Development of UTAYA: Implementing Snakes and Ladders Media for Contextual Teaching and Learning of Forces in Physics Education

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Abstract: Conventional learning and limitations in learning media made students passive in learning, which resulted in students' lack of interest in learning and achievement. This research aimed to develop innovative, technology-based instructional media, and to determine the validity and effectiveness of UTAYA, snakes and ladders media for contextual teaching and learning (CTL) of forces in fourth-grade. The research was developed using the Borg and Gall model. UTAYA was categorized as very appropriate for use with a validity percentage of 93% media experts, meaning that the media presented was interesting and appropriate to the content, easy to use by teachers and students, practical and fun, and had an appropriate appearance to the students' level of development and character, Content experts validated and assessed the accuracy of the content of the media in the very appropriate category with a percentage of 91%, which meant that the content presented was appropriate to the learning objectives and made it easier for students to understand the content. The forces topic content was covered entirety in the media, stimulated students' curiosity, which was appropriate to support learning and increase students' knowledge, it used of appropriate language, according to students' development. Based on the pretest and posttest results, UTAYA was effective to improve learning outcomes, as seen from the effectiveness of the t-test and Ngain tests. The t-test showed a Sig. <0.05, meaning there was a significant difference between learning outcomes before and after treatment. The N-gain test showed a medium criterion, 0.70 on a large-scale test, and a medium criterion, 0.64 on a small-scale test, that the students were very enthusiastic and could understand the lesson. From these results, UTAYA was valid and effective to be an instructional media to improve learning

Keywords: CTL; Elementary school; Instructional media; Snakes and ladders

Introduction

Education was an effort to educate and taught students' so that later students could develop their knowledge, from "not knowing" to "knowing" and from good to better. Education was an activity carried out by humans consciously and programmed to build a good personality and developed the abilities or talents that existed in human individuals to achieve certain goals or targets in life (Pratiwi et al., 2022). In Indonesia, education contained several subjects that students were required to master. One of the subjects was a natural science (IPA). In the curriculum currently used by Indonesia, namely the Merdeka curriculum, Indonesia's Ministry of Education and Culture Republic changed the IPA subject to IPAS (Natural and Social Science). The change of subject name was hoped to provide students with an understanding of two points of view: natural

and social science (Anjarwati et al., 2022). Through the IPAS subject, students were expected to understand natural and social science as well as process skill (Standar Asesmen Pendidikan Kementerian Pendidikan & Teknologi, 2022).

According to Ahmad Susanto in the Class Action journal, science was a human effort to examine the universe through precise vision and explained through the understanding obtained to then reach a clear and better conclusion (Nastiti et al., 2022). Natural Sciences (IPA) subject was always related to a way to find out about nature systematically. Science was not only mastering a collection of knowledge of facts, concepts, or principles but also a process of discovery, which was expected to be a means for students to know more about themselves and nature.

In the new curriculum, where science (IPA) and social (IPS) studies were combined into "natural and social sciences" (IPAS) subject, the implementation of this learning in elementary schools could not be separated from several problems (Masrifah & Setyasto, 2024).Among the problems that arose in the implementation of IPAS in elementary schools were that educators who found it difficult to sort and choose the approaches, models, strategies, and methods in learning, especially teachers who had difficulty integrating technology into science learning (Syamsudin et al., 2024) and teachers' inability to determine learning differentiation for each student (Marlensi et al., 2024). The implementation of science learning in schools was still mostly carried out conventionally (teacher-centered learning) (Samsudin et al., 2023). Lack of student involvement in the learning process occured because teachers did not provide opportunities for students to be directly involved in learning (Suhelayanti et al., 2023). These problems were due to several internal factors, which included students' attitudes towards learning, interest, learning motivation, study habits, and lack of self-confidence in following lessons, while external factors included the family environment or conditions, such as parental attention, and the school environment, such as the learning methods or models used by teachers that were less varied and innovative as well as learning support facilities, such as the use of teaching aids and instructional media that were less than optimal (Ameliya & Setyawan, 2020). This problem was also found in research, where many students struggled to understand science subjects, especially in forced content

