The Role of Smart Technologies in Maintaining Students' Motivation to Learn Foreign Languages

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Abstract: - Aim. The aim of the article is the study and analysis of the impact of smart technologies on students' foreign language learning motivation. Methods. The research employed the testing method (SLAM), the interview method, and the method of expert evaluations. The t-test, factor analysis, and Cronbach's alpha reliability coefficient were used for processing the research results. Results. The control group (CG) mainly shows instrumental motivation, which is based on the need to learn the language to solve practical tasks, such as professional activities or travel. The main factors affecting their motivation are interest in innovative methods of acquiring foreign language skills. The EG students more often use innovative learning methods, such as smart technologies, and note a significant increase in motivation compared to the CG. The results of the study gave grounds to reject the null hypothesis, while the alternative hypothesis was accepted, confirming significant differences in motivation between the CG and EG. Conclusions. It was established that the use of smart technologies significantly increases overall academic productivity, promotes easier assimilation of educational material, and enhances interest in learning a foreign language. Research prospects. Further research should be focused on comparing the effectiveness of smart technologies with other innovative technologies for learning foreign languages.

1 Introduction

Finding the optimal strategy of interaction with students in the learning process requires, first of all, taking into account the psychological and pedagogical peculiarities of higher school students. The reason is that they go through several stages of development during the period of study. Besides, each of the stages has its characteristics. The integration processes are intensifying under the influence of globalization, having a significant impact on the social, political, and economic system of the world of the new millennium, which is

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closely related to the global informatization of communication and innovative technologies, [1]. These processes require new approaches to the organization of the educational process.

In recent decades, bilingualism has become a subject of significant researchers' interest, especially in the context of modern smart technologies and the process of learning foreign languages. Bilingualism, the ability to speak two languages, is becoming increasingly important in the context of globalization and the expansion of international contacts. Smart technologies can become a powerful tool for supporting bilingualism. For example, mobile applications and online platforms offer various opportunities for learning and improving foreign languages, providing access to exercises, interactive lessons, and audio and video materials, [2].

Traditional education cannot yet fully satisfy the growing social demand for its quality and content, as it is mostly a conservative mechanism of knowledge transfer, [3]. However the social task of higher education is to prepare students for future life in society and professional activity by the advanced requirements of their time, [4].

Foreign language learning motivation is defined as a multifaceted concept and the most important factor that stimulates the process of acquiring foreign language competence. The motivation stimulates purposeful activity and also determines the arrangement and selection of means and methods to achieve the set goals, [5]. In this context, we can talk about the need to understand the motives for learning foreign languages among students of HEIs, [6]. The need to strengthen the pragmatic aspects of language learning should be emphasized, in particular, achieving quality results in mastering foreign language communication and finding a real connection with another culture and its representatives, [7]. The means of maintaining motivation for cognitive, developmental, and educational activities, which ultimately leads to communicative motivation, are of particular importance in the context of learning a foreign language as a part of a foreign culture. This is not only about knowledge of the language but also about the ability to use it in practice — in real communicative situations. In other words, this is about the practical mastery of a foreign language. In turn, the process of enhancing foreign language learning motivation consists of the following stages:

The first stage is the manifestation of abstract speech. The structure of the first stage consists in the formation of personal needs, goals, and motivations. The incentive to satisfy a need arises due to the achievement of a certain level of its intensity, and thus motivates the search for ways and means and leads to the formation of motivation, [8].

The second stage is the search activity. It is an action that is aimed at transforming the situation, taking into account the assessment of the possibilities that will make it possible to satisfy a particular need, [9].

The third stage is the choice of a specific goal and the formation of intentions. An image of the result of the need satisfaction is formed and a path is chosen to achieve the result, [10].

The innovative paradigm of education strengthens the role of smart technologies in education, as it actively uses the achievements of science, and intensifies the educational process, contributing to the formation of a new type of personality capable of intercultural adaptation. The unified educational information space enables its participants to interact virtually in various forms, contributing to the development of distance, online, and mobile education.

