

Development of a Web Application for Learning Basic Mandarin Chinese

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Abstract—The College of Information and Communications Technology of Bulacan State University offers Mandarin Chinese as a foreign language course in one of its programs. The main objective of this study is to develop a web application that focuses on giving Mandarin Chinese dictionaries, lessons, assessments, and tests. Upon the development of the web application, topics under basic Mandarin Chinese, covering Hànyǔ Shuǐpíng Kǎoshì (HSK) Levels 1 and 2, are considered as its contents since they contain essential topics for learning Mandarin Chinese. The web application for basic Mandarin Chinese was evaluated by its intended end-users and technical experts in web application development using the standard software quality evaluation criteria based on ISO/IEC 25010. The acceptability ratings of intended end-users and technical experts are 4.56 and 4.58, respectively, with a descriptive interpretation of Extremely Acceptable. These ratings show that the Mandarin Chinese language web application was developed well, with appropriate functionalities, features, and content. Upon its implementation, this Mandarin Chinese language web application may be used as an additional tool in teaching and learning.

Keywords—applications development, e-learning, Mandarin Chinese language, web applications, web development

1 Introduction

Due to the spread of the Corona virus (COVID-19) in 2020, the Philippines and its educational pedagogy started shifting to online learning to continue the delivery of education [2,8,10,16]. Online learning may be in the form of synchronous or asynchronous classes as mandated by the government under flexible learning [3]. With such a modality, students can access learning materials at their own pace should they have intermittent internet connectivity [4,15,18].

As a silver lining within the pandemic, learning foreign languages for students has been easier [20]. With learning materials available online, they tend to recall all past lessons, try different assessment methods and quizzes, and explore more possibilities in learning a foreign language [4,11,12]. Higher education institutions took advantage of this opportunity to continue delivering foreign language courses [6,13,19] in their program offerings.

The Bulacan State University (BulSU), a state university in the Philippines in Central Luzon, is partnered with the Confucius Institute to offer Mandarin Chinese courses integrated into degree programs of different colleges. During the pandemic, flexible learning modality has also been implemented [3] to continue delivering foreign language courses. The College of Information and Communications Technology (CICT) offers two (2) Mandarin Chinese courses within the curriculum of its Bachelor of Science in Information Technology (BSIT) program. These Mandarin Chinese courses were integrated within the third-year level of the students. The courses in the BSIT program cover basic Mandarin Chinese, which prepares students to take both Hànyǔ Shuǐpíng Kǎoshì (HSK) Levels 1 and 2, a Mandarin proficiency examination for non-native speakers. Faculty members of CICT who were able to pass the HSK Level 3 are eligible to teach basic Mandarin Chinese. One of the main concerns of CICT in teaching Mandarin Chinese is the educational resource. Additionally, students have difficulty reviewing for HSK Levels 1 and 2, specifically for the reading part [1,7], since online materials are not dynamic [9].

This study focused on developing a web application [5] to learn basic Mandarin Chinese that covers HSK Levels 1 and 2. It is aimed at digitalizing all learning materials, resources, and lessons that could be controlled and modified by the faculty members handling the Mandarin Chinese courses at CICT. Moreover, a dictionary for the HSK Levels 1 and 2 words will be provided for students to learn individual words, with sample sentences that may guide them on how to use the word. Lastly, assessments after every lesson and a mock test for both HSK Levels 1 and 2 are provided for the students to be more prepared before taking the proficiency examination.

1.1 Objectives

The general objective of this study is to develop and evaluate a web application that contains lessons, assessments, mock tests, and a dictionary for basic Mandarin Chinese, covering Hànyǔ Shuǐpíng Kǎoshì (HSK) Levels 1 and 2. The following specific objectives are also considered: (1) to develop a web application for learners of basic Mandarin; (2) to develop an administrator panel with features to manage the web application; and (3) To determine the acceptability of the developed system using the standard software quality evaluation criteria of ISO/IEC 25010:2011 as perceived by its intended end-users and technical experts.