Based on the results of questionnaires, interviews, and observations conducted by researchers at Jawisari Elementary School, it was found that several problems occurred with students and teachers, including the teacher-centered learning models or methods, the absence of scientific learning models where students did not play an active role, and conventional learning that

still lacked the used of concrete instructional media that made it difficult for students to understand science, especially in "Force Around Us" content. This problem occurred because teachers only used audiovisual media, displayed simple presentations containing only the same content in books, and lacked creativity in developing technology-based media, so it did not attract students' enthusiasm and interest in learning. These problems result in student learning outcomes in certain content that did not meet the existing assessment standard criteria, especially in "Force Around Us" content. Therefore, researchers conducted a study on instructional media and models that could influence the learning outcomes of fourth-grade students at Jawisari Elementary School.

In an effort to get good learning results, good quality learning was also required. The quality of learning required various efforts to make it happen, and each effort was related to components of learning, one of which was the use of instructional media (Hendra et al., 2018). The research results of Felton et al. (2001) showed that using media in the learning process could significantly increase the achievement of learning outcomes (Illiyin & Roesminisngsih, 2018). Apart from instructional media, learning models could also improved student learning outcomes (Nurrita, 2018), as stated in the Edunomika journal, where learning methods or models that were appropriate to the conditions of the students would make it easier for students to accept the content presented by the teacher (Lahir & Ma, 2017). Therefore, researchers intended to develop engaging instructional media and learning models appropriate to student characteristics.

Researchers would develop a game into a learning medium educational games were an effective tool or medium for improving academic achievement, problem-solving abilities, creative thinking, and developing students' independent learning abilities. Various studies showed that educational games, gamification, and the use of technology in learning positively impacted various aspects of education, including interest in knowledge, learning activities, understanding, motivation, satisfaction, and students' perceptions of the learning process (Usman et al., 2024). Educational games were unique and interesting media that could be used in the learning process (Patmanthara et al., 2019). Implementing games in learning was a way to create fun and meaningful learning. Piaget suggested that implementing games helped create a relaxed atmosphere through a fun and engaging activity crucial for students' knowledge construction (Vitoria et al., 2020). Educational games could be used in learning since technology has penetrated various regions (Jamalludin et al., 2023). Games in learning had several benefits for children, as stated by Nurhayati, the benefits of games

in learning were developing intellectual intelligence, developing emotional intelligence, developing creativity, increasing the students' creativity, being used as therapy, and developing students' multiple intelligences (Yudiyanto et al., 2023). In the study, the Snakes and Ladders game was chosen. The snake and ladders game was already known by children, and involved interaction, communication, and discussion between players, as stated by Sadirman et al, Every game must had four main components: the existence of a player, the existence of an environment in which the players interacted, the existence of game rules, and the existence of certain goals that are set to achieve (Yudiyanto et al., 2022). Snakes and Ladders was a traditional game that used dice in the game. Mukh explained that there was an interaction between learning styles and creativity toward cognitive and affective achievement by using the Snakes and Ladders game as a media (Meriyati et al., 2019). The Snakes and Ladders game could help increase students' physical-motor, language, intellectual, moral, social, and emotional development so that the games became a fun learning medium and developed students' attitudes about rules (Gultom et al., 2023). Snakes and Ladders game could be fun instructional media for students. Students would be interested in following the learning process. Students who were active in the game could discover the concepts of the content being studied because the method of using snakes and ladders was combined with group discussion (Saputra et al., 2019).

The learning model must be appropriate to the instructional media and researchers wanted students to have real experience and practice. Therefore, the contextual teaching-learning (CTL) was chosen as a learning model. Contextual Teaching Learning (CTL) was a learning concept that helped the teachers link the content with students' real-world situations and encouraged students to make connections between the knowledge they had and its application in their lives as members of the family and society (Yuberti, 2014). The Contextual Teaching and Learning (CTL) learning model was an educational process that could help students saw meaning in the academic content they studied by connecting academic content with the context of everyday life (Sapulete et al., 2023). The Contextual Teaching and Learning (CTL) learning model could be used to acquire 21st-century abilities such as teamwork, communication, creativity, and critical thinking (Akmal & Festiyed, 2023). Contextual learning aimed to enable students to actively use skills without losing their usefulness, as they attempted to learn various existing concepts while applying and correlating them to their life experiences (Buhungo et al., 2023) learning using contextual models provides great opportunities for students' thinking skills (Ningrum & Murti, 2023).

