Triple Video Subtitles and Full Pleco Integration: The New Horizon of Advanced Chinese Learning? - A Phase I Study

Abstract

Objective

The purpose of this study is to investigate the effectiveness of an innovative web-based video player ("TriplePlayer") in increasing motivation for learning Mandarin Chinese as a second language. This tool uses television series subtitled in Chinese and at least one other language.

Methods

TriplePlayer was designed to support any video file and up to three sets of subtitles. First, we used the Newpipe app to download video (*.MP4) and subtitle (*.SRT) files from YouTube, and had Google Translate create a Pinyin version of the Chinese subtitles. Second, we added a rewind button for quick re-listening, a play/pause button, a forward button for skipping non-dialogue sequences, and a button speed control. Finally, and perhaps most importantly, we introduced a Pleco button that allows instant transfer of the Chinese subtitles to the Pleco Dictionary app for translation of individual words and inclusion in customized word lists. The study included students at different proficiency levels to assess the acceptability of the TriplePlayer.

Results

The unique features of TriplePlayer appear to enhance Chinese language learning, as evidenced by high engagement and satisfaction scores and increased vocabulary retention. Participants added an average of 29 words to their Pleco dictionaries.

Conclusion

TriplePlayer, with its integration of multiple subtitles and instant transfer of Chinese subtitles to the Pleco Dictionary, could be a powerful tool to accelerate vocabulary mastery and enhance the language learning experience for self-directed students.

Introduction

Achieving second language (L2) excellence, defined as near-native proficiency, remains a formidable challenge, especially for students who begin learning in adolescence or adulthood. L2 excellence requires compressing the two-decade language acquisition process of native speakers into a significantly shorter time frame. This endeavor, inherently an exercise in time compression, requires a systematic and persistent approach.

While pronunciation and basic grammatical structures can be acquired relatively quickly, typically within one to two years, mastering a large vocabulary, often 20,000 to 30,000 words or more, is a long-term commitment. To match the language proficiency that native speakers develop over 20 years in a condensed period of 5 to 7 years, L2 students must adopt an exceptionally structured and diligent approach to their studies. The almost daily use of dictionaries remains the cornerstone of intensive language study.

Language educators face a trio of challenges in guiding students toward second language (L2) excellence: first, identifying a vast lexicon; second, having their students assimilate this vast lexicon; and third, maintaining high levels of student motivation over time. In response to these challenges, we launched the ambitious 2049 Chinese Project (https://www.2049Chinese.com). Building on this initiative, we now introduce TriplePlayer, an innovative video player designed to harness the educational potential of TV series for language learning. By incorporating interactive elements, TriplePlayer aims to address these three challenges by increasing student motivation and improving both oral and written comprehension. An outstanding feature of this tool is the

integration of Mandarin subtitles with the Pleco Dictionary, providing users with instant access to translations and facilitating efficient word list building.

Methods

We first identified suitable freely available TV series in MP4 format along with their corresponding subtitle files in SRT format. (SRT stands for SubRip Text, which is a file format used for storing subtitles for video files.) We then generated a Pinyin version of the Chinese subtitle files. Finally, we developed a single web page (in HTML format) containing a video player capable of displaying three sets of subtitles simultaneously: Chinese, Pinyin and English. This player was further enhanced with features designed to make its use as engaging as possible for young students.

Identification of suitable material

The IQIYI website is a popular online video platform that offers a wide range of content, including TV dramas, movies, and more. Their selection often includes popular and current Chinese dramas, many of which are also uploaded to YouTube. These series on YouTube often have subtitles in different languages. Therefore, we performed a Google search for "iqiyi.com chinese drama ep01 eng sub" and selected TV dramas that offered Chinese and English subtitles. Table 1 shows some of the dramas we found. Generally, subtitles are available in 8 languages other than Chinese. For a comprehensive list of more than 50 Chinese dramas, including the corresponding YouTube links, see "Appendix 1, List of Accessible Chinese Dramas with Chinese and English Subtitles".

