

Development of Web Based Secret Snake Ladder Media for Learning to Make Simple Mandarin Sentence

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Abstract: Mandarin is increasingly significant in the global and bilateral context between Indonesia and China. However, students often face challenges in mastering basic vocabulary essential for forming simple sentences. This study aims to develop an interactive web-based learning media called "Secret Snake Ladder" to support Mandarin vocabulary learning for 11th-grade students. The media was designed using the 4-D development model (Define, Design, Develop, Disseminate) and validated by experts in media, content, and language. Validation results indicate that the media is highly feasible for use, with an average score of 100%. Trials with students showed positive responses, achieving an effectiveness rate of 98%. This media not only enhances vocabulary acquisition but also motivates students through interactive gamification. With its accessibility and flexibility, Secret Snake Ladder serves as a modern and relevant solution for Mandarin language learning in the digital era.

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Introduction

Language is one of fundamental aspects that is unique to humans and not shared by other creatures. Noermanzah (2019) states that language has metaphysical and material dimensions, in addition to its function as a communication tool. This shows that language not only functions for interaction but also for conveying deeper thoughts and feelings. In this context, language reflects the human ability to form complex social relationships and think abstractly. Mandarin is the national language in China. Based on the Statistika Education and Science page published in 2024 regarding "The Most Spoken Language Worldwide in 2023," Mandarin ranks second as the most widely used language in the world after English as an international language.

The teaching of Mandarin in Indonesia is becoming increasingly important in line with the development of bilateral relations between Indonesia and China. The education cooperation agreement signed by both countries in 2013 further strengthens the position of Mandarin as one of the foreign languages that need to be studied in various educational

institutions in Indonesia, as recorded in data from Kemdikbud.go.id. According to Zhu (2016), Mandarin is very important for education and international communication, especially in countries with close economic ties to China, such as Indonesia. Handoko (2019) explains that proficiency in Mandarin is a valuable asset in the workforce, especially in the fields of trade, technology, and tourism, given the dominant interactions with China. Although Mandarin offers many advantages, learners often face various difficulties in learning it. These difficulties are primarily caused by the lack of basic vocabulary, which is the main foundation for constructing simple sentences, such as in the topics of greetings and self-introduction. In addition, the difference in the structure of Mandarin and Indonesian, as well as the pronunciation of tones that can change the meaning of words, also poses a challenge. The lack of interactive learning media is an additional obstacle, as students find it difficult to connect lessons with real-life experiences. Some students also feel anxious or afraid of making mistakes when speaking or writing, which makes them less confident in practicing.

Mandarin is known for the complexity of Hanzi characters and differences in pronunciation, making it difficult for students to memorize and use vocabulary to form simple sentences in Mandarin. Yulianto & Wang (2021) revealed that students in Indonesia often face difficulties in mastering Mandarin vocabulary due to the differences in linguistic structure and writing system, which are very different from Indonesian. Mandarin is estimated to have around 52,000 words, but only about 29,000 words are frequently used in daily life (Sitaresmi, 2024). The first important thing in learning a foreign language is understanding each vocabulary in that language, because vocabulary is the foundational basis of a language. Miraj (2015) explains that vocabulary is an important foundation in the development of listening, speaking, reading, and writing skills. If learners do not have a strong vocabulary foundation, they will have difficulty understanding the language and expressing themselves effectively. Learning a foreign language, especially Mandarin, is often considered difficult and complicated, which creates a sense of fear for learners. Therefore, an interesting, effective, and efficient learning method is needed. Hanzi characters not only function as units of meaning but also as units of sound, which adds to the difficulty in memorizing and applying them. According to Dasion (2023), the characteristics of Hanzi writing lie in the shape, order, and number of strokes of the characters.

The use of interactive media in Mandarin vocabulary learning can impact learners' ability to construct Mandarin sentences, which requires a deep understanding of grammatical elements such as 主语 (Zhǔyǔ) or subject, 谓语 (Wèiyǔ) predicate, 宾语 (Bīnyǔ) object, 状语 (Zhuàngyǔ) adverbial, and 补语 (Bǔyǔ) complement. Simple sentences can be formed with just a subject and a predicate, such as in the sentence 我吃饭 (Wǒ chī fàn), which means "I eat," or 我们学习 (Wǒmen xuéxí), which means "We study." However, to create more complex and specific sentences, additional elements such as objects and adverbials are needed, as in the sentence 我们在图书馆学习 (Wǒmen zài túshūguǎn xuéxí), which means

