Development of Online Language Teaching Tool Using the Embedded YouTube Videos-Taking English/Chinese Learning as an Example

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Abstract

Language is an important communication medium for the development of economic globalization. In recent years, language learning has undoubtedly become a new content for people's self-improvement. The rapid development of information and communication technology (ICT) provides a broad space for development and favorable conditions for online second language teaching. Computer-assisted language learning has become a new form of learning that is not limited by time and space. In this project, it develops an English teaching tool that uses YouTube videos and listening quizzes to improve Chinese English proficiency.

The teaching tool has two major features, one is to encourage users to customize their own learning content and learning videos, and fully give users autonomy. The second is to use Chinese TV dramas as the material for English learning, so that users do not feel unfamiliar with the environment. To enhance usability, the site includes a responsive design compatible with different device screen sizes, and a fully keyboard-operated design. In addition, the teaching tool simplifies the process of customizing learning materials, which is very suitable for users without any programming knowledge to customize learning videos. It also uses the Vue.js framework to establish testing and scoring functions.

This project not only combines Internet technology and language learning, breaking through the time and space constraints of traditional English education, but also takes the lead in proposing the idea of using mother tongue to learn a second language, which has a very good prospect.

Declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institution of learning.

Signed:
Yifan Chen

Acknowledgements

I would like to thank my supervisor Frank Boehme for providing guidance and feedback throughout this project. I am also very grateful to Dr.Frank for his encouragement and help when I encountered difficulties. Lastly, thank you Mum and Dad for your unconditional support.

Chapter 1

Introduction

With the rapid growth of the Internet and the increasing demand for second and third languages, more and more people are choosing to use online platforms to learn new languages. The advantages of online learning include: improved efficiency, cost savings, overcoming time and space constraints, repeatability, user-centered learning, active learning, integrated multimedia learning, and real-time interactive communication and discussion. Users can learn flexibly according to their needs under the consideration of low cost, and arrange the course schedule and learning methods according to their own level and interest, and according to their own space and time considerations, so as to truly achieve the best effect of barrier-free learning, because the network can make the effective integration of information and resources, no matter where users are, as long as they can connect to the Internet, they can be the entry point or receiving point of information, so that This makes the access to information or communication more free and flexible. With the rapid increase in user demand, online learning based on web platforms is a promising and important development direction for the future.

However, there are some users who cannot concentrate on videos in non-native languages for a long time, which can lead to most of the learning time being wasted and reduce the efficiency of learning. And not all videos such as movies or TV shows in a second language will be helpful in learning the language, which makes it a tough job for new users to choose a video that suits them and stick to it. Also, the quality of many language learning websites and online classes varies, which can cause not only a loss of time but also a financial loss.

Therefore, the goal of this project is to develop an online language teaching tool that allows users to customize learning materials of their own interest using native language video content on the YouTube platform, and to improve foreign language proficiency with the aid of listening comprehension quizzes. But considering the time constraints of the research, I selected specific target groups and needs in the actual project development, and created a website to help Chinese people improve their English skills.

By analyzing the difficulties that Chinese learners generally face in English learning and combining my own experience of learning English, I have given this website two characteristics.

(1) The website supports user-made learning lessons, which not only allows learners to use their favorite videos as learning materials, but also provides a new teaching method for English

teachers without any programming foundation. Teachers can use this website to prepare teaching content and quiz questions.

(2) The website encourages the use of Chinese TV dramas to learn English, so as to train learners' reaction speed in converting between Chinese and English.

1.1 Background of the Research

Language is an important communication medium for the development of economic globalization, and language learning has undoubtedly become a new content for people's self-improvement in recent years. More and more people need to learn a second foreign language or even a third foreign language for business or life purposes. English is the most widely spoken language in the world, with 110 countries around the world using it as a mother tongue, an official language or a common second language. Many non-native English-speaking countries incorporate English language learning into their basic education curriculum. Not only that, in China, the most populous country in the world, English learning is very important. Some of the school's awards and evaluations are related to it, and most of the job details pages recruited by the company clearly indicate that those with excellent English will be given priority, which shows the importance of English learning.

Fortunately, the rapid development of information and communication technology (ICT), as well as the popularization of intelligent terminal equipment and 4G/5G mobile networks, make online learning that is not limited by time and space an important way for people to receive education, which provides a broad development for online teaching of a second language space and favorable conditions. Because the Internet has the characteristics of fast dissemination, large information capacity, convenient access, no time limit and strong interaction, the online teaching method based on the Internet will make users' learning more convenient and efficient.

At present, there are endless online language learning platforms on the market, such as Hujiang Online School, BBC Learning English, Duolingo, etc. The learning resources of such platforms are very rich and of high quality. Take Hujiang Online School, a popular foreign language learning platform in China as an example. The platform provides courses in English, Japanese, Korean, German and French, not only for the CET-4, CET-6 and postgraduate English tests unique to China. It also provides professional and high-quality learning courses, and also teaches English that is closer to daily life such as workplace English, which provides convenience for many Chinese students and social people to learn English. In addition, BBC Learning English is also an excellent English learning website with high quality. It provides different learning programs for different target audiences such as children, teachers and business personnel, including more specific and direct learning of grammar, vocabulary, pronunciation, etc. method. It aims to increase the interest of English learning by making various current affairs videos and citing classic American dramas.

1.2 Problem Statement

Although Internet-based learning can enable learners to learn English without the limitation of time and space, the English learning resources provided by various platforms are limited after all, and most of them choose classic American dramas such as “Friends” and “Modern Family” as learning resources. The purpose of these websites or apps is to increase learners’ interest in learning English by watching dramas to learn English, so that they can become accustomed to the English-only environment, so as to achieve the effect of being immersed in their ears and eyes. It is undeniable that interest is the best teacher, and the effect of active learning must be better than passive learning.

However, not all English learners enjoy watching American TV shows. For English learners who don’t have much interest in American TV series, they may not be able to focus on non-native language videos for long. If they are forced to learn English in this way, it may have the opposite effect, resulting in aversion to English learning. In addition, even for those learners who like to watch American TV series, they will be attracted to the plot to a large extent by learning English only by watching American TV series, rather than focusing on the vocabulary of the character dialogue for the purpose of learning, so It will cause most of the learning time to be wasted and reduce the efficiency of learning.

The selection of learning resources and the choice of learning methods are the key factors to ensure users’ learning efficiency. It is necessary to ensure that the learning resources are of interest and suitable for the user, and also to ensure that the user does not forget the purpose of learning and is fully immersed in the entertainment. The types of videos that everyone likes to watch are different, and only the users themselves know their interests best.

Thus, providing an opportunity for users to personalize learning resources can ensure that users can learn English actively driven by their interests. Learning resources should not be limited to watching American TV dramas. It is also a good choice to use domestic TV dramas as learning resources to allow users to learn English in a familiar and stress-free language environment. At the same time, inserting quizzes into video viewing can not only test the user’s listening comprehension ability, but also effectively prevent them from chasing dramas.

Based on my own English learning experience and the common problems faced by Chinese students, translating English to Chinese presents a greater barrier than translating Chinese to English. And when speaking English, Chinese students are accustomed to thinking about Chinese answers in their minds and then translating them into English. This thinking process seriously affects the fluency of spoken English. In addition, another factor that affects Chinese-English translation is that many times people cannot immediately come up with suitable words or fixed collocations to express the same semantics as Chinese. And there are some fixed collocations that cannot be interpreted according to the meaning of a single word, otherwise the meaning will be completely different. For example, “break a leg” does not mean breaking somebody’s leg, but means good luck.

1.3 Purpose of the Project

The project set out to develop an English teaching toll that would provide learners with a platform to customize their own study materials with embedded YouTube videos and test listening comprehension with quiz questions. On this website, users can improve their English skills by watching Chinese TV dramas and completing listening comprehension quizzes at specific timestamps. In this way, learners can accumulate corresponding English expressions according to the context in the Chinese environment they are most familiar with.

English is essentially a tool for communication. Therefore, English learning should not be limited to the content of foreign language textbooks, but should accumulate vocabulary and expressions in dialogue and communication, so that this communication tool can be used flexibly. Different from other English learning websites or apps on the market that select American dramas such as “Friends” as learning materials, this website encourages users to use Chinese TV dramas that users are interested in as learning materials, so that users can purposefully translate Chinese dialogues into English while binge-watching, establish the connection between English and Chinese in the brain, and train users’ ability to respond to invoking English. When the video is played to a specific timestamp with keywords or fixed collocations, it will be paused automatically and a multiple-choice quiz will pop up. After completing all the quiz questions set in this lesson, the user’s quiz score will be displayed at the end of the video, which can quantify the user’s learning outcomes.

In addition to the user-customized lessons, I also provide some default video lessons as a resource for users who are just starting to explore the site, so that users can understand how the site works.

1.4 Organization of the Thesis

This thesis consists of seven chapters, and the content is as following:

Chapter 1 presents a whole picture of the thesis which consists of the background of the research, problem statement, purpose of the project and an organization of the thesis.

Chapter 2 is the literature review which explains the definition of computer-assisted language learning, the advantages of using multimedia to learn language and which YouTube videos are a reliable resource for learning English.

In chapter 3, the interface design of the website will be introduced one by one according to the sketch of the desktop version.

Chapter 4, the most important part, aims at implementing the functional development of the website with code according to the design sketch of the website.

Chapter 5 evaluates the site from both usability and accessibility perspectives.

Chapter 6 also presents the limitations of the site, in addition to drawing a conclusion.

Chapter 7 makes some suggestions for future work, which are mainly divided into three aspects: the layout of the home page, the sort options of the learning resource library, as well as the authentication and storage features.

Chapter 2

Literature Review

The popularity of the Internet has made distance education and autonomous learning possible (Kartal and Levent, 2010). Computer-assisted language learning (CALL) is to create a language learning environment, teach language knowledge, train language skills, guide language learning methods, improve expression levels, and cultivate communication strategies through rational and flexible use of modern information technology such as computers, multimedia, and networks (Levy, 1996). So that learners can effectively acquire the language ability to communicate with the world. Experts have been conducting research on multimedia learning in computer-assisted language learning for decades. Studies have found that people learn better from words, pictures, animations and videos than from language learning because the presentation of the material is consistent with the nature of the human cognitive system (Mayer, 2009).

The Internet is like a database that is updated in real time, which can provide numerous online learning resources for language learning and teaching, and at the same time, language learning websites provide a way to use learning resources for distance learning. YouTube, as the world's largest video site for video search and sharing, contains a considerable number of video resources uploaded by creators from various countries. Among them, there are many official accounts of video media from various countries to upload their national TV series with foreign language subtitles on it. For example, Tencent Video, a well-known online video media platform in China, uploads English subtitles made by professional translators to YouTube along with Chinese TV dramas, so that users in other countries can watch Chinese TV dramas without barriers. Although its purpose of providing English subtitles is to provide an access for non-native Chinese speakers to watch Chinese TV series, and its target audience is not Chinese native speakers, it can also be a useful learning resource for Chinese learners when designing English learning websites .

How to cultivate listening comprehension has always been an important issue in the development of multimedia learning (Mohsen, 2016). Due to differences in cultural backgrounds, even with the help of English subtitles, Chinese people cannot fully understand some slang words or jokes in American dramas. However, if the learner is placed in the most familiar Chinese TV drama plot, and then learns English with the help of the corresponding English subtitles, it will help to establish the connection between Chinese and English in the brain in the familiar context. With the help of quiz questions that pop up at specific timestamps, the user's awareness of translating Chinese into corresponding English is cultivated.

Nevertheless, it must be acknowledged that not all materials are equally valuable or reliable, and not all language learning sites make the most of the resources available online. In 2005, Kartal also mentioned that most language learning websites do not include all the opportunities provided by the Internet, and the target and audience of the website are not clearly stated (Kartal, 2005). Such a website will not be able to precisely meet the needs of a particular user. So, when I created the English teaching tool, I focused on the users themselves, giving them great autonomy to choose videos on the YouTube platform and personalizing quizzes to test listening comprehension. It should be noted that the learning videos should be Chinese videos that have been translated by professionals to ensure that the knowledge acquired by English learners is reliable and of high quality.

Chapter 3

Interface Design

The most important feature and advantage of this website is that even users with no programming knowledge can use YouTube videos to create their own English learning lessons and the quizzes in the lessons can be written entirely by the user. Therefore, in addition to the main function page, the website should also provide a guide for writing lesson description files and an introduction to how to use the website.

I design this website based on the principle that users can easily and quickly find the services they need, and use the simplest operation method to complete all operations. I divided the navigation bar into 5 sections: the home page that reflects the characteristics of the website, the "Get started" page contains the default materials, the "LDF" page that guides users to write the lesson description file (LDF), the "Help" page that guides the use of the website, and the "About" page that introduces the background and features of the website.

Since mobile devices and tablets have gradually played a key role in learning productivity tools, in order to allow users to learn without being limited by the screen size of the device, I will also make the website responsive.

In this chapter, I will describe the design of each page in detail based on the design sketches I drew for the desktop version.

3.1 Home Page Design

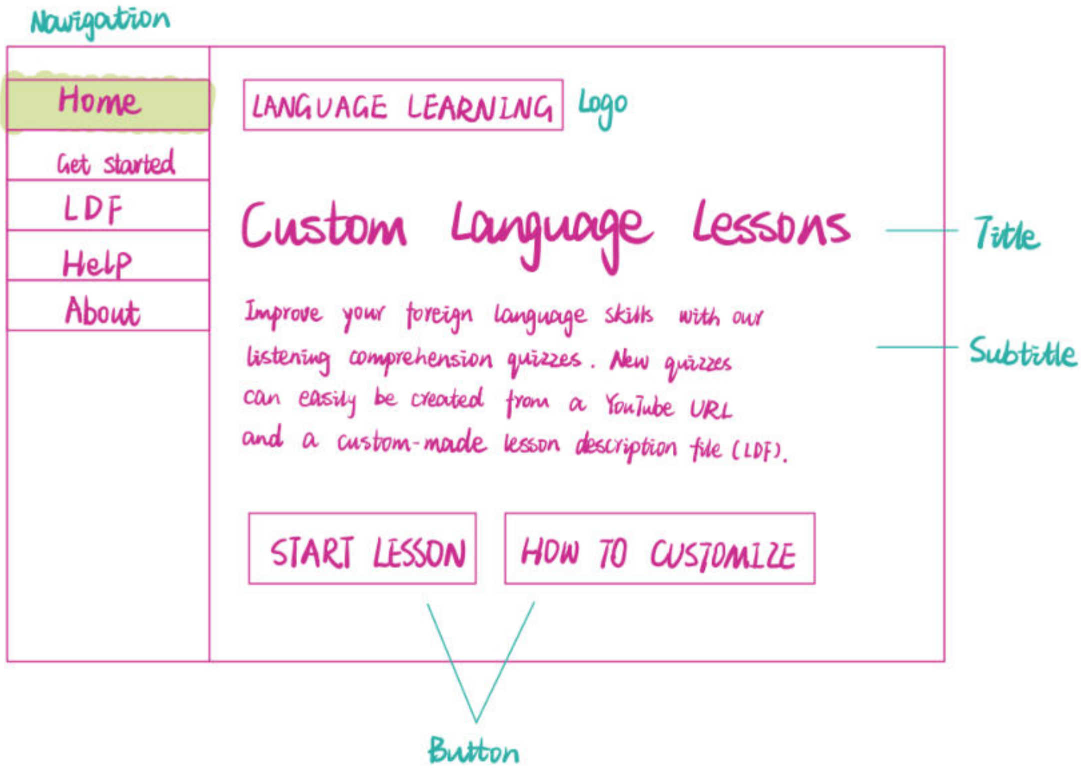

Navigation
Home
Get started
LDF
Help
About
LANGUAGE LEARNING
Logo
Custom Language Lessons
Title
Improve your foreign language skills with our listening comprehension quizzes. New quizzes can easily be created from a YouTube URL and a custom-made lesson description file (LDF).
Subtitle
START LESSON
HOW TO CUSTOMIZE
Button

Figure 3.1: The sketch of the “Home” page (Please note that this and the following sketches were early drafts. Some UI elements and English phrases have subsequently been changed.)

Figure 3.1 is a design sketch of the home page. When users open the website, the first thing they see is the page shown in Figure 3.1, which includes an outstanding title, an introduction highlighting the features of the website, a logo, and two buttons.

