ISSN 2522-6398 Vol. 7, Issue 6: 197-206, DOI: 10.25236/FER.2024.070630

The Feasibility of Generative Artificial Intelligence-Meet Aiden in Assisting English Learning

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Abstract: *The vigorous development of information technology and artificial intelligence technology has given rise to the concept of digital social rights [1] . Young people are keen to use various APPs and online platforms to learn foreign languages. There are also many games that create an all-English environment to assist foreign language learning. The launch of ChatGPT in 2023 will make it possible for humans and 24-hour online generative language robot training [2] .This study aims to explore the advantages of game -assisted English learning (Meet Aiden) equipped with Generative Artificial Intelligence (GAI : Generative Artificial Intelligence) over traditional English learning [3] . The Unity 3D platform was chosen for scenario construction and the Inworld platform was used as the artificial intelligence design tool to evaluate the feasibility of this system as an auxiliary English learning tool. Through a questionnaire survey in the early stage of the project, it was found that students' attitudes toward English learning status, environment, and independent learning will lead to differences in attitudes toward GAI-assisted foreign language learning. In this empirical study, two students (anonymous as A and B) with roughly the same basic vocabulary interacted with the GAI system in a closed environment, and the learning effect was evaluated through regression analysis and the mean square error formula. The experimental results showed that both experimental participants showed significant improvement in word learning efficiency after using GAI, while the students with higher autonomy showed a smaller improvement, but they also made some progress. This implies that the GAI system generally has good applicability and potential teaching value among learners with different levels of autonomy.*

Keywords: *Generative Artificial Intelligence; English Learning; Empirical Research; Word Learning Efficiency*

1. Research background

With the continuous development of science and technology, various diversified Internet products emerge in endlessly, among which AI products, game applications, and the Metaverse must occupy the top spot. Take the well-known ChatGPT as an example. The large AI model developed by OpenAI is known as the ancestor of the large AI model. On top of its powerful text generation and understanding capabilities, it is based on the four basic language fields of listening, speaking, reading and writing. "Application" not only improves students' language ability and cultural sensitivity, but also cultivates students' digital learning capabilities [4] , provides greater help for teachers' academic research and teaching preparation, and can replace the work of the human brain to a certain extent. The general trend of combining AI with education and hybrid teaching [5] is inevitable. However, as a special tool, will AI users "transform their thinking from instrumental rationality to value rationality" [6] ? Or how to effectively combine instrumental rationality and value rationality. In contrast, in the field of online games, the cultural value they bring is uneven, and there are only a few mainstream games that can truly effectively spread cultural value. Education and games have always had an awkward balance that cannot be maintained. It is impossible to accurately impart knowledge while maintaining fun, and most knowledge cannot be transmitted through games. Therefore, as one researcher said: "So far in China, there has not been a truly educational online game that has appeared in front of the public" [7] .

Combined with the problems existing in current large AI models and game applications, this experiment combines AI models with games to assist English learning. The massive knowledge stored in the powerful database based on the large AI model is effectively integrated with the vivid game scenes to create a virtual scene of all-English learning. This scene also combines virtual characters to communicate face-to-face with students. Students can ask about the humanities, culture, technological

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development, historical sites, etc. of the place in the set experimental scene. In addition, during oral communication, students can ask questions on the spot about some unclear words, and the virtual person can give English explanations in real time. Through this "multi-channel, multi-means experience of Western culture" [8], for interactive cross-cultural human-computer interaction experiences, students can better understand multi-cultures in immersive scenes. In July 2007, the Ministry of Education issued the revised "Teaching Requirements for College English Courses" which stated that "College English is guided by foreign language teaching theory, with English language knowledge and application skills, cross-cultural communication and learning strategies as the main content, and A teaching system that integrates multiple teaching models and teaching methods" [9]. This research is also a new attempt to creatively integrate the GAI-integrated multi-modal language learning environment into students' extracurricular learning resource network.