Table 1. Subtitles in many languages other than Chinese

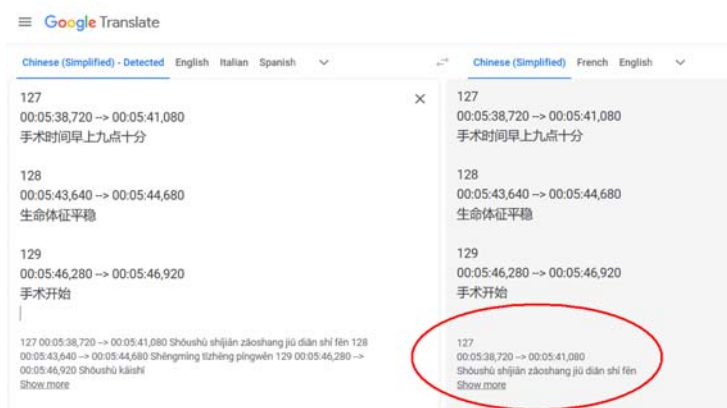|	ARA	ENG	IND	JAP	KOR	MSA	SPA	THA	VIE
Beloved Life	x	x	x	x	x	x	x	x	x
Moonlight	x	x	x		x	x	x	x	x
Forever and ever	x	x	x		x	x	x	x	x

Downloading video and subtitle files

We used NewPipe to download the videos and their subtitles. NewPipe is an open source media player that allows users to stream and download videos from multiple platforms without using Google services. It's not available in the Google Play Store, but can be downloaded from the F-Droid repository (https://f-droid.org/en/) or directly from the NewPipe website (https://newpipe.net/). Once installed, NewPipe provides an intuitive interface for downloading videos in MP4 format and, if available, the corresponding SRT subtitle files.

Pinyin transcription

To generate a Pinyin version of the Chinese subtitles, we used Google Translate (https://translate.google.com/). The process is as follows:

1. Set both the input and output languages to "Chinese (Simplified)".
2. Paste the Chinese text into the input area.
3. After translating, scroll to the bottom of the output area to find the Pinyin transcription (see Figure 1).
4. Transfer the Pinyin subtitles to a text document, save it with an SRT extension, and identify it as the Pinyin version by adding "py" to the filename, such as "Moonlight01_py.srt".

Figure 1. Pinyin version of the subtitles. Click on "Show more" and copy the Pinyin transcription into a text file.

TriplePlayer Development

See Appendix 2 for a detailed description of the Triple Player and Appendix 3 for an overview of selected JavaScript code snippets.

The TriplePlayer is designed to load a video file and up to three separate subtitle tracks (see the buttons labeled *Video*, *SRT1*, *SRT2*, *SRT3* on the left side of the screen, or use the keyboard shortcuts *G*, *V*, *C*, *X*.) While this process is simple in desktop environments, it can take up to 15 clicks to fully load all components on mobile devices.

TriplePlayer basic features include:

- Rewind and Forward
- Play/Pause Toggle
- Speed Control
- Font Size Toggle
- Adjustable Subtitle Delay

An advanced feature of TriplePlayer is the AB looping function, which allows users to select two points within a video, "A" (start) and "B" (end), and create a loop for continuous playback. This allows students to repeatedly listen to and practice specific phrases or dialogues until they achieve better comprehension and pronunciation. To set the A and B points, users press the AB button, which first displays "Set A" to mark the beginning of the segment to be repeated, and then press again for "Set B" to mark the end. The video then automatically loops between these markers until the user clicks the button a third time to exit the loop.

The most innovative feature is the Pleco button. Pleco is a comprehensive Chinese dictionary application that provides translations, pronunciation guides, and learning tools (https://www.pleco.com/). In TriplePlayer, a single click on the Pleco button sends the Chinese subtitles displayed directly to the Pleco application, where sentences are broken down into individual words. This integration is remarkable for its simplicity and has the potential to significantly improve educational outcomes, as discussed below.

TriplePlayer is available free of charge and its source code can be downloaded from https://2049Chinese.com/tripleplayer.

Figure 2. TriplePlayer interface. On the left are buttons for loading the video and up to three subtitle files, and a button for adjusting the font size of the subtitles loaded via the SRT1 button. On the right side (from top left) are the speed adjustment, AB loop, rewind, play/pause and forward buttons. Note the small "P" button next to the rewind and play/pause buttons. At the top left are the D-, D0, and D+ buttons for correcting video/subtitle synchronization problems.