1.2 Conceptual framework

Figure 1 displays the conceptual framework of the study used to determine and recognize the flow of the study. Input, process, and output phases are the three critical elements presented in the study's composition.

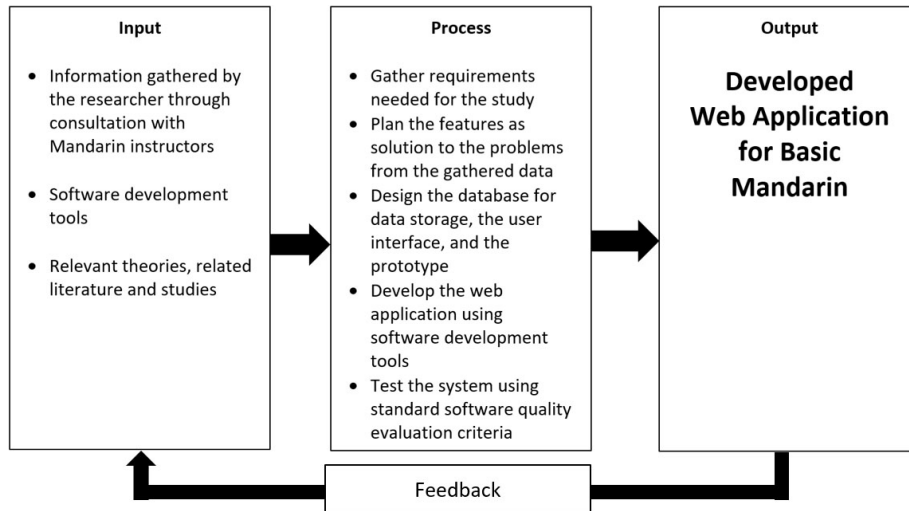


Fig. 1. Conceptual framework of the study

2 Materials and methods

A developmental research methodology was applied for the accuracy and effectiveness of the developed web application. In this research, the processes involved in developing the web application are studied, developed, and evaluated to meet the criteria for the acceptance of the intended users of the developed application. The developmental research was followed after the consultation with Mandarin Chinese instructors from CICT. This process enabled the identification of features and functionalities to be included within the web application.

The web application for learning basic Mandarin Chinese was developed by following and applying System Development Life Cycle (SDLC) processes and phases [14]. Agile software development methodology was followed and used as its primary SDLC method. This methodology enabled going back and forth on different phases, revisiting a phase should there be a need, and modifying contents from past phases should there be inconsistencies happened during the development of the web application.

2.1 Respondents of the study

Table 1 presents the respondents of the study who were the intended end-users and technical experts of the developed web application for basic Mandarin.

Table 1. Respondents of the study

Respondents		Frequency	Percentage
Intended end-users	Mandarin Instructors	5	6.67%
	Mandarin Students	50	66.67%
Technical Experts	Experts in the field of Web Development	10	13.33%
	Faculty Members handling Web Development	10	13.33%
Total		75	100.00%

The respondents of the study were divided into two major categories: the intended end-users and technical experts. Intended end-users are the target users of the developed web application for basic Mandarin, while technical experts are people with expertise in developing a web application. These respondents validated and verified the quality and correctness of content, features, and functionalities of the developed web application. Table 2 presents a five-point Likert scale that was used to determine the acceptability of the web application with the following range and descriptive interpretation.

Table 2. Five-point Likert scale

Scale	Range	Descriptive Interpretation
5	4.50–5.00	Extremely Acceptable
4	3.50–4.49	Very Acceptable
3	2.50–3.49	Acceptable
2	1.50–2.49	Fairly Acceptable
1	1.00–1.49	Poorly Acceptable

3 Results and discussion

3.1 Development of the web application for basic Mandarin

The web application was developed to maximize the learners’ experiences. This application for basic Mandarin contains a home page, a dictionary, a lessons page, assessments, and a mock test. Figures 2 to 6 present the said features of the web application accessible to learners of basic Mandarin. The web application is accessible at <https://mandarin-web-app.000webhostapp.com/>.