Contextual learning could encourage students to have a more positive attitude toward learning science. When students could relate the concepts, they had learned to real-life situations, which meant that they had inserted the context learned into the actual situation and transformed it into a life experience (Suryawati & Osman, 2018). Contextual teaching and learning methods were invaluable in encouraging the necessary match between science teaching and students' interest in learning. Through this concept, the purpose of the teaching and learning process was emphasized to facilitate students with real-world learning where students could relate their learning and experiences (Yasin et al., 2022). In the learning process using contextual teaching, the teacher carried out preliminary, core, and closing activities. In core activities, the teacher carried out exploration, elaboration, and confirmation

There were several relevant studies related to thos topic, including those conducted by elementary school teacher education students at Trilogi University, Jakarta, who developed the Snakes and Ladders game as instructional media on energy source contents for fourth-grade students in elementary schools showed that there was effectiveness, good quality, and suitability to use snakes and ladders as instructional media on energy source contents (Ester et al., 2022). Also explained in subsequent research by Prain et al. students from Wira Wacana Christian University, who developed the android-based snakes and ladders instructional media, stated that it was successfully implemented and motivated students (Rony et al., 2023). Also, research conducted by Ningsih, et al. elementary school teacher education students at Muhammadiyah University, Gresik who developed the snakes and ladders instructional media for animal classification contents in elementary schools stated that in this research, the media developed was valid and suitable for fourth-grade students in elementary schools (Ningsih et al., 2022). Therefore, based on previous studies, researchers chose the snakes and ladders as instructional media in this research, where researchers developed a creative, technology-based snake and ladders media.

The novelty of this learning media lied in its features, whereas the "snakes and ladders force" game focused on the "Forces around us" content, there were more interactive features equipped with audio, video, images, and animations in the form of interesting applications, equipped with buttons and audio commands, which could make things easier for students. Furthermore, the material menu contained materials and quizzes for each subchapter. This game also had study cards, magic cards, and question cards. This Android-based media can be operated anywhere and anytime, making learning easier for students.

Based on existing phenomena, researchers conducted studies on the topic of the development of CTL-based "snakes and ladders force" (UTAYA) instructional media to improve student learning outcomes on the content "Forces Around Us," to develop creative and innovative instructional media and also test the level of validity and level of effectiveness of instructional media, snakes and ladders force (UTAYA). Researchers would develop instructional media using the learning model to improve student learning outcomes. The implications of this research could help and made it easier for teachers to deliver content using fun media and learning models, improved the quality of learning science, and added insight to teachers regarding the use of media and learning models for science subject to improve students' understanding and learning outcomes.

Method

Research on the development of CTL-based "snakes and ladders force" (UTAYA) instructional media to improve student learning outcomes was designed using the type of research and development (R&D). According to Sugiyono (2017), R&D is a research method that aimed to produce certain products and tested the effectiveness of these products. In order to produce certain products, an analysis of needs was used to test the effectiveness of these products which would later be useful and used in the wider community. This was the reason why this research was needed to test the effectiveness of these products (Okpatrioka, 2023).
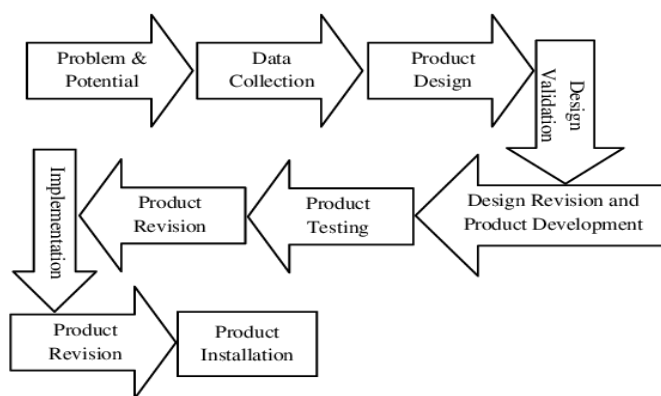

Figure 1. Borg and Gall development model

The development model used was the Borg and Gall development model as stated in Sugiyono (2013). The process of implementing development research consisted of 10 steps as follows; potential and problems, data collection, product design; design validation, design revision, product testing, product revision, trials, product revision, and mass production (final) (Assyauqi, 2020). This research was conducted at Jawisari

Elementary School, and the subject was 25 fourth-grade students (Oktaviani, 2021). A concept map for research implementation adapted to the Borg and Gall development model could be seen in Figure 1.