The problem with this study is that students who learn foreign languages often face a low level of motivation and interest in the learning process. This problem is especially relevant in the context of the modern educational environment, where the competition for students' attention is growing, and the distance form of education causes additional challenges in terms of maintaining motivation and activity. The lack of an adequate level of motivation can lead to low interest in the subject, loss of learning productivity, and, ultimately, deterioration of results in learning a foreign language. Therefore, understanding the reasons and ways of enhancing students' foreign language learning motivation is an important problem that requires further research and analysis.

The study focuses on analyzing how smart technologies support students' motivation to learn foreign languages. Particular attention will be given to the utilization of interactive teaching techniques, the individualization of instruction, and the impact of smart technology on increasing educational efficacy and enhancing students' language proficiency.

The article aimed to analyse the impact of smart technologies on students' foreign language learning motivation.

Objectives/Questions

1. Study the foreign language learning motivation.

2. Explore how digital technologies affect the quality of foreign language learning.

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3. Test the links between the use of digital technologies and the motivation to learn a foreign language.

2 Literature Review

It should be noted that different researchers studied the problem of learning motivation. The very interpretation of motivation is ambiguous because of its complexity. It is impossible to hide the importance of this postulate for increasing the effectiveness of the learning process. Motivation is traditionally interpreted by teachers and researchers as one of the key factors affecting the degree of success in foreign language learning. According to [11], the study of foreign language learning motivation is based on social psychology because of the fact that learning the language of another society is closely related to the established social attitude towards the language culture of another society.

According to [12], accurately describe social motivation is one type of extrinsic motivation. Learning motivation is related to a sense of civic duty. It is also related to the idea of education as a way to acquire great cultural values. Researchers believe that education is a powerful tool for a person to achieve their goals and have a positive impact on the world. People can become more efficient and effective in their pursuits by acquiring knowledge and skills, which ultimately leads to a more fulfilling life. Specific studies in the field of motivation and informal surveys showed no dependence on people's age and social status, [11], [13]. The respondents distinguished the communicative component of motivation during foreign language learning. A foreign language acted as a satisfaction of the need to communicate with friends, and loved ones, as a tool for raising one's professional level, for entertainment, simply for correspondence with foreigners. According to the researchers, such motivation contributes to a more active process of assimilation of the material by the student and can be qualified as educational motivation.

The researches in [14] emphasize the importance of creating motivation for communication, although the desire to communicate may arise spontaneously. Usually, it needs to be simulated for learning purposes. Researchers emphasize that when interesting and innovative tasks are offered, this can lead to the emergence of natural motivation, and not to another form of pseudo-communication.

As asserted by [15], the utilization of intelligent technologies in the context of foreign language learning has been demonstrated to facilitate the advancement of communicative abilities and the acquisition of professionally relevant competencies. A substantial corpus of authentic materials facilitates students' engagement in a virtual language environment, wherein they can read, view, and listen to contemporary foreign language speech and subsequently employ it in their discourse.

In their article, the researchers in [16] observed that smart technologies present a valuable opportunity for intercultural communication, which can facilitate the overcoming of stereotypes and the development of students' sociocultural tolerance. The majority of students express positive sentiments regarding the advent of smart technologies, which have expanded the opportunity to communicate with native speakers. This further motivates them and ultimately has a beneficial effect on their language training. Furthermore, the utilization of smart technologies can be considered advantageous in instances where the acquisition of a foreign language is a student's independent objective. In other words, students are prepared to engage in practice and enhancement of their skills and abilities outside the classroom setting. According to [17], [18] a student can find a person for whom a foreign language that the student studies is his/her native language, so that study and communicate, read and watch the news together, talk about general topics and discuss books or movies of interest.

As posited by [19], several issues pertaining to the acquisition of foreign languages can be addressed through the utilization of mobile learning. The integration of sophisticated technologies affords students immediate access to the requisite information, thereby enhancing their reading proficiency. The capacity to listen to the material being studied in a foreign language allows for the training of listening skills without disrupting the primary activity. Furthermore, the portability of such technology enables the resolution of the issue of saving time and space in the workplace. As observed by the researchers in [16], the utilization of computer technologies in the acquisition of foreign languages has the potential to facilitate the full realization of one's intellectual and creative capabilities. Concurrently, the educator can establish an environment wherein the learners' interests and inclinations are extensively integrated into the educational process.