"We study in the library." In this case, the locative phrase 在图书馆 (zài túshūguǎn) provides additional information that clarifies the context of the sentence. The web-based Secret Snake Ladder media is an adaptation of the traditional snake and ladder board game with interactive digital elements designed to support vocabulary learning and the construction of simple sentences in Mandarin. Mujtahidin (2024) explains that the snake and ladder game is played by two or more people with a board that has small squares as needed and is equipped with images of ladders and snakes. Secret Snake Ladder, a web-based game, is an adaptation of the traditional snake and ladder board game, enhanced with interactive digital elements to support vocabulary learning and the construction of simple sentences in Mandarin. Web-based means a system, application, or media designed to run over the internet and accessed using a browser such as Google Chrome, Mozilla Firefox, or Microsoft Edge. Web-based media do not require software installation on the user's computer, as all functions and data are accessed directly through a server connected to the internet.

As a web-based medium, this media can be accessed through a browser without the need for software installation, thus offering practicality, flexibility, and ease of updates. In learning, web-based media allows access to materials and features at any time, supporting interaction between students, teachers, and computers both individually and in groups (Supriyono, 2014). The development of this project uses the 4-D model (Define, Design, Develop, Disseminate), which ensures that the product is valid, practical, and effective through validation and iterative development and allows for wider dissemination. The main focus of this media is not only to introduce vocabulary but also to train users in understanding the context of vocabulary usage through enjoyable interactive and competitive challenges. This makes the learning media more engaging and relevant to the needs of modern digital learning.

The first research was conducted by Aisyam and Umi Baroroh (2019) with the title Development of Snakes and Ladders Game Media in Arabic Language Learning. The research results show that the snakes and ladders game media in Arabic language learning received very good evaluations, with student responses in field trials also rated positively, and contributed to improving learning outcomes. The second study was conducted by Anis Na'il Fulka Bia'yuni (2021) with the title Development of Snakes and Ladders Board Game for Teaching Vocabulary. This study concludes that the snakes and ladders media is suitable for use in learning and can enhance student motivation and engagement, although it is less appropriate for online learning. The third study comes from Zakiah N. Harahap (2023) and is titled Development of Monopoly Game Media in Visual-Based Arabic Language Learning to Improve Vocabulary Mastery. The results of this study highlight the effectiveness of the Monopoly game as a tool for learning Arabic vocabulary, which is capable of increasing students' interest, engagement, and motivation in learning.

The novelty of this research lies in the development of the web-based Secret Snake Ladder media, which adapts the snake and ladder game into an interactive digital format specifically for vocabulary learning and simple sentence construction in Mandarin. Unlike previous research that focused on physical-based learning media or was less optimal for online learning, this media utilizes web-based technology to provide access flexibility,

interactivity, and gamification features. With this approach, this research not only enhances student motivation and engagement but also provides a modern solution that is relevant to the needs of digital learning in the technological era. The web-based Secret Snake Ladder learning media was developed as an interactive tool to support vocabulary learning and the construction of simple sentences in Mandarin. By integrating web-based technology, this media offers a fun and flexible learning alternative, allowing students to learn anytime and anywhere. Through interactive features that combine educational and gaming elements, Secret Snake Ladder is designed to enhance vocabulary comprehension, train the ability to construct simple sentences, and motivate students to learn independently and creatively, making it a modern solution for Mandarin language learning needs in the digital era.

Research Method

The research method in this study uses a quantitative approach with the 4-D development model (Define, Design, Develop, Disseminate) developed by Thiagarajan. This approach was chosen to ensure that the developed learning media meets the standards of validity, practicality, and effectiveness in the learning process. Sugiyono (2009) explains that the R&D (Research and Development) method is a method used to produce certain products and test the effectiveness of those products. Through this testing process, the product can be optimized to better meet user needs or existing conditions. The R&D approach also allows for continuous improvement through an iterative process based on trial results and user feedback.

This research was conducted involving eleventh-grade students of SMA Muhammadiyah 10 Surabaya as research subjects. The data collection process was carried out systematically through several stages, starting from media validation by experts, implementation, and field trials. This stage aims to ensure that the developed media can be used optimally by educators and learners. Validation is carried out by subject matter experts and media experts to assess the quality of content, design, and usability of the media in the learning process. After the validation stage, the media is then implemented and tested on a limited scale to identify strengths and weaknesses before further dissemination.