The data collection techniques used were interviews, questionnaires, validation sheets, document data and documentation, and data analysis using validity tests, which included validity and reliability tests. Different levels and discrimination power (Nurrita, 2018). After the final product stage and the data had been collected, further data analysis of the influence of instructional media on student learning outcomes was carried out. This data analysis aimed to determine whether the research hypothesis was accepted or rejected using the pretest and posttest results. The data analysis was the normality test to test whether the data was normally distributed. The normality test used was the Shapiro-Wilk test using SPSS 25 for small data (Quraisy, 2020). Hypothesis testing in this study used the t-test, while to determine the suitability of the media, the n-gain test in SPSS 25 was used (Nuryadi et al., 2017).

Result and Discussion

In this research, the product developed was an instructional media that applied the snakes and ladders game on the science content, "force around us." The application-based Snakes and Ladders game was chosen because it had benefits and did not bore students. Apart from that, by using the application to develop technology-based learning media that attracted interest and attention, students' enthusiasm for learning and learning outcomes also increased. The researchers used the R&D model with the Borg and Gall method as shown in Figure 2.

Potential and Problems

The first stage was potential and problems. This stage was the initial stage carried out by researchers to determine the potential problems that would be used for problem identification. In this stage, the author observed and interviewed class teachers about the learning process, curriculum, and learning media. After the results from this stage of the research were obtained, various problems were found in the learning process, such as a teacher-centered learning model like lectures, where it was found that it did not attract the attention of students and did not provide a learning experience, and then the lack of teachers' creativity in developing concrete learning media and technology-based learning. The lack of concrete learning media during learning activities caused students to have difficulty understanding the lesson. This decreased student learning outcomes, especially in one of the science content, "force around us."
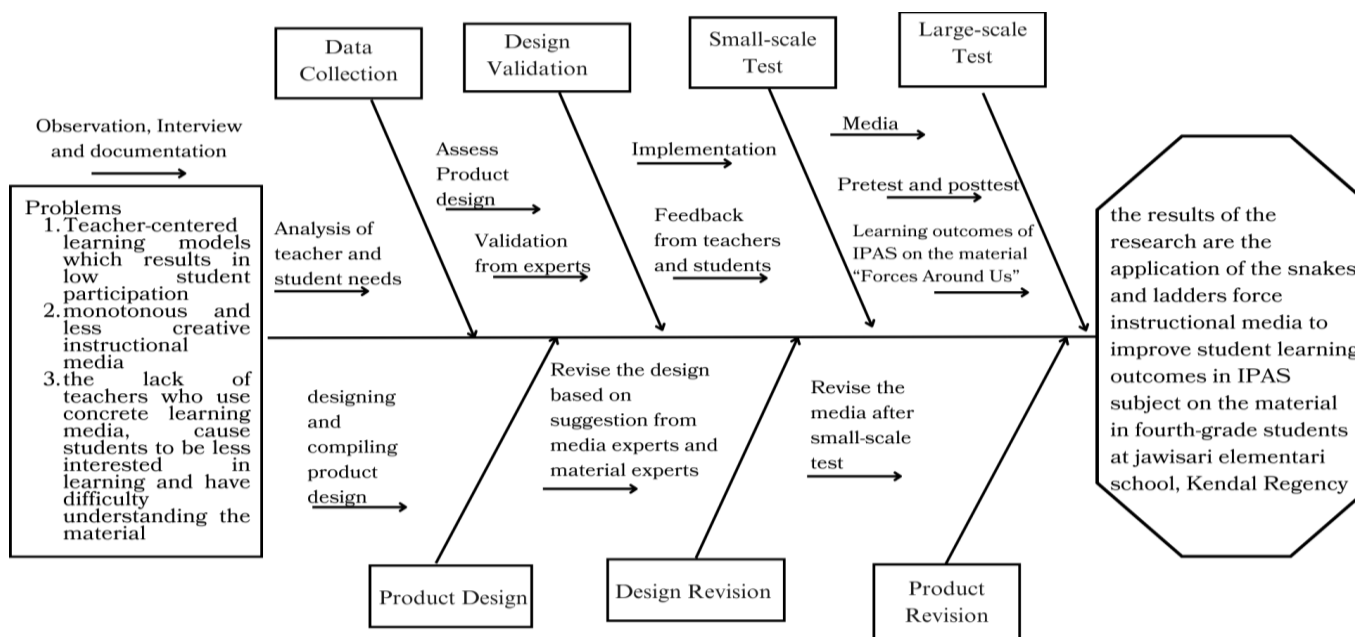
Figure 2. Borg and Gall development model