The side navigation bar and logo will not change with page switching. No matter which page the user is on, they can easily return to the home page by clicking on the logo.

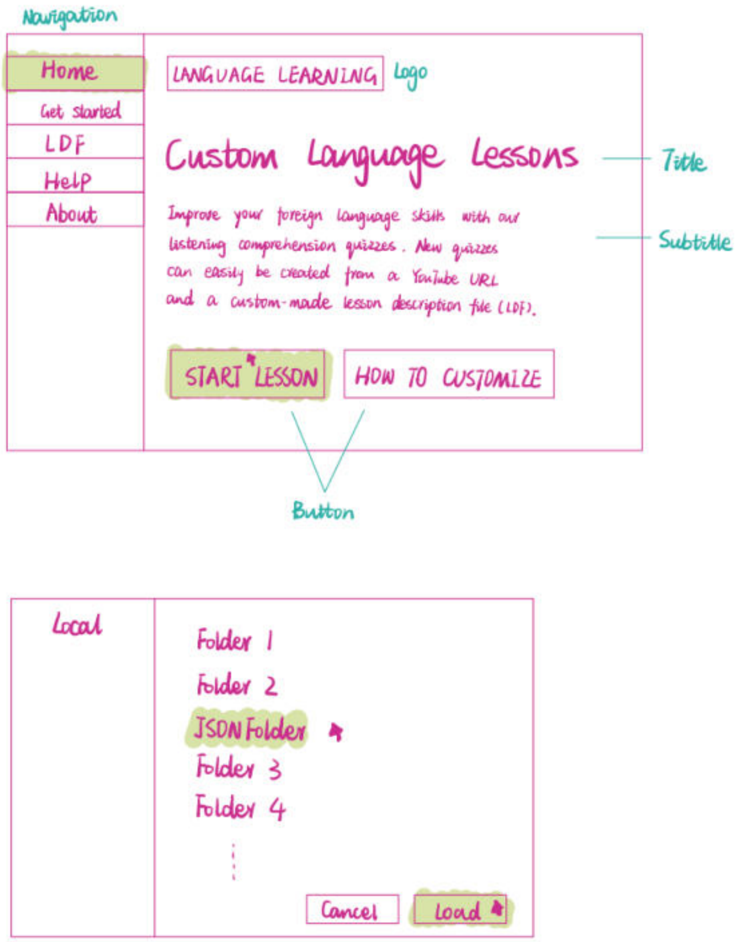


Figure 3.2: The sketch of loading a local folder

There are two buttons on the home page, one is the “START LESSON” button and the other is the “HOW TO CUSTOMIZE” button. When the user clicks the “START LESSON” button, the local file window shown in Figure 3.2 will appear. It allows the user to select a local folder containing the lesson description files as the source of learning materials. After the upload is complete, the page will jump to the “Get started” page showing the lessons available in the folder. In addition, users can click the “HOW TO CUSTOMIZE” button to jump to the “LDF” page to learn how to create a custom-made lesson description file (LDF).

3.2 "Learning Resource Library" Page Design

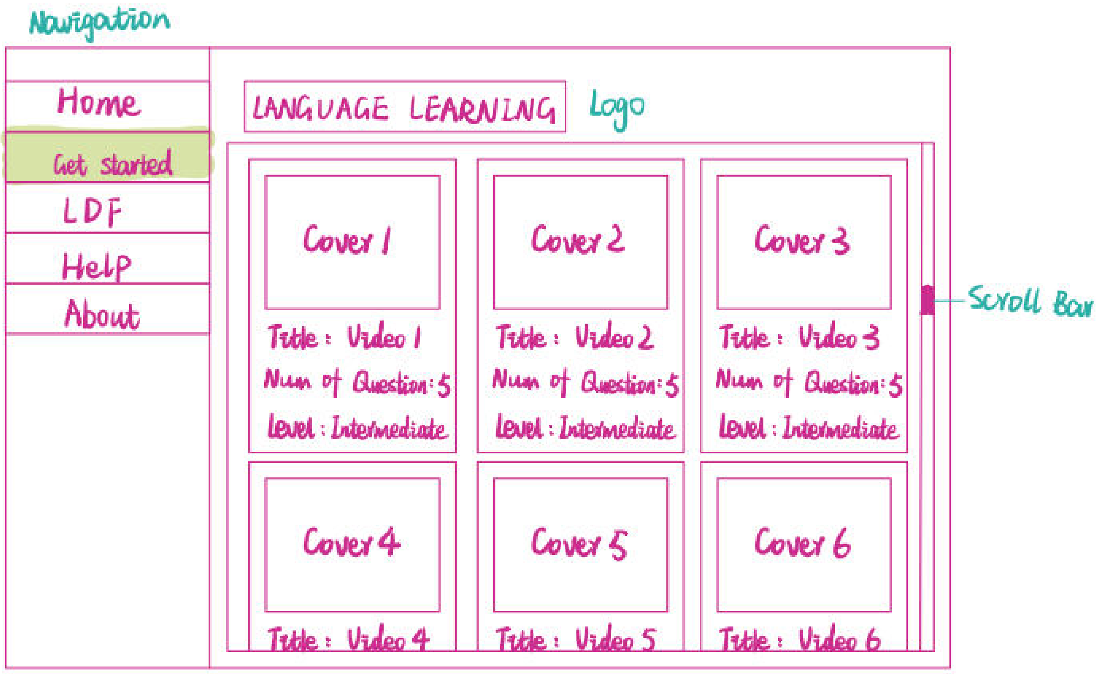


Figure 3.3: The sketch of the "Get started" page

For users who have not yet written their own lesson description files, I also provide 4 default video lessons for all users to learn about the features of the site. When the user clicks on the "Get started" section of the navigation bar, they can switch to the "Learning Resource Library" page as shown in Figure 3.3. If the user does not load a local folder as a source of learning resources, the page will display 4 default lessons. They can still learn with limited learning resources. For each lesson, it provides video cover, video title, number of questions, and difficulty level as a reference for selecting a lesson, aiming to let users choose the learning materials they are interested in and suitable for to improve learning enthusiasm and efficiency.

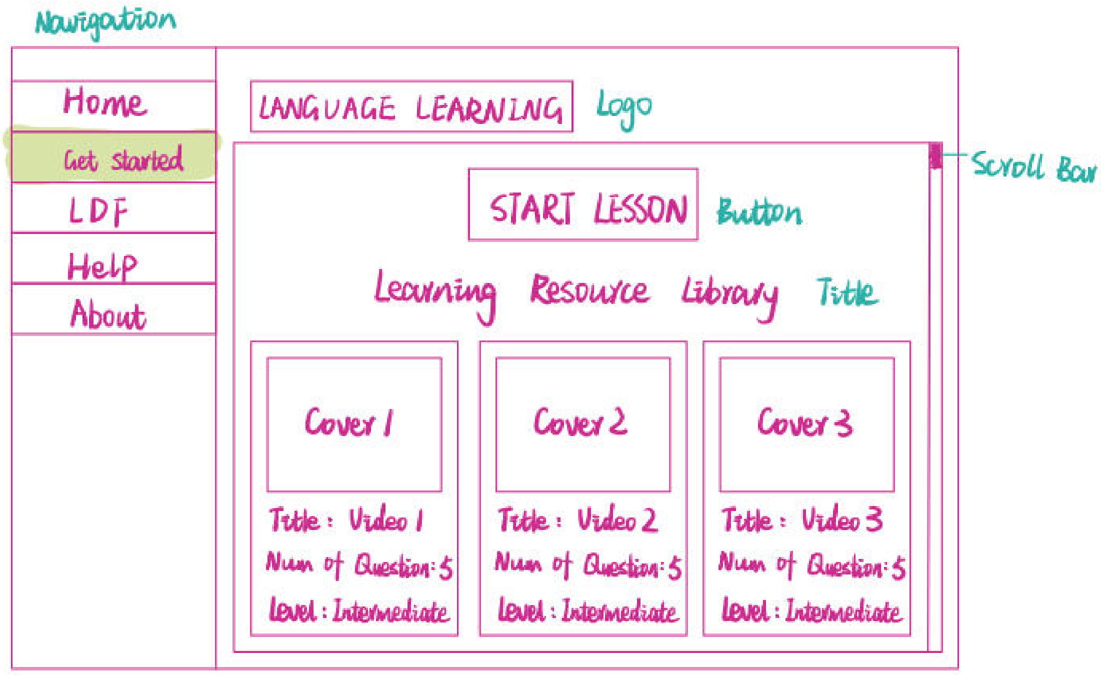


Figure 3.4: The sketch of the "Get started" page with default lessons and custom-made lessons

Whether the user clicks the "START LESSON" button on the home page or the "Get started" page, it can supplement the lesson description files written by the user to the learning resource library. As shown in Figure 3.4, the default lessons do not disappear after the user loads the local lesson folder. The website has an internal test function, which can check whether the necessary data is stored in the lesson description file in the local folder loaded by the user. Lesson description files with missing data are invalid and will not be loaded into the "Learning Resource Library".

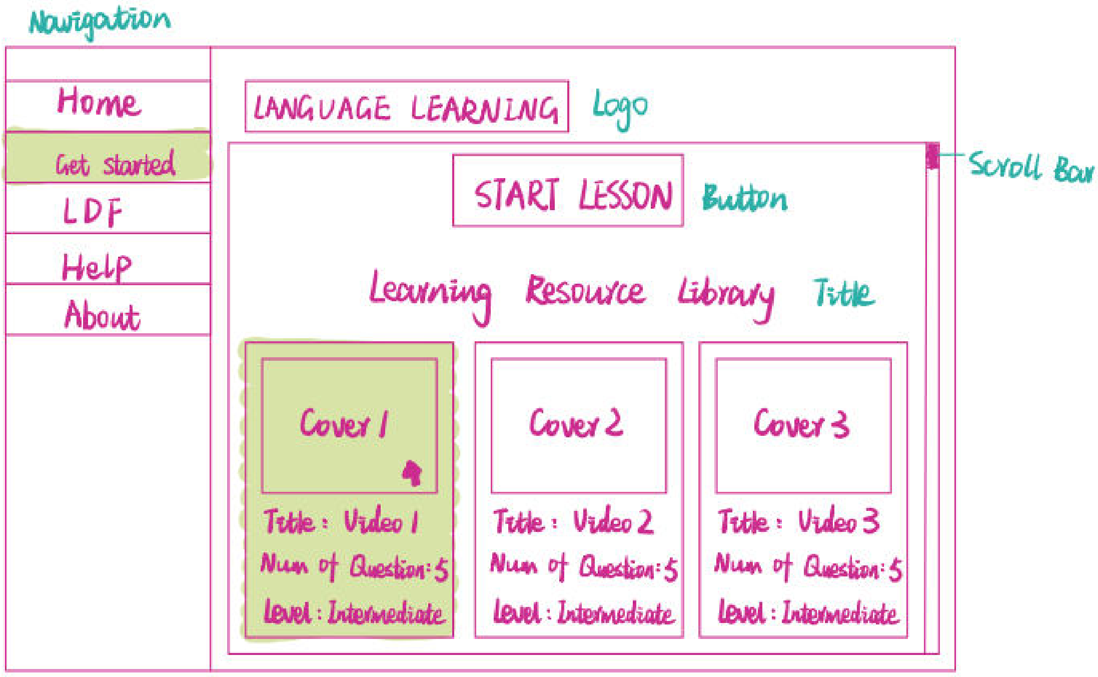


Figure 3.5: The sketch of the lesson selection process from the "Learning Resource Library"

Users select a lesson by looking at a brief description of each course, such as the video cover, video title, the number of quiz questions in the lesson, and the overall difficulty level of the quiz questions. As shown in Figure 3.5, when the user hovers the lesson card, there will be some interactive designs, such as the card background color changing and the video cover becoming larger.

3.3 Lesson Page Design

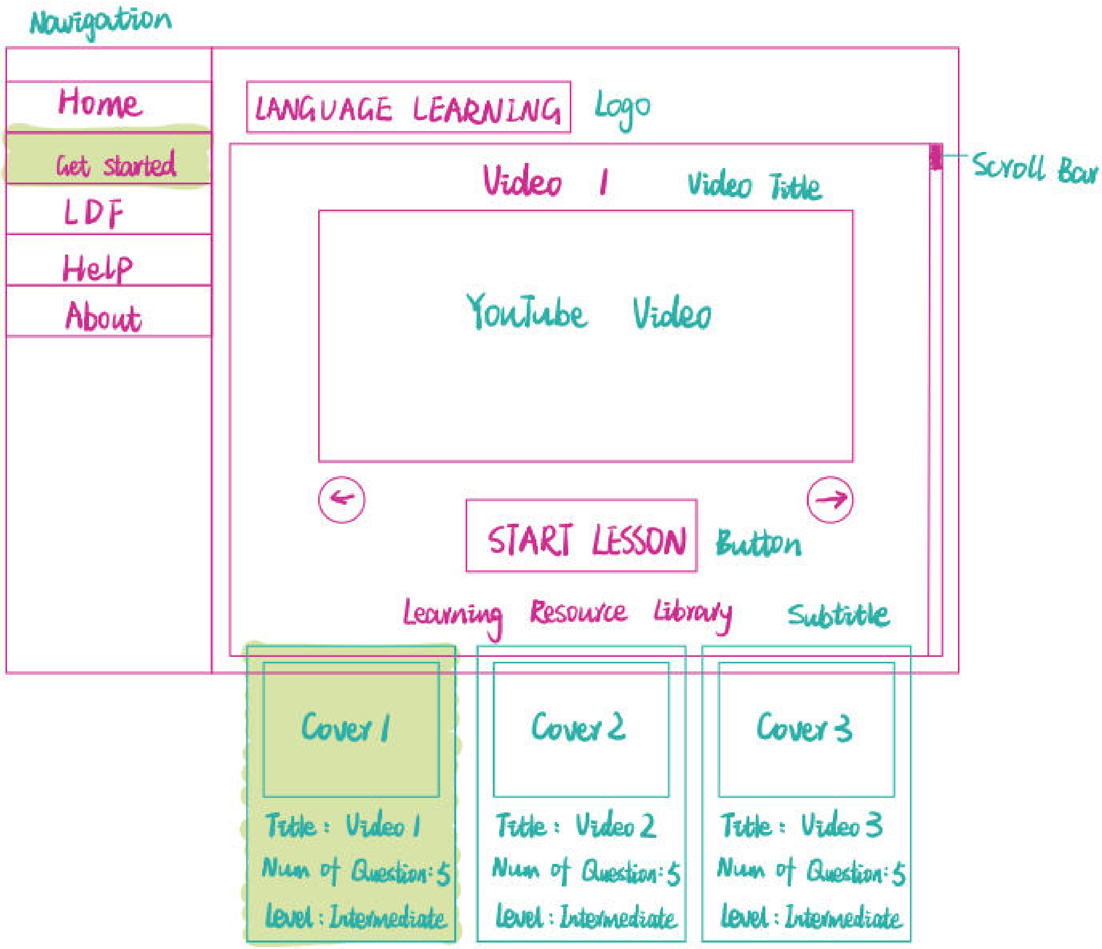


Figure 3.6: The sketch of the lesson page

After the user selects the lesson, the page will jump to the playback page of the selected video as shown in Figure 3.6. This page includes three buttons, an embedded YouTube video and a learning resource library. The “START LESSON” button still allows the user to load new lesson description files into the “Learning Resource Library”. At the same time, the selected lesson will be highlighted in the “Learning Resource Library”, indicating that the video has been selected. The “Previous Question” button and the “Next Question” button can allow users to quickly test the listening comprehension. When the lesson starts, users can quickly jump to 3s before the first quiz question by clicking the “Next Question” button, which allows users to answer this question after listening to the current line. After the user finishes answering, he/she can click the “Previous Question” button to view the correct answer and his/her choice.

