

## **MINI PROPOSAL**

### **1. Title**

A Study of Interactive Strategies to Improve the Effectiveness of Online English Teaching——base on university students

### **2. The aim and objectives of the investigation**

- **Aim:**

Improving teaching and learning by investigating better ways to interact with online university English teaching and enhancing student motivation

- **Objectives:**

1. User research through a qualitative research approach to identifying the interactions that influence student motivation
2. A study of teacher users through a qualitative research approach to identifying the interactions that influence teachers' teaching
3. Formulate a hypothesis and develop a strategic framework/model (product prototype) for designing improved interactions and validate with eye-tracking tests
4. Develop an MVP product to test the hypothesis through quantitative research using data burial methods to collect user behaviour data

### **3. The rationale and main conceptual themes**

- **research background**

Under the rapid development of information technology today, has brought great changes to education. Being in the present time of mobile internet, many learning apps based on mobile devices have emerged to help teachers improve their teaching efficiency and students improve their learning effectiveness. Internet + education is becoming increasingly mainstream, and the Internet itself is gradually becoming the infrastructure.

Around the world, the US government formally proposed the construction of a National Information Infrastructure (NII) in 1993(*National Education Technology Plan*), and in 1996(*National Education Technology Plan*) the US supported the establishment of an educational environment in which information and

communications technology was integrated with teaching and learning. In 1998(quoted in Tong & Xiaoqing), the UK also launched a strategy for information technology in education; in 1999(quoted in Tong & Xiaoqing), Japan put forward its New Millennium Plan, which also set out clear goals for the future development of information technology in education, and in 2001(quoted in Tong & Xiaoqing), China started to promote the process of technology in education.

In 2018(Xiaohan Liu), China's Ministry of Education released the Education Informatization 2.0 Action Plan. This was followed in 2019(Pei Li) by the issuance of guidelines on promoting the healthy development of online education. One of the guidelines mentions the need to promote the integration of information technology and intelligent technology into the whole process of education and teaching. However, since the introduction of education informatization in China, a lot of human and material resources have been invested more in the construction of hardware, and the focus on the actual teaching and learning process in online classrooms has not been comprehensive, especially in subjects with high interaction needs (e.g. English), where not much research has been done and not deep enough.

The world was hit by the new coronavirus in 2020, during which time global education faced very serious challenges. The epidemic accelerated the development of online teaching and learning, which was fuelled by a surge in demand for online classes at home. In the same year, UNESCO(*Education in a post-COVID world: Nine ideas for public action 2020*) released Education in a Post-Epidemic World: Nine Proposals for Public Action, in which Proposition 6 proposed the need to provide free and open access to resources and technical support for teachers and students. The International Commission on the Future of Education(*Education in a post-COVID world: Nine ideas for public action 2020*) also called for greater global collaboration between governments, philanthropic organisations and non-profit organisations to open up and share educational resources and platforms, encouraging private companies to take social responsibility and provide learner-centred services to learners, with the Online-Merge-Offline model becoming a must for online teaching and learning. Moreover, the development and innovation of technology does not only rely on technology companies alone but requires the cooperation of teachers, students, government, citizens and society. As a result, many applications have emerged in the market to help teachers and students with online teaching and learning, such as Microsoft's team and zoom, and Chinese tools such as DingTalk, but they are all general-purpose software and do not have applications that are specific to the needs of teaching English online.

- **Research value**

As we all know, language learning and transmission is a two-way activity, and human interaction plays an important role in this process. In the online English classroom, the limited functionality provided by common applications that support online classes has

led to a great limitation in the way teachers and students interact with each other. More often than not, the online classroom model is a one-way communication format in which the teacher talks and the students listen, which greatly reduces students' motivation and active participation, and makes the teacher's teaching less effective than desired.

At this point, if we can take interaction design as the starting point, researching an interaction strategy that can improve the teaching of English online can largely promote the effectiveness of English teaching, not only to enhance teachers' confidence in teaching but also to stimulate students' learning motivation. It can also improve the level of information technology in English education, and use technology to promote the process of equality in education.

- **Research questions**

- 1.How do university students learn in the process of online English class?
- 2.What problems do they encounter in the learning process?
- 3.What are the interactions that affect students' motivation to learn?
- 4.How do these interactions affect student motivation?
- 5.what are the psychological changes in the process?
- 6.How can these interactions be improved?

