# Development of an Educational Game Utilizing Construct 2 for Learning German Vocabulary

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**Abstract.** In order to improve the process of learning German language, the primary focus of this research is on the creation of an educational game that applies the use of Construct 2. This study aims to create an engaging and less boring learning medium that enhances vocabulary acquisition. This is in light of the fact that in today's globalized world, it is of critical importance for individuals to be able to communicate their thoughts in a foreign language. Empathize, Define, Ideate, Prototype, Test, Implement, and Evaluate are the seven steps that make up the design thinking methodology that is utilized in this study. The study identifies the needs of the students, devises learning objectives, and creates an interactive game that makes the learning process easier. All of these steps are included in the study. This research led to the creation of an educational game that had been developed with the help of software that is used to create games. Not only does the educational game encourage students, but it also helps them enhance their knowledge of German vocabulary in a pleasant way. Additionally, it adds to the development of a versatile and efficient instrument for teaching German vocabulary, which ultimately results in an improvement in the standard of the learning experience.

**Keywords:** Educational Game, Construct 2, German Vocabulary, Language Learning, Design Thinking

## 1 Introduction

Language acquisition is undergoing a transformation in a world that is becoming increasingly digital. Foreign language training, such as English, French, Mandarin, and German, has been introduced into the curricula of a significant number of secondary schools as a whole. People who learn a foreign language have more opportunity to access a wider variety of material, which ultimately leads to an increase in their level of knowledge and comprehension.At the secondary school level, including SMA, SMK, and MAN, as well as at higher education institutions, German is one of the foreign languages that is taught through the curriculum. The growing bilateral cooperation between Germany and Indonesia is a significant factor that contributes to its significance. A person's level of linguistic proficiency is directly proportional to the size of their vocabulary, as stated by (Sulaiman & Akidah, 2021) [7]. The result is that having a larger vocabulary makes communication easier and more effective. When it comes to developing language skills for everyday interactions, pupils who have mastered vocabulary are substantially more likely to succeed. As a result of its incorporation into all of these abilities, vocabulary is inextricably tied to the four basic language skills, which are reading, writing, speaking, and listening.

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However, because to the restricted variety of instructional media that is easily obtainable for vocabulary acquisition, students frequently run into challenges when endeavoring to learn German vocabulary. Particularly among the most frequently encountered methods in which individuals learn vocabulary is through monotonous constant repetition and other methods that are conventional. This approach is becoming more widely recognized as burdensome. For reasons such as this, it makes perfect sense to have interesting instructional media, such as educational games available. According to (Tas, 2023) [11], educational games are specifically created to help facilitate learning, develop concepts, enhance knowledge, and guide players in the development of their abilities while at the same time encouraging them to engage more actively in the process of learning.It is instructional games have the potential that would enhance students' comprehension and make the learning process simpler and more enjoyable. This can be achieved through the delivery of instructional content through the medium of engaging gameplay. Traditional teaching approaches, such as textbooks and classroom instruction, are being augmented and sometimes replaced by digital technologies that are interactive and engaging. A technology that is classified as the above classification is the game-based learning approach, which makes use of the power of play to make educational experiences more easily understood. Construct 2, an internationally recognized piece of software that allows for developing games of all kinds, is the primary focus of this article, which discusses how the design thinking approach might be took advantage of to create an educational game with an explicitly stated goal of assisting students in improving their comprehension of German language.