Installing the Triple Player

To use TriplePlayer on your computer or mobile device (ideally a tablet), we download and open the TriplePlayer.html file, then load a video and up to three corresponding subtitle (SRT) files. For the Pleco button to work correctly, we load the Chinese subtitle file as SRT1. The Pleco Dictionary application must be installed on the mobile device where TriplePlayer will be used. The Pleco button will not work in a computer environment.

Phase I study

To evaluate the effectiveness of Triple Player, we conducted an open-label phase I study with ten participants between the ages of 24 and 70. They were asked to use Triple Player to watch a Chinese drama of their choice for a total of 60 minutes over four to six consecutive days (either 4 sessions of 15 minutes, 5 sessions of 12 minutes, or 6 sessions of 10 minutes). Participants were especially encouraged to use the AB loop function and the Pleco button, in addition to adding new words to their Pleco dictionary.

Prior to the start of the study, participants were instructed to complete a questionnaire at the end of the study (see Appendix 4 for the questionnaire). This questionnaire was designed to measure their engagement with the learning material, perceived improvement in listening skills, confidence in understanding spoken Chinese, motivation to continue learning, ease of use of Triple Player, effectiveness of Triple subtitles, overall satisfaction with the experience, and likelihood of recommending Triple Player to others. It used a structured scale ranging from -2 to +2, allowing participants to articulate their experiences from negative to positive. The final question of the questionnaire asked participants to indicate the number of new words added to their Pleco dictionary during the study period.

Results

All participants completed the Phase I study. The mean average participant feedback scores for TriplePlayer usage are shown in Table 2.

Table 2. Summary of Participant Feedback on TriplePlayer Usage

Engagement with learning material	+1.8
Perceived improvement in listening skills	+0.9
Confidence in understanding spoken Chinese	+0.6
Motivation to continue learning	+1.7
Ease of use of TriplePlayer	+1.4
Perceived effectiveness of triple subtitles	+1.9
Overall satisfaction with learning experience	+1.8
Likeliness to Recommend	+1.7

The participants added an average of 29 words to their Pleco dictionary (range: 6 to 71 words).

Discussion

The Triple Player is a single web page that can be opened locally, offline, on a computer, or on a mobile device to study languages with freely available videos and subtitles. It can display up to three sets of subtitles simultaneously. With a 3-second rewind and AB loop function, it allows students to focus on specific segments of dialogue and review them repeatedly, potentially improving listening skills and comprehension. TriplePlayer's outstanding feature, the Pleco button, interacts directly with the Pleco Chinese dictionary application, allowing instant word lookup and vocabulary building directly from the video subtitles. The TriplePlayer is available free of charge. Its source code can be downloaded from https://2049Chinese.com/tripleplayer.

The results of our Phase I trial are encouraging. The special features of the TriplePlayer may have contributed to a highly engaging and effective learning experience. This is reflected in the high scores for engagement with the learning material (+1.8), perceived effectiveness of the triple subtitles (+1.9), improvements in listening skills (+0.9), and confidence in understanding spoken Chinese (+0.6). These improvements can be attributed to the focused listening practice facilitated by the AB loop feature and the instant access to definitions and translations provided by the Pleco button. The TriplePlayer's user-friendly design, as reflected in its Ease of Use score (+1.4), further enhances its appeal to students by minimizing barriers to effective language learning. Overall satisfaction with the TriplePlayer (+1.8) and the high likelihood of recommending the TriplePlayer to others (+1.7) underscore its potential as a transformative tool. Finally, by allowing students to add an average of 29 words to their Pleco dictionaries, the TriplePlayer demonstrates its significant impact on vocabulary building and retention.

These results must be interpreted with caution. The design of the study and the interaction between the researcher and the participants introduce potential biases. In particular, the researcher, who was familiar with most of the participants, explained the features of the TriplePlayer, especially the use of the Pleco button to transfer the Chinese subtitles to the Pleco Dictionary app. The researcher also presented the questionnaire. This proximity could influence participants to respond in ways they perceive as favorable to the researcher, potentially distorting their experiences.