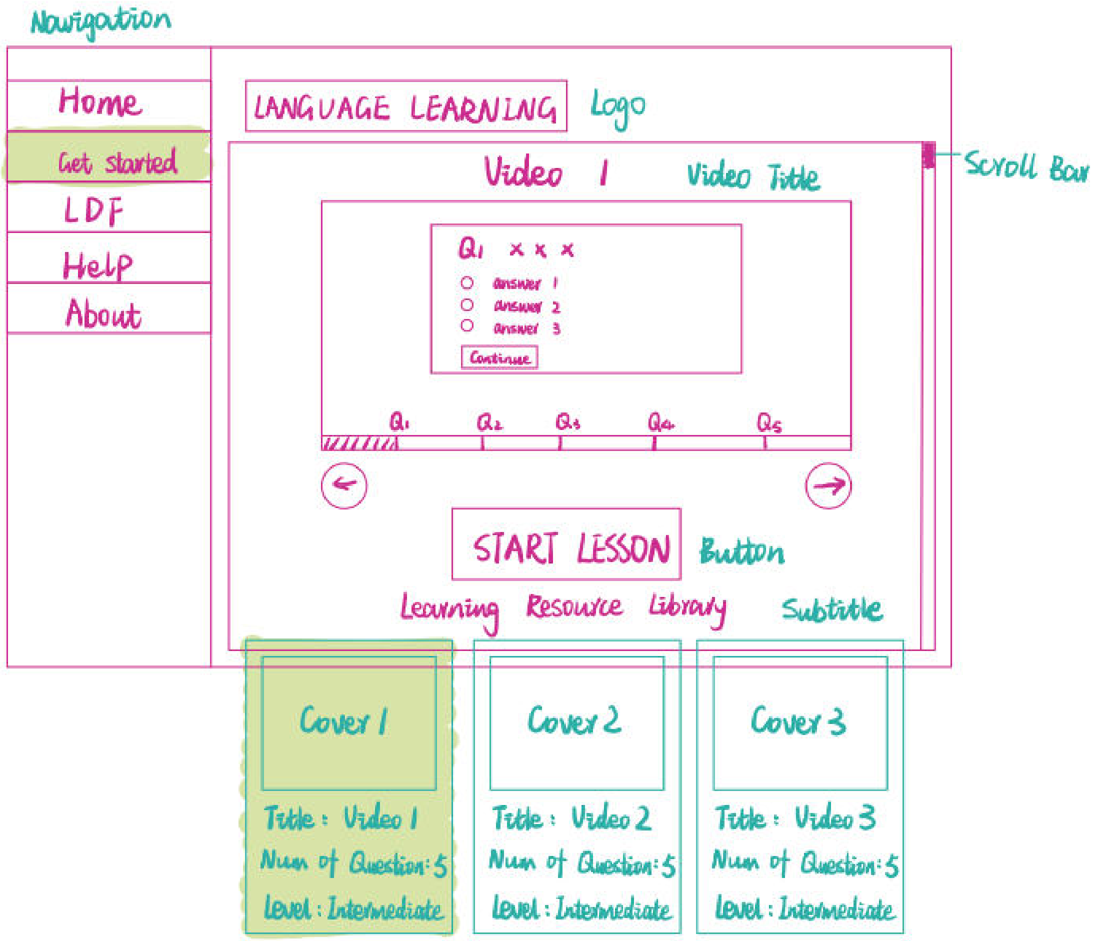


Figure 3.7: The sketch of the quiz panel

When the video plays to the specified timestamp, the quiz panel for the corresponding question will appear and automatically pause the video. Figure 3.7 shows the quiz panel, which contains a question, options, and a "Continue" button. The number of options for the quiz is not specified, but is rendered to the quiz panel based on the number of options set in the user-written lesson description file. In other words, the number of options for each question is allowed to vary. When the user completes the quiz, just click the "Continue" button to make the quiz panel disappear and continue playing the video.

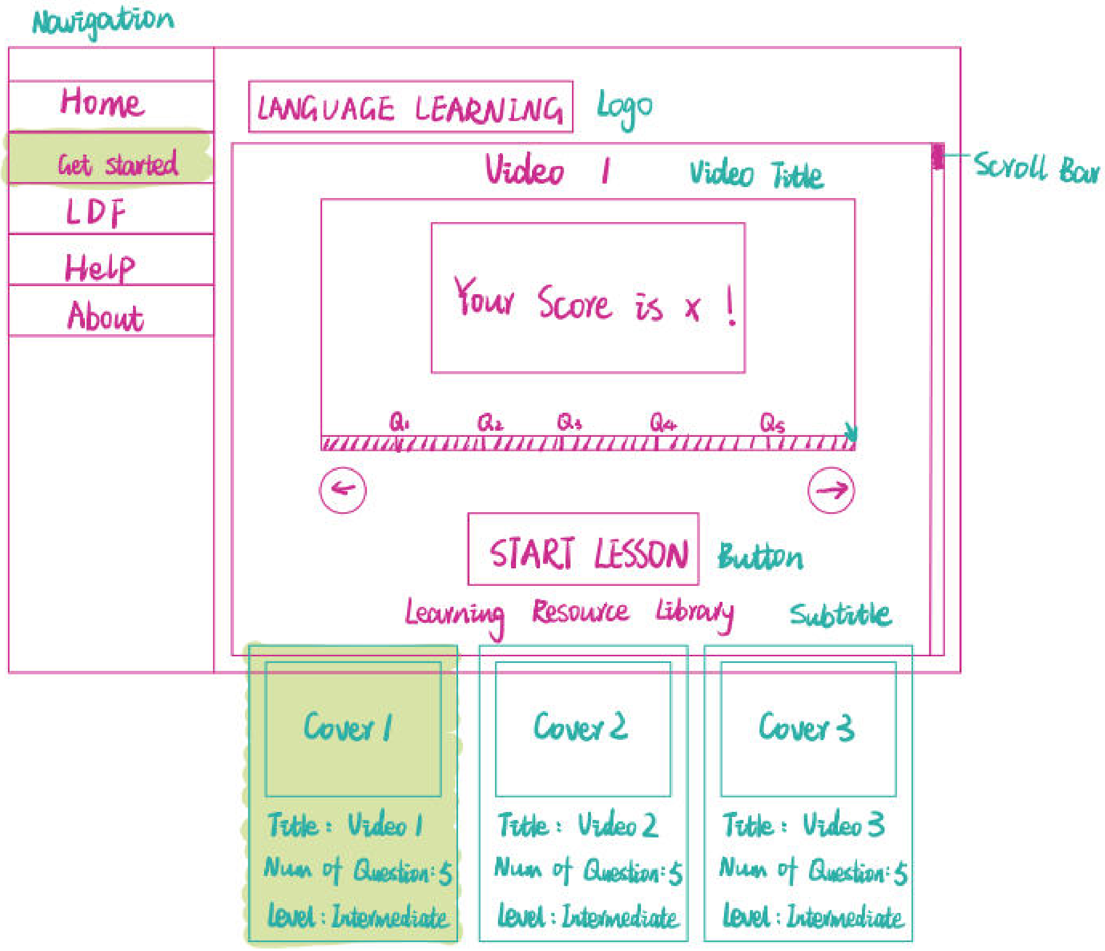


Figure 3.8: The sketch of the result panel

The final score calculation is based on the grading weight of each quiz question. As shown in Figure 3.8, after the user has completed all the quiz questions in this lesson, a result panel will appear at the end of the video showing the user's final score.

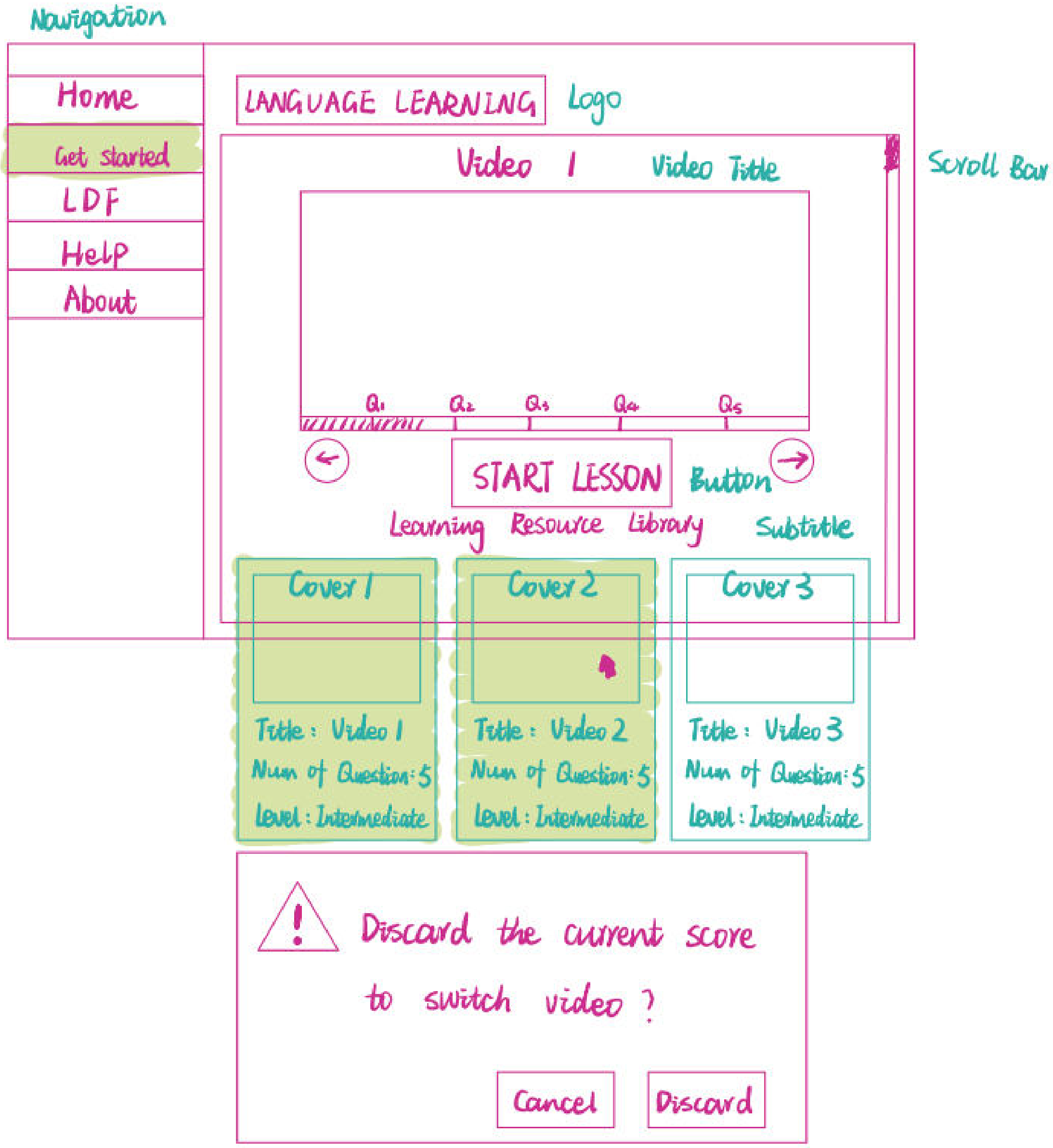


Figure 3.9: The sketch of the warning panel

Users can browse other lessons in the “Learning Resource Library” on the current page by pulling down the scroll bar, which is convenient for switching lessons. It is worth noting that switching lessons means giving up the score of the quiz in the current lesson, and the completed quiz questions in the current lesson will not be retained. If the user chooses this lesson again after switching to another lesson, the calculation of the score will start from 0. Therefore, when the user clicks on another lesson, a warning panel will appear as shown in Figure 3.9 to prompt the user that switching lessons will clear the quiz score for the current lesson. And when the user continues to click on the current lesson in the “Learning Resource Library”, nothing happens.

3.4 Design of the Remaining Pages

3.4.1 “LDF” Page Design

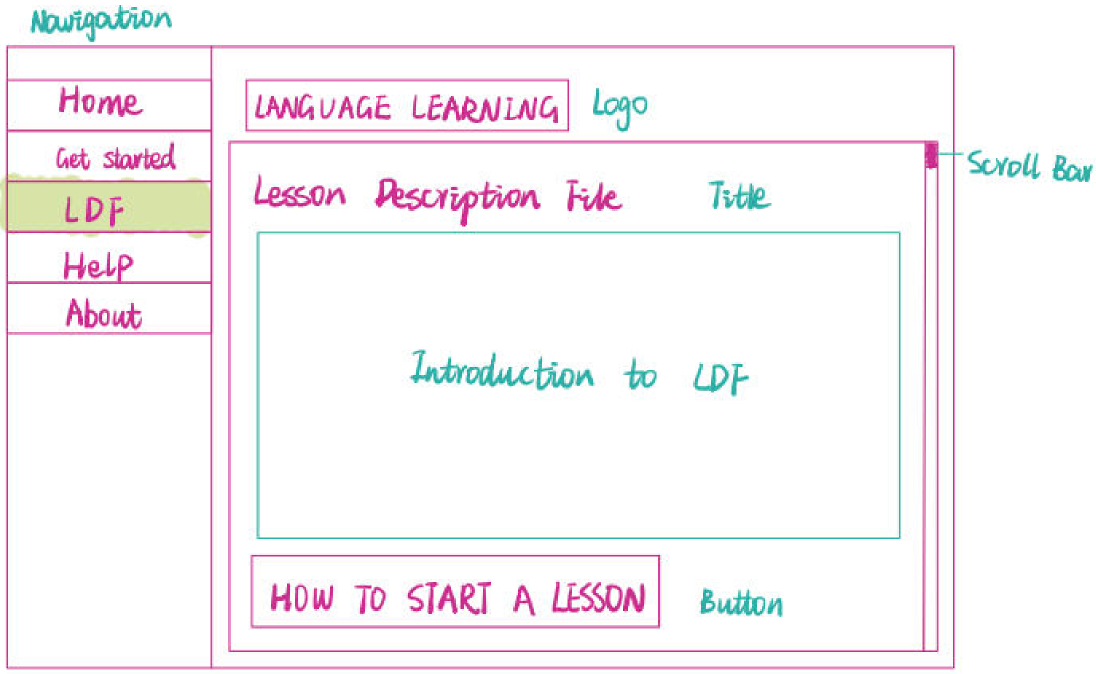


Figure 3.10: The sketch of the “LDF” page

If the default learning materials are not enough to meet the user’s learning needs, read the “LDF” page to learn how to write the user’s own lesson description file (LDF). Figure 3.10 is a sketch of the “LDF” page, which contains a “HOW TO START A LESSON” button in addition to detailed step-by-step instructions for making a lesson description file. This button navigates the user to the “Help” page.

3.4.2 "Help" Page Design

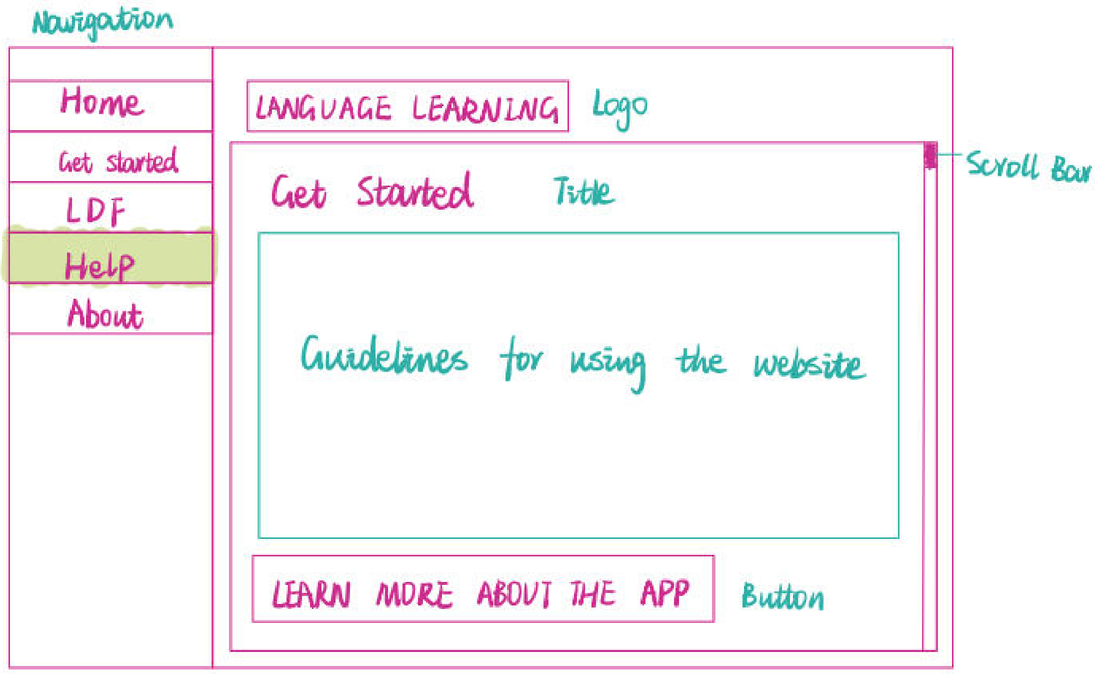


Figure 3.11: The sketch of the "Help" page

The "Help" page is mainly used to provide users with instructions on how to use the website, so as to help users get started quickly. Only after fully mastering the operation and functions of the website can users make the most of the website for language learning. Additionally, as shown in Figure 3.11, the "LEARN MORE ABOUT THE APP" button at the bottom of the page can navigate the user to the "About" page.