It has been observed by (Romero & Barma, 2014)[7] the fact that educators have obstructions when it comes to taking advantage of and creating of new games to enhance educational activities and activities that correspond to learning. According to (Akcaoglu, n.d.) [1] immersion has an effect on the ways in which educators see obstacles, approaches to problem-solving, and their attitudes toward games and design. In accordance with (Mccolgan, 2018) [5] that there is incorporation of games back into the teaching and learning of learning materials has been recognized as a potentially significant technological method that has the potential to boost the learners' motivation and engagement. It is possible for teachers to use games as tools to improve student achievements in a variety of subject areas. (Boyle et al., 2016) [2] conducted an investigation on the empirical evidence about the effects of demanding games and the impact that computer games have on educators in educational settings. Educational games can be played in the style of "guess-the-picture" activities specifically for the purpose of vocabulary acquisition. The fact that this particular kind of game contains visual stimuli that trigger students' memories of German terminology and, as a result, contributes to their language acquisition therefore makes it a particularly appealing option. In taking into account the information laid out above, it is deemed very significant in order to produce an educational game that can be utilized by individuals who have just begun learning German to allow them to learn as well as practice their German vocabulary. This educational game will be designed taking advantage of the most recent developments in technology with the intention to be responsive to the needs of students and stay up with the most recent developments in the field. Construct 2 is an instance of software which can be freely accessible to the general public for being utilized for the development of digital games. (Priyambodho et al., 2023)[6] stated that Construct 2 is an application that was developed by Scirra LTD. Its purpose is to facilitate the creation of HTML5-based games, with particular attention primarily directed on 2D platforms. Construct 2 was chosen because it does not call for the usage of specialized programming languages, which results in it more user-friendly. The management of all game instructions is possible through the use of an event sheet, which is comprised of both actions and events. As a result of Construct

2, an application that is compatible with Android has been developed. This application makes it simpler for students to use when learning German vocabulary. The picture-matching game that will be produced with the help of this game creation software will integrate a number of different themes. These topics are designed to cater to the requirements of students who are just beginning their German language studies. A number of topics are covered, such as food and beverages (*Essen und Getränke*), members of the family (*Familie*), different kinds of vocations (*Berufe*), and different sections of the body (*Korperteile*).

The design thinking development technique is utilized by the author in the process of creating this instructional game that involves matching educational pictures. In recognition of the fact that it is user-centered and is concentrated on German language learners, this model is regarded to be adequate to effectively address the research problem. The user-centered approach referred to as design thinking places an emphasis on gaining a knowledge of the requirements and challenging circumstances faced by the target audience, coming up with innovative solutions, and iterating in response to the feedback received in return. By taking advantage of this methodology, it can be accomplished to come up with educational games that can be both efficient and interesting, as well as games that can be customized to the particular needs of the students who are playing them.

It will be expected that by the time the development process has been finished, this strategy will have came up with a solution that is successful in helping learners as they navigate the process of acquiring German vocabularies

# 2 Literature Review

## 2.1 The Development Model

Herbert A. Simon was the first person to discuss the concept of design thinking, which was presented in 1969. In the years that have passed since then, it has evolved into a development framework that has been widely deployed across a wide range of industries, including education. When it comes to developing solutions to tackle difficult difficulties, design thinking is an approach that is both imaginative and based around the human being. An in-depth awareness of the end users, the use of empathy during the process of problem-solving, and the development of solutions through iterative ways of working are all required by the method that is being utilized. Not only is it possible to successfully use this model in the field of education, but it also has the potential to be utilized in the fields of product development, service development, and business innovation. To be more specific, this research makes use of the development approach that Kelley and Brown provided using design thinking. In accordance with the framework presented by Kelley and Brown (in Hasanah)[4], this model encompasses a total of eight stages of development:

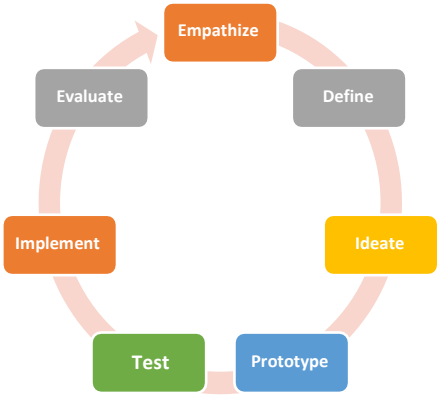


**Fig. 1.** Diagram Model Design Thinking

Design thinking is a strategy that is centered on people and has its foundation on three key concepts in mind, as that of Kelley and Brown (in Hasanah) point out. Design thinking extends beyond mere creation of a product. The design process thrives on collaboration among individuals who bring together a variety of experience, which makes it possible everyone on the team to produce the greatest possible end result.The design team is responsible for comprehending and dealing with the perspectives of consumers when it comes to an issue that is particular. This includes considering the customers' reactions and expectations, which are the necessary elements in the lengthy procedure of establishing an a solution.The design team builds prototypes or mockups for the purpose of experimentation and feedback, drawing from the insights that they have acquired over time. This method of iterative development additionally helps to improve the product in order to ensure it more effectively meets the wants and needs of the people who use it.