- **Theories and concepts**

In terms of English language learning, this study will be guided by Krashen's(1981:22, 101, *Stephen Krashen's Theory of Second Language Acquisition*) input theory and the affective filter theory as the main theories. Krashen's input theory attempts to explain how learners acquire a second language and how second language acquisition occurs. The theory can be combined with Vygotsky's (1978:86) theory of the zone of proximal development to help learners learn and acquire language. When a learner is at level N, acquisition occurs when he/she is exposed to N+1 levels of comprehensible input as he/she progresses along the 'natural sequence'.Also, the teacher can build a suitable scaffold for the student(Wood et al., 1976)to help the student reach the learning goal. The affective filter hypothesis refers to several 'affective variables' that contribute to but are not causal for, second language acquisition. If teachers give students the right feedback promptly during second language learning, it can help to increase student's confidence and motivation to learn the language and reduce negative emotions such as anxiety and lack of confidence. Comprehensible input can be beneficial if the teacher helps students to develop positive emotions about language learning through appropriate interactions and avoids raising the emotional filter and resulting in a 'mental block'.

This study will use Hillman et al.(1994) and Rafaeli & Sudweeks(1997)as the theoretical basis in terms of interaction strategies. Hillman et al.(1994), after a very

thorough study of interaction behaviour in distance education, points out that the interface is the link between the learner and the learning content, indicating that the quality of both interpersonal interaction (learner-learner, learner-teacher) and human-computer interaction (learner-learning content, learner-interface) has a crucial impact on learning outcomes. Rafaeli & Sudweeks(1997) classifies learner interaction as one-way, two-way, and feedback interaction based on the direction of interaction propagation. Interaction in the learning process is two-way communication between learners to learn, explain and challenge some ideas which are a major means of knowledge transfer, therefore, the effectiveness of interaction largely affects learners' learning outcomes.

This study will refer to Liu, Huang, Lingzi et al.'s (2005) TAP2 model based on the framework of activity theory (i.e. studying CSCL interactions in three dimensions: topic change (TC), affective change (AC) and process pattern (PP)) to develop an online interactive model for ELT suitable for this study. The discovery of patterns and theories implied by the interaction data using grounded theory(Strauss & Corbin, 1998, p.7) analysis. Using event analysis(Suthers et al., 2010)to investigate the relationship between different events in the interaction process; and using the results of this analysis to optimise the interaction strategy.

In terms of psychology, in addition to the ZPD theory (1978:86) and scaffolding(Wood et al., 1976) mentioned above. The hook model (Eyal & Hoover, 2014) will also be introduced for the specificity of this study and will be used as a basis to investigate how teachers can give students variable rewards through the optimisation of interaction strategies to enhance student motivation in the process of teaching English online.

#### **4. A description of the evidence you intend to collect**

The data to be collected in this project is divided into three parts: data from user research, data from eye-tracking tests and data collected through data burial points

##### **I. During the user research phase**

In the user research phase, data will be collected through questionnaires on which online teaching tools are used by university English teachers and students, how they teach and learn online in the process, what problems they encounter in the process and their psychological changes and needs in the process.

##### **II. During the eye movement test phase**

Eye-tracking technology is used to collect data on the movement of the subject's eyes when facing the screen and the number of pupil dilation and contraction, which is aggregated into heat maps, gaze indicators and visual scan paths.

### III. During the user behaviour data collection phase

The server-side scripting language was used to collect behavioural data from university teachers and students: teacher and student user IDs, mobile phone numbers, timestamps, network IP addresses, network environment, mobile device models, length of stay on different pages, number of clicks on features within different pages.

## 5. Research Idea and Research Methodology

- **Research Idea:**

Based on the above research objectives and research content, the research idea of this topic is divided into three main stages:

