

CHAPTER 3

RESEARCH METHODOLOGY

This chapter provided the methodology utilized to conduct the study. This chapter outlines the methodology utilized to conduct the study, covering six sections: research design, research variables, population and sample, data collection and instruments, data analysis, and research schedules. More details are described below.

A. Research Design

This study employs a quantitative correlational research design. This design is selected because the study aims to examine the extent to which learners' interest and learners' enjoyment predict perceived cognitive development in AI-assisted English learning, without manipulating any of the variables. In a correlational design, the researcher measures variables as they naturally occur and analyzes the statistical relationships among them (Osborne & Waters, 2002). This approach is appropriate for the current study because the researcher aims to comprehend the predictive relationships between affective variables, such as learners' interest and learners' enjoyment, and a cognitive outcome variable, such as perceived cognitive development, among undergraduate students who use AI tools in English learning.

The quantitative technique is preferred because the data of this study are collected through structured questionnaire and examined through statistical procedure. The quantitative technique allows the researcher to accurately measure the variables, test hypotheses and generalize the findings to a wider population (Osborne & Waters, 2002). Since this study is dealing with numerical data of students' opinions on three factors and tries to find out the extent to which the independent variables predict the dependent variable, quantitative technique is the most acceptable strategy.

In the present study, Artificial Intelligence (AI) is understood as AI-based learning tools used by students to support their English learning activities, such as AI-powered language learning applications, intelligent tutoring systems, automated feedback tools, and generative AI platforms like ChatGPT, Gemini, and Perplexity. These tools are used to tailor learning information, provide instant feedback and enable independent learning which might affect emotional and cognitive responses of the learners during the learning process.

The study performs multiple linear regression analysis to evaluate the predicted correlations between variables. In this study, learners' interest (X_1) and learners' enjoyment (X_2) are treated as independent variables, while perceived cognitive development (Y) is treated as the dependent variable. Multiple linear regression is considered the most appropriate statistical technique because it allows the researcher to (1) examine the simultaneous and individual contributions of two independent variables toward one dependent variable, and (2) determine which independent variable serves as the stronger predictor of perceived cognitive development (Hair Jr et al., 2014). The regression model used in this study can be written as follows:

$$Y = a + b_1X_1 + b_2X_2 + e$$

Where:

Y = Perceived Cognitive Development

a = Constant

b_1 = Regression coefficient of Learners' Interest

X_1 = Learners' Interest

b_2 = Regression coefficient of Learners' Enjoyment

X_2 = Learners' Enjoyment

e = Error term

This model directly addresses both research questions in this study: whether learners' interest and enjoyment significantly predict perceived cognitive development, and which of the two variables is the stronger predictor.

B. Research Variables

This study involves three variables: two independent variables and one dependent variable.

Independent Variables (X):

- X_1 = Learners' Interest
- X_2 = Learners' Enjoyment

Dependent Variable (Y):

- Y = Perceived Cognitive Development

The first independent variable is learners' interest. “Learners’ interest” in this study refers to an internal motivation state of curiosity, sustained attention and a sense of personal importance to the English learning activities with AI tools. Interest is conceptualized on the basis of the Four-Phase Model of Interest Development (Renninger & Hidi, 2022) which describes how interest develops from situational interest, triggered by particular stimuli in the learning environment, to individual interest, a more stable and self-sustaining engagement with a particular subject. Six criteria are employed to assess the degree to which students view AI-supported activities as stimulating, personally significant, and worth engaging in when compared to AI-assisted English learning.

Learners' enjoyment is the second independent variable (X_2). In this study, learners’ enjoyment refers to pleasant emotions that students have when participating in English learning activities mediated by AI systems, including sensations of pleasure, comfort and satisfaction. The variable is conceptualized drawing on the Foreign Language Enjoyment (FLE) framework proposed by Dewaele and MacIntyre (2014) who define enjoyment as a distinct pleasant emotion experienced in language learning contexts and which contributes to

students' motivation and engagement. Six questions derived from the Foreign Language Enjoyment Scale are used in this study to gauge learners' enjoyment of utilizing AI in English learning.

Dependent Variable: Perceived Cognitive Development (Y) Perceived cognitive development in this study refers to students' self-perceived progress in cognitive processes resulting from their involvement in AI-assisted English learning activities. This variable is developed based on Bloom's Revised Taxonomy (Anderson et al., 2001) that classifies cognitive learning into five cognitive processes: remembering, comprehending, applying, analyzing, and evaluating. Perceived cognitive development in this study is operationalized by 10 questions that measure the amount to which students feel their involvement with AI technologies has contributed to their capacity to recall, understand, apply, analyze and assess English language knowledge and skills.

The relationship among the three variables in this study is illustrated in Figure 1 below.