The theoretical framework of design thinking corresponds to these concepts, and therefore encourages the development of innovative solutions that are proactively user-oriented and that successfully address problems that occur in the actual world.

## 2.2 The Concept of the Educational Game

In recent years, educators have been drawing on the latest technical advances in hardware and software relating to the use of computers. Multimedia and hypermedia, games, chat, electronic mail, MUDs, and MOOs aim to enrich educational settings. It is hoped to demonstrate via the use of an educational game that foreign language learning can be efficiently integrated into more formal instruction without laborious and tiresome methodology or at the expense of other subjects.

Unfortunately, the teaching of foreign languages is often a secondary concern in a curriculum crowded with an usually inflexible array. The choice of activities in which language exercises are presented should be appropriate for the language proficiency level at which the learners are working. One strategy that leverages information technology to enhance mastery of a specific topic in learning is the use of games. This gaming technology has been developed and applied in the field of education in the form of educational games. It can be a very useful tool for representing authentic, spontaneous uses of the foreign language in question and can provide varied and enjoyable activities that serve as the basis for authentic fun learning. Game playing

can create an ideal setting in which to learn a foreign language. They also offer an environment that helps to create intrinsic motivation in which children can take part independently and with self-discipline. Beside that, educational games aim to provide users with a more enjoyable and engaging learning experience. One type of educational game that can be utilized for learning German vocabulary is a picture-matching game, commonly referred to as a memory card game. Memory card game is a game at finding and matching pairs of cards that are conceptually related and placed face-down. In this game, German language learners are tasked with matching nouns to the corresponding images provided. This memory card game is described as a suitable tool for acquiring and practicing reproducible subject knowledge.

## 2.3 The Concept of the Construct 2

Taken from the construct official website, it is explained that construct 2 makes HTML5 games. Construct 2 games operate online through web browsers on a wide range of devices and operating systems, including mobile devices like phones and tablets, ensuring broad accessibility for users. This section provides an overview of the technology used, primarily aimed at those with a technical background. If your focus is on learning how to use Construct 2, you may choose to skip this part. Although Construct 2 games can be adapted for multiple platforms, including as “native” applications, the core technology remains an HTML5-based engine.But although HTML5 games typically run in a web browser, Construct 2 games utilize the users to enable offline functionality. This feature is particularly beneficial for iOS web apps and Chrome Web Store applications, as it allows users to play even without an internet connection. Additionally, offline support reduces server bandwidth usage, as the game files are downloaded only once. Subsequent visits load the game directly from the local storage on the user’s device.

## 2.4 The Concept of Vocabulary

The acquisition of competency in foreign languages is greatly aided by vocabulary, which plays a very important function. A person's capacity to comprehend a wide range of subjects is directly proportional to the extent of their vocabulary. There is a considerable correlation between having a larger vocabulary and having a greater capacity to comprehend written and audio texts. Furthermore, when a someone possesses a solid command of language, it becomes much simpler for them to communicate effectively with native speakers. This is true not just for the goal of comprehending the spoken or written word, but also for the purpose of communicating or making oneself understood in the language. This is fascinating when we consider that many language classes that are based only on grammar began with grammar drills. This was done primarily on the idea that grammatical precision would lead to speaking competency, provided that these grammar underpinnings had been firmly implanted. It is true that practically all audience experts would warn us to be very skeptical and mistrustful of somebody who claimed to know a foreign language completely while he was very weak in exactly 148 items of vocabulary. This is because the person may be lying about his or her knowledge of the language. In spite of this, the majority of classrooms continue to focus primarily on providing pupils with practice drills and practice, to the detriment of vocabulary study. This is not without a certain degree of humiliation.