Participants noted minor issues such as translation inaccuracies and transcription errors, including incorrect Pinyin tones. For example, the pinyin transcription provided by Google Translate is mostly accurate, but errors in tone markings can occur. Common transcription errors include the word 不是, which is incorrectly rendered as "bù shì" instead of the correct "bú shì", and errors with 了 ("liǎo" instead of "le"), 都 ("dōu" instead of "dū"). While these errors are noticeable, they are generally manageable for learners. The overall benefits of using

TriplePlayer for language learning, such as improved vocabulary and listening comprehension, far outweigh these inaccuracies.

In the introduction to this paper, we emphasized that achieving excellence in a second language, akin to near-native proficiency, requires mastery of over 20,000 words through a rigorous and systematic approach, along with extensive dictionary use - effectively compressing years of native language acquisition into a significantly shorter period of time. Within this framework, the Pleco Button feature of the TriplePlayer plays a key role. This direct transfer to Pleco not only promotes immediate comprehension, but also encourages curiosity and detailed exploration, which greatly enhances vocabulary learning. Students can encounter new words in context, tailoring their learning experience and accelerating vocabulary growth toward long-term proficiency - a critical leap for language learners.

Future studies should aim to evaluate the long-term impact of TriplePlayer on language acquisition and compare its effectiveness with traditional learning methods. Further research should also explore the integration of artificial intelligence to enhance the personalization of the learning experience. Given that TriplePlayer is an open source framework, it offers a promising platform for innovative adaptations and provides an opportunity to explore new technologies that could transform language education.

In conclusion, TriplePlayer, developed to enrich Chinese language learning through video content, shows great promise as a language learning tool. As it is freely available with open source code, its distinctive features, including support for multiple subtitles and integration with the Pleco dictionary, could make learning both more efficient and more enjoyable. The synergy between TriplePlayer and Pleco has the potential to accelerate vocabulary learning, making the long march to excellence in a second language faster and more rewarding.

Appendix 1

List of accessible Chinese dramas with Chinese and English subtitles (ARA: Arabic, ENG: English, IND: Indonesian, JAP: Japanese, KOR: Korean, MSA: Malay, SPA: Spanish, THA: Thai, VIE: Vietnamese). All dramas have Chinese subtitles.