In this experiment, the concrete indicator of the change in English learning efficiency is the "degree of mastery of new vocabulary", which is mainly measured by students meeting with generative artificial intelligence. The data obtained from the conversation with Aiden was used to observe and record the number of new words in the conversation, and to record the efficiency of the student's vocabulary memory after GAI intervention. Then, after the end of the experiment every day for 20 consecutive days, the students' grasp of the words in the context was tested (the first 10 days) and compared with the traditional method of memorizing words (the last 10 days). This method can show that "GAI" is more effective in assisting English learning. This method not only breaks through the limitations of teaching time and teaching location [10], but also provides platform support and technical guarantee for English learning, improves teaching efficiency, expands the breadth of teaching, and increases the depth of teaching [11], forming an efficient connection between class and after-class, thereby effectively assisting English teaching.

2. Research methods

This study conducted a 20-day controlled experiment on two students A and B (both students who passed College English Band 6 with similar scores and came from Jiangxi, and their specificity was the level of learning autonomy) [12]. A and B will be controlled in the first 10 days, that is, students will use VR equipment to conduct city tours in Los Angelos with the assistance of Meet Aiden and have 30 minutes of oral communication with them every day. When encountering unfamiliar words, the subjects will the reader asks GAI and memorizes the word based on the explanation provided by GAI. The dialogue scripts are backed up in the background and handed over to the members of the experimental group at the settlement of the day for statistics and collection of new words in preparation for the word test the next day. For the next 10 days, the experimental process and variables were kept unchanged, and only the word memory mode was changed to traditional paper memory. In order to ensure the effectiveness of the experiment, the experimental group applied for a closed compartment to isolate external interference and ensure that the subjects could focus on interacting with GAI (see Figure1).

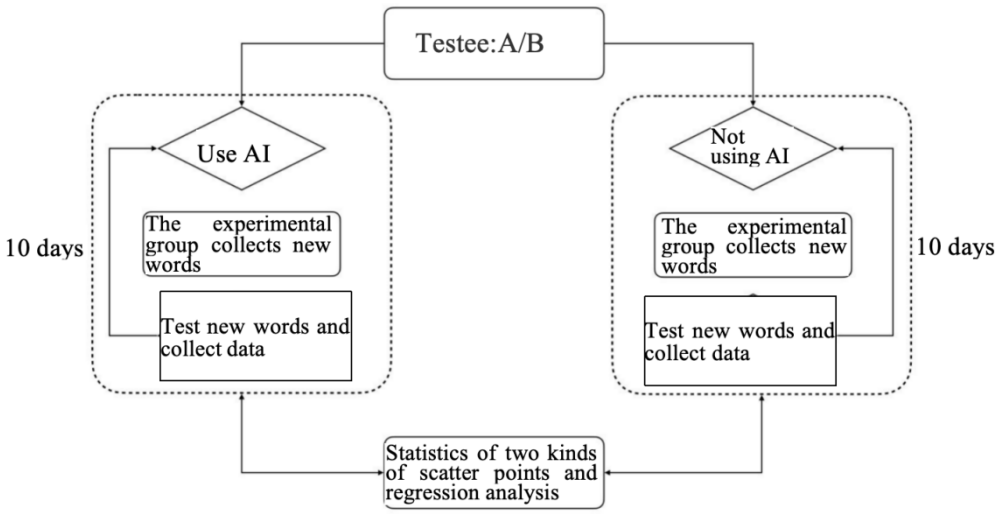

Figure 1: GAI experimental procedure flow chart

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2.1 Experimental stage and purpose

This experiment first used statistical inference methods such as Bayesian inference [13] based on the large number of learning tools and their derivatives generated in the English learning environment. With the experimental results of the previous experimenters, the big data analysis of various learning tools, and personal subjective learning experience, the experimental results of this experiment can be roughly judged. Subsequently, in the preliminary questionnaire survey analysis, statistical methods such as T-test [14] , one-way analysis of variance (ANOVA) [15] and independent sample test [16] were used to find that students had certain deviations in their attitudes towards the current status of English learning, learning environment and autonomous learning. However, students showed high satisfaction and interest in using " GAI " as an auxiliary means of English learning. Based on these questionnaire feedback, we designed this experiment to explore whether "GAI" can improve students' efficiency in learning English and whether it can serve as a third virtual classroom for students.