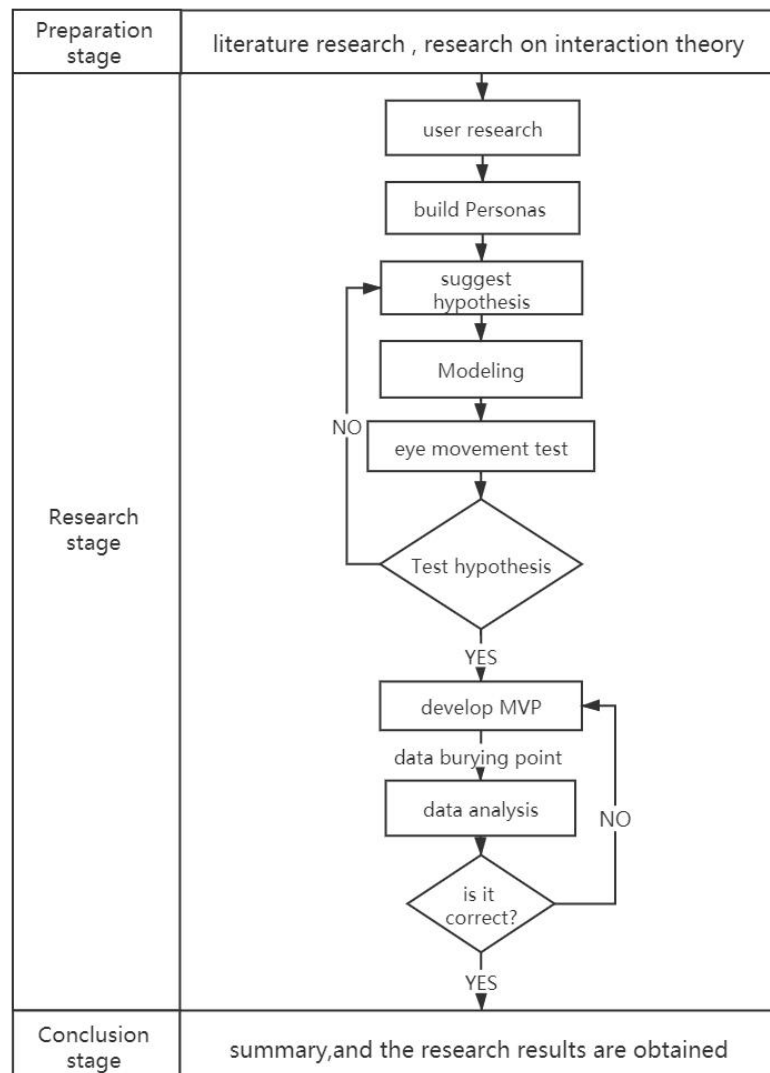


**Table 1:** research idea

### I. Preparation phase

Through the literature research method, read literature in related fields to understand the current state of interaction research in the field of online English teaching and learning as well as the concepts and theories related to interaction design.

## **II. The research stage: this stage is divided into three steps, user research, product development, data analysis**

### **1. User research:**

Through qualitative research methods, user interviews are conducted with university teachers and students to uncover the unmet needs of teachers and students for interaction in the current stage of online English teaching. The results of the interviews were collated and the common characteristics were extracted to build user personas and put forward hypotheses.

### **2. Product development.**

First, a model is constructed based on the hypothesis and then an eye movement test is performed. Next, the hypothesis is validated by generating a heat map and gaze metrics from the data collected with the eye-tracking device. Finally, after the hypothesis has been verified, technical development is carried out to develop a minimum viable product (MVP) and to bury the data before going live for the required data.

## **III. Summary Phase**

Based on the actual situation in the experimental research phase, a summary is made to extract the interactive strategies that can improve the effectiveness of online English teaching.

## **● Research Methodology**

### **I. Analysis of the current situation:**

It is the basic work of model construction and optimization strategy exploration.

#### **1. Literature method:**

analyze relevant research literature at domestic and abroad, and sort out the current status of research in related fields.

#### **2. Case study method:**

select typical outstanding and failed English online teaching applications at both domestic and overseas as cases and analyse the advantages and disadvantages of their interaction strategies.

#### **3. Questionnaire and interview method:**

to investigate teachers and students who use English online teaching through

questionnaires and interviews to understand their experiences, needs and various problems they encounter in the learning process.

## **II. Big data collection and correlation analysis:**

the basic basis for building behavioural models.

### **1. Eye-movement experiment method:**

combining eye-movement experiments with effect tests, using eye-movement meters to track teachers' and students' eye-movement behaviour (gaze time, gaze times, eye jumps, gaze hotspots, eye-movement trajectories, etc.) when using the application, and conducting learning effect tests after learning is completed to reveal the close relationship between learners' eye-movement data and learning effects, reflecting the visual cognitive processing mechanism of learners conducting English online learning.