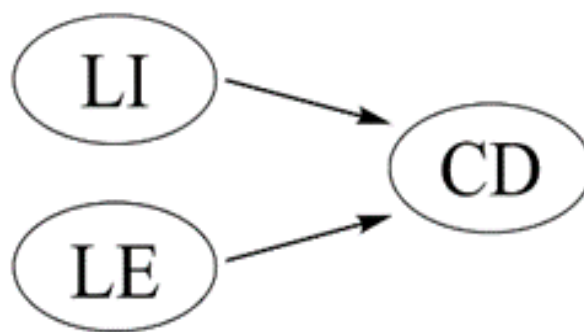


Figure 1. Research Variable Framework

Note:

LI = Learners' Interest

LE = Learners' Enjoyment

CD = Cognitive Development

C. Population and Sample

The population of this study is the undergraduate students who are registered in the English Education program at Universitas Siliwangi, Tasikmalaya, Indonesia. This population is chosen because the students of English Education are the ones who learn English as a Foreign Language (EFL) and are actively participating in academic English learning activities. The study focuses on this specific programme, ensuring respondents receive more homogeneous learning opportunities and experiences, and the relationship between the learners' interest, enjoyment, and perceived cognitive development can therefore be explored more evidently. At the time of data collection, the total population of active undergraduate students in the English Education study program was 111.

The researcher selected a sample to represent the population, as including all students was unfeasible. The purposive sampling technique was employed to select the respondents based on two criteria: (1) they are active undergraduate students of the English Education program, and (2) they have direct experience of using AI-based tools such as ChatGPT, Gemini, or others in their English learning activities. All 111 members of the population met these criteria and were therefore included as the sample of this study. This technique was considered appropriate because it allows the researcher to gather data from respondents who are most relevant and informative in relation to the research objectives (Hair Jr et al., 2014).

Prior to the main data collection, a pilot test was conducted involving 30 respondents who were not included in the main sample, to examine the validity and reliability of the research instrument. The instrument was a questionnaire measured by five point Likert scale (1 (Strongly Disagree) – 5 (Strongly Agree)).

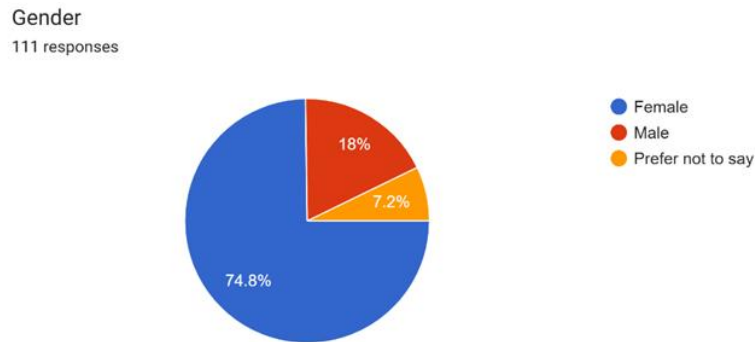


Figure 2. Distribution of Respondents by Gender

The demographic profile of the 111 respondents comprised of 20 male students (18%), 83 female students (74.8%), and 7.2% of the respondents who opted not to respond.

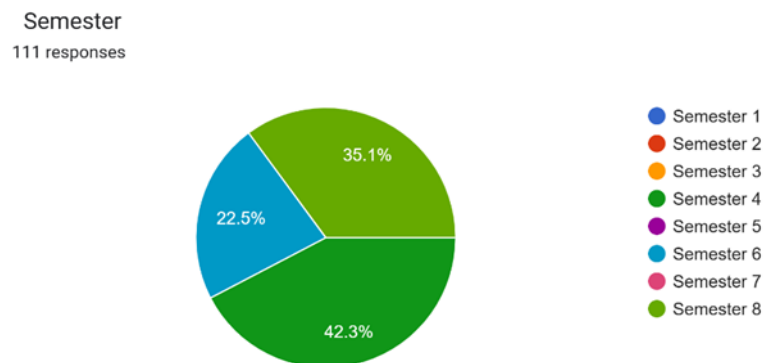


Figure 3. Distribution of Respondents by Semester

The respondents were students of the English Language Education study program at Siliwangi University, from the fourth until the eighth semester. The distribution based on semester is shown in Figure 3.

D. Data Collection/Instruments

A questionnaire was the primary tool used in this study to collect data on learners' interest, learners' enjoyment, and learners' perceived cognitive

development in AI-assisted English learning. The questionnaire method was chosen because it aids the researcher in collecting data from many respondents in an expedient way and it offers an opportunity to measure the variables under the study quantitatively (Hair Jr et al., 2014). The use of a structured questionnaire is consistent with the correlational research design of this study, in which the researcher measures participants' responses to examine the predictive relationships among variables without manipulating any conditions.