2.2 Experimental tool design

Build environment scene: In this experiment, the resource package of Google Maps is first integrated into the Unity environment, which includes importing the necessary map data and images. Next, complete the configuration of the Google Maps service in Unity's Package Manager to ensure seamless connection to the background resources of Google Maps. Afterwards, 2D flat map resources were imported from Google Maps and converted into 3D models in Unity through a series of conversions to create a three-dimensional city landscape. In addition, the main camera in the scene was adjusted, set to dynamic mode, and programmed to move the camera based on user input or specified logic. Finally, we input the specific longitude and latitude coordinates of Los Angeles into the Google Maps platform, and controlled the camera in Unity to move to the corresponding geographical location through the written script, allowing users to view the 3D urban environment of Los Angeles through the camera.In this way, a basic platform for a human-computer dialogue system is built, which combines real geographical information and virtual 3D environment to provide users with an immersive interactive experience (see Figures 2 and 3).

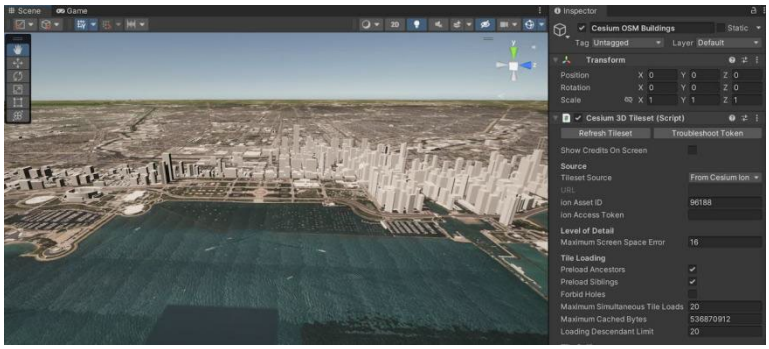

Figure 2: Google Maps resource debugging

Figure 3: Los Angeles map resource integration package

Create the GAI character model: GAI is the main development object of this experimental tool. After screening and comparison, the experimental group finally chose to carry out comprehensive development through the Inworld platform.

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Step 1: The core description of GAI was determined, with Los Angeles tourism as the theme. Meet-Aiden is a local tour guide in Los Angeles, with both TESOL (Teaching English to Speakers of Other Languages) and senior tour guide certificates. He has knowledge covering travel strategies, geographical background, famous buildings and historical culture, as well as second language acquisition theory, pedagogy and other related knowledge. In terms of setting the dialogue content, in order to allow users to experience realistic interaction effects, a natural and smooth dialogue mode was adopted, and key tourism vocabulary was integrated, aiming to reduce communication barriers while testing users and maximize the purpose of expanding vocabulary (see Figure 4).

Step 2: In order to enrich GAI's knowledge base, it can use relevant tourism knowledge to explain terms that users may encounter in conversations, so that users can better understand these vocabulary words. Considering that two students with similar English proficiency were used as experimental subjects, the speaking speed of GAI was specially adjusted to 0.75 times that of regular conversation and the British pronunciation was RP (Received Pronunciation) [17] to facilitate students' understanding and recognition (see Figure 5).

Step 3: In order to make the conversation livelier and more interesting, GAI designed a series of actions and expressions, and controlled them through codes so that they could respond accordingly according to different situations during the conversation, enhancing the authenticity and interactivity of the simulation. Finally, in order to make GAI more attractive, its appearance design was set to a Chinese image, and combined with rich action coding, aiming to increase the interest of the entire conversation process, reduce the tedium of the process, and achieve a high degree of reality restoration Conversational experiences in life. Through these meticulous designs and settings, GAI has become an educational and entertaining interactive travel conversation partner, providing users with a highly realistic learning and interactive environment.