### **2. Development research method:**

programming and developing special English online teaching applications as well as server-side script analysis tools for indirectly tracking and analysing data on learners' dwell time, number of visits, playback behaviour, learning paths, interaction behaviour, etc. when they engage in English online learning. Big data collection and correlation analysis: the basic basis for building behavioural models.

### **3. Eye-movement experiment method:**

combining eye-movement experiments with effect tests, using eye-movement meters to track teachers' and students' eye-movement behaviour (gaze time, gaze times, eye jumps, gaze hotspots, eye-movement trajectories, etc.) when using the application, and conducting learning effect tests after learning is completed to reveal the close relationship between learners' eye-movement data and learning effects, reflecting the visual cognitive processing mechanism of learners conducting English online learning.

## **III. Supporting strategy exploration:**

Conducting teaching experiments that are a validation of the teacher-student model of interactive behaviour for teaching and learning English online, as well as exploring strategies for optimising the application of interactive teaching in online English classrooms.

**1. Design research method:** Conducting a needs analysis based on the teacher-student model of online teaching and learning behaviour for designing and producing interactive features that help to enhance the effectiveness of online English classroom teaching.

**2. Teaching experiment method:** carrying out experiments on the application of different English teachers' teaching strategies and different students' learning

strategies, and extracting corresponding strategies to support the optimisation of interaction in online teaching and learning of English.

## **6. Settings**

In the first phase, the experiment began with a sample of students from a first-year university English class, a class size of around 50-60 students. Due to the new coronavirus attack in 2020, all universities were unable to conduct face-to-face teaching and learning of English courses, and instead, teaching and learning were done online, so all the above students and teachers had the experience of participating in online teaching and learning, which provided a good background for this research.

In the second phase of the eye movement test, the limited number of devices meant that data could only be collected in batches. However, now that face-to-face courses have resumed in Chinese universities, students are on campus, the eye movement devices are on campus, and the time required for one person to take the test is not too long (around 15-20 minutes per person), so it is easy to collect the data because the timing of the data collection can be flexibly arranged and students do not have to travel to participate in the test.

In the later stages of the MVP testing and the official use of the product, teachers and students will be able to use it with simple mobile and web technology. Simply put, students and teachers only need to have a mobile phone, computer or iPad with a working network to use it, which is no different to the equipment requirements for online classes during the epidemic when everyone was able to access the internet, and similarly, there will be no problems during the MVP testing phase and finally the official use of the product.

## **7. The ethical issues you need to consider**

Participants will be informed of all data collection, use and security issues in advance of the study. Before the MVP product is delivered to the test subjects, they will be informed in writing about the privacy of their data and will be asked to sign to ensure that they are aware of what data will be collected, how it will be collected and used, and how it will be stored securely. Most importantly, it is essential to confirm that participation in the experiment is entirely voluntary.

During the experiment, we have the right to use, protect, share, disclose and delete personal information of the test subjects following the relevant laws and regulations, and we will also comply with the relevant laws and regulations to protect the privacy and security of the test subjects and sign an agreement with the test subjects. We promise to erase all data when the experiment is completed.

- **Definition of Privacy Policy**

**Personal information:** all types of information recorded electronically that, alone or in combination with other information, can identify a specific natural person or reflect the activities of a specific natural person, including name, date of birth, gender, ethnicity, telephone number, e-mail address, education, occupation, personal property information, mobile device information (including device model, MAC address, operating system type, software list International Mobile Equipment Identity Code IMEI, Android ID, serial number, etc.), address book (phone book), geolocation information (precise location information, including latitude and longitude, etc.).

**Personal privacy information:** personal information that, if leaked, illegally provided or misused, may endanger the safety of persons and property, and may easily lead to damage to the reputation, physical and mental health of individuals or discriminatory treatment, including identity information (including personal identity cards, passports, driving licences, active military identity documents), personal biometric information (including fingerprints, transaction and consumer information, etc.), health and physiological information, web pages browsing history, address book (phone book), geographical information (precise positioning information, including latitude and longitude, etc.).

**Children:** are minors under the age of 14.

- **Details**

**1. Ways of collecting information related to participants**

When providing functions or services, the platform may collect and store personal information and or personal privacy information related to the subjects through the app, paper files, complaint feedback, website operation and maintenance analysis and service surveys. Subjects will be made informed and understand this before the commencement of the experiment.