Despite the wide popularity of the chosen topic among the researchers, there is still a low gap that needs research and clarification. The main focus of understudied issues is the analysis of the influence of the language atmosphere on students' foreign

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language learning motivation. Research should focus on the problem of perception of the language environment, how often students are in contact with the language outside the classroom, and how this affects their motivation and learning.

Compared to previous works, this article reveals the issue of student motivation while learning English through smart technologies. Mobile applications were used as the latest ones.

3 Methods

3.1 Design
Several phases of research and experimentation were conducted to increase students' enthusiasm to learn foreign languages while utilizing smart technologies:

1. Summative stage (2022) – analysis of theoretical studies on the problem; identification of general theoretical provisions; formation of experimental (EG) and control (CG) groups; collection of data on the level of motivation of students of the control group (CG) and experimental group (EG) before the study.

2. Formative stage (2023) – implementation of pedagogical conditions for the use of smart technologies during foreign language learning for EG. This involves a comprehensive approach to the integration of modern technologies into the educational process. First of all, it is necessary to ensure students' access to the necessary hardware and software. It is necessary to conduct preparatory work with teachers, and provide them with the necessary support and training in the use of modern technologies in teaching.

It is important to define the specific goals and objectives of the implementation of smart technologies. This involved the development of interactive online courses, the use of mobile applications for self-study, and the use of virtual reality for immersion in a foreign language environment. The opportunity for students interaction and cooperation was also provided with the help of modern communication tools. This is implemented through online forums, chats, and webinars. The use of these conditions in the EG during research and experimental work. Study of motivation development factors. Study of academic performance. Identification of statistically significant factors in the enhancement of foreign language learning motivation.

3. Control stage (2024) – evaluation of the effectiveness of the implementation of pedagogical conditions. Carrying out control tests; data analysis, and generalization of work results.

3.2 Participants
The study was conducted at the Department of Foreign Languages, Faculty of Biology and Technology of Sumy National Agrarian University; the Department of the Practice of the English Language and its Teaching Methods, Faculty of Ukrainian and Foreign Philology of Drohobych State Pedagogical University of Ivan Franko. The respondents were chosen by drawing lots among the students of the specified departments. Students of 2nd-4th years participated in research and experimental work. The control group consisted of 58 people: 25 young men and 33 girls. The experimental group consisted of 60 people: 11 young men and 49 girls. The age composition of the study groups is identical, and the groups are instructed by the same educational standards applicable to higher education. A team of educators is responsible for guiding the students through the theoretical and practical aspects of the training program. The pedagogical conditions for the utilization of smart technologies in an educational context were applied to the EG students. The control group students followed the standard curriculum. Additionally, an expert group comprising 15 teachers was involved in the study. As a digital technology for EG students, the possibilities of digital e-courses, mobile applications, and educational video libraries have been utilized during the study of a foreign language. CG students for the experiment gave informed consent not to use additional digital foreign language learning tools.

3.3 Instruments
The survey was conducted via the online platform Google Forms. The data were entered and processed using the statistical software package SPSS Statistics 19.0 and the spreadsheet software Microsoft Excel. All data are presented as relative percentages of the total number of respondents.

3.4 Data Collection
1. Learning Motivation Scale (SLAM). It is a standardized instrument used to measure students' learning motivation. The SLAM scale consists of 28 statements to explore different aspects of learning motivation. The SLAM scale measures the following five subscales of motivation:

Value. The value students attribute to learning.

Expectation. Students' expectations regarding academic performance.

Significance of achievements. The value students

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attribute to academic performance.

Interest. The level of students' interest in learning.

Self-regulation. The student's ability to independently regulate their educational activities.

2. Interview. Conducting in-depth interviews with students reveals their motivations and barriers to learning (Appendix), [20].

3. The method of expert evaluations. This method was used to carry out an independent and objective assessment of the role of smart technologies in the enhancement of students' foreign language learning motivation. The expert group also analyzed students' academic performance in two groups — the EG and the CG. The results of this analysis became the basis for identifying the correlation between learning motivation and the use of smart technologies in the educational process.