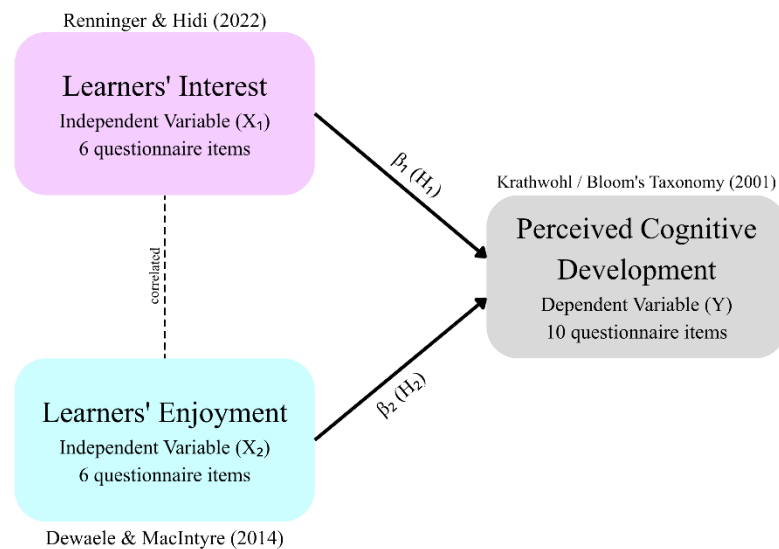


Figure 4. Research Framework: Multiple Linear Regression Model

The research framework of this study is illustrated in Figure 4. As shown in the figure, this study involves two independent variables, namely learners' interest (X_1) and learners' enjoyment (X_2), and one dependent variable, namely perceived cognitive development (Y). The arrows indicate the predictive relationships that were examined, in which it was hypothesized that each independent variable would significantly predict the dependent variable. The statistical model used to investigate these relationships concurrently is the regression equation $Y = a + b_1X_1 + b_2X_2 + e$

In this study, the questionnaire consists of 22 items with three variables. Indicators are used to measure the variables, which are based on well-

established theoretical frameworks. Learners' interest (X1) is measured by six items based on Renninger and Hidi's Four-Phase Model of Interest Development, which reflects three dimensions: attention to learning activities, curiosity toward the subject matter, and personal value and relevance toward AI-assisted English learning. Learners' enjoyment (X2) is assessed with six items adapted from the Foreign Language Enjoyment framework of Dewaele and MacIntyre (2014), which captures three dimensions: enjoyment during learning activities, comfort and ease in the learning environment, and satisfaction with the learning experience. Perceived cognitive development (Y) is measured by ten items derived from Bloom's Revised Taxonomy (Anderson et al., 2001) that capture five cognitive processes: remembering, comprehending, applying, analyzing and evaluating English language knowledge while participating in AI-assisted learning activities.

All items were scored on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). All respondents were informed about the goal of the study, asked to give voluntary consent, and assured that all replies would be kept confidential before data collection. Validity and reliability tests were conducted prior to the major data collection to confirm the quality of the instrument. Below are the results of the tests.

Validity Testing

The clarity, applicability and relevance of each topic in the questionnaire were determined by the professional opinion of two professors of the English Education department to ensure content validity. The concept validity was then evaluated using the Corrected Item-Total Correlation obtained from the Item-Total Statistics output in SPSS via Reliability Analysis. An item was considered authentic if its Corrected Item-Total Correlation was greater than 0.30. The findings of validity test show that all 22 questionnaire items including learner interest (L1-L6), enjoyment (E1-E6), and perceived cognitive development (C1-C10) have Corrected Item-Total Correlation values

more than 0.30. As a result, all items were declared genuine and included in the main data collection.

Table 2.
Validity Test Results

Questions	Corrected Item–Total Correlation
Question 1	0.900
Question 2	0.766
Question 3	0.791
Question 4	0.797
Question 5	0.771
Question 6	0.845
Question 7	0.873
Question 8	0.741
Question 9	0.795
Question 10	0.731
Question 11	0.848
Question 12	0.886
Question 13	0.895
Question 14	0.875
Question 15	0.824
Question 16	0.774
Question 17	0.775
Question 18	0.785
Question 19	0.827
Question 20	0.833
Question 21	0.878

Reliability Testing

The reliability of the instrument was examined using Cronbach's Alpha. A variable is considered reliable if the Cronbach's Alpha value is greater than 0.70 (Hair Jr et al., 2014). The pilot reliability test ($n = 30$) produced Cronbach's Alpha values of 0.936 for learners' interest, 0.930 for learners' enjoyment, and 0.959 for perceived cognitive development, as summarized in Table 3 below; all three variables therefore exceeded the 0.70 threshold and were categorized as reliable.

Table 3.