**2. Recording and collection of information**

The research project will record and collect information such as registered accounts, mobile phone numbers, IP addresses, operating information, device models, operating system versions, etc., as well as log information related to the platform, under relevant laws and regulations.

**3. Use, protection, disclosure and deletion of privacy information**

This study will collect the necessary personal information for use. After collecting the participants' personal information, the data will be anonymised through technical means to ensure the security of the participants' information. Once the study is completed, all personal information collected, such as personal information and log information, will be deleted. However, the personal information required for this study

may be disclosed publicly with the consent of the individual or when compelled by government order by relevant laws and regulations.

#### **4. Cases in which the participant's authorized consent is not required**

Your prior authorized consent is not required for the collection, sharing, and disclosure of your personal information in the following cases: directly related to national security and defence security; related to public safety, public health, and significant public interest; related to crime investigation, prosecution, trial, and judgment enforcement; related to the protection of your or other individuals' life, property, and other significant legitimate rights and interests, but it is difficult to obtain your consent. As well as personal information that participants disclose to the community on their own and personal information collected from lawful public disclosures.

#### **5. Children's information protection**

This research will strictly comply with relevant laws and regulations, fulfil its responsibility and obligation to protect children's personal information, and protect children's personal information. If there are minors under 14 years old (inclusive) using the product after its launch, prior consent must be obtained from a legal guardian before using the platform's functions and services, and we will protect the user's personal information following relevant laws and regulations.

#### **6. Management of personal information**

We will store personal information appropriately under relevant laws and regulations. A request for deletion of personal information is made by a participant to this researcher in the following situations:

1. when the researcher's handling of personal information in the course of the research violates relevant laws and regulations or the agreement with the participant.
2. when the collection and use of the participant's personal information are carried out without the participant's prior authorised consent.
3. when the participant does not wish to continue to participate in the subject before the end of the study
4. when the study cannot be continued for any reason

*Note:* As this study is conducted with Chinese students and the research context is within China, the study will follow the relevant rules and regulations of China and the UK(*Ethical Guidelines for Educational Research, fourth edition (2018)*).

#### **8. The methods you expect to use to analyse the evidence you collect.**

The data analysis for this study consisted of three main components: user research data analysis, eye-tracking test data analysis and buried data analysis

## **I. Analysis of user research data**

Using grounded theory, the results of user research were studied qualitatively. The following methods were mainly applied.

**1. Open coding:** Organise the textual data from the user research, including interview transcripts and questionnaire results, and conduct open coding of these textual data.

**2. Spindle coding:** The results of the above open coding were repeatedly reflected on, sorted out their internal links and coded in a correlative manner to further form a few spindle codes.

**3. Selective coding:** Analysis of the open-ended and linked codes and distillation of the core codes.

**4. Constructing theory:** summarise the above three stages of coding, find out the path of action according to the relationship between the codes, and complete the theoretical construction.

Firstly, the frequency statistics of the main axis codes were conducted to identify the three main axis codes that received the most attention. Secondly, the interrelationships between the main axis codes are analysed in depth to discover the respective roles of the core codes on the spindle codes and their different paths of action. Finally, a theoretical model is constructed using the core codes as the mainline.

## II. Analysis of eye movement test data

### 1. Heat map analysis



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**Figure 1:** Eye Movement Heat Map(GAN, 2014)

The viewing behaviour of the test subjects was aggregated into a heat map, and the colour shades of the viewing heat map were analysed according to the heat map. The darker the colour, the more attention is paid to the area; conversely, the lighter the colour, the less attention is paid to the area. The heat map is used as a basis to verify the rationality of the product design, placing core features in areas that receive more attention and non-core features in areas that receive less attention.