Figure 2 presents the home page of the web application. Learners are welcomed on this page upon logging in to the application. Figure 3 displays the basic Mandarin dictionary provided within the application. This dictionary contains words from the HSK levels 1 and 2 as part of their review in preparation for the proficiency test.

Figure 4 presents the lessons page where the learners can see the prepared lessons by the instructor. Figure 5 presents the assessments page for every lesson within the application. Every lesson has a designated assessment with it. Lastly, Figure 6 presents the mock tests page. A mock test for HSK levels 1 and 2 is available for the learners on this page. They may take it at their own pace.

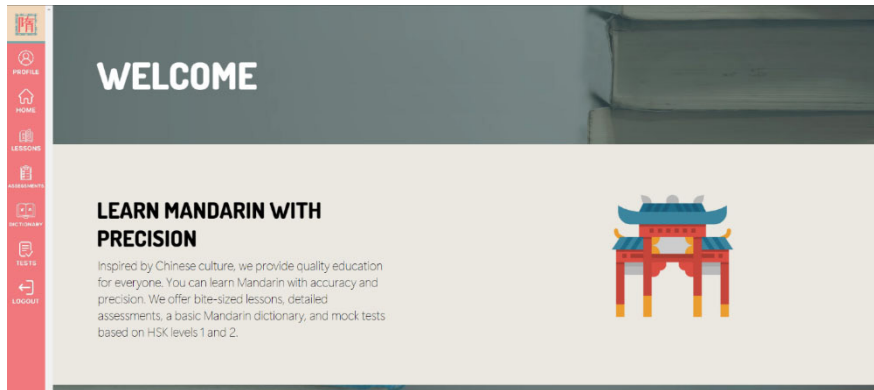


Fig. 2. Home page of the web application

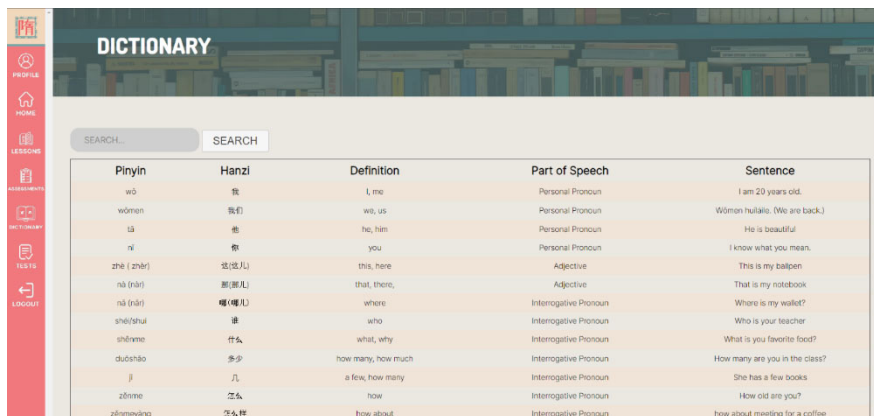


Fig. 3. The dictionary for basic Mandarin

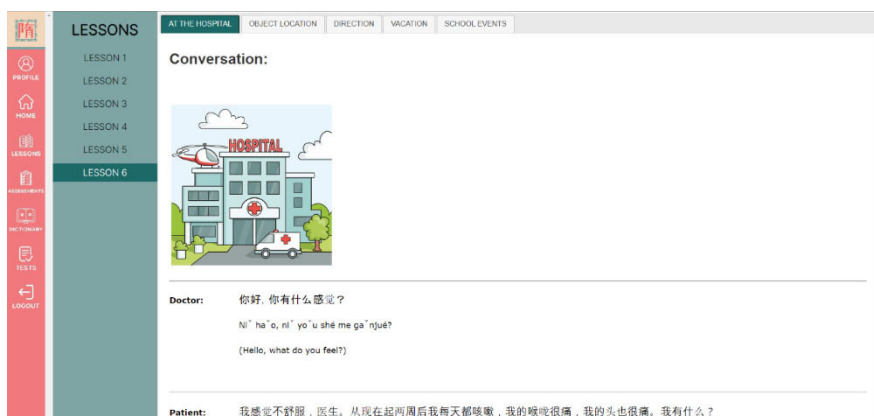


Fig. 4. Lessons page

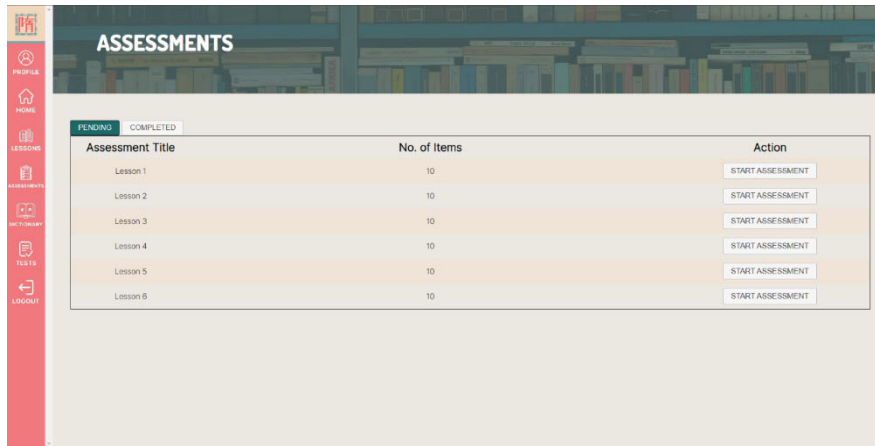


Fig. 5. Assessments page



Fig. 6. Mock tests page

3.2 Development of administrative features of the web application