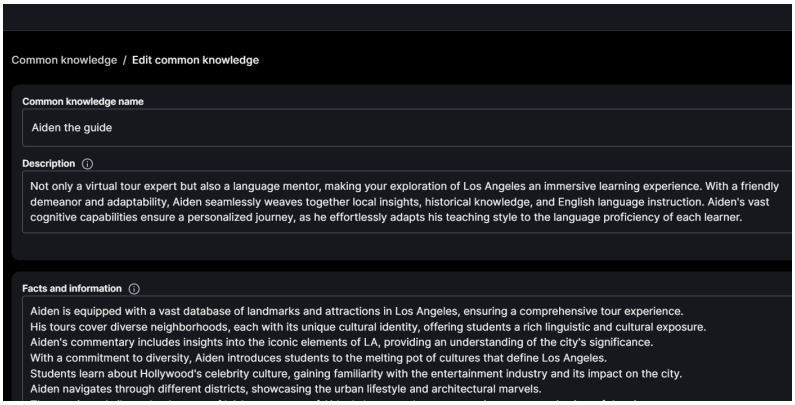

Figure 4: The process of setting the character details of GAI-Meet Aiden

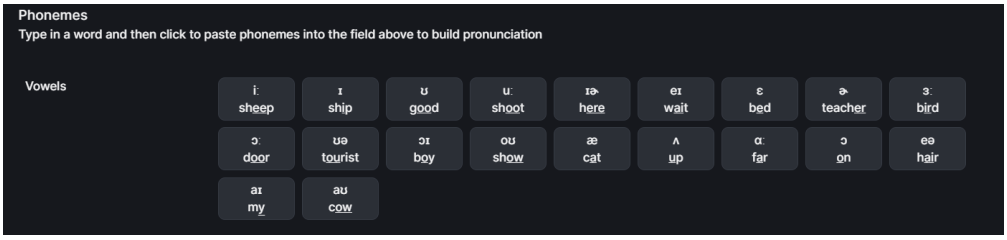

Figure 5: The process of setting the pronunciation details of GAI-Meet Aiden characters

GAI dialogue debugging: In order to ensure that human-computer dialogue can proceed smoothly and conduct a comprehensive evaluation of GAI after setting it up, professional English teachers were invited to participate in the dialogue test (see Figure 6). Teachers made detailed evaluations based on GAI's speaking speed, pronunciation, conversation content and interaction methods. Based on teachers' feedback, our development and setup team conducted detailed records and analysis of the problems GAI encountered during the dialogue testing process. This link is crucial for identifying and adjusting various parameters of GAI. It helps us optimize the performance of GAI to ensure that it can provide a smooth and natural conversation experience in actual applications. Through this iterative testing and adjustment process, the efficiency and effectiveness of GAI as a travel dialogue partner are further improved, making it more in line with the actual needs of users, thereby providing users with a highly realistic and interactive learning and interaction platform.

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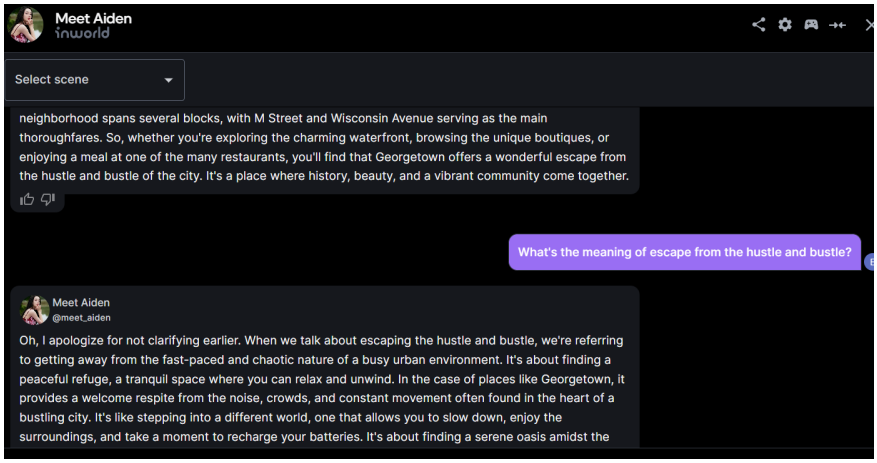

Figure 6: Dialogue test in text form

Import GAI into Unity: In order to integrate the set GAI with the Unity scene, the generated key was set through the interface of the Inworld background and imported into the Unity scene interface. Next, the scene in Unity was run, and GAI and the map scene were debugged to ensure that there would be no code conflicts between the two. If a source code error occurs during the debugging process, the debugger will perform debug detection and debug and correct the source code error that occurs in the secondary test. In addition, the debugger also checked the system connection problem to ensure that the connection is normal. If the cause of the abnormal connection is found, debug and modify it to ensure the normal operation of the entire system. Through these meticulous debugging and optimization work, the smooth integration and operation of GAI in the Unity scene is ensured, providing users with a stable, smooth and highly realistic dialogue experience (see Figure 7).