3.4.3 “About” Page Design

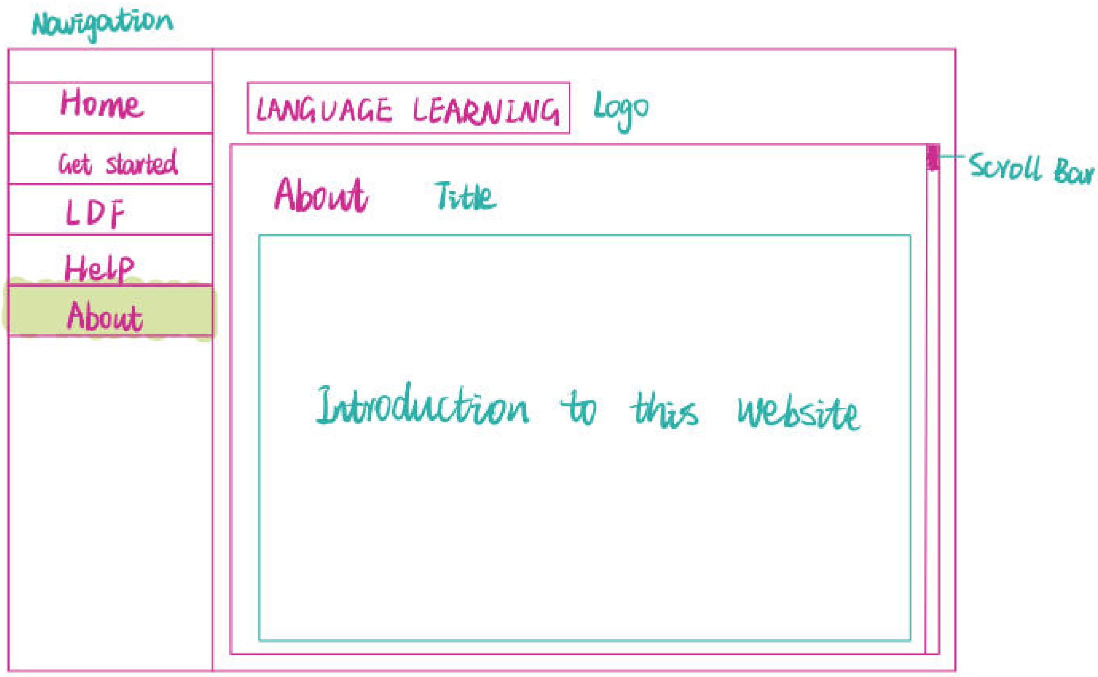


Figure 3.12: The sketch of the “About” page

The “About” page, shown in Figure 3.12, is a detailed introduction to the site, from the purpose of development to the direction of future optimization.

Chapter 4

Implementation

In this chapter, I explain how the chosen design was translated into code and which 3rd party frameworks we employed. I chose to store all the data needed to create learning resources and quizzes in a JSON file, which I call the lesson description file (LDF). At the same time, I utilize the Vue framework for website development and its reactivity helps me reduce DOM manipulation and improve the performance of rendering pages.

In addition, I will cover four pieces of code that are critical in building this project.

4.1 Selecting Suitable 3rd Party Libraries and Frameworks

JSON is a text format for storing and transporting data, which is "self-describing" and easy to understand. Although the JSON syntax is derived from JavaScript object notation, the JSON format is text only. So I chose to use JSON file format to define lessons. For some language teachers without knowledge of Vue.js, JavaScript and HTML, it is achievable to write a new JSON file with different video sources and their own questions etc.

Vue is a JavaScript framework for building user interfaces. It is built on standard HTML, CSS and JavaScript and provides a declarative and component-based programming model. Declarative coding improves development efficiency by eliminating the need for coders to directly manipulate the DOM. Since it adopts a componentized model, it can also improve the code reuse rate and make the code easy to maintain. More importantly, the two-way coupling between data and DOM elements can reduce times from user interaction to result, remove or reduce page-refreshes, and allow for the potential of smooth transitions between page changes. Considering the characteristics of the website that frequently changes page content, if only using JavaScript to manually manipulate the DOM to keep the page updated, it is prone to bugs and inefficient. However, after using the Vue framework, Vue's built-in reactivity system can automatically keep data and DOM elements updated in sync.

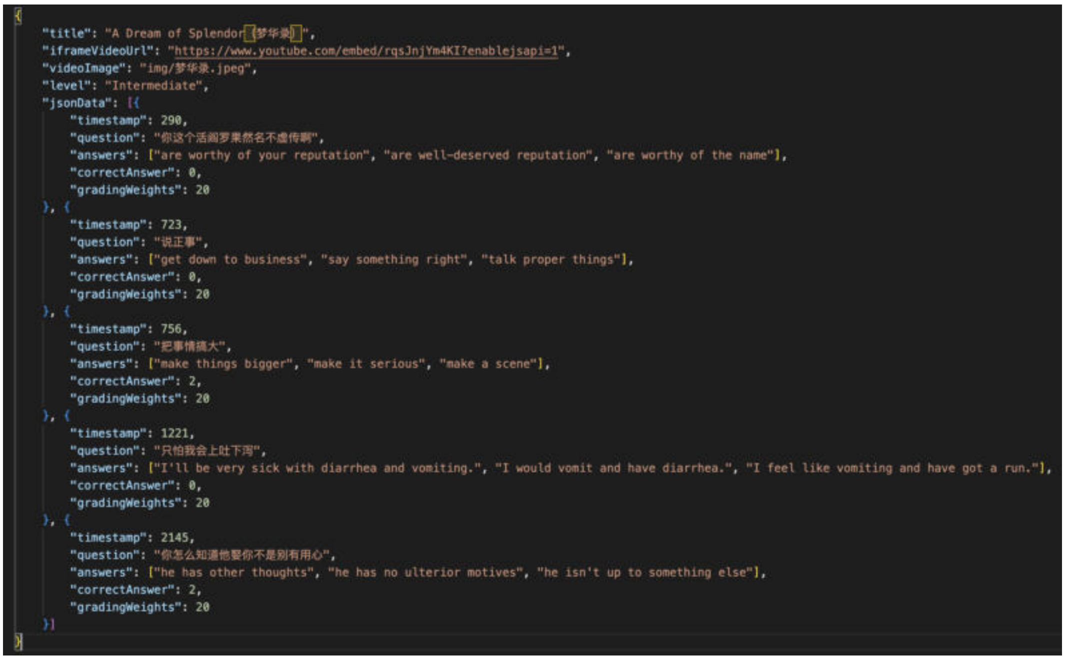
Therefore, a lesson description file (LDF) is created in JSON file format to store the video name, video link, video cover, timestamp, questions, options, correct answers and grading weights, which is also an easy and modifiable way for non-technical people to write data files. In addition, the quiz panel needs to be repeatedly shown and hidden at specific timestamps and the data rendered to the DOM needs to be changed each time. If only JavaScript is used to manipulate the DOM, the code with the same logic is repeatedly written many times, which not only reduces the coding efficiency, but also increases the difficulty of maintaining the code in the future. Hence, using Vue.js to create the user interface for the quiz panel simplifies code and increases code reuse. At the same time, it is also easy to update and maintain the website later.

4.2 Lesson Description File (LDF)

Lesson Description File (LDF)	**Key**	**Value**	**Meaning**
	title	a string	Video title
	iframeVideoUrl	a string	The embedded YouTube video link
	videoImage	a string	Video cover
	level	a string	The overall difficulty level of the quiz
	jsonData	an array	timestamp
			question
			answers
			correctAnswer
			gradingWeights

Table 4.1: Data stored in the lesson description file (LDF)

The lesson description file (LDF) is a file that stores various attributes of the lesson in JSON format, including 5 properties which are video title, video link, video cover, difficulty level and data related to quiz questions.



```
{
    "title": "A Dream of Splendor（梦华录）",
    "iframeVideoUrl": "https://www.youtube.com/embed/rqsJnjYm4KI?enablejsapi=1",
    "videoImage": "img/梦华录.jpeg",
    "level": "Intermediate",
    "jsonData": [{
        "timestamp": 290,
        "question": "你这个活阎罗果然名不虚传啊",
        "answers": ["are worthy of your reputation", "are well-deserved reputation", "are worthy of the name"],
        "correctAnswer": 0,
        "gradingWeights": 20
    }, {
        "timestamp": 723,
        "question": "说正事",
        "answers": ["get down to business", "say something right", "talk proper things"],
        "correctAnswer": 0,
        "gradingWeights": 20
    }, {
        "timestamp": 756,
        "question": "把事情搞大",
        "answers": ["make things bigger", "make it serious", "make a scene"],
        "correctAnswer": 2,
        "gradingWeights": 20
    }, {
        "timestamp": 1221,
        "question": "只怕我会上吐下泻",
        "answers": ["I'll be very sick with diarrhea and vomiting.", "I would vomit and have diarrhea.", "I feel like vomiting and have got a run."],
        "correctAnswer": 0,
        "gradingWeights": 20
    }, {
        "timestamp": 2145,
        "question": "你怎么知道他要你不是别有用心",
        "answers": ["he has other thoughts", "he has no ulterior motives", "he isn't up to something else"],
        "correctAnswer": 2,
        "gradingWeights": 20
    }]
}
```

Figure 4.1: The JSON file format of “A Dream of Splendor” video

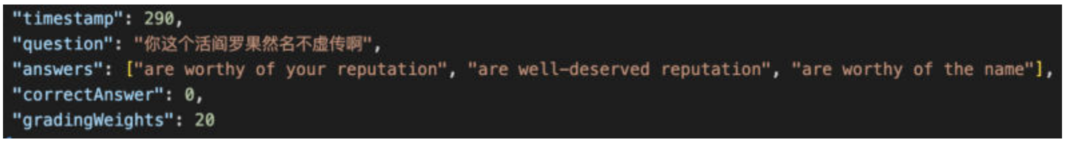
As shown in Figure 4.1, it is the lesson description file of the “A Dream of Splendor” video. I use it as an example to explain the meaning of each property in detail.

The **“title”** key refers to the video title and its value is the English title and Chinese title of the video.

The **“iframeVideoUrl”** key is used to store external links of embedded video. Its value can be obtained from the video’s play page on YouTube by clicking the “Share” button, choosing “Embed” option and copying the source of the link.

The relative path of the video cover is stored in the value of **“videoImage”** key. Users can also directly copy the link of the image on the Internet and paste it here.

The **“level”** key refers to the overall difficulty level of the quiz questions in the video. Its value can be “Beginner”, “Intermediate” or “Advanced”.



```
"timestamp": 290,
"question": "你这个活阎罗果然名不虚传啊",
"answers": ["are worthy of your reputation", "are well-deserved reputation", "are worthy of the name"],
"correctAnswer": 0,
"gradingWeights": 20
```

Figure 4.2: The “jsonData” object in the lesson description file of “A Dream of Splendor” video

The value of the **“jsonData”** key is an array that stores 5 properties describing each quiz question. The number of JSON objects depends on the number of questions set by the user. Figure 4.2 shows one of the JSON objects of the “jsonData” object in the lesson description file of “A Dream of Splendor” video.

(1) The **“timestamp”** key is used to set the time point at which the quiz question pops up. Its value is the time in seconds. For example, to set the first quiz question at 4 minutes and 50 seconds, the value of the “timestamp” key would be 290 (60 * 4 + 50 = 290).

(2) The **“question”** property is the Chinese line at the timestamp, and it is also the question of the quiz. Users should translate Chinese lines into appropriate English lines.

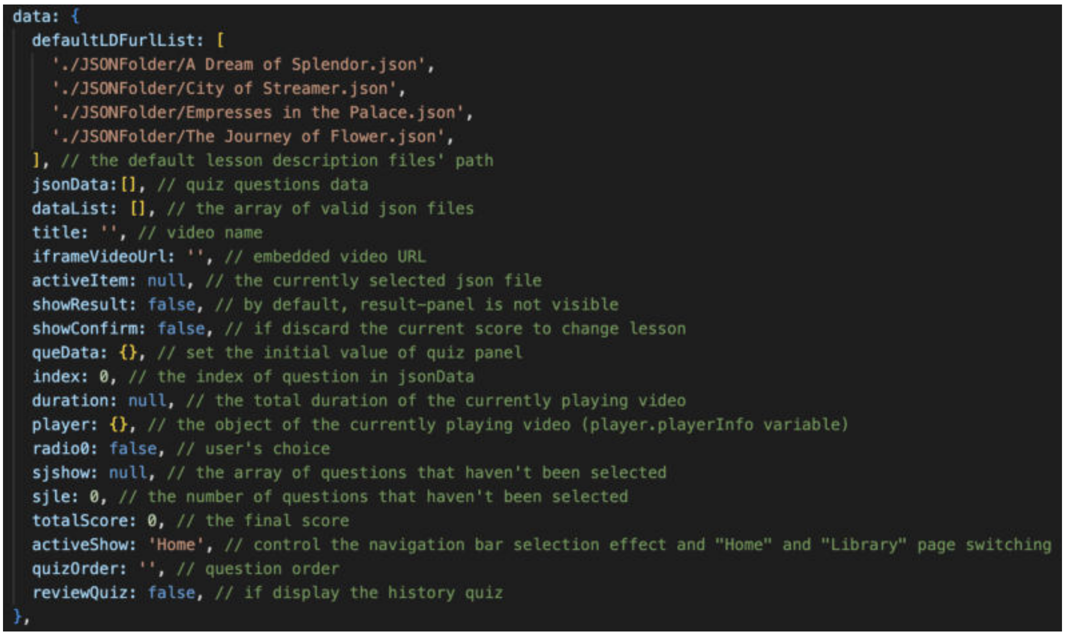
(3) The options for the question are stored in the value of the **“answer”** key as an array. It usually includes the authentic expression that is used by native speakers, as well as two other less idiomatic translations but commonly used by Chinese students. But the user can also increase or decrease the number of options stored in the array.

(4) The value of the **“correctAnswer”** key is the index of the correct answer in the “answer” array.

(5) The grading weight for each question can be set individually without having to set the same score for all questions. But in the example shown in the figure, since the number of questions is 5, for the convenience of calculating the final quiz score, I set the **“gradingWeights”** of each question to 20.

4.3 Vue Instance Data

This section requires some basic understanding of the Vue Javascript framework. For a very quick overview see “Vue.js - Understanding Data, Methods, Computed and Watch” (Sundaran, 2020). The “data” property is used to store the values in the vue instance in the form of an object (multiple key-value pairs).



```
data: {
  defaultLDFurlList: [
    './JSONFolder/A Dream of Splendor.json',
    './JSONFolder/City of Streamer.json',
    './JSONFolder/Empresses in the Palace.json',
    './JSONFolder/The Journey of Flower.json',
  ], // the default lesson description files' path
  jsonData:[], // quiz questions data
  dataList: [], // the array of valid json files
  title: '', // video name
  iframeVideoUrl: '', // embedded video URL
  activeItem: null, // the currently selected json file
  showResult: false, // by default, result-panel is not visible
  showConfirm: false, // if discard the current score to change lesson
  queData: {}, // set the initial value of quiz panel
  index: 0, // the index of question in jsonData
  duration: null, // the total duration of the currently playing video
  player: {}, // the object of the currently playing video (player.playerInfo variable)
  radio0: false, // user's choice
  sjshow: null, // the array of questions that haven't been selected
  sjle: 0, // the number of questions that haven't been selected
  totalScore: 0, // the final score
  activeShow: 'Home', // control the navigation bar selection effect and "Home" and "Library" page switching
  quizOrder: '', // question order
  reviewQuiz: false, // if display the history quiz
},
```

Figure 4.3: The “data” property of the Vue instance

Figure 4.3 shows the 19 key-value pairs in the “data” property of the Vue instance.

(1) **“defaultLDFurlList”**: An array that stores the path to the default lesson description files. I currently have 4 lesson description files written as default learning resources for users to learn.