In this study, data were collected using three main types of instruments, namely validation sheets, questionnaires, and test sheets. The validation sheet is used to evaluate the feasibility of the learning media based on input from subject matter experts and media experts. The questionnaire was developed to measure the responses of students and educators regarding the ease of use, design, and benefits of the media in learning. In addition, the test sheet is used to measure the effectiveness of the web-based Secret Snake Ladder media in improving students' mastery of Mandarin vocabulary.

The data analysis process was conducted using quantitative descriptive analysis techniques to observe the trends in validation results, user responses, and the improvement in student learning outcomes. Data from the validation sheet were analyzed using the percentage of feasibility scores to determine whether the media met the validity criteria. Student and teacher responses from the questionnaire were analyzed using descriptive statistical techniques to determine the level of acceptance and ease of use of the media in learning. Meanwhile, the test results were analyzed to measure the improvement in students' abilities before and after using the web-based Secret Snake Ladder media.

Through the combination of data collection and analysis methods, this research is expected to provide a comprehensive overview of the contribution of the developed learning media to the Mandarin language learning process. The results of this research can also serve as a basis for further development in the application of interactive digital media as an innovative solution in foreign language teaching, particularly Mandarin.

Result and Discussion

The development of the web-based Secret Snake Ladder media was carried out using the 4-D development model (Define, Design, Develop, Disseminate) designed by Thiagarajan. In the first stage, which is the definition stage, a needs analysis was conducted that included identifying problems in Mandarin vocabulary learning. Based on the initial survey of 21 eleventh-grade students at SMA Muhammadiyah 10 Surabaya, it was found that many students had difficulty memorizing vocabulary and constructing simple sentences. The analysis of students' academic abilities was conducted by referring to the odd semester final exam scores for the 2024/2025 academic year, where the lowest score obtained by the students was 40, and the highest score was 88, with an average final exam score of 67.05. Next, in the task analysis, the researcher also examines the reference books or Mandarin language textbooks used at SMA Muhammadiyah 10 Surabaya.

The second stage is the design stage. the main objective of this development phase is to design and develop effective, engaging, and needs-based learning media for students learning Mandarin, particularly in terms of vocabulary and sentence construction in Mandarin. This design involves several important elements that will support the success of the developed learning media. The selection of the web-based Secret Snake Ladder media aims to provide an interactive, enjoyable, and easily accessible learning experience for students. This media is designed to enhance students' motivation in learning Mandarin, particularly on the topic of greetings and self-introduction. The initial design of the web-based Secret Snake Ladder media was created in the form of a prototype, which serves as a detailed representation of the elements and visuals of the media. According to Kristiyani (2014), a prototype is the original type, form, or example of something used as a reference or standard for things categorized similarly. Here is the prototype of the web-based Secret Snake Ladder media.



Figure 1 Opening page of Secret Snake Ladder.



Figure 2 Rules of the game page.



Figure 3 Learning objectives page.

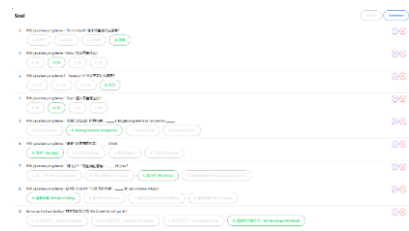


Figure 4. Question input page.



Figure 5. Game Board Page.

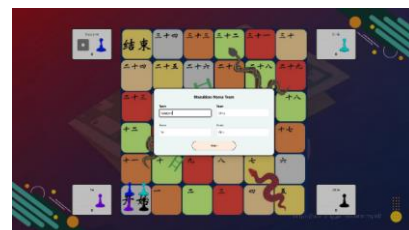


Figure 6. Entering team name.

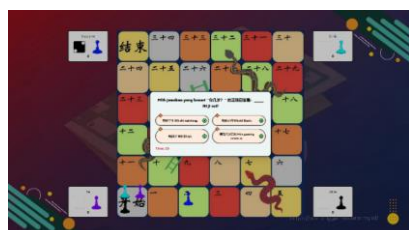


Figure 7. Presentation of multiple choice question.

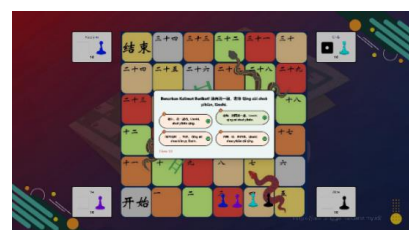


Figure 8. Display if the question is correctly.