Initial Data Collection

The second stage was data collection. In this stage, observation and interviews with fourth-grade teachers at Jawisari Elementary School were carried out with the results stated that the learning model and learning media used in learning were not optimal and teachers still had difficulties in developing technology-based learning media. Apart from that, the needs of teachers and students were analyzed by distributing a questionnaire, where the results of the questionnaire stated that 62% of students had difficulty understanding science, 75% of students needed interesting media in learning, 41% of students were interested in learning while playing, and 58% of students agreed that the "snakes and ladders force" game was developed into a learning medium. Researchers also collected and looked for contents, modules, and learning tools for learning "Forces Around Us" content throughout the semester, which would be used to make the media products. The next stage was product design after collecting data with observation and interviews.

Product Design

This phase was carried out based on the results of data collection. Some of the designs made for this application. This application was adapted to the learning outcomes and learning objectives that would be achieved. This media was developed with an attractive design consisting of writing, audio, video, images, animation, and a Snakes and Ladders game that created using Adobe Animate cc and Canva. Those applications could be played offline or without an internet connection on a laptop or cellphone and had 6 menus in the application, such as user instructions, which contained

game instructions before starting the game, developer profile, and learning objectives that would be achieved using this media. There was a main content menu linked in the Canva application, as well as a menu for playing the Snakes and Ladders Force game. The results of the display design of the "snakes and ladders force" (UTAYA) game consisted of the following parts.

Figure 3. Cover

Figure 4. Main menu
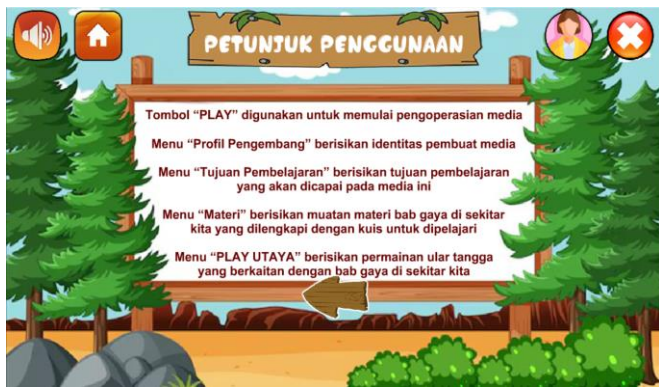
Figure 5. Instructions use

Figure 6. Instructions use

Figure 7. TP

Figure 8. Profile developer

Figure 9. Login game

In the Snakes and Ladders Force (UTAYA) application, there was a primary content that was connected to the Canva application, which contained four learning contents for the "Force Around Us" chapter which was equipped with a quiz for each content and could be seen in Figure 10 and Figure 11.

Figure 10. Content

Figure 11. Quiz

To play this game online, click "Play Utaya" which contained the game Snakes and Ladders Force that included dice, scores, game instructions, cards snakes, and Ladders Force (UTAYA), showed in figure 12.

Figure 12. Snake and ladder force game application (UTAYA)

Apart from these six menus, other elements such as letter size, font selection, color selection, and others according to the results of the data collection stage had also been prepared.