(2) **“jsonData”**: the unserialized live value of the “jsonData” key from the current lesson description file.

(3) **“dataList”**: An array used to store available lesson description files.

(4) **“title”**: A string used to store the video name.

(5) **“iframeVideoUrl”**: A string used to store links to embedded YouTube videos.

(6) **“activeItem”**: represents the currently selected lesson description file. It is also used to control the style of the selected lesson description file on the “Get started” page.

(7) **“showResult”**: used to control the display of test results. By default, its value is “false”. Only when the video reaches the end does its value become “true”, showing the final score.

(8) **“showConfirm”**: used to control the pop-up window for confirming switching courses, and its default value is “false”. When the user switches to another lesson on the selected lesson play page, a pop-up window will appear to remind the user that switching lessons will lose the score of the current lesson quiz. At this point, its value becomes “true”.

(9) **“queData”**: An object whose initial value is empty. It is used to store data for each quiz item. Its value can be obtained by indexing the “jsonData” array.

(10) **“index”**: refers to the index of the “jsonData” array, which can be used to obtain data for each quiz item.

(11) **“duration”**: represents the total duration of the currently playing lesson video. It is used to compare the current time of the video to determine if the video has reached the end. If the video is at the end, the value of the “showResult” key becomes “true” and the quiz score is displayed.

(12) **“player”**: represents the currently playing video object.

(13) **“radio0”**: refers to the user’s choice in a quiz. Its initial value is “false” because the user has not yet made a selection when each quiz question appears. It is used to compare whether the option selected by the user is the correct answer to calculate the score.

(14) **“sjshow”**: represents an array of questions that have not yet been answered.

(15) **“sjle”**: represents the number of questions that have not been answered.

(16) **“totalScore”**: used to store the final score for the quiz in a lesson.

(17) **“activeShow”**: used to control “Home” and “Get started” page switching as well as the navigation bar selection effect.

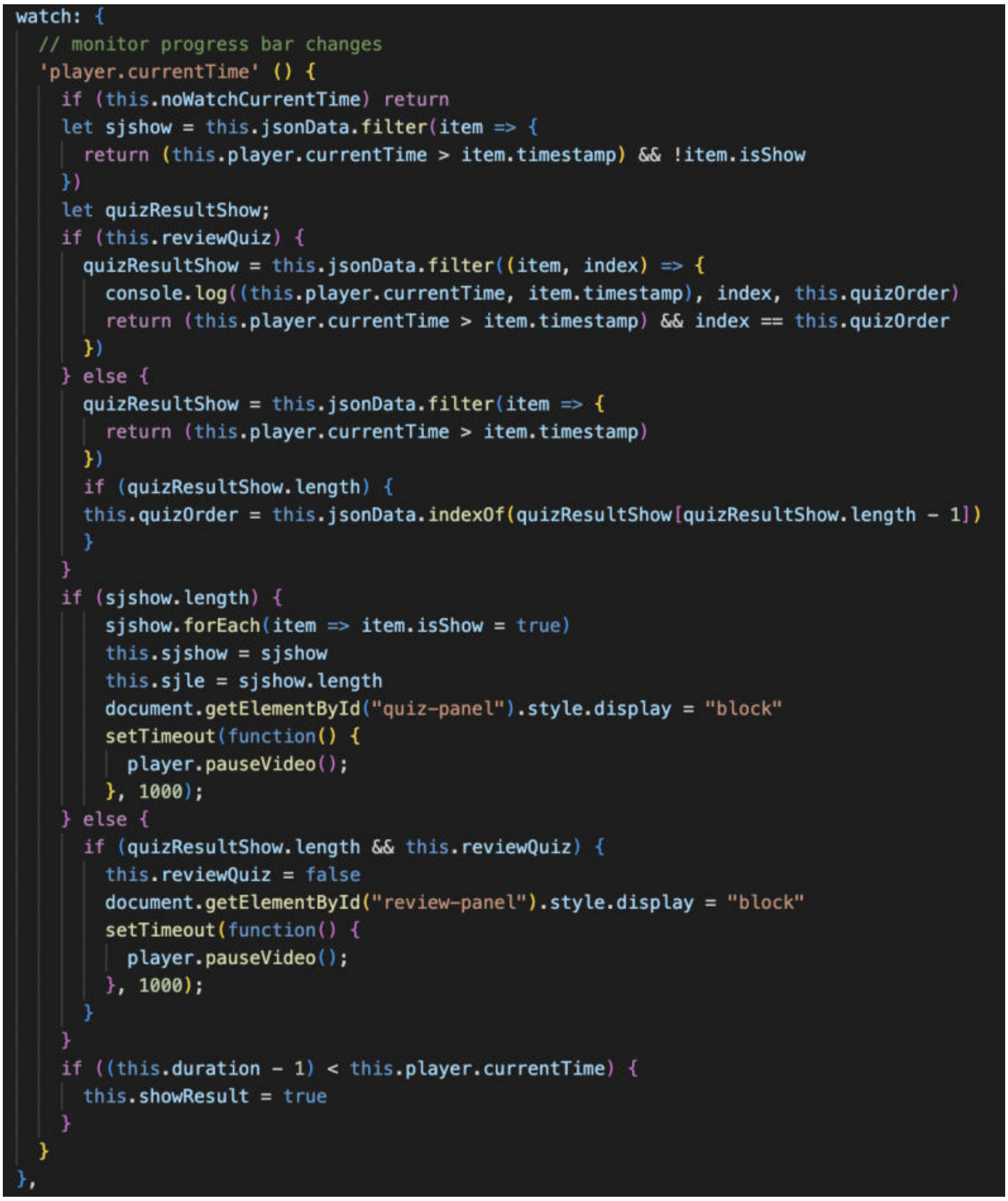
(18) **“quizOrder”**: A string representing the index of the current quiz question.

(19) **“reviewQuiz”**: represents the display state of the historical quiz. By default, its value is “false”.

4.4 Quiz Question Pop-up

The quiz popup feature is one of the main features of this site. When a user watches a video lesson, a quiz question related to the current line will pop up at a specific timestamp to test the user's foreign language ability.

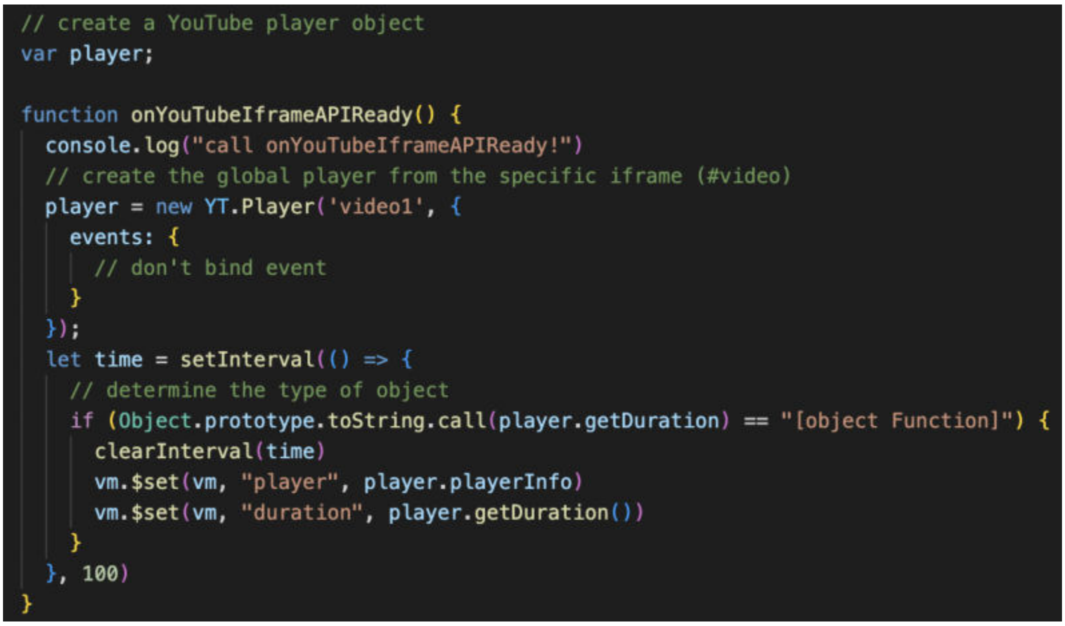
In order to implement the function of the corresponding quiz question appearing at a specific timestamp, it is necessary to monitor the progress bar change of the currently playing YouTube video. The YouTube API does not allow to register a custom callback function which will be automatically executed at a certain time mark. Therefore, we have to implement this feature with the help of the Vue watch concept. By comparing the current time of the video with the time when the quiz questions should appear, a quiz question that should be displayed at this time is filtered out.



```
watch: {
  // monitor progress bar changes
  'player.currentTime' () {
    if (this.noWatchCurrentTime) return
    let sjshow = this.jsonData.filter(item => {
      return (this.player.currentTime > item.timestamp) && !item.isShow
    })
    let quizResultShow;
    if (this.reviewQuiz) {
      quizResultShow = this.jsonData.filter((item, index) => {
        console.log((this.player.currentTime, item.timestamp), index, this.quizOrder)
        return (this.player.currentTime > item.timestamp) && index == this.quizOrder
      })
    } else {
      quizResultShow = this.jsonData.filter(item => {
        return (this.player.currentTime > item.timestamp)
      })
      if (quizResultShow.length) {
      this.quizOrder = this.jsonData.indexOf(quizResultShow[quizResultShow.length - 1])
      }
    }
    if (sjshow.length) {
        sjshow.forEach(item => item.isShow = true)
        this.sjshow = sjshow
        this.sjle = sjshow.length
        document.getElementById("quiz-panel").style.display = "block"
        setTimeout(function() {
          player.pauseVideo();
        }, 1000);
    } else {
      if (quizResultShow.length && this.reviewQuiz) {
        this.reviewQuiz = false
        document.getElementById("review-panel").style.display = "block"
        setTimeout(function() {
          player.pauseVideo();
        }, 1000);
      }
    }
    if ((this.duration - 1) < this.player.currentTime) {
      this.showResult = true
    }
  }
},
```

Figure 4.4: Code snippet to monitor progress bar changes

Figure 4.4 is a code snippet for monitoring progress bar changes with the help of the "watch" property of the Vue instance. According to the YouTube iframe player API, using "player.getCurrentTime()" can return the elapsed time in seconds since the video started playing. However, the "watch" property can only monitor for changes in variables (data variables or computed variables), not for changes in the return value of a function. I tried printing "player.getCurrentTime()" in the console and found that there is a "player.playerInfo.currentTime" variable in that function. The "watch" option also supports a dot-delimited path as the key. Therefore, the variable that the "watch" property listens to should be the "player.playerInfo.currentTime" variable.



```
// create a YouTube player object
var player;

function onYouTubeIframeAPIReady() {
  console.log("call onYouTubeIframeAPIReady!")
  // create the global player from the specific iframe (#video)
  player = new YT.Player('video1', {
    events: {
      // don't bind event
    }
  });
  let time = setInterval(() => {
    // determine the type of object
    if (Object.prototype.toString.call(player.getDuration) == "[object Function]") {
      clearInterval(time)
      vm.$set(vm, "player", player.playerInfo)
      vm.$set(vm, "duration", player.getDuration())
    }
  }, 100)
}
```

Figure 4.5: Code snippet to create a YouTube player object

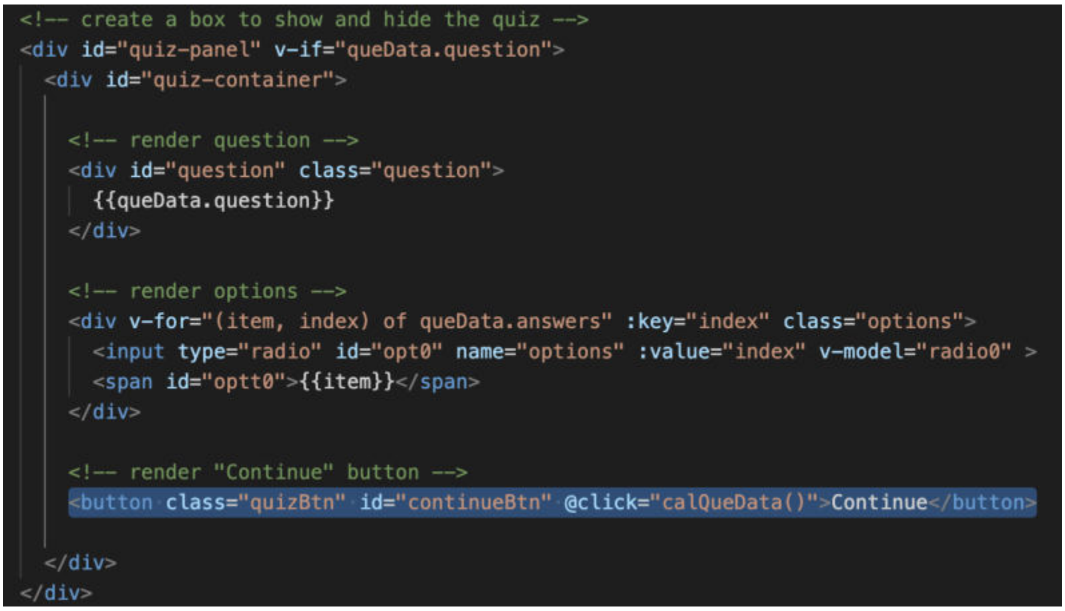
In the code snippet that creates the YouTube player object shown in Figure 4.5, I set the value of the "player" key in the Vue instance to "player.playerInfo". Therefore, the variable monitored by the "watch" property is "player.currentTime" as shown in Figure 4.4.

The "isShow" property is used to indicate whether the quiz item has been displayed. Its default value is "false" because none of the quiz questions have appeared before the lesson starts. The current time is greater than the timestamp and the quiz questions that have not been shown are filtered out and stored in a variable named "sjshow".

When the user clicks the "Previous Question" button or the "Next Question" button, the value of the "reviewQuiz" variable turns to "true". At this point, all currently completed quiz questions and corresponding indexes need to be filtered out and stored in a variable named "quizReviewShow". However, in the case where the user does not click the "Previous Question" button or the "Next Question" button, it is only necessary to store all completed questions in the "quizReviewShow" variable. If there are already answered questions, the index of the current question is the index of the latest completed quiz question in jsonData.

If there are questions, it means that the array of to-be-do questions is not empty, that is, "sjshow.length" is not 0. Then mark all the questions in the array of to-be-do questions as displayed, and assign values to the array of to-be-do questions and the number of to-be-do questions in the Vue instance. I use the "setTimeout" function to automatically pause the video after 1s of showing the quiz panel. Conversely, if there are no questions to do and the user clicks the "previous question" button or "next question" button, this means that each popup will display a review panel, the user's actual answer can be compared against the expected answer.

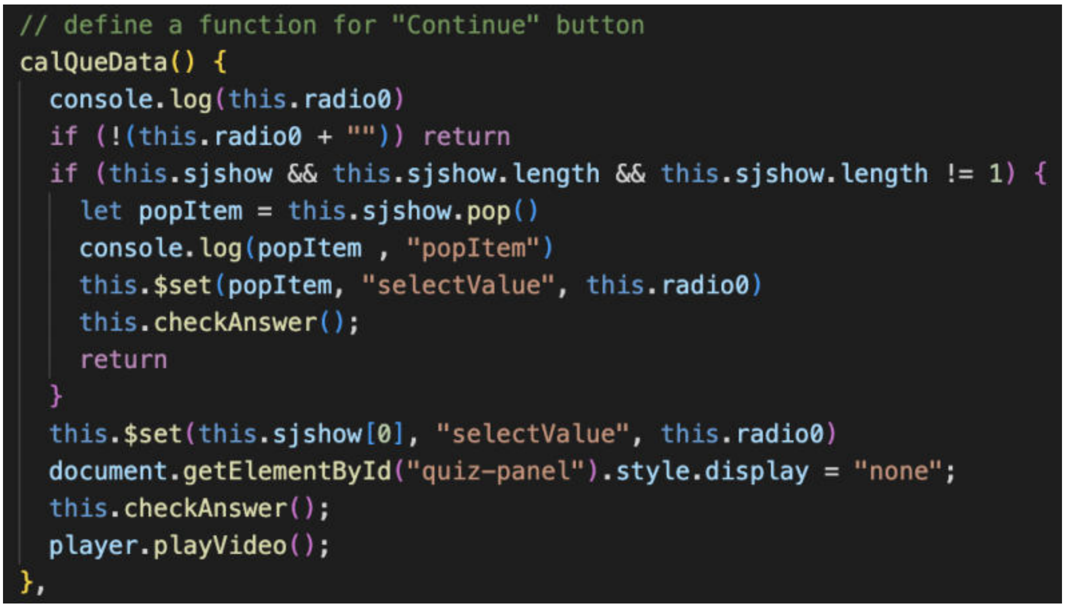
For the display of the result panel, it is necessary to compare the current time with the total duration of the current playing video. If the current time is greater than (duration-1), it means at the end of the video, so the final score is displayed.



```html
<!-- create a box to show and hide the quiz -->
<div id="quiz-panel" v-if="queData.question">
  <div id="quiz-container">

    <!-- render question -->
    <div id="question" class="question">
      {{queData.question}}
    </div>

    <!-- render options -->
    <div v-for="(item, index) of queData.answers" :key="index" class="options">
      <input type="radio" id="opt0" name="options" :value="index" v-model="radio0" >
      <span id="optt0">{{item}}</span>
    </div>

    <!-- render "Continue" button -->
    <button class="quizBtn" id="continueBtn" @click="calQueData()">Continue</button>

  </div>
</div>
```

Figure 4.6: Code snippet for quiz panel

Figure 4.6 is the HTML code snippet for the quiz panel. After the user completes the quiz question, they need to click the “Continue” button to continue watching the lesson video. Therefore, after clicking the “Continue” button, the quiz panel should be hidden, the answer to this question should be checked, and the video should be automatically played.