ARA	ENG	IND	JAP	KOR	MSA	SPA	THA	VIE		
	x								Arc peace	https://www.youtube.com/watch?v=WGdb0-Z2KO4
x	x	x	x	x	x	x	x	x	Always on the Move	https://www.youtube.com/watch?v=BPXlwtNZkvM
x	x	x		x	x	x	x	x	Beauty of Resilience	https://www.youtube.com/watch?v=JOD3rFeBNEg
x	x	x	x	x	x	x	x	x	Beloved Life	https://www.youtube.com/watch?v=78mYf5M9IGU&t=80s
x	x	x	x	x	x	x	x	x	Born to Run	https://www.youtube.com/watch?v=RZqPbi48u9Y
x	x	x		x	x	x	x	x	Celestial Authority Academy	https://www.youtube.com/watch?v=ZLq-YCajjxl
x	x	x	x	x	x	x	x	x	Chasing the undercurrent	https://www.youtube.com/watch?v=DXWgEvRO7nM
x	x	x		x	x	x	x	x	Decreed by Fate	https://www.youtube.com/watch?v=9u2NqyAK6Rw
x	x	x		x	x	x	x	x	Destined	https://www.youtube.com/watch?v=aOB7Z3XnX14
	x	x			x		x	x	Destiny's Love	https://www.youtube.com/watch?v=hnKt8oyko2M
x	x	x	x	x	x	x	x	x	Divine Destiny	https://www.youtube.com/watch?v=zACN48gqtwo
x	x	x	x	x	x	x	x	x	Double Love	https://www.youtube.com/watch?v=kil-antei9l
x	x	x	x	x	x	x	x	x	Dr. Tang	https://www.youtube.com/watch?v=ap0Egj5vWbg
x	x	x	x	x	x	x	x	x	Echo	https://www.youtube.com/watch?v=l758GdZ9lCw
	x								First Love	https://www.youtube.com/watch?v=dOFJfhEAa1o
	x	x			x		x	x	Flavour It's Yours	https://www.youtube.com/watch?v=wpJYZ6zxSwg
x	x	x		x	x	x	x	x	Forever and ever	https://www.youtube.com/watch?v=4k9lQy4m6lA
x	x	x	x	x	x	x	x	x	Have A Crush On You	https://www.youtube.com/watch?v=JxTboCMxJrs
x	x	x		x	x	x	x	x	Hello My Love	https://www.youtube.com/watch?v=kMBYLOJhW7k
	x	x			x		x	x	I've Fallen for You	https://www.youtube.com/watch?v=LrlavCiGta4
x	x	x		x	x	x	x	x	Love between Fairy and Devil	https://www.youtube.com/watch?v=2KdPiLT9MwE&t=80s
x	x	x		x	x		x	x	Love in Time	https://www.youtube.com/watch?v=L8fqygGnnhE
x	x	x		x	x	x	x	x	Love Is An Accident	https://www.youtube.com/watch?v=WQjqDRFZioE
x	x	x		x	x	x	x	x	Love is Sweet	https://www.youtube.com/watch?v=y0_B9xAhRHc&t=76s
x	x	x	x	x	x	x	x	x	Love The Way You Are	https://www.youtube.com/watch?v=KEBq7fg9FDs&t=1344s
x	x	x		x	x	x	x	x	Love under the full moon	https://www.youtube.com/watch?v=vK38K_e0_Hc
x	x			x		x	x		Love yourself	https://www.youtube.com/watch?v=-MXxWqffu8U
x	x	x		x	x	x	x	x	Moonlight	https://www.youtube.com/watch?v=FDV8e1KCbDA
x	x	x		x	x	x	x	x	My Dear Guardian	https://www.youtube.com/watch?v=MPL_b8fKB0k
x	x	x		x	x	x	x	x	My Heart	https://www.youtube.com/watch?v=hZ8YkvRj-vs&t=1436s
x	x	x		x	x	x	x	x	My Huckleberry Friends	https://www.youtube.com/watch?v=ikE4YuDmDAc
	x				x				My Journey To You	https://www.youtube.com/watch?v=dKHxBB5BPyl
x	x	x	x	x	x	x	x	x	My Special Girl	https://www.youtube.com/watch?v=ydd6hiGejtw&t=481s
x	x	x	x	x	x	x	x	x	New Life Begins	https://www.youtube.com/watch?v=JKElRoMZCYl

									Title	Link
x	x	x	x	x	x	x	x	x	Pledge of Allegiance	https://www.youtube.com/watch?v=7BwjGDFAwTw
x	x	x		x	x	x	x	x	Rising With the Wind	https://www.youtube.com/watch?v=GYkM8inCKrY
x	x	x		x	x	x	x	x	Road Home	https://www.youtube.com/watch?v=iy5NuvfFWhs&t=334s
x	x	x	x	x	x	x	x	x	Romance on the Farm	https://www.youtube.com/watch?v=HU4wVRGxduU&t=258s
x	x	x	x	x	x	x	x	x	See you again	https://www.youtube.com/watch?v=LN4bGfRBPxc&t=80s
x	x	x		x	x	x	x	x	Something Just Like This	https://www.youtube.com/watch?v=tKSOt9ClxR4
	x								Song of the Moon	https://www.youtube.com/watch?v=UU265u3RM6k
x	x	x	x	x	x	x	x	x	Special Lady	https://www.youtube.com/watch?v=xRNg8E4FfTA
									Story of Kunning Palace	
x	x	x		x	x	x	x	x	Strange Tales of Tang Dynasty	https://www.youtube.com/watch?v=FFmLubkrv-0
x	x	x		x	x	x	x	x	Sweet teeth	https://www.youtube.com/watch?v=JkUbbsVsuHU
x	x	x		x	x	x	x	x	The Day of becoming you	https://www.youtube.com/watch?v=8cjctWGYGkQ
x	x	x	x	x	x	x	x	x	The Ingenious One	https://www.youtube.com/watch?v=9gfECJHQEIo
x	x	x		x	x	x	x	x	The Mutations	https://www.youtube.com/watch?v=wmxlFSiUIco
x	x	x		x	x	x	x	x	The Silent Criminal	https://www.youtube.com/watch?v=Kkq2kTgxmbc
x	x	x		x	x	x	x	x	The World of Fantasy	https://www.youtube.com/watch?v=MRL2UE-mXGw
x	x	x		x	x	x	x	x	Thousands years for you	https://www.youtube.com/watch?v=kyW264mnQDg
x	x	x		x	x	x	x	x	Tiger and Crane	https://www.youtube.com/watch?v=K7SPMYe1Zqw
x	x	x	x	x	x	x	x	x	Unchained love	https://www.youtube.com/watch?v=IjmLBKuqejQ
	x	x	x	x	x		x	x	White Cat Legend	https://www.youtube.com/watch?v=Zo1_H09AGQU&t=816s
x	x	x		x	x	x	x	x	Wisher	https://www.youtube.com/watch?v=SV_Nq-w6M5k
x	x	x		x	x	x	x	x	With you	https://www.youtube.com/watch?v=K7zzXSXz76A