Design Validation

The next stage was design validation. After designing the learning media, the next stage was the content and media validation stage. The content and media validation stage were carried out by media expert validators and content experts. In this stage, the assessment process was carried out to determine the content, such as suitability for learning objectives and contents, media appearance, language, and writing in the media. For the assessment process, the researcher used a form of questionnaire based on a Likert scale using a rating scale of 1-4, and there were columns with suggestions and comments. This questionnaire had been adapted to the needs of the learning media being developed. After being assessed by an expert validator, there would be feedback regarding the product, so that researchers could revise the product being developed. The recapitulation results from the assessments of media expert validators and content experts could be seen in Table 1.

Table 1. The Recapitulation Results from the Assessments of Media Expert Validators and Content Experts

Aspect Feasibility	Validation Index (%)	Information
Media	93	Valid
Content	91	Valid

Table 1 showed that the media validation provided by media expert validators was 93% in the very appropriate category, and content validation by content experts was 91%. The average validation value obtained was 92%. So it could be categorized as valid as seen in the score above 70%, which was included in the valid criteria (Arikunto, 2018). The Snakes and Ladders force application was valid regarding content, appearance, media, and language and was ready to be tested. This finding followed the research from Ernawati (2017) and Sukardiyono (2017) who obtained a score of more than 70% in testing the validity of interactive learning media based on Arikunto scoring criteria so that the media developed was valid and could be used as learning media in the learning process (Ernawati & Sukardiyono, 2017).

Design Revision

After design validation, design revision was carried out after the researcher had been assessed by the content expert validator and media expert through the questionnaire provided, then the researcher revised the design according to the results of the suggestions and input provided by the content expert validator. Some of these revisions included the addition of concept maps to the content menu, re-adjusted examples of animated images in media related to daily life, adjusted learning objectives with evaluation question indicators in teaching modules, adjusted the writing of standard and non-standard, and adjustments to grammar and writing by KBBI (Indonesia Dictionary) rules. After revised the design, validation was carried out again to get improved scores. After design revision, the Snakes and Ladders Force (UTAYA) instructional media that was developed was categorized as very valid so that it could be tested in the field.

Product Trial

The next stage was product trial. Before the product trial, a test of the validity of the questions in the form of validity, reliability, level of difficulty, and differentiability tests were performed before the pretest and posttest questions. Based on the validity test, the results obtained with 25 out of 45 questions were declared valid and had good discrimination power. Product trials could be carried out after the design revision stage was complete. In the product trial, only 6 out of 25 fourth-grade students at Jawisari Elementary School were selected using the purposive technique to test the product. Six students were selected based on several categories: 2 students with the highest average score, 2 students with a medium average score, and 2 students with a low average score. In this product, the trial used a contextual teaching-learning model (CTL) based on snakes and ladders force (UTAYA) instructional media. Started with doing a pretest and ending with a posttest, students were very enthusiastic and understood the lesson about the force. This was proven by the results of the teacher response questionnaire, which was 63 out of a maximum score of 68 with a percentage of 92% which showed that this instructional media was very appropriate for use, and the results of the student response questionnaire were

96%, while the average pre-test result from 6 children was 65.33 and the average posttest result was 84.67, so the media and the instructional model developed were very good category that the student learning outcomes increased.

Table 2. Results of Teacher and Student Responses to Small-Scale Snakes and Ladders Force

Respondent	Evaluation (%)	Information
Teacher	92	Very practical
Learners	96	Very practical

Table 2 showed that the response of teachers and students to the CTL-based "snakes and ladders force" media had a very positive value as it obtained a score above 85%, so it could be concluded that the media was appropriate and effective for use in learning activities. This learning media was declared very positive and influential based on 17 Likert scale questions with the highest score of 4 on the teacher response questionnaire, while almost all of the 10 Gutmann scale questions got a scored of 1 on the student response questionnaire. Therefore, product revisions were carried out in small-scale trials.

Product Revision
Product revision, after conducting test on the product and getting improved learning outcomes, the media was appropriate for use. Then after a good response from students and teachers, revisions were not made to the media.