To make the web application that is accessible to the learners more dynamic, an administrator panel was developed to manage all contents. The administrator panel contains dictionary management, lesson management, assessment management, mock test management, user management, and report generation. Figures 7 to 12 present the administrative features accessible to the instructors of basic Mandarin Chinese.

Figure 7 shows the page where the administrator can dynamically control the dictionary of the web application. The administrator can modify the contents of the dictionary

should there be a need to. Figures 8 and 9 show the lesson and assessment management pages, respectively. The administrator can add content to the lessons, making the web application more dynamic. Moreover, assessments for each lesson may be modified. This could be done by providing different questions to test the student’s learning in the lesson.



Fig. 7. Dictionary management page

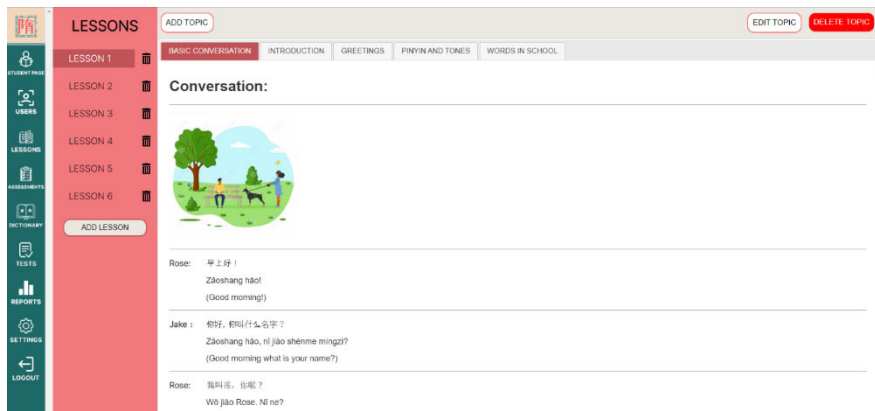


Fig. 8. Lesson management page



Assessment Title	No. of Items	No. of Questions
Lesson 1	10	50
Lesson 2	10	50
Lesson 3	10	50
Lesson 4	10	50
Lesson 5	10	50
Lesson 6	10	50

Fig. 9. Assessments management page

Figure 10 shows where the administrator could manage the mock tests. The administrator could modify an existing mock test or can add a new mock test as another option for the learners.