https://www.youtube.com/watch?v=qUz9WV0HX90

Appendix 2

TriplePlayer Features Overview:

- **Rewind and Forward:** Designed for language learning, these controls allow students to revisit interesting or difficult content or skip passages that don't contain speech.
- **Play/Pause Toggle:** Simplifies video playback control, critical for studying the details of complex sentences
- **Speed Control:** Provides the ability to adjust the playback speed, critical for tailoring the learning experience to individual skill levels.
- **Font Size Toggle:** Allows users to adjust the font size of captions for readability, including any UI controls provided for this functionality.
- **Adjustable Subtitle Delay:** Sometimes the subtitles are not perfectly synchronized with the video. With the D- and D+ buttons, Triple Player can accurately synchronize the subtitles with the video playback.

Figure 3. TriplePlayer interface. On the left are buttons for loading the video and up to three subtitle files, and a button for adjusting the font size of the subtitles loaded via the SRT1 button. On the right side (from top left) are the speed adjustment, AB loop, rewind, play/pause and forward buttons. Note the small "P" button next to the rewind and play/pause buttons. At the top left are the D-, D0, and D+ buttons for correcting video/subtitle synchronization problems.

1. Loading Multimedia Content

TriplePlayer lets you load any video file in MP4 format along with up to three subtitle files in SRT format. This versatility is essential for learners seeking diverse content, including TV series with subtitles in multiple languages. The ability to simultaneously display triple subtitles - Chinese, Pinyin and English - is invaluable and provides a comprehensive approach to language learning by integrating native script, phonetic guidance and translation.

2. Navigation controls

3-second rewind and forward: Users can easily navigate through video content by moving back and forth in 3-second increments. This is particularly useful for revisiting difficult dialogues or skipping over non-essential content.

Play/Pause Button: This control toggles between playing and pausing the video, allowing students to study the subtitles in detail.

3. Speed control

The player offers speed adjustments (normal speed, 0.75x, and 0.5x) that allow students to slow down playback. This aids comprehension by accommodating the student's listening skills.

4. AB Looping Function

The AB button allows users to select a specific segment of the video for looping playback. This feature is designed for intensive listening practice and mastering difficult phrases or sentences.

5. Pleco Dictionary Integration

With the Pleco button, students can instantly transfer entire sentences to the Pleco dictionary app for detailed translation and word study. This integration supports vocabulary acquisition and contextual learning.

6. Font size adjustment for subtitles

Users can adjust the font size of the first subtitle track (SRT1), improving readability and making it easier to follow the video content.

7. Subtitle delay

To address synchronization issues between audio and subtitles, TriplePlayer includes a feature to adjust the timing of subtitle display. This ensures that subtitles are in sync with the spoken dialog.

8. Keyboard shortcuts

TriplePlayer provides a comprehensive set of keyboard shortcuts for students learning on a computer, including