Figure 9. Display if answered question is incorrectly.

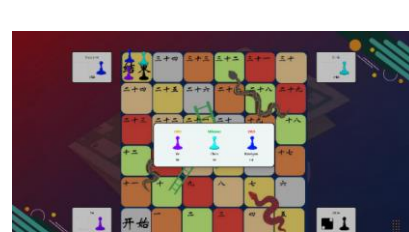


Figure 10. Winner display.



Figure 11. Display of "Main Lagi" and "keluar" option.

The web-based Secret Snake Ladder media was developed with various key elements, such as an opening page, game rules, learning objectives, and an interactive game board. The game design includes multiple-choice questions and sentence creation based on specific vocabulary, with a direct feedback feature to help students correct their answers. Competitive

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game elements are integrated to enhance students' motivation in learning. With the combination of technology and interactivity, this media is expected to make the learning process more engaging compared to conventional methods.

The third stage is the development stage, which involves a series of systematic steps that researchers must undertake to ensure the quality of the digital-based Secret Snake Ladder media. This process includes the validation assessment of the web-based Secret Snake Ladder media by experts, media trials with students, response assessment questionnaires for students and educators, and the effectiveness results of the web-based Secret Snake Ladder media. The assessment results from expert validators indicate that the web-based Secret Snake Ladder media has an average score of 100%. The score indicates that the web-based Secret Snake Ladder media is very suitable for use in vocabulary learning to create simple Mandarin sentences at the XI grade level in high school.

Table 1. results of expert validator assessment

Expert Validator	Percentage	Average	Category
Assessment	Score	Percentage	
Media Expert Validator	100%	100%	Very Strong
Material Expert Validator	100%		
Language Expert Validator	100%		

After the validation test by experts, the next stage is to conduct the first practitioner trial involving Mandarin language teachers at SMA 10 Muhammadiyah Surabaya. In addition, a small-scale trial was conducted involving 9 students categorized by their Mandarin proficiency levels, namely 3 students with high Mandarin proficiency, 3 students with medium Mandarin proficiency, and 3 students with low Mandarin proficiency. This trial aims to evaluate the effectiveness of the Secret Snake Ladder media in the context of classroom learning, as well as to obtain feedback regarding the acceptance and use of the media by practitioners and students with different levels of proficiency. From the results of the educator response questionnaire, a percentage of 100% was obtained, and from the student response questionnaire, a percentage of 98% was obtained; both response questionnaire results fall into the very strong category. It can be concluded that the use of the web-based Secret Snake Ladder game media, which has been implemented as a practical interactive digital game, helps and facilitates students in the learning process.

Table 2 Results of the Educator and Student Response Assessment Questionnaire

Instrument	Results Assessment Questionnaire	Percentage
The Educator Response Assessment Questionnaire	44	100%
The Students Response Assessment Questionnaire	427	98%
Category		Very Strong

The effectiveness test through student test results was conducted after the learning process by applying the Secret Snake Ladder media during 3 meetings. The effectiveness questionnaire for student responses was prepared and administered with the aim of collecting data on students' perceptions and responses to the web-based Secret Snake Ladder learning media that has been used in the classroom learning process. This questionnaire is designed to measure how effective the media is in helping students understand the material, improve their Mandarin language skills, and provide an engaging and interactive learning experience.

The vocabulary comprehension test for constructing simple sentences in Mandarin was conducted in the third meeting. The questions given in the test consist of multiple-choice and essay questions that have been previously validated by the material team. The results of the students' work are analyzed based on specific criteria. After the students' test scores were obtained, the researcher calculated the mean score to evaluate the effectiveness of the web-based Secret Snake Ladder media. Here are the test results and the level of vocabulary comprehension of the students in constructing simple Mandarin sentences.

Table 3. Result of the student test

NAME	INITIAL SCORE	TEST SCORE
AJP	40	80
DAF	40	100
PO	40	80
FA	50	94
IA	50	95
PA	60	100
NAP	70	85
QAP	70	100
SSA	70	89
AA	75	85
AFR	75	88
AMZ	75	85
AZI	75	100
BHA	75	85
DAKW	75	100
DKS	75	85
KF	75	100
KNA	75	90
TAR	75	95
PA	80	83
NIB	88	95
AVERAGE	67,05	91,14

Based on the table, the ability to understand vocabulary for constructing simple sentences in Mandarin using the web-based Secret Snake Ladder media among 21 students in the XI Soshum class at SMA Muhammadiyah 10 Surabaya obtained an average score of

91.14, which rounds to 91. This indicates that the level of vocabulary understanding for constructing simple sentences in Mandarin using the web-based Secret Snake Ladder media falls into the effective category with a percentage of 73%.