HSK Level	No. of Items	No. of Questions
LEVEL 1	20	20
LEVEL 2	20	20

Fig. 10. Mock test management page

Figure 11 shows where the administrator manages the web application's users. Details of the active and archived users are visible to the administrator. Lastly, Figure 12 shows the report generation page of the administrative panel. The administrator can filter what type of data the report is to be generated within a specified range of time or can be a custom time selection. A portable document format (PDF) file will be generated upon creating the report.

Name	Username	Email	Address	School	Birthday	Gender
John Vincent Viojan	Vio	johnvincent.viojan.cj@bulacu.edu.ph			06/27/2012	Female
Philip Pingul Miranda	Drew	drewmiranda10@gmail.com	Mojon Malolos City of Bulacan	Bulacu	03/10/2001	Male
Patrick Ivan Santos Silungan	ivan123	psilungan@gmail.com			12/19/2000	Male
John Paul Paglalunan	Ampol	Ampol			12/11/2001	Male
Maria Santos	MSantos	MSantos@gmail.com			06/03/1992	Female
Christine Cruz Santos	CSantos	CSantos@gmail.com	Bustos, Bulacan		03/08/2003	Female
Angela Bautista	ABautista	ABautista@gmail.com	Pullian, Bulacan		03/04/2022	Female
Dan Victor Ramos Bondoc	danbondoc	danvictor.ramosdoc.rj@bulacu.edu.ph		Bulacan State University	01/02/2000	Male
Jonkyiel Lagrada Cadag	JCadag	JCadag	San Rafael Bulacan	Bulacan State University	03/03/2022	Male
Christian Rey Galvez	chan	xtiangalvez16@gmail.com	Caingin, Malolos, Bulacan		01/01/2000	Male
John Henrick Espiritu	henrick405	henrick405	Malolos City	Bulacan State University	12/16/2000	Male

Fig. 11. User management page

Date	Type	Message
06/07/2022	ADD WORD	Admin user added the word zhè (zhè) in the dictionary
06/07/2022	ADD ASSESSMENT	Admin user added an assessment titled aaa
06/07/2022	ADD WORD	Admin user added the word nà (nà) in the dictionary
06/07/2022	DELETE ASSESSMENT	Admin user deleted an assessment titled aaa
06/07/2022	ADD WORD	Admin user added the word nà (nà) in the dictionary
06/07/2022	ADD WORD	Admin user added the word shé/shù in the dictionary
06/07/2022	ADD WORD	Admin user added the word shǒnǐn in the dictionary
06/07/2022	DELETE USER	Admin user deleted user reg@gmail.com Account
06/07/2022	ADD WORD	Admin user added the word dúbànǎo in the dictionary
06/07/2022	ADD WORD	Admin user added the word jǐ in the dictionary
06/07/2022	ADD WORD	Admin user added the word zǐmǐn in the dictionary
06/07/2022	ADD WORD	Admin user added the word zǐmǐnyǎng in the dictionary
06/07/2022	ADD WORD	Admin user added the word yǐ in the dictionary
06/07/2022	ADD WORD	Admin user added the word èr in the dictionary
06/07/2022	ADD WORD	Admin user added the word sǎn in the dictionary
06/07/2022	ADD WORD	Admin user added the word sǎn in the dictionary

Fig. 12. Report generation page

3.3 Acceptability of the developed web application

The developed web application for basic Mandarin was evaluated by 55 intended end-users and 20 technical experts to determine its acceptability [17]. The criteria used to evaluate the application’s acceptability were based on the ISO/IEC 25010:2011 software product quality model.