## 3 Research Method

The methodology of design thinking, which was presented by Kelley and Brown (in Hasanah)[4], is utilized in this investigation, which takes a development-oriented approach. Through the integration of user requirements with appropriate technology capabilities, this model places an emphasis on a user-centered methodology, which ultimately results in solutions that are both functional and effective for addressing particular difficulties. Adult students who are learning German as a second language are the core audience that this project intends to primarily target. For the purpose of catering to the needs of this particular demographic, the game's content and gameplay mechanics can be modified to match their specifications. The design process can be informed by trends and preferences that are discovered through the process of seeing and evaluating the behaviors of learners. This can be done through surveys or by direct classroom observation.The next phase in the design thinking process is to establish the game's objectives, which comes after acquiring a full grasp of the requirements of German language learners from the previous step. Establishing distinct learning objectives, developing game mechanics, and specifying the vocabulary subjects that will be covered are all necessary steps in this process.The major purpose of the game is to simplify the process of learning German vocabulary in a way that is both interesting and efficient. Setting goals that are measurable, reachable, and connected with the needs of the learners is necessary in order to accomplish this. Examples include:

a. Vocabulary Acquisition: Enabling learners to recognize and recall a specific set of German words and phrases by the end of the game.
b. Contextual Usage: Equipping learners to apply the acquired vocabulary in appropriate contexts, such as constructing sentences or participating in basic conversations.

By setting these goals, the game design process gains a structured roadmap, ensuring all components contribute to the intended educational outcomes. Testing was conducted with students in Class A of the 2023 of the German Language Program at Universitas Negeri Medan. During playtesting, several key aspects were assessed:

a. Engagement Levels: Determining whether players found the game captivating or experienced boredom or frustration.
b. Usability: Ensuring the game controls were intuitive and user-friendly.
c. Learning Outcomes: Evaluating whether players successfully learned and retained the German vocabulary presented in the game.

Within the framework of design thinking, empathy serves as the foundation for the creation of solutions that actually address the requirements of users and guarantee that a clear knowledge of the target audience is achieved. When it comes to the process of building a game for learning German vocabulary using Construct 2, it is essential to obtain an understanding of the requirements and preferences of the learners. An immersion in the experiences of the learners, the identification of the obstacles they face, and the collection of data to drive the creation of the game are all part of this phase.This is the following step, which entails identifying vocabulary themes that are pertinent. A variety of topics, including parts of the body (*Korperteile*), different types of occupations (*Berufe*), members of the family (*Familie*), food and beverages (*Essen und Getränke*), school items (*Schulgegenstände*), hobbies (*Hobby*), and breakfast (Frühstück), were selected for this game in order to effectively cater to the requirements of learners who are already at the beginning of their educational journey. Subsequently, the ideation phase is carried out, during which a wide range of imaginative ideas

for the game are investigated. At this stage, the emphasis is placed on brainstorming, the production of ideas through collaborative efforts, and the imaginative visualization of potential game narratives and mechanics. A memory card game, often known as a picture-matching game, was chosen for this project. Memory card games are extremely popular. This concept was built as a foundation for the prototyping phase, with the goal of ensuring that the game is both educationally impactful and enjoyable for users. Construct 2, a game production platform that is user-friendly, was used to begin the development process once the fundamental concept of the game was determined. Designing game components, constructing the game foundation, and including vocabulary drills were all tasks that were included in this stage.Following the completion of the game's development, it went through a testing process in order to assess how well it worked and how well it engaged the intended audience. The feedback and observations that were gathered during this phase were used to inform iterative refinement.The data that was gathered through direct observation, screen recordings, and embedded analytics provided insights into the game's strengths as well as areas that could use development. These discoveries served as the basis for further development, which ensured that the final game successfully accomplished its instructional goals while also providing a fun and engaging learning experience.

## 4 Result and Discussion

An educational game that is supposed to be a picture-matching activity is the result of this research project. There are various varieties of this game, including a memory card game, a game in which players match photos with corresponding nouns, and a multiple choice game in which players choose the proper word for a given image (with two or more noun possibilities being presented). Around ninety percent of students in Class A of the 2023 German Language Program at Universitas Negeri Medan said that digital educational games are more entertaining and help them recall and increase their German vocabulary. This information was gathered through classroom observation and a straightforward questionnaire.