The Dissemination Stage was conducted on a limited basis at SMA Muhammadiyah 10 Surabaya, specifically for 11th-grade Social Science students and Mandarin language teachers. Further evaluation of the aspects of validity, practicality, and effectiveness showed very positive results. Students gave a satisfaction percentage of 90%, with game elements such as virtual dice, pop-up questions, and interactive design being the most favored features. Teachers also consider this media innovative and in line with technology-based learning in the Merdeka Curriculum.

The results of this study indicate that the development of the web-based *Secret Snake Ladder* media is valid, practical, and effective in enhancing students' mastery of Mandarin vocabulary and their ability to construct simple sentences. This is supported by the expert validation results, which reached 100% across media, material, and language assessments. Student test scores also showed significant improvement, with the average score increasing from 67.05 to 91.14. These findings affirm that the use of interactive and gamified learning tools can have a substantial positive impact on student learning outcomes, particularly in language acquisition, as also suggested by Miraj et al. (2019), who emphasized vocabulary mastery as a core component of language proficiency.

In addition to quantitative results, qualitative feedback from students and educators further supports the media's effectiveness. Students reported higher motivation and engagement due to the media's visual appeal, interactive design, and gamification elements, such as virtual dice, pop-up questions, and immediate feedback. Educators found the media easy to implement and aligned with the Merdeka Curriculum's emphasis on student-centered, digital-based learning. These results align with the findings of Aisyam & Baroroh (2019), Bia'yuni et al. (2021), and Harahap (2023), who each demonstrated that game-based learning, especially board games like snake and ladder or monopoly variations, could effectively improve vocabulary acquisition and student engagement in language learning.

From a theoretical perspective, this study is grounded in Vygotsky's sociocultural theory, particularly the concept of the Zone of Proximal Development (ZPD) and scaffolding. The *Secret Snake Ladder* media serves as a form of scaffolding that guides learners progressively through vocabulary mastery by combining challenge and support. According to Vygotsky, learning is most effective when students are provided with support that matches their developmental level. The competitive and interactive nature of the game supports collaborative learning and social interaction, which are key elements of Vygotsky's theory. Moreover, the media design resonates with the cognitive load theory, where multimedia learning helps to reduce unnecessary cognitive load and facilitates meaningful learning (Sweller, 1988).

Compared with previous studies, this research contributes novelty by integrating the traditional board game concept into a fully web-based platform, which enhances accessibility and aligns with current technological trends in education. While Bia'yuni (2021) noted that traditional game media may be less suitable for online learning, the current study addresses this limitation through web-based deployment, ensuring broader usability. The *Secret Snake*

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Ladder not only functions as a vocabulary drill but also facilitates contextual understanding of Mandarin sentence structure, a dimension often overlooked in prior research. Therefore, this media offers an innovative approach that merges theory, technology, and pedagogy for effective Mandarin language instruction.

Conclusion

Using of web based secret snake ladder media in mandarin learning for students eleventh-grade SMA Muhammadiyah 10 Surabaya proven effective in improving vocabulary mastery and the ability to construct simple sentences in Mandarin. The results of small and large-scale trials show that this media is easy to use and capable of helping students memorize vocabulary and construct sentence structures more systematically. In addition, the use of this media significantly increases students' learning motivation. Based on the data analysis results, the average test scores of students increased from 67.05 to 91.14, indicating the effectiveness of the media in supporting the learning process. Student responses to the use of this media reached 90%, confirming that the web-based Secret Snake Ladder provides an interactive, enjoyable, and needs-based learning experience for students studying Mandarin.

From the aspect of validity, this learning media meets the criteria with an average validity score of 100%. In terms of practicality and effectiveness, this media is also deemed suitable for use in learning, with an effectiveness rate reaching 73%. Thus, the development of the web-based Secret Snake Ladder can be used as an innovative alternative learning media to support vocabulary mastery and the ability to construct simple sentences in Mandarin for 11th-grade high school students.

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