionnaires were also distributed to lecturers and students after testing the use of the product in class. User validation tests were carried out by lecturers who teach speaking courses at the University of Bengkulu, the State Institute for Islamic Studies (IAIN) Curup, and the University of Hazairin Bengkulu. The indicators used are product convenience, attractiveness, suitability, and usefulness.

**Data Analysis Techniques**

Data analysis techniques in this research include validity testing and practicality testing. This validation aims to receive input, responses, criticism and suggestions from experts to improve the model being developed. Validated components include the developed learning model and instruments. The data analysis procedure in this research is first, for data from the results of analysis and analysis of lecturers' and students' needs which are summarized and described qualitatively. Second, the data in the first stage is compared with the formulation of the main tasks that students must master, data from understanding the learning outcomes of the course, the composition of the main skills that will be taught, data from the study of relevant theories, and data from the study of research. The previous one was also described qualitatively. Third, the data collected first and second are used to formulate learning objectives.

Furthermore, data from the results of product feasibility tests by experts (expert appraisal) and product development trials (developmental tests), were analyzed using quantitative descriptive techniques with Likert scale calculation criteria, namely score 1 (very bad), score 2 (not good), score 3 (fair), score 4 (good), and score 5 (very good). After giving the score, the calculation is then carried out using the formula below.

$$P = \frac{Total\ assessment\ score}{highest\ number\ of\ scores}\ x\ 100\%$$

Then the results of the calculation using the formula above are interpreted using the reference of converting the score into a scale in the following table.

| No | Validation | Category | Description |
|---|---|---|---|
| **1** | 1 | Very bad | Must not be used |
| **2** | 2 | Not good | Must not be used |
| **3** | 3 | Fair | May be used after proper revision |
| **4** | 4 | Good | Can be used with minor revisions |
| **5** | 5 | Very good | Very good to use |

## FINDINGS

The research development process can be effectively organized into five distinct stages: Analysis, Design, Development, Implementation, and Evaluation. These stages provide a structured framework for conducting research and ensure a systematic approach to achieving research objectives. By following this process, researchers can effectively gather and analyze data, design appropriate methodologies, develop research materials, implement research protocols, and evaluate the outcomes. Each stage plays a crucial role

in the overall research process, contributing to the generation of reliable and valid findings.

**Results of the Analysis of The Needs of Students and Lecturers**

The Analysis phase is carried out through the analysis of development objectives, model design, and required model development. The analysis phase is carried out through the distribution of needs questionnaires to lecturers and students. In this study, 216 student needs analysis questionnaires and 17 teachers were randomly sent to five institutions in Bengkulu Province, especially to students and lecturers registered at the Faculty of Education.

Based on the results of the needs analysis conducted on students, it can be seen that this coding learning model has never been implemented. As many as 97% of students agree that 21st-century skills are needed, one of which is through coding-based learning. As many as 91% of students also agree that there is a need to redesign Speaking Learning by integrating it with coding-based learning. Based on the results of the interviews conducted, it can also be seen that when learning to speak in class, students feel that learning is monotonous. Students are only told to practice speaking on certain topics without engaging in any challenging learning activities.