Effectiveness of Trial Use of Snake and Ladders Force Instructional Media Products
Usage trial, after product revision, the researcher conducted a large-scale usage trial which was attended by 19 students at Jawisari Elementary School. The researcher carried out the learning process using the same instructional media and learning methods as the product trial, starting with a pretest which was carried out before learning using UTAYA instructional media and contextual teaching learning (CTL) models and ended with a posttest test after the learning activities were completed. In this usage trial, the average pretest result was 70.73 and the average post-test result was 89.68. As seen from the results of the pretest and posttest, students experienced increased learning outcomes, were enthusiastic and understood the content well. Apart from that, the results of the recapitulation of teacher response questionnaires were 65 out of a maximum score of 68 with a percentage of 95% teachers found it helpful and stated that it was very appropriate for instructional media because it could be used without an internet connection, while the results of the recapitulation of student response questionnaires were 98%.

Table 3. Results of Teacher and Student Responses to Large-Scale Snakes and Ladders Force

Respondent	Evaluation (%)	Information
Teacher	95	Very practical
Learners	98	Very practical

Table 3 showed positive teacher and student responses to learning media scored above 85%. Based on research and questionnaires regarding teacher and student responses to this media that had been carried out, it could be concluded that this media was effective and appropriate for use in learning activities (Agustin et al., 2024). Apart from that, based on the results of the teacher and student's responses to the questionnaire from small and large scale tests, it had an average of 93.5% of teacher responses and 97% of student responses were categorized as a very good category, These findings aligned with the previous research, which found that the teachers' responses to the questionnaires with a Likert scale obtained 81%-100% and were categorized as very good, as well as the students' questionnaires with the Guttman scale obtained 75%-100% and were categorized as very good; hence, it showed that the Snakes and Ladders Force media was practical and appropriate to use in learning activities (Basri & Al-Asasiyya, 2022). Based on these results, it could be concluded that the Snakes and Ladders Force (UTAYA) instructional media could be used in the learning process to improve student learning outcomes, especially in learning science on "Forces Around Us" content.

The final product, after going through several stages from the content expert validation stage, media, revision, validity test to test the effectiveness of the instructional media, it could be recommended as a companion for learning science and content, especially on "Forces Around Us" content, the final product of this research was the Snake and Ladder Force (UTAYA) instructional media application. This learning media was quite effective and appropriate for use to improve student learning outcomes.

Data analysis, after carried out trial use, the researcher carried out data analysis such as normality test, t-test, and n-gain test to determine the effectiveness and suitability of the instructional media through the pretest and posttest results that were obtained. Normality test, this test aimed to find out whether the data was normally distributed or not. In this normality test, the Shapiro-Wilk SPPS 25 test was used. This is because the Shapiro-Wilk method was an effective and valid normality test method used for small samples. Data on normality test results from all students showed

the student's pretest and post-test result data. Each obtained a significance result > 0.05. The significance result of the pretest was 0.014 and the posttest was 0.020 with a significance of 0.05 (5%). The criteria of the test was that if the significance value > 0.05, then the data was normally distributed, so it could be concluded that the data from the pretest and posttest results were normally distributed. Next, the t-test was tested to determine the difference in the average learning outcomes of all students and to see if the learning outcome improved. This t-test used and processed data from the pre-test and post-test results in the SPSS 25 application. The recapitulation results from the pre-test and post-test, small-scale and large-scale test, could be seen in Table 4 and Table 5.

Table 4. Pretest and Posttest Results of Students on Small-Scale Product Use Trial

Test Type	Average	Average difference
Pretest	65.33	19.34
Posttest	84.67	

Table 5. Pretest and Posttest Results of Students on Large-Scale Product Use Trial

Test Type	Average	Average difference
Pretest	70.73	18.95
Posttest	89.68	

The analysis technique used was two samples with the Analyze Step > Compare means > Paired sample t-test. Data from the t-test showed the results of Sig. (2-tailed) of 000 or Sig. (2-tailed) < 0.05 (Sukarelawa et al., 2024), meaning that the pretest and posttest data results had a significant difference, and the pretest and posttest results on small-scale obtained were h 15,122 and b, 2.571, where h is greater than b. Therefore, ha was accepted, with a significant value of 0.000, which meant less than 0.005, while large-scale test were obtained h 18,812 and b 2.101. So, the t-value and significance value proved that ha was accepted and ho was rejected; it showed that there was an influence in the use of the Snakes and Ladders Force (UTAYA) instructional media on learning outcomes in the social sciences material, "Forces Around Us" in fourth-grade students in elementary school.