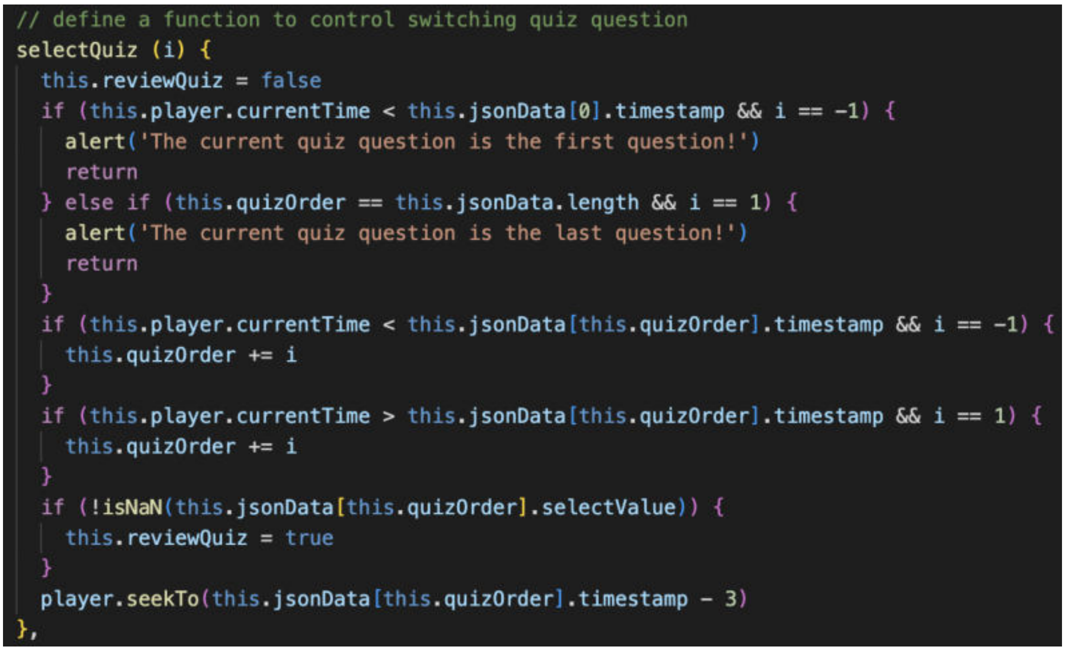
```
// define a function for "Continue" button
calQueData() {
  console.log(this.radio0)
  if (!(this.radio0 + "")) return
  if (this.sjshow && this.sjshow.length && this.sjshow.length != 1) {
    let popItem = this.sjshow.pop()
    console.log(popItem , "popItem")
    this.$set(popItem, "selectValue", this.radio0)
    this.checkAnswer();
    return
  }
  this.$set(this.sjshow[0], "selectValue", this.radio0)
  document.getElementById("quiz-panel").style.display = "none";
  this.checkAnswer();
  player.playVideo();
},
```

Figure 4.7: Code snippet to define a function for “Continue” button

I use the “v-on” directive of Vue.js to listen to the “Continue” button, and when the button is clicked, the “calQueData” function is triggered. Figure 4.7 shows what the “calQueData” function does. In the case where the user watches the course video and answers the quiz questions in sequence, the “Continue” button hides the quiz panel, checks the answer to the question, and continues playing the video. However, if the user does not select either option, clicking the “Continue” button will not hide the quiz panel and autoplay the video. If the user does not answer the quiz questions sequentially from the first question, but manually seeks to the specified time in the video (the time point is greater than the timestamps of some quiz questions), then when filtering the to-be-do question, there will be more than one to-be-do question. For example, when the user manually specifies a timestamp between Q2 and Q3, then Q1 will be displayed, and Q2 will appear immediately after the user answers Q1 and clicks the “Continue” button. When done, clicking the “Continue” button will hide the quiz panel and continue playing the video. I have a key called “selectValue” for the current quiz question, and its value is used to store the user’s selection. This is to determine whether the user’s choice is consistent with the correct answer, thereby displaying the review panel.

4.5 Quiz Question Review

Clicking either the “Previous Question” button or the “Next Question” button will trigger the “selectQuiz” function, which displays the user’s answer and the correct answer. The difference is that the parameters passed in when the two buttons are clicked are different. The former parameter is -1, the latter parameter is 1.



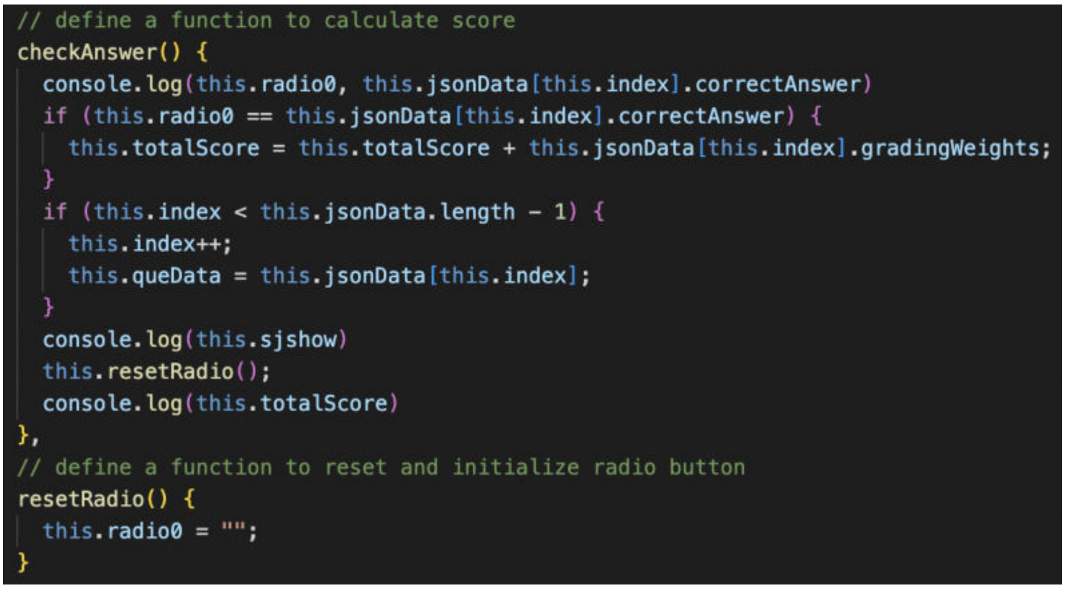
```
// define a function to control switching quiz question
selectQuiz (i) {
  this.reviewQuiz = false
  if (this.player.currentTime < this.jsonData[0].timestamp && i == -1) {
    alert('The current quiz question is the first question!')
    return
  } else if (this.quizOrder == this.jsonData.length && i == 1) {
    alert('The current quiz question is the last question!')
    return
  }
  if (this.player.currentTime < this.jsonData[this.quizOrder].timestamp && i == -1) {
    this.quizOrder += i
  }
  if (this.player.currentTime > this.jsonData[this.quizOrder].timestamp && i == 1) {
    this.quizOrder += i
  }
  if (!isNaN(this.jsonData[this.quizOrder].selectValue)) {
    this.reviewQuiz = true
  }
  player.seekTo(this.jsonData[this.quizOrder].timestamp - 3)
},
```

Figure 4.8: Code snippet to define a function to control switching quiz questions

Figure 4.8 is a code snippet to define a function to control switching quiz questions. When on the first quiz question, clicking the “Previous Question” button will get a warning that the current quiz question is the first question. Correspondingly, when in the last quiz question, clicking the “Next Question” button will also get a warning that the current quiz question is the last question. What the “Previous Question” button does is take the user to the previous quiz question, which means that the index of the current quiz question will be decremented by 1. Conversely, when the user clicks the “Previous Question” button, the index of the current quiz question will be incremented by 1. On the premise that the user has answered the quiz question, clicking these two buttons, the video player will skip forward or backward 3 seconds before the next/previous quiz question, and then display the review panel of the corresponding quiz question at the specified timestamp.

4.6 Quiz Score Calculation

The quiz score is displayed after the user has watched the video and answered all the quiz questions, which helps to quantify the user's learning outcomes. The whole system implements a single choice quiz. So the user cannot tick multiple answers at the same time and therefore we do not need to implement a penalty system with negative weights or similar.



```
// define a function to calculate score
checkAnswer() {
  console.log(this.radio0, this.jsonData[this.index].correctAnswer)
  if (this.radio0 == this.jsonData[this.index].correctAnswer) {
    this.totalScore = this.totalScore + this.jsonData[this.index].gradingWeights;
  }
  if (this.index < this.jsonData.length - 1) {
    this.index++;
    this.queData = this.jsonData[this.index];
  }
  console.log(this.sjshow)
  this.resetRadio();
  console.log(this.totalScore)
},
// define a function to reset and initialize radio button
resetRadio() {
  this.radio0 = "";
}
```

Figure 4.9: Code snippet to define a function to calculate score

Each time the user answers the quiz question, the user's actual answers can be compared against the expected answers. If the expected answer is ticked then the corresponding weight is added to the final score. Otherwise no action is taken. As shown in Figure 4.9, the "radio0" property represents the user's choice, and its value is the index of the option. The "correctAnswer" property is the index of the correct answer in the options array. If the two are equal, the grading weights for this question can be added to the total score. After each quiz question is answered, the index of the "jsonData" object is incremented by 1, thereby assigning the data for the next quiz question to the "queData" object. After calculating the score of this question, the user's choice must be reset to initialization, otherwise, when the next question appears, the user's choice of the previous question will also be applied to this question.

Chapter 5

Evaluation

Usability and accessibility are two of the most important metrics when building a website. From the definitions given by the World Wide Web Consortium, usability is “design of products to be effective, efficient and satisfying” for end users, while accessibility is “the equivalent user experience for people with disabilities, including age-related disabilities.”

Usability emphasizes the user-centered design of a website, which is related to the quality of user experience when interacting with the website, the efficiency with which tasks are completed, and user satisfaction, while accessibility emphasizes the technical aspects of the website. Although the focus of the two is different, and sometimes one is optimized and the other is lost, both standards are equally important for web development.

In this chapter, I will evaluate the site from both usability and accessibility perspectives.

5.1 Usability

5.1.1 Consistency

Consistency refers to keeping all repeating elements of a website the same behavior throughout the design of the website. This includes everything from the placement of buttons and icons to the colors and fonts used.

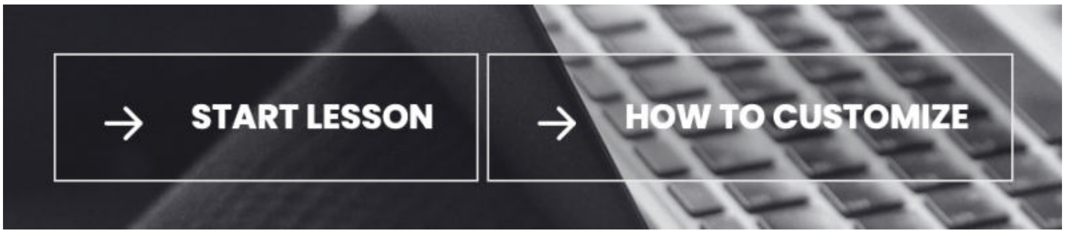
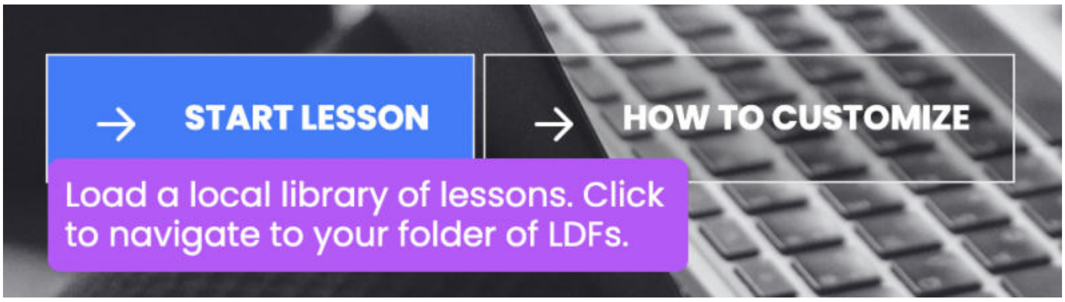


Figure 5.1: The style of the buttons

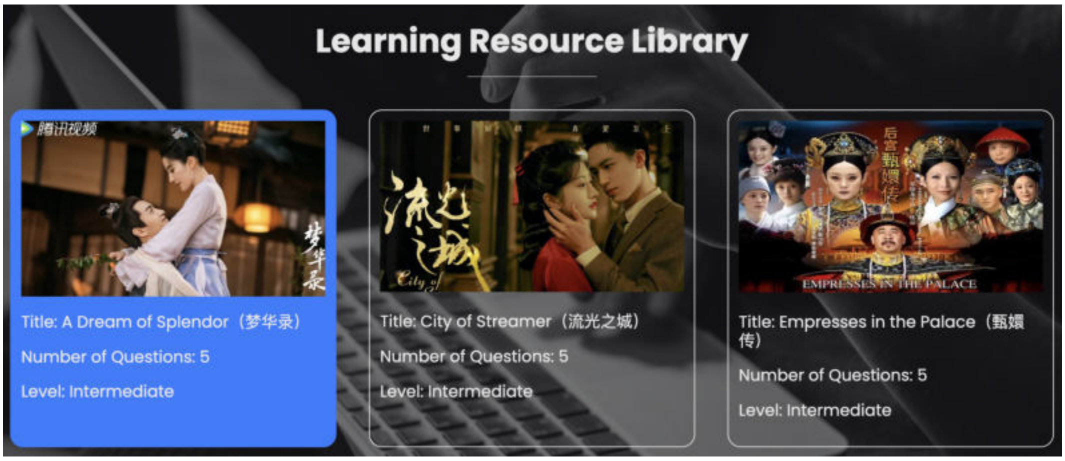
Website elements that are perceived in the same way constitute visual consistency, which helps users learn the website. To prevent clutter, the font of this website is “Poppins”, and the style of the buttons is composed of an arrow image and button name as shown in Figure 5.1.



Load a local library of lessons. Click to navigate to your folder of LDFs.

Figure 5.2: The hover style of the button

The hover effect of the button is shown in Figure 5.2, and the background color of the button will be filled with blue.