3.5 Data Analysis

1. t-test – a method used to compare two groups through one quantitative variable: foreign language learning motivation, [21]. It is calculated by using the formula:

$$t = \frac{(M_1 - M_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} \qquad (1)$$

where:

M_1 – mean value of the first group; M_2 – mean value of the second group; s_1^2 – variance of the first group; s_2^2 – variance of the second group; n_1 – the size of the first group; n_2 – the size of the second group.

Research hypothesis:

H_0 – the use of smart technologies in education does not affect foreign language learning motivation among students of HEIs.

H_1 – the use of smart technologies in education has no effect on the foreign language learning motivation among students of HEIs.

2. Factor analysis. It helped reduce the number of variables without losing important information. This was done by grouping similar variables into factors. In this study, factor analysis determined how different factors affect the outcome of the study, [22]. The factor analysis model is described as follows:

$$X = F A + E \qquad (2)$$

where:

X – data matrix (n x p); F – factor loading matrix (k x p); A – factor score matrix (n x k); E – error matrix (n x p).

3. The internal consistency of the test items is shown by the Cronbach's alpha reliability coefficient. To compute Cronbach's alpha, use this formula:

$$\frac{N}{N-1}\left(\frac{\sigma_x^2 - \sum_{i=1}^{N}\sigma_{Y_i}^2}{\sigma_x^2}\right) \qquad (3)$$

where σ_x^2 – total test score variance; $\sigma_{Y_i}^2$ – i element variance.

4 Results

The foreign language learning motivation of CG and EG students was studied using the Learning Motivation Scale. All results are presented in percentages. The results are presented in the form of a diagram in Figure 1.
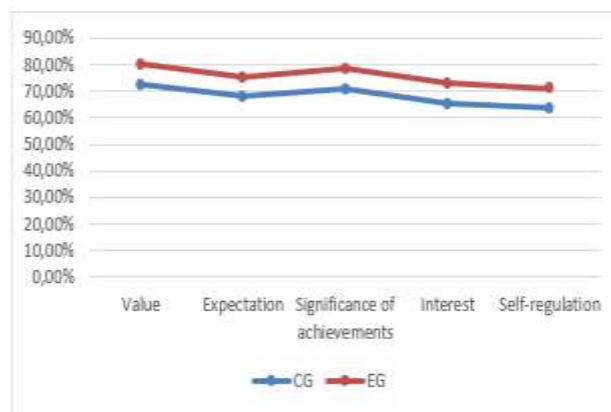

Fig. 1: The results of the learning motivation scale (SLAM) for the CG and the EG
Source: developed by the authors based on research results

In EG, a slightly higher level of learning value is observed compared to the CG. This indicates that students who participated in the additional experiment valued learning more, possibly because of the new methods or approaches used in the experiment. The EG has higher expectations for academic performance than the CG. Such results indicate greater confidence in one's abilities or a more positive perception of learning by the EG participants. The EG participants appear to place greater value on their academic performance, which may indicate greater motivation to succeed and improve performance. The CG showed less interest in learning compared to the EG. This may be the result of less interesting or outdated methods used when applying for a standard foreign language learning program. The EG participants have better

self-regulation skills in educational activities, which may indicate greater self-discipline and organization in their studies.

The results indicate that the introduction of additional methods or approaches (experiments) can contribute to enhancing students' learning motivation. However, more research is required to confirm these results and understand the specific factors that influence student motivation. It is also important to consider other possible factors that may influence motivation to get a more complete picture of the situation. The results of the structured interview gave grounds to identify the main factors contributing to the enhancement of foreign language learning motivation. Table 1 presents the average results of processed answers.

Table 1. The results of the structured interview in the CG and the EG

Questions	Control group (n = 58)	Experimental group (n = 60)	t-test
1. Motivation	3.2	3.8	$p < 0.05$
2. Language selection	2.9	3.5	$p < 0.05$
3. Goals	3.1	3.7	$p < 0.05$
4. Factors	2.8	3.4	$p < 0.05$
5. Advantages	3.0	3.6	$p < 0.05$
6. Level of motivation	3.3	3.9	$p < 0.05$
7. Methods	3.2	3.8	$p < 0.05$
8. Restrictions	2.7	3.3	$p < 0.05$
9. Changes	2.9	3.5	$p < 0.05$
10. Support	3.1	3.7	$p < 0.05$
11. Barriers	2.8	3.4	$p < 0.05$
12. Measures	3.0	3.6	$p < 0.05$

Source: developed by the authors based on the research results

The SE (standard error) values are calculated on the assumption that all questions have similar characteristics and distribution. For each item of the table, the t-test is calculated by comparing the mean values in the control (CG) and experimental groups (EG). The difference between the mean values is divided into the standard difference error, which allows us to determine the significance of the differences. All results indicate a significant difference between the groups, since $p < 0.05$.