N-gain test, this test was used to determine the effectiveness of using a media or method, this n-gain test also used the results of the pretest and posttest, with the following calculation formula:

$$N - gain = \frac{Skor\ posttest - skor\ pretest}{SMI - Skor\ Pretest} \quad (1)$$

Information: N – gain= Coefficient N – gain, Pretest score = the average score on the pretest, Posttest score =

Total average score on the posttest, and SMI = Maximum Ideal Score.

SPSS 25 was used to carry out this n-gain test. The data from the n-gain test results could be seen in Table 6 and Table 7.

Table 6. Small Scale N-gain Test Result

Average difference	N-gain	Criteria
19.34	0.64	Medium

Table 7. Large Scale N-gain Test Result

Average difference	N-gain	Criteria
18.95	0.70	Medium

Based on the results of the N-gain test on the SPSS 25 application, the large-scale n-gain score was 0,70. The N-gain percentage was 70%, meaning the data showed a moderate N-gain score category. The effectiveness of the media and learning models in the category was quite adequate, with an average increase of 0.70 and a difference in the average results post-test and pre-test of 18.95, which was included in the medium criteria. Meanwhile, on a small scale and 19,34 with an N-gain of 0.64, which was classified as medium criteria, based on the results of the N-gain test on a small scale and large scale, an average of 0.64 was obtained, which meant that the effectiveness of this media within the medium criteria. By the criteria where there were 3 criteria for the N-gain results, namely N-gain ≥ 0.70 was in the high category, 0.30 < N-gain < 0.70 was in the medium category, and N-gain ≤ 0.30 was in the low category (Hake, 1998; Sukarelawa et al., 2024), These results were supported by research from Auliyawati (2023) and Fajar (2023) about the Snakes and Ladders learning media to increase elementary school students learning motivation in science content, where it showed that the results of N-Gain, the Snakes and Ladders learning media were in the moderate category (Wati, 2021), so it could be concluded that Snakes and Ladders media was effective as a supporting media for science content.

Learning media had advantages and disadvantages, just as in the Snakes and Ladders Force (UTAYA). One advantage of this learning media was that it could make learning more fun and increase enthusiasm and interest because students could also learn while playing and practicing directly. Apart from that, this learning media could be used without an internet connection and could be downloaded on a laptop or Android phone, while the downside of this application was that the main content menu required an internet connection because it was connected to Canva. Only laptops with Windows in them could download this application.

Conclusion

Based on research on Snakes and Ladders Force (UTAYA) products developed using the Borg and Gall model, positive responses from teachers and students and very good product quality were obtained. UTAYA instructional media was categorized as very appropriate, with a validity percentage of 93% of media experts. This meant that the media presented was interesting and appropriate to the material, easy to use by teachers and students, practical and fun, and also appropriate to the student's level of development and character. Besides, material experts validated and assessed the accuracy of the content of the media, which had a percentage of 91% with a very good category. This score meant that the material presented was appropriate to the learning objectives and would make it easier for students to understand. In addition, the "Forces Around Us" material was covered in the media, stimulating students' curiosity, which was appropriate to support learning and increase students' knowledge, using appropriate language, according to students' development. Moreover, the t-test showed the value of Sig. < 0.05. This meant that there was a significant difference between learning outcomes before and after the media implementation. The N-gain test showed that the score increased by 18.95 with an N-gain value of 0.70, which was classified as a medium criterion. Meanwhile, on a small scale, the increase was 19.34 with an N-gain value of 0.64, which was classified as medium criteria; this meant that the media was effective and very appropriate to use as a learning media as it could improve student learning outcomes and increase student enthusiasm and interest in learning. Based on the results of the response questionnaire distributed, a very positive response was obtained from teachers and students. From these results, it could be concluded that CTL-based "Snakes and Ladders Force" (UTAYA) instructional media on "Forces Around Us" material was feasible and quite effective to use as a science instructional media on" Force Around Us" material to improve learning outcomes.

Author Contributions
Riska Kartikaningrum contributed to the creation of articles from the beginning to the end, such as developing products, analyzing data, and writing articles. Petra Kristi Mulyani is a supervisor for research activities and article writing.

Conflicts of Interest
There was no conflict of interest.

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