Figure 7: Experimental tool after importing GAI

3. Data results and analysis

This test data uses the Py charm encoder of Python for data statistics and result presentation: statistics of 20 word test data of users before and after using GAI conversation, and the words used (first 10 days) and unused (last 10 days). The data scatter points are sorted separately using the accumulation method , and put into linear regression analysis charts and mean square error formulas for testing respectively , and it is concluded that user A uses Meet Aiden and does not use AI; user B uses Meet Aiden and does not use AI. AI's four sets of linear regression equations are interpreted by comparing their R square and mean square error.

A and B linear regression plot (Figure 8-11)

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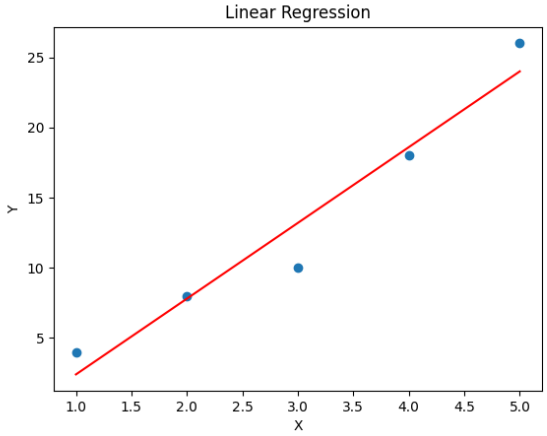

Figure 8: Linear regression plot of user A not using GAI

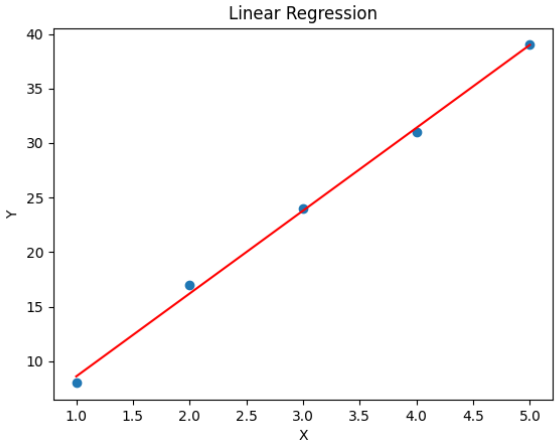

Figure 9: Linear regression graph of user A after using GAI

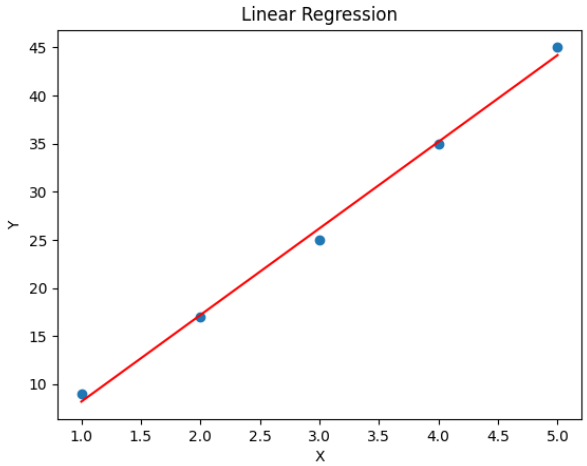

Figure 10: Linear regression plot of user B not using GAI

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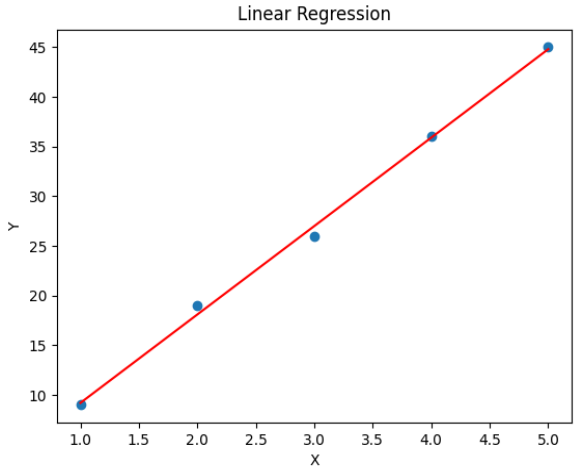