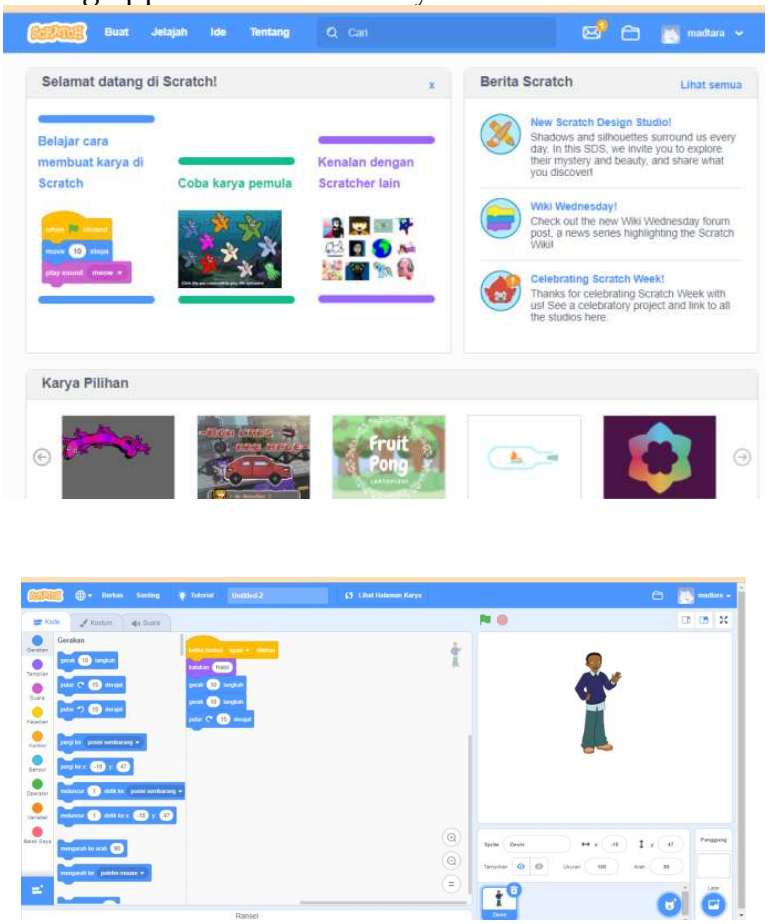
Based on the results of the needs analysis conducted for lecturers, it can be seen that the use of information technology in learning in the era of the Industrial Revolution 4.0 is urgently needed. This is in line with the times and paradigm shifts towards the use of technology in learning (Taufiqurrahman, 2019). All lecturers agree that 21st century skills are needed, one of which is through coding-based learning. As many as 94% of lecturers also agree that there is a need to redesign Speaking Learning by integrating it with coding-based learning. This is because lecturers find it difficult to find effective, innovative, and interactive learning models.

**Product Form of Development**

Coding learning designs take the form of instructions for how to use coding learning models. These instructions include information about the user's identity, how to use the model, learning achievement, learning objectives, facilities and infrastructure, achievement targets, meaningful understanding, critical questions, and a short explanation of the learning model. The next is the syntax flow of the learning model equipped with a learning experience framework. The framework is divided into pre-, during, and post-learning activities, manifested in apperception, exploration, collaboration, coding, and publication activities. Then, a description of the activities in each stage, containing the learning steps in each meeting, is added. The descriptions cover the areas of learning objectives, time allocation, facilitator (lecturer)

activities, student activities, activity planning, reflection, and assignments. In this stage, visualization in coding is carried out through various applications.

One coding application that is easy to use as shown below:




Picture 1. Example of coding application from Scratch

The procedure of coding learning consists of three stages, namely the pre-learning, during-learning, and post-learning stages. The pre-learning stage is to help students prepare by strengthening theoretical knowledge. There should be clear concepts and designs for speaking practice activities according to the lecturer's instructions. To help students understand better, the design of the coding to be visualized should be completed. In the learning stage, students perform speaking practice and visualize it in the form of code according to their needs. Students are allowed to use a variety of applications that are suitable for utilizing coding for learning. Coding in this activity serves as a medium to assist students in designing and explaining the flow of their ideas and notions expressed in their speaking performance. The post-learning stage provides opportunities for students to evaluate their performance through peer assessment. Lecturers may also provide input that encourages

students to improve the work they have done. The stages of learning in the speaking course are shown in Table 1.

**Table 1. The Stages of Learning in Speaking Course**

| Phase | - Activity |
|---|---|
| **Apperception** | - The lecturer asks students about their previous learning experience<br>- The lecturer provides questions to measure students' initial abilities<br>- The students show their critical thinking and answer the questions |
| **Exploration** | - The lecturer facilitates students to collect information as the resources for conveying their ideas in speaking performance<br>- The students make lists of ideas, do activities of reading, discuss, interview, and share experiences to help prepare a topic for speaking<br>- The students carry out initial activities through reading, writing, or speaking about the material/problems provided based on the speaking theory being taught<br>- The students compile a concept map/essay framework through draft coding |
| **Collaboration** | - The lecturer initiates various activities to share their understanding with other students (through discussion, collaborative, and cooperative activities), generates new information, and introduces coding applications as 21st-century learning innovations.<br>- The students are actively involved and focused on collaborative conversations that are in alliance with learning objectives.<br>- The students connect their sketches (of their previous experience, prior knowledge, attitudes, and skills) with other texts encountered in various life contexts and the use of computers as a medium in carrying out coding activities. |
| **Coding** | - The students consistently conduct writing activities by taking notes on their own ideas, experiences, and knowledge<br>- The students find strategies or techniques that can be used to improve their writing skills in various text genres |