### 4.1 Memory Card

It has been demonstrated that the memory card game is an appropriate instrument for the purpose of acquiring and exercising replicable subject knowledge. It is necessary for users to click on the cards that are provided in order to locate picture and phrase combinations that are a match. In the event that he clicks on two cards that do not match, both cards will automatically revert to their initial positions. In order for the player to effectively match newly revealed words or images with the matching cards that will emerge later, the player must recall the placement of previously disclosed words or images. Memory card portions of the body (also known as Korperteile) and school things (also known as Schulgegenstände) are the two topics that are featured in their respective games.


**Fig. 2.** Memory card parts of the body

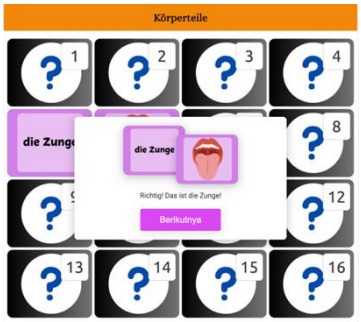


**Fig. 3.** Matched cards the parts of the (Körperteile) body (Körperteile)

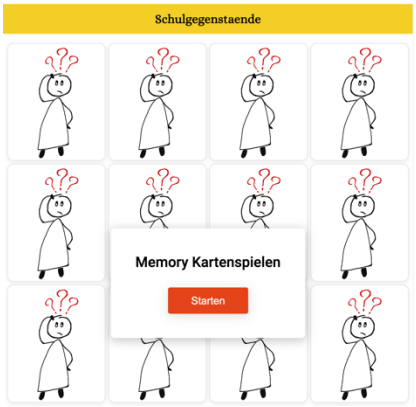


**Fig. 4.** School items (Schulgegenstände)


**Fig. 5.**Matched Cards School Items (Schulgegenstände)

In the event that the user is successful in matching a pair of cards, both cards will continue to be open, while the remaining cards will continue to be face down.

## 4.2 Matching images with corresponding nouns

One of the most effective educational strategies is to match images with the nouns that correlate to them. This allows for the integration of visual learning with linguistic development. Making connections between visual representations, such as pictures or illustrations, and the nouns that correspond to them is the task at hand in this practice. It is a technique that is frequently used in language teaching, and it helps students increase their vocabulary, improve their ability to remember information, and develop a more profound comprehension of how context affects language usage. Berufe, which refers to different forms of occupations, and Frühstück, which means breakfast, are the two topics that are utilized in this game.

### *4.2.1 Theme types of occupation (Berufe)*

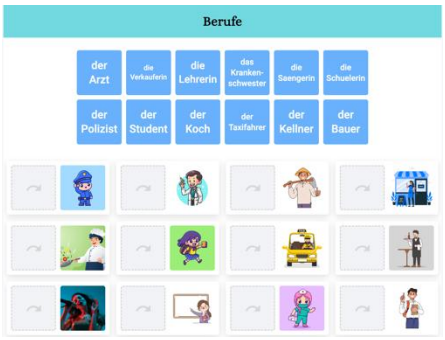


**Fig. 6.** Matching images with corresponding types of occupation (Berufe)

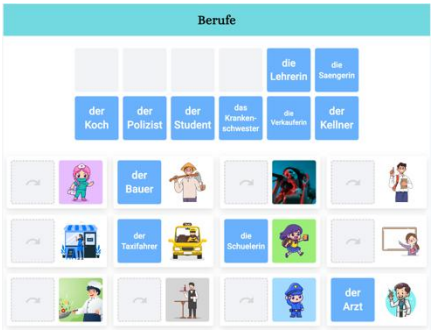


**Fig. 7.** matched cards types of nouns occupations (Berufe)

Players are required to drag the noun into the box next to the corresponding image. To engage with this game, players should possess prior knowledge of the theme "types of occupations." (*Berufe*) and breakfast (*Frühstück*)

### *4.2.2 Theme breakfast (Frühstück)*


**Fig. 8.** Matching images with corresponding nouns breakfast (*Frühstück*)


**Fig. 9.** matched cards breakfast (*Frühstück*)

## 4.3 Multiple choice game by selecting the appropriate noun for a given image (with two or more noun options provided).