Figure 11: Linear regression graph of user B after using GAI

The Slop slope and Intercept of Student A's two linear regressions are (see Figure 12):

```
D:\360downloads\exercise\Scripts\python.exe C:\Users\wcw\PycharmProjects\pythonProject\xianxing.py
Slope: 5.400000000000001
Intercept: -3.000000000000013

Process has ended, exit code 0
```

```
D:\360downloads\exercise\Scripts\python.exe C:\Users\wcw\PycharmProjects\pythonProject\xianxing.py
Slope: 7.6000000000000005
Intercept: 0.9999999999999843
```

Figure 12: Comparison of R-squared and intercept of user A 's two regression analyses.

Therefore, the regression equation of A is:

Not used: Y=5.4X-3.0

Used: Y=7.6X+1.0

The Slop slope and Intercept intercept of Student B's two linear regressions are (see Figure 13):

```
D:\360downloads\exercise\Scripts\python.exe C:\Users\wcw\PycharmProjects\pythonProject\xianxing.
Slope: 8.9
Intercept: 0.2999999999999907

Process finished with exit code 0
```

```
D:\360downloads\exercise\Scripts\python.exe C:\Users\wcw\PycharmProjects\pythonProject\xianxing.py
Slope: 9.000000000000002
Intercept: -0.800000000000014

Process has ended, exit code 0
```

Figure 13: Comparison of R-square and intercept of user B 's two regression analyses

Therefore, the regression equation of B is:

Not used: Y = 8.9X + 0.30

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Used: Y=9.0X-0.8

The mean square error of two linear regressions for students A and B (see Figure 14-15)