- **Video button:** The 'g', 'h' and '0' keys are shortcuts for loading a video file. Users can press any of these keys to open the file selection dialog and select a video file for playback.
- **Subtitle Buttons (SRT1, SRT2, SRT3):**
- **SRT1:** The 'v', 'n' and '1' keys are shortcuts to load the first subtitle file.
- **SRT2:** The 'c', 'm' and '2' keys are used to load the second subtitle file.
- **SRT3:** The 'x', ';' and '3' keys are used to load the third subtitle file.
- **Rewind:** The "f," "j," and "4" keys allow users to rewind the video by 3 seconds, making it easier to focus on specific sentences.
- **Forward:** The 'r', 'u' and '7' keys allow users to fast forward the video by 3 seconds, useful for skipping non-dialogue sequences.
- **Play/Pause:** The 's', 'l' and '6' keys toggle the play/pause state of the video, allowing users to control video playback for detailed sentence analysis.
- **Speed Control:** The 'e', 'i' and '8' keys are shortcuts for adjusting the video playback speed. Users can cycle through different speed settings (1, 0.75, 0.5) to match their comprehension level.
- **AB loop**: The 'd', 'k' and '5' keys activate the AB looping feature, allowing users to set the start (A) and end (B) points for repeated playback of a specific video segment, a feature critical for intensive listening practice.
- **Font Size Toggle:** The 'w', 'o' and '9' keys provide a quick way to adjust the font size of the first set of subtitles (SRT1), making the text easier to read or more discreet, depending on the user's preference.

Appendix 3: The Pleco Button

Pleco (https://www.pleco.com) is a popular app among Chinese learners for its comprehensive dictionary and language learning tools. By integrating a button that links directly to Pleco, the Triple Player greatly streamlines the process of looking up new words or phrases encountered in video subtitles.

To fully appreciate the integration and functionality of the Pleco button within the Triple Player, it's important to understand both the JavaScript that manages its behavior and the CSS that defines its appearance.

JavaScript description for the Pleco button

The functionality of the Pleco button in the Triple Player is primarily managed by a set of JavaScript functions and event listeners. The main parts of this functionality are

- **Pleco Button Generation:** The `generatePlecoButton` function creates a form with a hidden input field filled with the currently displayed subtitle text. This form uses Pleco's custom URL scheme (`plecoapi://x-callback-url/s`) to perform dictionary lookups directly when the "P" button is clicked. Embedding the Chinese subtitle text into this hidden field allows for seamless data transfer to Pleco for instant word or phrase lookups. This integration ensures that users can efficiently access dictionary definitions. Please note that the x-callback-url feature is not universally supported, a list of compatible applications can be found at https://x-callback-url.com/apps.
- **Subtitle display and Pleco button integration:** The `displaySubtitles` function is central to the integration. It listens to the video's timeupdate events to synchronize the captions with the video playback. When the correct time for a subtitle is reached, the function updates the container with the subtitle text. If the `PlecoButtonContainer` is specified and the subtitle belongs to the primary track (`subtitlesDiv1`), the function also calls `generatePlecoButton` to insert the Pleco button into the DOM, linking the current subtitle text directly to the Pleco dictionary query.

CSS Considerations

The CSS styling for the Pleco button and its display container ensures that the button is both functionally and aesthetically integrated into the Triple Player interface. Key CSS features include

- **Pleco Button Styling:** The `.pleco-button` class applies visual attributes to the button, such as background color, text color, border properties, and cursor appearance.
- **Pleco World Display:** The `#pleco-world-display` ID styles the container in which the Pleco button appears. Positioning is absolute, with specific top and left values to ensure it doesn't unnecessarily overlap with video content. The background is nearly transparent, and the text color is styled for readability. This container is critical to making the Pleco button accessible without distracting from the video content.

Importance of the <form> tag

The decision to use a <form> tag to pass captions to Pleco is not arbitrary. It is essential to allow direct interaction with the Pleco dictionary through its custom URL scheme. A simple hyperlink (<a> tag) would not suffice for this purpose, as the Pleco API requires a form submission to process the request correctly.

Appendix 4

The questionnaire:

#	Question	-2		-1	0	+1	+2	
1	Engagement with the Learning Material	Not engaged						Extremely engaged
2	Perceived Improvement in Listening Skills	Worsened						Improved
3	Confidence in Understanding Spoken Chinese	Decreased						Increased
4	Motivation to Continue Learning	Less motivated						More motivated
5	Ease of Use of the TriplePlayer	Very difficult						Very easy
6	Perceived Effectiveness of Triple Subtitles	Not effective						Extremely effective
7	Overall Satisfaction with the Learning Experience	Very dissatisfied						Very satisfied
8	Recommendation Likelihood	Would not recommend						Would highly recommend