During this section, visitors are tasked with selecting the appropriate response based on the picture that is presented to them. This game is centered around three different themes: the family (*Familie*), the hobby (*Hobby*), and the food and beverages (*Essen und Trinken*).

### *4.3.1 Theme food and beverages (Essen und Trinken)*


**Fig. 10.** Multiple choice game food and

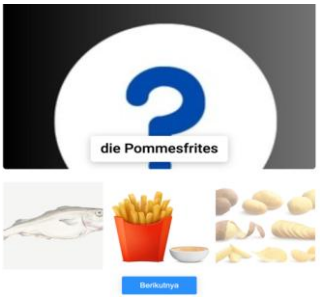


**Fig. 11.** Right Choice Beverages (*Essen und Trinken*)

As was the case with the game that came before it, players are expected to have prior knowledge of the theme in order to participate in this game.

### *4.3.2 Theme family (Familie)*


**Fig. 12.** Multiple choice game family


**Fig. 13.** right choice (*Familie*)

### *4.3.3 Theme hobby (Hobby)*

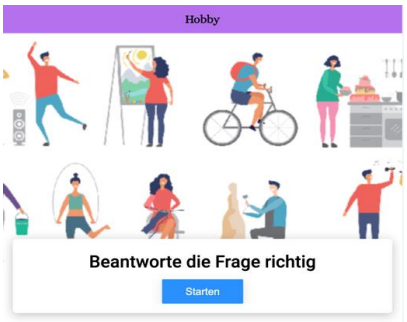


**Fig. 14.** Multiple choice hobby (*Hobby)*

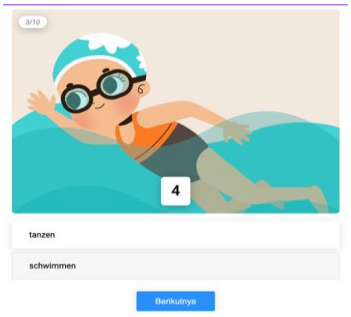


**Fig. 15.** Right Choice

Following the completion of the game's development, it went through a testing process in order to assess how well it worked and how well it engaged the intended audience. The feedback and observations that were gathered during this phase were used to inform iterative refinement. The pupils who were enrolled in the German Language Program and were in Class A in 2023 took part in the game. After that, participants filled out a brief questionnaire to evaluate the efficiency of the game in improving their vocabulary comprehension and their ability to use it in context. According to the findings, more than ninety percent of the students were in agreement that the educational memory card and image-matching games were effective in increasing their vocabulary retention and comprehension.

## 5 Conclusion

When it comes to learning foreign languages, vocabulary is one of the most important elements to consider. The capability of an individual to comprehend a wide range of subjects is directly proportional to the size and breadth of their vocabulary. The capacity to grasp written and aural texts is substantially improved by having a vocabulary that is more extensive. It was discovered, on the basis of observations conducted throughout the process of learning German in the classroom, that a significant number of German language learners have an inadequate command of the vocabulary, which results in difficulty in comprehending particular topics. In addition, they frequently face difficulties when engaging in conversations in German. The author has created an educational game by employing the game development program Construct 2 and adopting a development-focused strategy by implementing the design thinking concept that was presented by Kelley and Brown (2018). The purpose of this game is to aid these learners in practicing and increasing their German vocabulary. Different varieties of this educational game are available, such as memory card games, games in which players match images with nouns, and games in which players choose between multiple-choice questions. Parts of the body (*Korperteile*), different types of vocations (*Berufe*), members of the family (*Familie*), food and beverages (*Essen und Getränke*), school supplies (*Schulgegenstände*), hobbies (*Hobby*), and breakfast (*Frühstück*) are some of the topics that are discussed in these games.

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