## 2. Visual scan path analysis

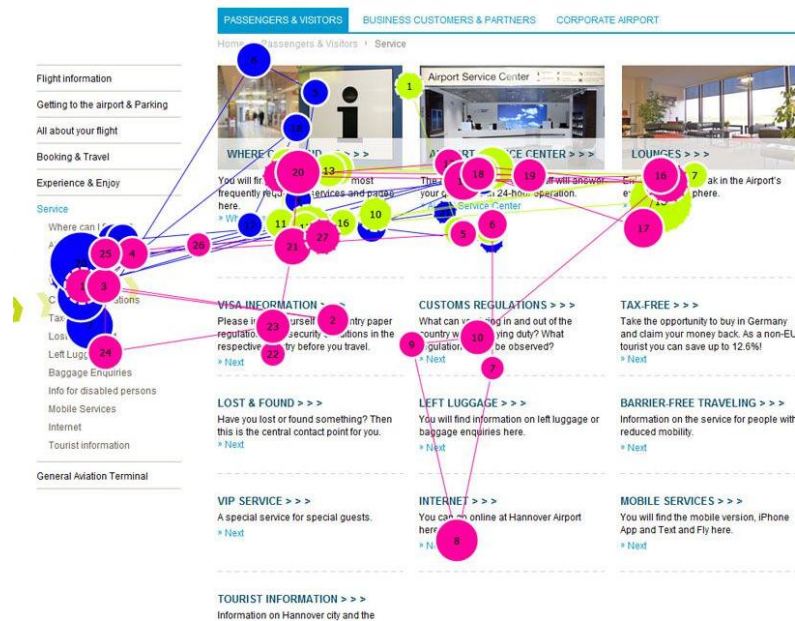


**Figure 2: Eye Movement Pathway Map**  
(Eye Tracking - usability test with eye-tracking)

Using eye-tracking, the user's eye scan path through the mobile interface can be monitored so that information can be captured about which element the user's attention starts with and then moves to another element. By analysing this scan path, it is clear what element the user looked at first and what element they looked at second. It is also possible to see how long the participant's eyes linger on the different elements. This test gives the researcher a clear picture of what is not working well in the interaction design of the product model so that it can be optimised in time.

## 3. User behaviour data analysis

A data analysis matrix model combining user retention data and on-page element click-through rates was constructed. By analysing user retention data and on-page element click-through rates, it was possible to find out whether there were any problems with the design of the product interaction strategy, and if so, the researcher was able to use the results of the data analysis as a basis for optimising the design of the product interaction strategy.

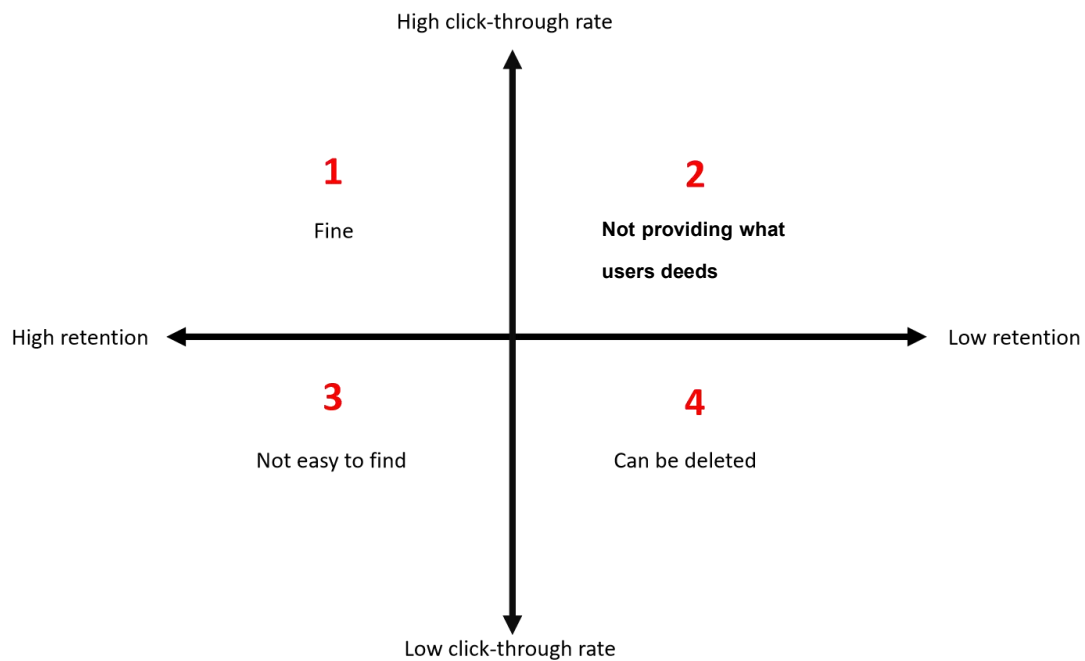


**Chart 1:** User Page Retention Rate Analysis

**Data analysis:**

**Zone 1:** the page with a high click-through rate and high retention rate, it can be initially determined that the page is well designed.