| Phase | - Activity |
|---|---|
| | - The students apply theories of speaking skills to various types of speech<br>- The students input the command code in coding about the text created previously<br>- The students put the created products into production activities towards digitization by using coding<br>- The students optimize creativity through computational thinking<br>- The students try out and revise contents, such as letters, colors, and pictures for more innovative work |
| **Publication** | - The students publish their work to various platforms/media in the form of digital products accessible online<br>- The students carry out peer assessments with their classmates<br>- The lecturer appreciates the work through evaluation activities |

The social system involved in the implementation of the coding learning model for learning speaking skills is reflected in student collaborative activities. It can be realized through group activities during learning. Moreover, all students are free to express their thoughts, ideas, and opinions throughout learning activities through active communication with lecturers. Active interactions between the lecturer and students are expected to contribute to achieving learning objectives.

One of the principles of the coding learning model for speaking courses is that the lecturer serves as a facilitator and administrator. The lecturer manages learning in the classroom by providing feedback that encourages students to actively explore their own abilities and utilize technology as a medium for achieving learning goals. The support system for implementing the coding learning model in language courses, especially speaking skills, is that the lecturer provides student worksheets, teaching materials, and assessment guidelines to make it easier for students to meet their learning needs.

The instructional impact of the implementation of the coding learning model is higher learning and innovation skills, better digital literacy skills, more creative thinking computing skills, and more directed career and life skills. The additional impacts of the implementation of the coding learning model are the improved students' capacity in the areas of (1) creativity and innovation; (2) critical thinking, problem-solving, and decision-making; (3) computational thinking and metacognition; (4) communication; (5) collaboration; (6) information literacy; (7) information and communication

technology (ICT) literacy; (8) citizenship attitude; (9) life and career; and (10) personal and social responsibility, including awareness of competence and culture.

**Product Eligibility Validation Results**

At this stage, the product is developed based on the first draft from the development phase. The product is developed by referring to the results of student and lecturer needs analyses as well as the need for technology development. This activity aims to ensure that the learning model developed meets the learning objectives. Upon the completion of the development stage, the next phase was validating the product through expert and user validation tests. Expert validation tests were carried out by content, media, and language experts. The coding learning model was assessed and validated by content (AR), language (EY), and design experts (WP). The results of the product validation assessment helped the researchers determine the validity of the product. The product validation assessments conducted through questionnaires provided information on the level of product validity as well as criticism and suggestions for product improvement.

**Table 2. Validation Results of Content Expert**

| | Indicator | Validator | Qualification |
|---|---|---|---|
| **1** | Supporting theory of learning models | 5 | Very good |
| **2** | Background of model development | 5 | Very good |
| **3** | The purpose of developing the learning model | 5 | Very good |
| **4** | Description of the learning model | 4 | Good |
| **5** | The syntax of the learning model | 5 | Very good |
| **6** | The social system of learning models | 4 | Good |
| **7** | Learning model support system | 4 | Good |
| **8** | Learning steps | 4 | Good |
| **9** | Learning scenario | 4 | Good |
| **10** | Up-to-date bibliography | 5 | Very good |
| | **Total** | 45 | 45 |
| | **Percentage** | 90 % | Very good |

The validation tests of the product in this phase show positive outcomes, with the results of the expert assessments showing a percentage of 90% (very good). This result indicates that the developed product can be brought to the next stage, which is testing on users. Through user trials, some suggestions and criticisms are given for product improvement, especially in the area of learning stages that are expected to be more applicable and referring to Kurikulum Merdeka. Moreover, the description of the learning model should be improved, as it was too short to fully describe the coding learning model.