Intended end-users’ evaluation. Table 3 summarizes the intended end-users’ ratings for the developed web application. These intended end-users are Mandarin instructors and Mandarin students of the CICT.

Table 3. Overall summary of the respondents’ ratings as perceived by the intended end-users to the developed web application

Criterion	Mean	Descriptive Interpretation
Functional Suitability	4.80	Extremely Acceptable
Performance Efficiency	4.56	Extremely Acceptable
Compatibility	4.71	Extremely Acceptable
Usability	4.55	Extremely Acceptable
Reliability	4.32	Very Acceptable
Security	4.16	Very Acceptable
Maintainability	4.63	Extremely Acceptable
Portability	4.73	Extremely Acceptable
General Mean	4.56	Extremely Acceptable

As perceived by the intended end-users, the functions provided within the web application suit the need to learn basic Mandarin, making it “Extremely Acceptable” ($\bar{x} = 4.80$). However, the intended end-users’ overall rating of the web application’s security is “Very Acceptable” ($\bar{x} = 4.16$). This result shows that the learners are concerned regarding how secure their profile is upon using the web application.

Technical experts’ evaluation. Table 4 shows the overall summary of the technical experts’ ratings for the developed web application. These technical experts are web application developers and faculty members handling web development courses in the CICT.

Table 4. Overall summary of the respondents’ ratings as perceived by the technical experts to the developed web application

Criterion	Mean	Descriptive Interpretation
Functional Suitability	4.51	Extremely Acceptable
Performance Efficiency	4.56	Extremely Acceptable
Compatibility	4.70	Extremely Acceptable
Usability	4.54	Extremely Acceptable
Reliability	4.37	Very Acceptable
Security	4.56	Extremely Acceptable
Maintainability	4.55	Extremely Acceptable
Portability	4.81	Extremely Acceptable
General Mean	4.58	Extremely Acceptable

Technical experts rated the portability of the web application with a mean of $\bar{x} = 4.81$, with a descriptive interpretation of “Extremely Acceptable.” Technical experts believe that the web application is portable since it is developed using web technologies and is available anytime, anywhere. However, technical experts are concerned about the reliability of the system regarding data visualization and presentation. This gives the overall rating of reliability with a mean of $\bar{x} = 4.37$, with a descriptive interpretation

of “Very Acceptable.” During the evaluation, one of the technical experts, precisely one of the web application developers, commented, “*Please ensure the data presented within the web application is 100% correct. This web application intends to teach, not to ripple inappropriate contents.*”

4 Conclusions and recommendations

With all the necessary features and functionalities being included in the web application for basic Mandarin, it has been concluded that the web application was successful. Upon implementation, this study may be an additional teaching and learning tool for learners and instructors of basic Mandarin in CICT. Additionally, the following findings are highlighted: (1) The web application for learning basic Mandarin Chinese accessible to learners contains a dictionary, lessons, assessments, and mock tests which prepare the learners to take HSK levels 1 and 2; (2) The administrative features of the web application are fully developed. Instructors, as the administrators, can manage all necessary features of the application; and (3) The intended end-users rated the web application with a general mean of $\bar{x} = 4.56$, with a descriptive interpretation of “Extremely Acceptable.” On the other hand, the technical experts rated the web application with a general mean of $\bar{x} = 4.58$, with a descriptive interpretation of “Extremely Acceptable.” Both groups of evaluators rated the web application’s acceptability upon its development and found the developed web application acceptable and provided the necessary features and functionalities.

Based on the conclusions, this study presents the following recommendations: (1) Develop an equivalent mobile application to make it more portable and accessible to the learners; (2) Include an immersive reader since Mandarin is specific to its tonality when speaking; and (3) Develop a continuation of the application covering intermediate Mandarin based on HSK levels 3 and 4, including writing Chinese characters.

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