Learning Resource Library

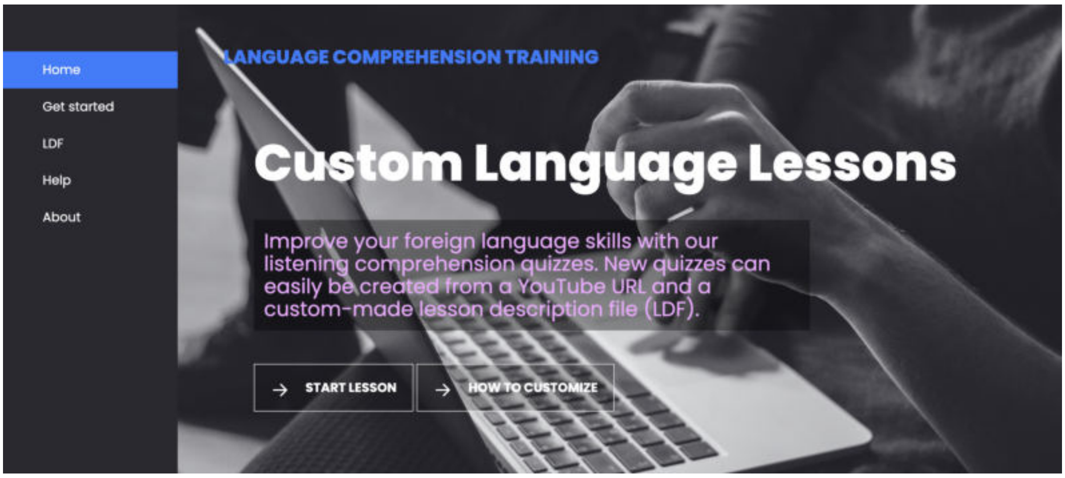
Title: A Dream of Splendor（梦华录）
Number of Questions: 5
Level: Intermediate

Title: City of Streamer（流光之城）
Number of Questions: 5
Level: Intermediate

Title: Empresses in the Palace（甄嬛传）
Number of Questions: 5
Level: Intermediate

Figure 5.3: The hover style of the lesson card

On the "Learning Resource Library" page, when the user hovers on the lesson card, as shown in Figure 5.3, the same background filling effect will also occur.



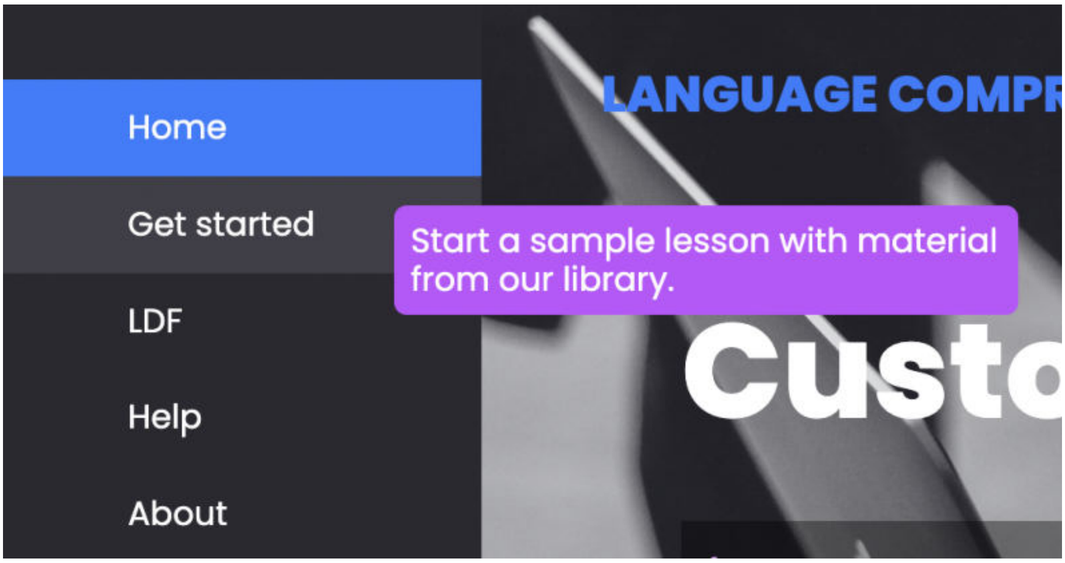
Improve your foreign language skills with our listening comprehension quizzes. New quizzes can easily be created from a YouTube URL and a custom-made lesson description file (LDF).

Figure 5.4: The style of the logo and buttons

For the logo in the <header>, it is the equivalent of a button that takes the user back to the home page when clicked, so I capitalized it and all the buttons on the site. Their style can be seen in Figure 5.4.

5.1.2 Feedback and Visibility

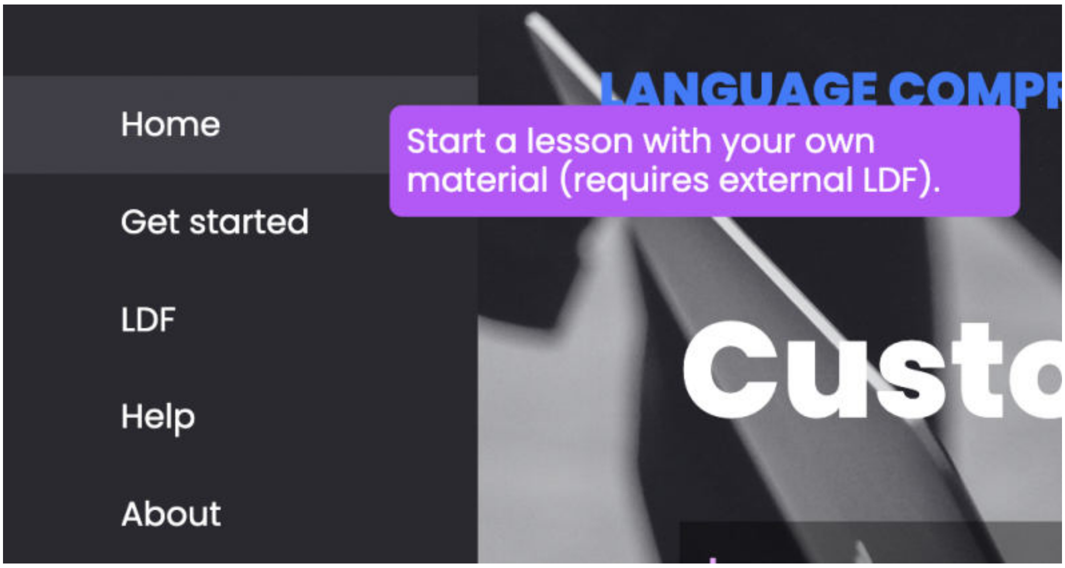
Feedback refers to communicating the results of any interaction to the user, making it both visible and understandable. Both the hover effects shown in Figures 5.2 and 5.3 belong to a visual signal sent by the website to the user. In addition, when the user hovers, the shape of the mouse will also become a gripper, which is used to indicate that the element can be clicked by the user.



Start a sample lesson with material from our library.

Figure 5.5: The hover style of the “Get started” section

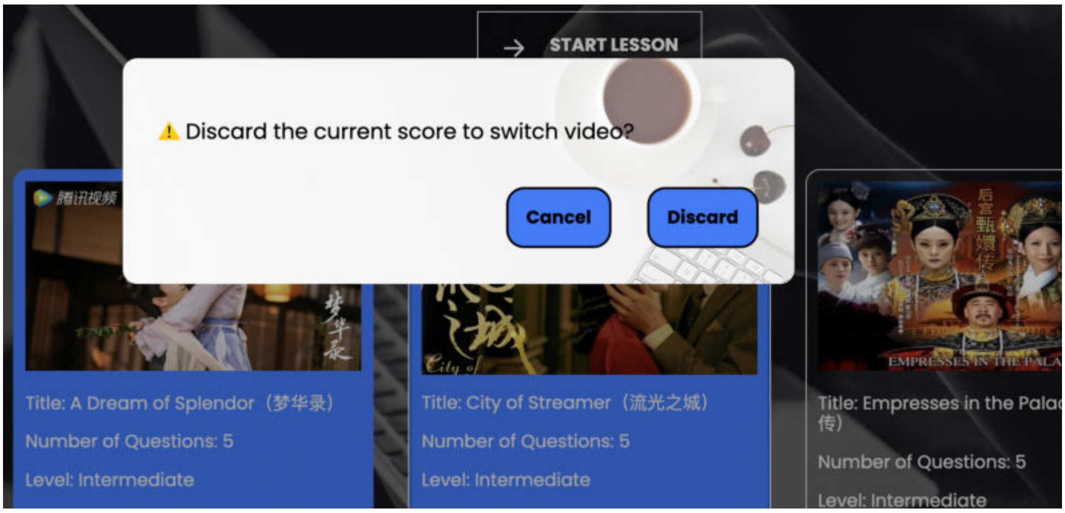
Taking the navigation bar as an example, the user can know the current page through the feedback information given by the website. Figure 5.5 shows the style that hovering the “Get started” section when the user is on the home page.



Start a lesson with your own material (requires external LDF).

Figure 5.6: The hover style of the “Home” section

However, when the user hovers over the current page, the hover effect will appear differently. As shown in Figure 5.6 , the user is already on the home page, so the hover effect is to fill the background with a slightly darker gray than the one in Figure 5.5 . This gives the user the visual effect of a blue and light gray overlay.



⚠ Discard the current score to switch video?

Title: A Dream of Splendor（梦华录）
Number of Questions: 5
Level: Intermediate

Title: City of Streamer（流光之城）
Number of Questions: 5
Level: Intermediate

Title: Empresses in the Palac
传）
Number of Questions: 5
Level: Intermediate

Figure 5.7: The modal alert for switching lesson

Feedback should also inform the user of the outcome of the action. For example, when a user has selected a course but clicks another course card in the “Learning Resource Library”, the website should confirm whether the user wants to change the course and remind them of the consequences of doing so. This prevents users from accidentally clicking on other lesson cards and losing quiz scores for the current lesson. Figure 5.7 is a modal alert. If the user clicks the “Discard” button, the lesson will be switched successfully, and if the user clicks “Cancel”, they can stay on the current lesson page.

5.1.3 Interactive Styles

The use of interactive styles in a website allows users to interact with the website, thereby increasing the engagement of website visitors. Whether it is navigating to other pages, clicking a call-to-action button, or scrolling down to see more content is how the website interacts with users.

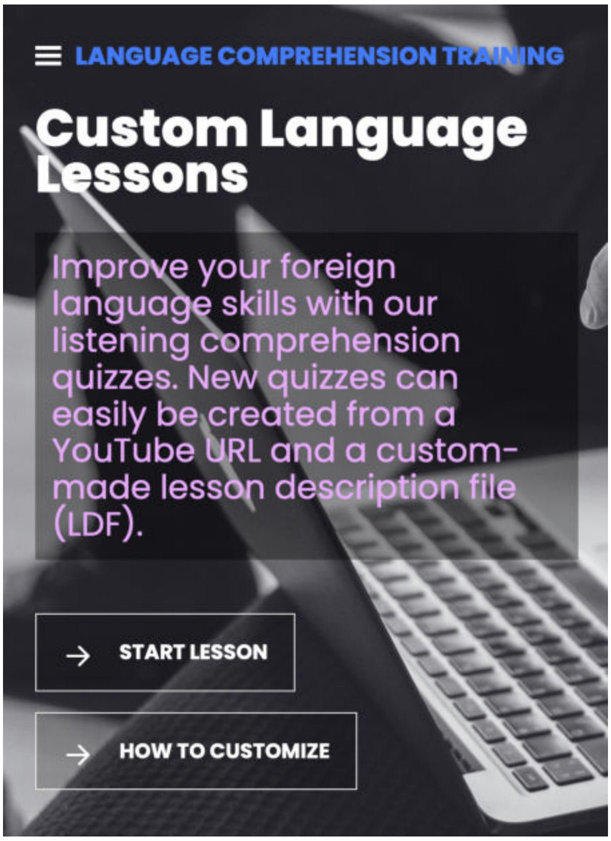


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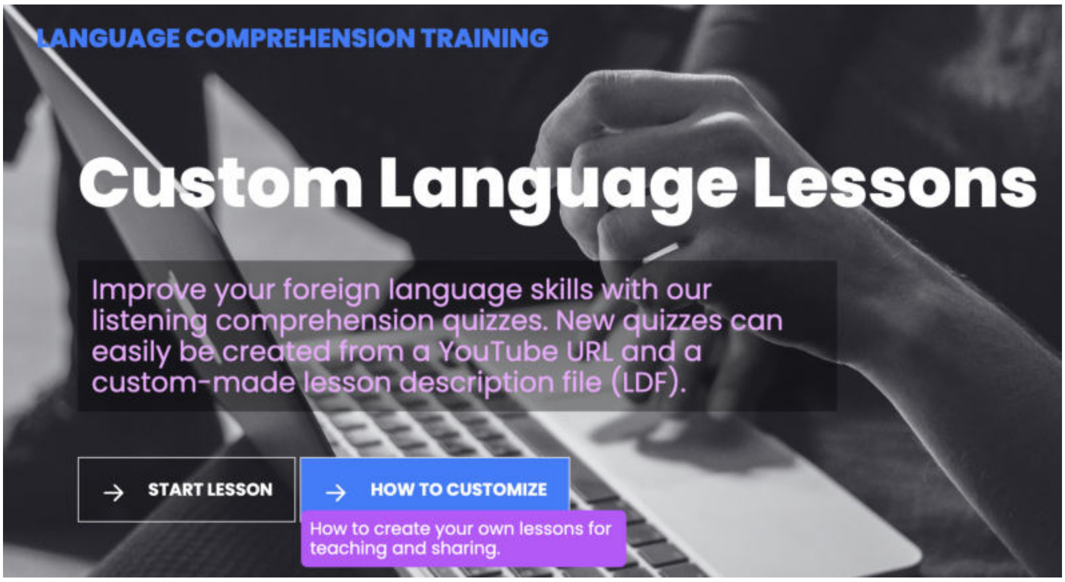
Figure 5.8: The hamburger icon for showing the navigation

Also, for mobile devices with smaller screens, I hide the side navigation bar to give the rest of the page breathing room. As shown in Figure 5.8, the user can display the navigation bar by clicking on the hamburger icon. Clicking the arrow icon is to hide the navigation bar. Users can interact with it when needed.

I also set a hover effect on each lesson card to make the website dynamic and interesting. When the user is browsing the “Learning Resource Library”, not only the background of the hovered lesson card will be filled with blue, but the video cover image will also become larger.

5.1.4 Prevent Errors

Reducing user errors in operation is also an important measure in the evaluation of website usability.



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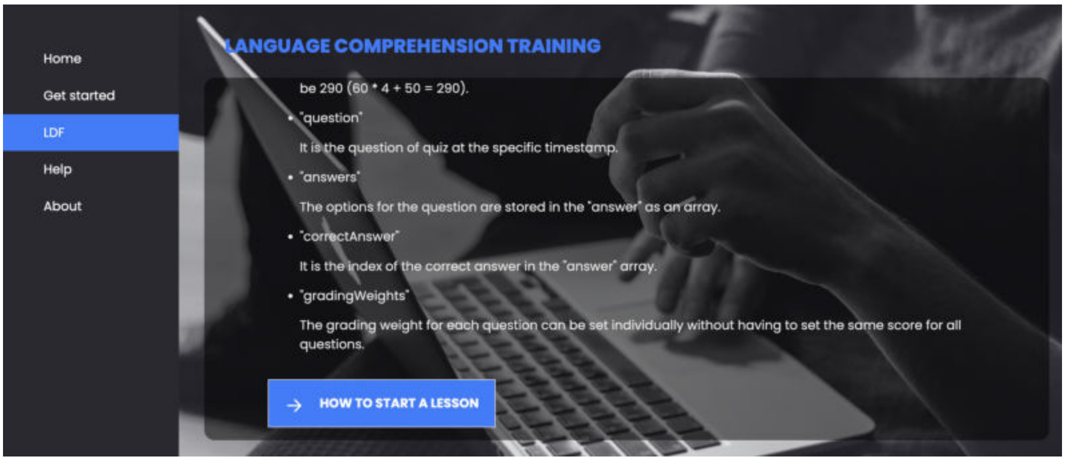
How to create your own lessons for teaching and sharing.

Figure 5.9: The "HOW TO CUSTOMIZE" button

In order to prevent users from making mistakes when writing the lesson description files, on the home page shown in Figure 5.9, I set up a call-to-action button that will navigate to the "LDF" page and instruct the user in detail on how to write an effective lesson description file (LDF). Apart from that, I added tooltips to both the navbar and button elements to specify extra information about something. When the user moves the mouse pointer over the element, the user can clearly understand the function of the UI element.



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be 290 (60 * 4 + 50 = 290).

- "question"

It is the question of quiz at the specific timestamp.

- "answers"

The options for the question are stored in the "answer" as an array.

- "correctAnswer"

It is the index of the correct answer in the "answer" array.