Media validation helped the researchers determine the validity or feasibility of the coding learning model development product from the perspective of the presentation. The media validation aspect measured user convenience. The results of the media expert validation are presented in Table 3.

**Table 3. Validation Result of Media Expert**

| No | Indicator | Validator | Qualification |
|---|---|---|---|
| **1** | Layout cover proportion | 5 | Very good |
| **2** | Conformity of color proportions | 5 | Very good |
| **3** | Image display | 4 | Good |
| **4** | Appropriateness of font type selection | 4 | Good |
| **5** | Title clarity | 4 | Good |
| **6** | Appropriateness of font size selection | 4 | Good |
| **7** | The attractiveness of the cover design | 5 | Very good |
| **8** | Size | 5 | Very good |
| **9** | Synchronization between graphic illustrations, visuals and verbal | 4 | Good |
| **10** | Ease of use | 4 | Good |
| **11** | Ease of interaction | 4 | Good |
| **12** | Ease of page search | 3 | Fair |
| **13** | Clarity and suitability of the language use | 4 | Good |
| **14** | Availability of examples and illustrations to clarify understanding of the material | 4 | Good |
| | **Total** | 59 | |
| | **Percentage** | 84% | Feasible |

The table shows that, based on the media evaluation, the coding learning model is in the feasible category. Some revisions from the expert are related to improving page numbers and changing the color of illustrations in some parts. The improvement was to ensure that the product is user-friendly and easy to comprehend. Language validation is also carried out to determine the feasibility of the coding learning model that has been created. Then, language validation is carried out to evaluate the appropriateness of the language used in the user manual to make sure it complies with the applicable rules and is also easy for readers to understand. The validation results show that the product is feasible with several suggestions and recommendations. Finally, the linguistic aspect of the activities to encourage critical thinking needs to be increased and multiplied since this learning model is used by students. Moreover, the motivating discourse also needs to be highlighted. The result of the language validation is presented Table 4 below.

**Table 4. Result of Linguistics Validation by Language Expert**

| | Indicator | Validator | Qualification |
|---|---|---|---|
| **1** | Sentence structure accuracy | 4 | Very good |
| **2** | Sentence effectiveness | 4 | Good |

| | | | |
|---|---|---|---|
| **3** | Terminology | 4 | Good |
| **4** | Understanding of messages or information | 4 | Good |
| **5** | Motivation increase | 4 | Good |
| **6** | critical thinking encouragement | 4 | Good |
| **7** | Grammatical accuracy | 5 | Good |
| **8** | Spelling correctness | 5 | Good |
| **9** | Term use consistency | 4 | Very good |
| **10** | Symbols or icons use consistency | 4 | Very good |
| | **Total** | 42 | |
| | **Percentage** | 84% | Feasible |

## DISCUSSION

The coding learning model is essentially a learning innovation that prioritizes 21st-century skills. 21st-century skills are realized to be able to improve and optimize learning situations in the face of globalization in the future (Mansir, 2020). Utilization of various literacy skills is also prioritized so that coding learning also integrates digital literacy with other language skills.

The development is based on a digital literacy model designed to equip students with the abilities to appropriately search, locate, sort, and understand information (Citraresmana et al., 2020). This model is designed to guide students toward independent and group learning through appropriate technology use. This model is also designed to help students learn independently, with the lecturer as a facilitator. Students are also required to be able to cooperate with other students.

The use of technology in the creative process, on the other hand, brings its own pleasure to students. Students who are familiar with technology in their everyday lives perceive technology-based learning as an interesting and engaging activity because learning through technology contains its own elements of interest (Fulton, 2012). Moreover, students' media literacy will increase along with the application of digital technology in impactful learning activities.

The coding learning design is recorded in the form of instructions for using the coding learning model, which contain things such as identity, instructions for use, competency achievement, learning objectives, facilities and infrastructure, achievement targets, meaningful understanding, trigger questions, and a brief explanation of the learning model. A learning experience framework that collects pre-learning, during-learning, and post-learning activities into apperception, exploration, collaboration, coding, and publication activities goes along with the syntax of the learning model. Product validation test results also show a high percentage, with criteria of 90% very feasible (material), 84% feasible (media), and 84% feasible (language). The assessment component is based on standards that have been

tested for validity and reliability so that the design of the coding learning model can fulfill the eligibility elements for use (Nieveen, 1999).