**Zone 2:** the page with a high click-through rate and a low retention rate, it can be initially analysed that the page is easy to be found by the user, but the settings in the page do not meet the user's needs.

**Zone 3:** the page with a low click-through rate and a high retention rate, it can be initially analysed that the page is useful to the user but not easy to find, in other words, the page is too deep and not easily accessible.

**Zone 4:** the page with a low click-through rate and a low retention rate, the page can be initially considered for deletion.

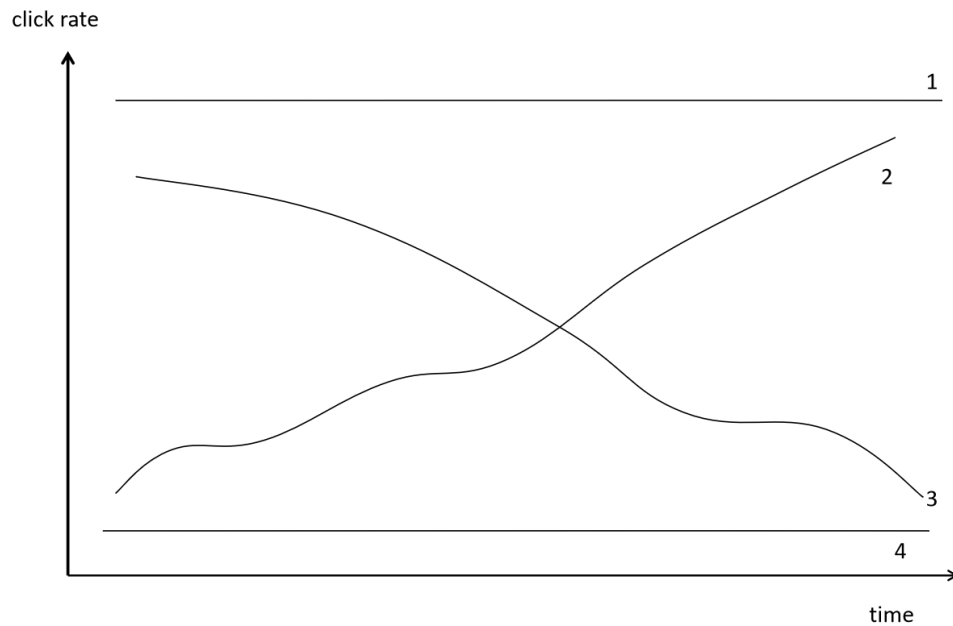


**Chart 2:** Analysis of functional settings

#### **Data analysis:**

A coordinate system is constructed by combining a timeline and a click-through rate to observe the trend in the number of times a function key is clicked on each page over a while (usually 1 week) to determine how the function is used on that page.

**Line 1:** it is not only accurately and quickly identified by the user but also used frequently, which means that the function is reasonably set up and meets the user's needs.

**Line 2:** which is an increasing trend, means that the function is not easy to be found by the user but it is more useful to the user, so it is necessary to think about increasing the weight of the page where the function is located and to optimise the settings.

**Line 3:** that is, a decreasing trend, it means that the weight of the page where the function is located is relatively high and it is easy to attract the attention of the user, but it is not very useful for the user, so consider reducing the weight of the function on the page where it is located and reset it.

**Line 4:** it means that the function is neither easy to find, nor is it used infrequently by users, so consider removing the function.

## 9. The timetable for the proposed project

The timeline assesses time according to the research process, as follows:

| Timeline                                                 | Details                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preparation phase<br/>(1 month)</b>                   | Reading of literature in the relevant field and understanding of theories related to interaction design and English language learning / second language learning.                                                                                                   |
| <b>Experimental research phase<br/>(9 months)</b>        | 1.User research and construction of user-profiles: 1 month<br>2.Product prototyping: 2 weeks<br>3.Eye-tracking testing and adapting product prototypes: 1 4.month<br>5.MVP product development: 4 months<br>6.Product data analysis and product iteration: 3 months |
| <b>Results summary and reporting phase<br/>(2 weeks)</b> | Collation of data to produce research results                                                                                                                                                                                                                       |

**Table 2:** Research Timeline

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