The analysis of the typical answers of the CG and EG revealed a difference in the perception of foreign language learning motivation. The CG mainly demonstrates instrumental motivation, i.e. motivation based on the need to master the language to solve practical tasks, such as work or travel. In general, students in this group choose languages that are popular and widely used, such as English or

German, and set themselves the goal of basic language proficiency. The main factors influencing their motivation are the school curriculum and personal interests, as well as preferences in the vision of empowerment and personal development.

At the same time, EG shows an integrative motivation, which is realized in language learning to understand the cultural context and communicate with native speakers. Students in this group choose more diverse languages, such as English, Spanish, or German, and set themselves higher goals, such as fluency. The main factors affecting their motivation are interest in innovative methods of acquiring foreign language competencies. The EG students are more likely to use innovative learning methods, such as online platforms and language clubs, and experience a significant increase in motivation compared to the CG. The research results give grounds to reject hypothesis H0 and accept hypothesis H_1. The factor analysis revealed that innovative and digital teaching methods play a pivotal role in driving language learning motivation in the experimental group (EG). These methods, which include the use of online platforms, interactive learning tools, and multimedia resources, create a more engaging and dynamic learning environment. Unlike traditional methods that may rely heavily on rote memorizationmemorization or passive learning, digital tools offer personalized feedback, real-time interaction, and varied content that caters to different learning styles.

Table 2. Factor analysis of foreign language learning motivation of the CG and the EG students

Factor	Load	Explanation
Innovative and digital methods	0.75	These methods make the learning process more interesting, interactive, and effective.
Support of classmates	0.68	Communication with other language learners can be motivating and provide a sense of community.
Personal goals and plans	0.62	Having clear goals and understanding the reasons behind learning a language can greatly enhance motivation.
Interest in culture	0.59	Learning a language can be a way to get to know a new culture, which can be very motivating.
Fear of mistakes	-0.53	This factor can negatively affect motivation, so it is important to create an atmosphere where mistakes are not punished but used as an opportunity for learning.

Source: developed by the authors based on the research results

As a result, students are more motivated to participate actively in the learning process, set higher academic goals, and take greater ownership of their progress. Table 2 presents the results of the factor analysis.

The results of the factor analysis show that it is important to create a stimulating learning environment using innovative methods, support from peers, determination of personal goals, and curiosity about culture while avoiding the fear of mistakes to enhance students' foreign language learning motivation. A negative factor that emerged during the analysis is the fear of mistakes. It can affect motivation negatively, so it is important to create an atmosphere where mistakes are not punished but used as an opportunity for learning.

5 Discussion

The study's findings reveal a significant difference between the motivations for learning a foreign language in the experimental group (EG) and the control group (CG). Following the introduction of novel approaches, the EG exhibited notably higher motivation, reflected in greater expectations for academic achievement, a stronger appreciation of learning, and improved self-regulation abilities. In contrast, the CG displayed lower motivation, likely due to the use of conventional teaching methods. The statistical significance of the differences between the groups was confirmed by the t-test results ($p < 0.05$).

The obtained results give grounds to state that students of both groups maintain foreign language learning motivation. In many ways, this is manifested due to sustainable motives embedded in the structure of educational activities, which are considered in the works, [23], [24]. According to the researchers, this can be evidenced by the expressiveness and predominance of cognitive, communicative, emotional-aesthetic, and didactic motives, as well as high indicators of pragmatic motives in each of the groups, which enhance motivation for educational activities. In turn, motives of coercion and obligation have the lowest indicators of expressiveness in each of the groups.