- "gradingWeights"

The grading weight for each question can be set individually without having to set the same score for all questions.

Figure 5.10: The "HOW TO START A LESSON" button

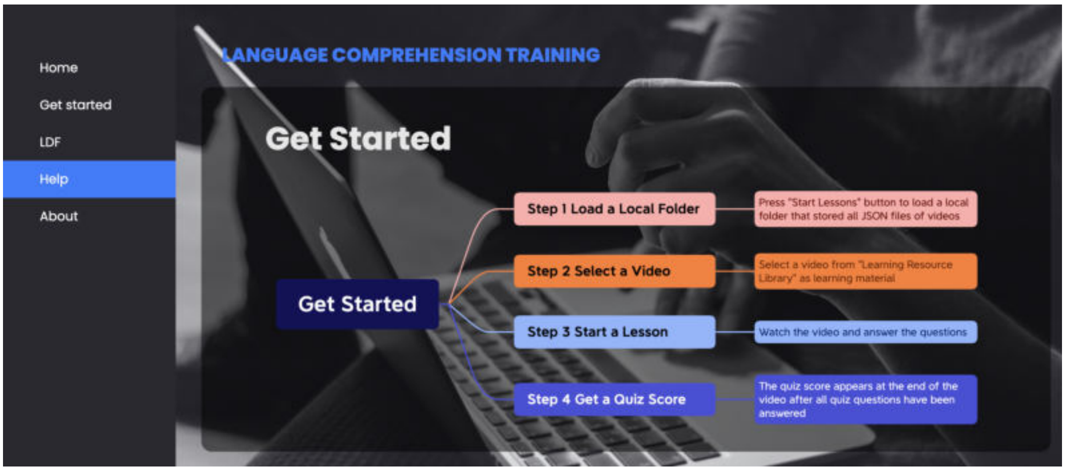
As shown in Figure 5.10, there is a "HOW TO START A LESSON" button at the bottom of the "LDF" page, which can navigate the user to the "Help" page to learn the steps of using the website. This saves time for users to become familiar with and learn the use of the website.

The previously mentioned modal alert in Figure 6 also prevents errors caused by accidental user operations to a certain extent.

5.2 Accessibility

5.2.1 Perceiving

When users open a website, their attention is focused on the right half of the home page, which takes up a lot of space, which is caused by the human visual hierarchy. There should also be different font sizes for website titles and description paragraphs.



Step 1 Load a Local Folder — Press "Start Lessons" button to load a local folder that stored all JSON files of videos

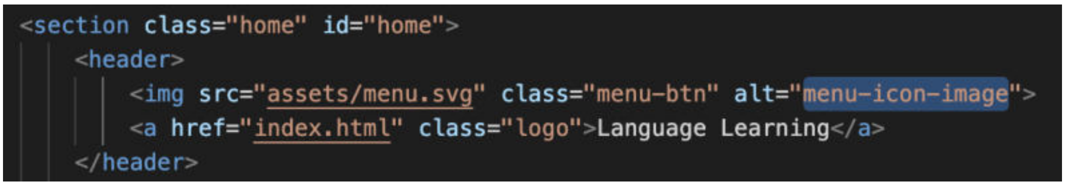
Step 2 Select a Video — Select a video from "Learning Resource Library" as learning material

Step 3 Start a Lesson — Watch the video and answer the questions

Step 4 Get a Quiz Score — The quiz score appears at the end of the video after all quiz questions have been answered

Figure 5.11: The mind map in "Help" page

On the "LDF" and "Help" pages, as shown in Figure 5.11, I have used mind maps to summarize the text content simply and clearly. Compared with the slightly monotonous text, this can attract the user's attention more, and can deliver more effective content to the user at the same time.



```
<section class="home" id="home">
    <header>
        <img src="assets/menu.svg" class="menu-btn" alt="menu-icon-image">
        <a href="index.html" class="logo">Language Learning</a>
    </header>
```

Figure 5.12: The alt attribute of <img> tag

In addition, I set the value of the alt attribute for all <img> tags in the site to display alternative information for the image, when the user cannot view the image for some reason, such as a slow connection, an error in the "src" attribute, or the user using screen reader. Figure 5.12 is an alternative message for the menu icon.

It is worth mentioning that all content of a website is marked with HTML tags such as <header>, <nav>, <section>, etc. These structured content allow browsers and users to understand the context of the information in the HTML document.

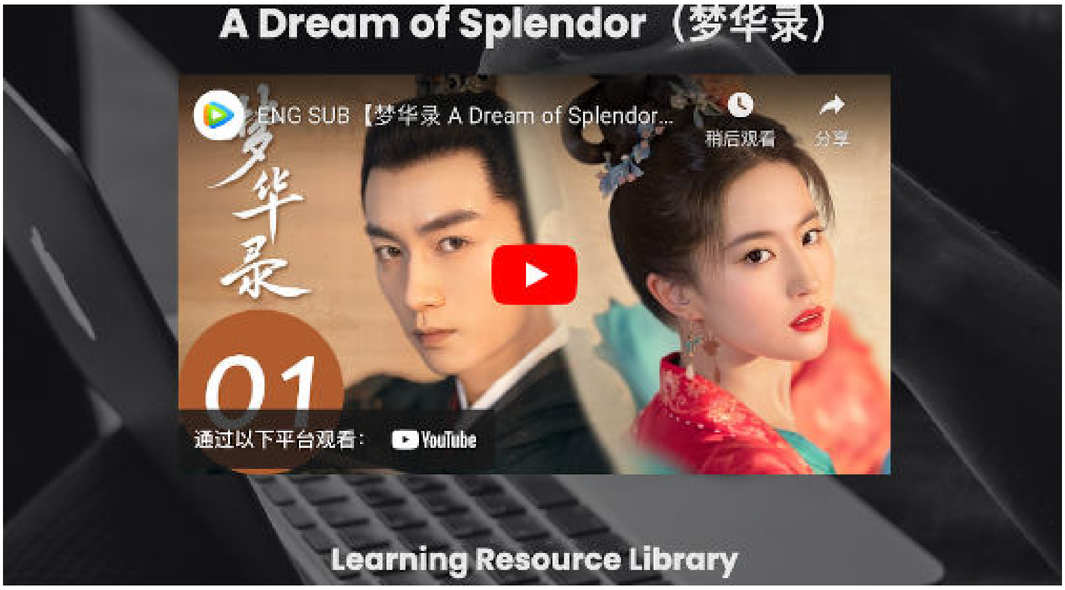
5.2.2 Understanding

Understanding a website means learning how to use it. Websites should be accessible to everyone, regardless of technical expertise or disability. Therefore, the use of the website should be easy for everyone to learn.

The textual content placed on all the buttons on the site actually guides the user, making it clear what the call-to-action button does. For example, the "START LESSON" button on the home page, after the user clicks, can load the local folder containing the course description file as the source of learning materials, thereby starting the course. The "HOW TO CUSTOMIZE" button indicates that users can click on it to learn how to customize their own lesson description file.

5.2.3 Navigating

In this website, the navigation and logo appear on every page. The navigation bar makes it easy for users to switch pages, and the logo is clickable to bring the user back to the home page.



A Dream of Splendor（梦华录）

Learning Resource Library

Figure 5.13: The heading hierarchy

A clear heading hierarchy helps users with screen readers understand the page, which also aids page navigation. So I use one <h1> tag per page for the title, and <h2> and <h3> tags for subsections. As shown in Figure 5.13, on the play page of the selected lesson, the name of the lesson is the main title of this page, and the "Learning Resource Library" should appear as the secondary title.

5.2.4 Interacting

One of the cornerstones of an accessible website is allowing users to browse the website without a mouse. Because users using assistive technology often need to rely on the keyboard to navigate pages. They can use the keyboard and the “Tab” and “Shift + Tab” keys to browse all the links on the website to test the accessibility of the keyboard. Use the "enter" key to activate controls and links while ensuring that all page functions are accessible using only the keyboard. This technology enables blind people to interact with and access websites without any problems.

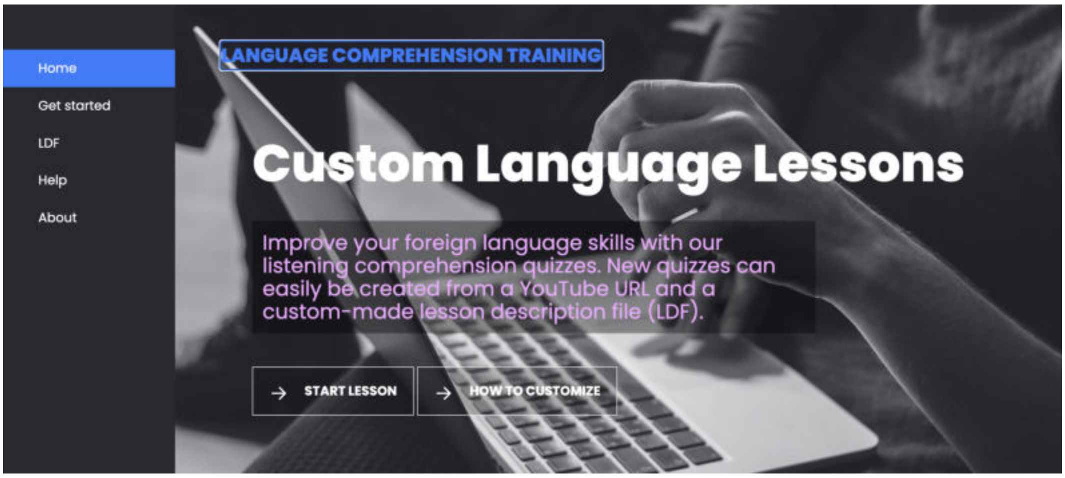


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Figure 5.14: The use of “Tab” and “Shift+Tab”

As shown in Figure 5.14, blind people can use “Tab” and “Shift+Tab” to control the screen reading software to read information in different positions without using the mouse to move the cursor position to select. During the reading process, the <a> tag will be recognized, and the user can implement the certain function by pressing the designated button.

Since the <input> tag cannot be recognized by the “Tab” key, I use the <button> tag to wrap the <input> tag, which allows the “START LESSON” button to be read, but pressing the “Enter” key still does not work. For this, I added a “@keyup.enter” listener for the keyboard enter event for the <button> tag. At this point, the user can use the “Enter” key to achieve the same operation effect as clicking a button.

In addition, in the learning resource library, I also use “@keyup.enter” to allow users to use the “Tab” key to iterate through each lesson card to select the appropriate lesson.

Chapter 6

Conclusion

In this project, I developed a website that uses YouTube videos and listening comprehension quizzes to improve English for Chinese. It differs from other English learning sites in two main ways. One is that it encourages users to customize their own learning lessons, from the selection of videos to the customization of quiz questions. Second, the website recommends using Chinese TV dramas as materials for learning English, allowing users to learn English in the most familiar and stress-free language environment. Considering that not all English learners in China like to watch American dramas or American drama lovers immerse themselves in wonderful plots and forget to focus on vocabulary and fixed collocations, I choose to use Chinese TV dramas that are more familiar to Chinese as learning materials, so that this website is more suitable for Chinese people who aim to learn English.

Each video corresponds to a lesson description file (LDF) which is essentially a JSON file. I use it to store all the data that we need to customize an English learning lesson, including video title, YouTube video link, video cover, quiz difficulty level, timestamps for setting quizzes, questions, options, correct answer, and grading weights for each quiz question. According to the instruction I provided in the “LDF” page about writing a lesson description file, anyone, even users without any programming background, can easily customize the English learning lessons they are interested in. Users only need to put all lesson description files in a local folder, and when loaded into the website, it will display all available courses in that folder in the form of lesson cards. Additionally, I have written 4 lesson description files as default lessons in the “Learning Resource Library”, which makes it easy for users to start a lesson at any time to see how the site works.

For the quiz panel, I use the Vue framework to render the data stored in the lesson description file to the page, which is more flexible and easier to maintain. At the end of the lesson, users can get a quiz score to assess their understanding and mastery of the lesson.

In order to improve the user experience, I evaluate the site for usability and accessibility. Whether it is a responsive design that is compatible with different device screen sizes, or a design that can be fully operated by using the keyboard, it proves that this website meets the different operational needs of all users.

However, due to the limitation of my research time, this English teaching tool also has some areas to be improved. In the future, I will provide a wider range of services for language learners from different countries, making the site not just for English learners in China. It should provide all foreign language learners with the opportunity to learn foreign languages with the help of videos in their native language.

Chapter 7

Future Work

Development of the online language teaching tool is ongoing. Besides code review, the future plans include redesigning the home page and adding sorting options and a search bar for the learning resource library. In addition, incorporating the authentication and storage features into the site is also under consideration.

7.1 Code Review

In the future, I will conduct a systematic review of the code with the aim of identifying bugs and improving code quality. For example, I will put the two key-value pairs “sjshow” and “sjle” currently stored in the “data” property of the Vue instance into the “computed” property. Because “computed” properties are more convenient and efficient when dealing with complex logic that contains reactive data.

A build system for JavaScript/CSS assets, like npm, can be used. Using Vue by loading it from a content delivery network (CDN) works for small projects, but given the site’s continued growth and the goal of possibly releasing the site under a certain license in the future, a build system is necessary.

7.2 Creating a Carousel for Default Materials in Home Page

The homepage is the first page displayed by users after entering the website, and should highlight the main functions and features of the website. Although the current home page provides a button for users to load a local folder, and also introduces the functions of the website through text, human beings are more sensitive to pictures than text. Hence, adding a carousel composed of the default video course cover for the homepage will allow users to quickly understand the main functions of the website. This carousel should be interactive. Users can switch videos by clicking the buttons on the left and right sides of the carousel. When clicking on the cover, it can jump to the selected lesson page.

7.3 Sorting Options and Search Bar

The current version of the “Get started” page does not provide the feature to filter lessons in the learning resource library based on different criteria. Considering the increase in the number of lessons in the future, I plan to allow users to filter courses that match their English level by the difficulty level of “Beginner”, “Intermediate” and “Advanced”. For example, if the user’s English level is intermediate, he/she can select the “intermediate” as sorting option to filter out the lessons with the overall difficulty level of “beginner” and “advanced” in the learning resource library. In addition, adding a keyword search bar also provides convenience for users to find related lessons and saves time. When the local folder loaded by the user contains a lot of lesson description files, it is the most efficient and fast to find the desired lesson by entering keywords.

7.4 Authentication and Storage Features

In order to improve the user experience, I plan to add at a later stage such features which require authentication and server side login. For example, load/save of sessions. So I will add two new sections to the navigation bar: “Notebook” and “Login”.

Users can register via Gmail or phone number. When users log in, they need to enter a user name and password on the login interface for authentication, and only legitimate users can access their personal accounts on the website.

The “Notebook” page is mainly used to display the saved quiz questions, which are convenient for users to review later. Users are also allowed to modify and delete existing notes, or manually add new notes. To do this, the quiz panel should also add a “Save” button to save the current quiz question and correct answer. However, only users who have registered an exclusive account of the language learning website and use the website while logged in can perform the operation of collecting quiz questions.

If a user browses the site as a guest, the local folder can be loaded for English learning, but the function to favorite quiz questions will not be available. Click the “Save” button at this point, a modal alert will pop up to inform the user that it is available after login.

For the default learning resources on the website, I plan to add a central repository to allow users to share their own lesson description files. With a central repository, all users have access to lessons created by experienced language teachers. At the same time, experienced language teachers can also rate lessons produced by users in the central repository to indicate the quality of the lessons. When users look for lessons in the central repository, they can select high-quality lessons with high ratings to learn.

Bibliography

Kartal, E. (2005). The internet and autonomous language learning: A typology of suggested aids. *Online Submission*, *4*(4).

Kartal, E., & Levent, U. (2010). The internet, language learning, and international dialogue: Constructing online foreign language learning websites. *Turkish Online Journal of Distance Education*, *11*(2), 90–107.

Levy, M. (1996). *Call: Context and conceptualisation*. Oxford University Press.

Mayer, R. E. (2009). Multimedia learning . cambridge university. *New York: Prentise Hall*.

Mohsen, M. A. (2016). The use of help options in multimedia listening environments to aid language learning: A review. *British Journal of Educational Technology*, *47*(6), 1232–1242.

Sundaran, S. (2020). Vue.js - understanding data, methods, computed and watch. https://medium.com/swlh/vue-js-understanding-data-methods-computed-and-watch-aa97df7d979a.