Coding learning for students can solve problems in new ways because games on computers use a visual programming language that will train logic (Nurhopipah et al., 2021) and children's thinking concepts so they are used to solving problems systematically (Popy Silvia, 2022). This proves that this skill is very important for students to have (Syamsudin, 2020), considering that students at the Faculty of Education are teachers, so learning coding will encourage imagination and creativity because, with this coding, you can make a game according to the ideas you have (Wijaya et al., 2023). So it can be said that computational thinking abilities develop when carrying out the coding learning process.

The integration of coding in the development of learning e-modules carried out by Fitriani et al. (2022) also showed that learning coding can solve problems in new ways because games on computers use a visual programming language that will train children's logic and thinking concepts (Nadila, 2021). Learning coding will encourage children's imagination and creativity because, with this coding, they can make a game according to the ideas they have. So it can be said that children's computational thinking skills develop when they are learning coding (Zahir et al., 2021). This is, of course, relevant to this research considering that they both integrate coding learning models into a teaching tool, namely modules and learning models.

The results of the development of coding-based learning that have been validated are followed by evaluation through initial trials on users. The tryout was carried out in one class at three tertiary educational institutions in Indonesian and English Education study programs. It is to provide evidence that this learning model can be used in language study programs.

The results of the evaluation show that the coding learning model that has been developed can be immediately implemented in class. The model designed to motivate students to be skilled in digital literacy increases students' enthusiasm for English-speaking courses. The employment of technology and learning innovations are the main attractions, so this model is interesting and useful to use. Speaking practice through this learning model is essentially the same as speaking practice using other methods. However, this model requires more effort, especially in the preparatory stage. Similar to other project activities, speaking practice is carried out through various preparations, from orientation to publication. Media coding serves as a tool to provide students with adequate media literacy.

The evaluation of the coding learning model is reflected in the four previous stages through formative evaluation, which aims to make accurate and fast improvements. In this final stage, an evaluation is carried out to measure the effectiveness of the coding learning model when it is

implemented to achieve the expected goals. Data is used to improve and refine the model to make it more effective and efficient. Tryouts were conducted in small groups, while field testing was on a large scale. The results of the tryouts and field testing serve as the basis for continuous evaluation for the improvement of the product.

## CONCLUSION

In conclusion, this study found: 1) In order for the speaking course to be able to support 21st century skill competencies, both the lecturers and the students will need to develop a coding-based learning model for the course. 2) This model consists of three primary activities: pre-learning, during learning, and post-learning. Within each of these three activities, there are five phases: perception, exploration, collaboration, coding, and publication. Because each one serves a unique purpose and performs a particular function, it is much simpler to put them into action. 3) The results of the validation test receive very high qualifications from subject matter experts and are suitable for linguists and media subject matter experts. This model is considered usable if it satisfies the standardization requirements of product development testing, as determined by the validation results.

This research and development were carried out in accordance with the procedures that were already in place; however, there were still some limitations, specifically the relatively short research time (four months), when in fact the implementation of this development research required a longer time so that it could be more optimal. The testing of the product only continued up until the point where the field trials were restricted to three campuses. The only stage of evaluation that was used for this research was the formative stage of evaluation, and its purpose was to reduce the number of flaws in the product and enhance the overall quality of product development.

In order to enhance coding learning models, the researchers propose several recommendations, including: 1) optimising research time; 2) conducting a thorough literature review to identify the limitations and potential of current models; and 3) engaging in collaboration with coding professionals to gain valuable insights and ensure practical relevance in the development of the model. By adhering to these recommendations, research and product development pertaining to coding learning models can be enhanced in terms of utility and innovation.

Innovations to improve 21st century competencies in tertiary institutions are the implications of the results of the research and development of coding learning models in learning to speak. This model makes it easier for students to use coding in a methodically and practically way, which will improve their communication skills. It is believed that the existence of a

coding-based learning model that is implemented in speaking course will help lecturers and students a great deal in the process of achieving the learning objectives. Students ought to become familiar with the coding learning model because it possesses its own unique allure and because doing so will allow them to maximize the brain's potential for productive activity.

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