Reliability Test Results

Variable	Cronbach's Alpha	Interpretation
Learners' Interest	0.936	Reliable
Learners' Enjoyment	0.930	Reliable
Perceived Cognitive Development	0.959	Reliable

E. Data Analysis

The data collected in this study were analyzed using multiple linear regression analysis with the assistance of IBM SPSS Statistics. Multiple linear regression was selected because it allows the researcher to examine the extent to which two independent variables learners' interest (X_1) and learners' enjoyment (X_2) simultaneously and individually predict the dependent variable, namely perceived cognitive development (Y), and to determine which variable serves as the stronger predictor (Hair Jr et al., 2014). The data analysis

in this study followed three main stages: (1) descriptive statistics, (2) classical assumption testing, and (3) multiple regression analysis, which encompassed hypothesis testing (F-test and t-test) and dominant predictor analysis.

1. Descriptive Statistics

Descriptive statistics were used to summarize the general characteristics of the data collected from each variable. The analysis included the calculation of mean, standard deviation, minimum value, and maximum value for learners' interest, learners' enjoyment, and perceived cognitive development. These statistics provided a general overview of respondents' responses and the overall tendency of each variable in the context of AI-assisted English learning.

2. Classical Assumption Testing

Before conducting Multiple Regression Analysis, several classical assumption tests were performed to ensure that the data met the requirements for regression analysis (Hair Jr et al., 2014). The tests conducted were as follows.

a) Normality Test

Normality Tests Skewness was performed to check for normal distribution. Skewness and descriptive was used for understanding normality. Normal distribution of skewness is near to zero. Skewness analysis and descriptive can also visualize using histogram, stem-leaf plot. Values within acceptable skewness range were considered as proof of normal distribution (Williams et al., 2013).

b) Multicollinearity Test

This test examines if the two independent variables are too highly associated with each other to be used together in the same regression model. Tolerance levels and Variance Inflation Factor (VIF)

scores were employed as indicators. Tolerance over 0.10 and VIF below 10 indicate no serious multicollinearity (Hair Jr et al., 2014).

c) Linearity Test

The linearity test was carried out to test the linearity of the association between the independent factors and the dependent variable. This test was analyzed with scatterplots and the Test for Linearity in SPSS. A linear relationship is needed since multiple regression analysis presupposes that changes in independent variables relate to proportional changes in the dependent variable (Osborne & Waters, 2002).

d) Homoscedasticity Test

Residual plots of standardized predicted values (ZPRED) vs. standardized residual values (ZRESID) were inspected to verify that the distribution of residuals was constant for the predicted values. A random, patternless distribution of points was taken as confirmation of homoscedasticity (Yang et al., 2019).

3. Multiple Regression Analysis

After all assumptions were fulfilled, Multiple Regression Analysis was conducted using IBM SPSS Statistics to examine the predictive relationship between learners' interest, learners' enjoyment, and perceived cognitive development in AI-assisted English learning.

The regression model in this study can be formulated as follows:

$$Y = a + b_1X_1 + b_2X_2 + e$$

Where:

Y = Perceived Cognitive Development

a = Constant

b_1 = Regression coefficient of Learners' Interest

- X_1 = Learners' Interest
- b_2 = Regression coefficient of Learners' Enjoyment
- X_2 = Learners' Enjoyment
- e = Error term

a) Hypothesis Testing

Two forms of hypothesis testing were carried out from the regression output.

1) Partial Test (t-test)

The t-test was used to determine whether each independent variable individually had a significant effect on perceived cognitive development. A variable was considered statistically significant if the p-value was less than 0.05 (Roustaei, 2024). This study used a test in response to the first research question to evaluate the individual predictiveness of the learners' interest and the learners' enjoyment separately.

2) Simultaneous Test (F-test) and R^2

The F-test was employed to examine whether the predictors, as a whole, explained substantial variance in the dependent variable with a significance level of $p < 0.05$ (Hair Jr et al., 2014). The coefficient of determination (R^2) was also presented to show the extent to which the two independent factors explained the variation in perceived cognitive development.

b) Dominant Predictor Analysis

To identify the dominant predictor among the two independent variables, the standardized beta coefficients (β) from the multiple regression output were compared. The variable with the larger standardized beta coefficient was identified as the stronger predictor of perceived cognitive development (Hair Jr et al., 2014).

F. Research Schedules

Table 4.

Research Schedules

Description	Aug/ 2025	Sept/ 2025	Oct/ 2025	Nov/ 2025	Dec/ 2025	Jan/ 2026	Feb/ 2026	Mar/ 2026	Apr/ 2026	May/ 2026	June/ 2026
Research Proposal Writing											
Research Proposal Examination											
Data Collection											
Data Analysis											
Report											
Thesis Result Seminar											
Thesis Examination											