A study of students' motives revealed a trend of gradual change from intrinsic integrative motivation to external instrumental motivation in the learning process. It is important to note that the motive in question can be variable and unstable, depending on several internal and external factors inherent to the structure of any given activity. This is in line with the findings of research studies [25]. In addition, students are guided by not only one, but several motives at the same time when choosing and further mastering a foreign language. For this reason, researchers use the term "motivational system" because it includes needs, motives, goals, and factors that stimulate the learning process. These studies belong to the category of research, therefore, it is necessary to take into account some limitations of the obtained data.

As posited by [26] and [27], the advancement of foreign language proficiency through the utilization of intelligent technologies encompasses three analytical levels: pre-textual, intertextual, and hypertextual. The authors posit that these components can enhance foreign language learning motivation by simplifying the learning process and facilitating rapid results. Conversely, researchers in [28], and [29] express reservations about the potential of smart technologies to enhance foreign language learning motivation. The authors note that their research shows that learning motivation is influenced to a greater extent by the factors of the need to master foreign language competencies. In turn, forms and auxiliary technologies are optional. As posited by [30] and [31], the advent of the innovative education paradigm has the potential to alter the fundamental tenets of learning motivation. The utilization of intelligent technologies (social networks, webinars, blogs, online textbooks, multimedia educational complexes) and intelligent devices (smart screens, smart boards) is predicated on an intelligent approach to information management, encompassing the processing of vast quantities of data and virtual information, as well as the deployment of electronic resources.

The practical implications of the research are that it offers valuable insights for enhancing foreign language teaching methodologies and sustaining student engagement. An understanding of the factors that influence motivation can assist educators and teachers in the development of more effective learning strategies that are tailored to meet the individual needs and motivations of students. For instance, it may be feasible to devise novel curricula or digital platforms that are more appealing to students, incorporating cutting-edge and digital methodologies. Understanding how peer support affects motivation can lead to the creation of a language-learning community where students can interact and support each other.

Theoretically, the research can contribute to the expansion of our knowledge about student motivation and its impact on learning. It can help identify new aspects and factors that can influence motivation and reveal their interaction. Such theoretical ideas can be used in further research and

practical activities to further improve the process of learning foreign languages.

Methodological limitations of this study include limitations related to research design and data collection. For example, the use of certain data collection methods, such as surveys or interviews, may lead to problems with the objectivity and reliability of the results due to the subjectivity of the responses. In addition, the sample may not be representative, which may limit the generalizability of the research findings. For example, a short-term study may not detect some long-term trends or effects that may change over time. In addition, some factors may not be adequately accounted for because of the limited scope of the study, which may lead to missing important associations or effects.

6 Conclusions

Relevance. The results obtained are relevant in that they have the potential to contribute to an understanding of and a solution to the problem of students' foreign language learning motivation. The research is particularly pertinent in the context of the modern world, where intercultural communication and international connections are becoming increasingly important, and knowledge of languages facilitates integration into the global community. *Research findings.* The study found that the use of smart technologies positively affects students' foreign language learning motivation in HEIs. It was found that the use of appropriate technologies significantly increases overall academic performance, simplifies the understanding of educational material, and stimulates interest in a foreign language. *Applications.* The research results have practical significance for teachers and educators, helping them to better understand and maintain students' foreign language learning motivation. In particular, they can point to effective methods of maintaining motivation, such as the use of innovative teaching methods or peer support. The obtained results will contribute to the development of individualized approaches to learning, taking into account students' personal goals and interests. *Research prospects.* Further research may expand our understanding of the nature of learning motivation. This research can help to reveal specific aspects of motivation that most contribute to successful language learning.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the authors used Grammarly for language editing. After using this service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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APPENDIX

Structured interview questions

1. How do you define your foreign language learning motivation?
2. Why did you decide to study this language, and what is your main goal in this?
3. What specific goals do you set for yourself in learning this language?
4. What factors or events motivated you to learn this language?
5. What advantages do you see in knowing a foreign language for your personal or professional development?
6. How do you rate your current level of motivation to learn this language?
7. What learning methods or tools motivate you the most?
8. Are there time or emotional constraints that affect your language learning motivation?
9. Has your motivation changed over the past year? What factors influenced these changes?
10. Do you feel supported by your classmates while learning a foreign language? How does it affect your motivation?
11. What barriers or difficulties do you encounter in the process of learning a language, and how do you overcome them?
12. What specific measures would you like to see to enhance your language learning motivation?