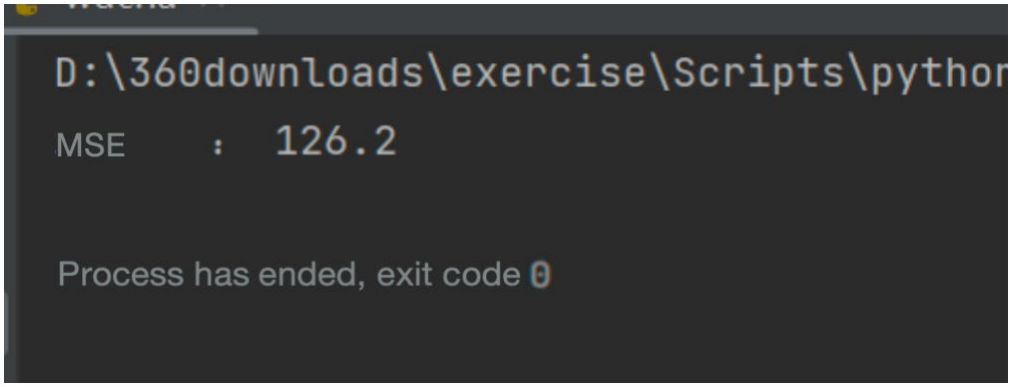

Figure 14: Mean square error of two linear regressions for Student A

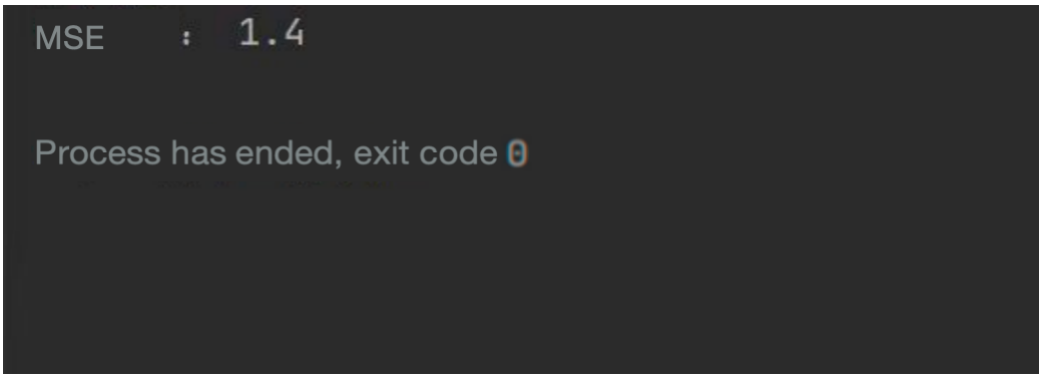

Figure 15: Mean square error of two linear regressions for Student B

Data analysis: After completing the experiment and obtaining the data, we used regression analysis plots to quantitatively study the relationship between variables. By comparing the regression plots before and after using the GAI system, we analyzed the changes in participants' learning effects. Specifically, we observed the slope and intercept of the regression line, which reflects the trend of word memory efficiency over time or other factors. For two users A and B, if the regression line after use shows a steeper slope, this indicates that the use of the GAI system may have improved learning efficiency; if the slope slows down, it may indicate that learning efficiency is reduced. In addition, we also focused on statistical indicators of the regression model, such as R^2 value to evaluate the explanatory power of the model, as well as F statistics and t statistics, which help us judge the significance of variables in the model. Combining these quantitative analyzes with error considerations allows us to validate our initial assumptions. If the data shows that both users A and B show significant improvement in learning after using GAI, then we can conclude that the GAI system is effective. This conclusion is reached on the basis of rigorous statistical analysis and provides us with strong evidence to support the application potential of the GAI system in the field of education.

In this linear regression analysis, it was observed that under the same basic word count, the slope of students with average autonomy after using GAI was greater than the slope before use, indicating that the intervention of GAI has a significant positive impact on this type of students. Relatively speaking, students with higher autonomy have little difference in slope before and after using GAI, but the slope still increases after use, indicating that GAI can provide additional assistance even for students with strong independent learning ability. From the perspective of mean square error, the mean square error of students with average autonomy after using GAI exceeds 100, which reflects that GAI has a very obvious assisting effect on their English learning. The mean square error of students with strong autonomy after using GAI is less than 1.5 but still greater than 0, which means that although the assistive effect of GAI on these students is not as significant as the former, it is still effective.

Therefore, the experimental data indirectly shows that students' English learning autonomy, environmental attitude, and attitude toward learning status do not significantly affect the effectiveness of GAI-assisted English learning. This shows that GAI, as an auxiliary tool, generally has good applicability

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and effectiveness among students with different levels of autonomy.

4. Research limitations and prospects

This experiment only involved two students with the same basic vocabulary, from the same region, and the experimental period was too short. This is insufficient for drawing broadly applicable conclusions and does not reflect the diversity and complexity of the overall student population. The experiment focused on short-term (20 days) learning effects, while ignoring long-term learning effects and memory retention. In order to comprehensively evaluate the effect of the GAI system, future experimental designs should extend the research and observation period (such as more than 1 year) and track students' learning progress over a long period of time in order to more accurately measure the persistence of learning results. The experimenter can select students of different grades from major colleges and universities in Jiangxi Province or expand the search nationwide. Expanding the sample size can better understand the applicability and effect of the GAI system in different contexts and continue to provide feedback after the experiment, adjust the GAI system to suit the needs of different individuals.

This experiment did not consider how to solve the problem of the subjects' learning motivation during the experimental period. How to make students' learning change from passive to active, from "I have to learn" to "I want to learn" has always been an important topic in educational research [18] . Therefore, we need to analyze the five theoretical foundations of "Maslow's Hierarchy of Needs Theory" [19] from physiological needs, safety needs, social needs, respect needs and self-actualization needs, to find the motivation for the subjects to continue to memorize words. In the process of the experiment, a "reward mechanism" [20] to stimulate the subjects' interest in continuous learning.

Acknowledgements

Fund Projects: Subordinate Metaverse-Constructing the Third Virtual Classroom for English Learning in College (Project number: 202310846004)

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