Quantitative Studies Project: Proposal Overview

The Effectiveness of Educational Apps for Vocabulary Learning in High School: Case of Students learning English at Bayonne High School in New Jersey

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Chapter I

The Problem

Developing a strong vocabulary is frequently identified by both students and educators as a key challenge to understanding what they read (Jun Zhang et al., 2008). Learning any language, including the English language, has been looking for the way to overcome the obstacles of limited vocabulary.

Introduction

Building a strong vocabulary is crucial for success in high school and beyond. Traditionally, vocabulary learning has involved textbooks, rote memorization, and flashcards. However, the rise of educational apps has offered a new and interactive approach in the era of digital technology. This study delves into the effectiveness of these apps in enhancing vocabulary acquisition among high school students.

Statement of the Problem

Schools and districts such as Bayonne High School and its districts spend an increasing amount of money on textbooks to help remediate student vocabulary learning deficiencies in English language. However, no research has been conducted to investigate the effectiveness of educational apps for vocabulary learning for students learning English at Bayonne High School in New Jersey. The effectiveness of educational apps for vocabulary learning in High School is one of the emergent trends in educational technology because it exhibits some gamification. Our study will explore the potential benefits of educational apps for vocabulary learning for students learning English at Bayonne High School in New Jersey in the age of higher technology and help to effectively implement technology and gamification to remediate high school students'

vocabulary deficiencies. One of the potential benefits of educational apps is increased engagement because gamification, interactive exercises, and multimedia elements can make learning vocabulary more engaging and enjoyable compared to traditional methods. Another benefit of educational apps is personalized learning because some apps match individual learning styles and adapt to a student's progress offering a more targeted approach. While there are some drawbacks such as over-reliance on technology with apps that might become a refuge preventing the development of independent learning skills, focus on mechanics over meaning with apps that might prioritize memorization of definitions over understanding context and proper usage, and quality and design with the fact that not all apps are created equal and the effectiveness can depend on the app's design, features, and alignment with educational standards, our study will help to implement educational apps for vocabulary learning in high school - case of students learning English at Bayonne High School in New Jersey.

Purpose of the Study

The purpose of this study is to examine the advantages of educational apps to determine their true impact on vocabulary learning for high school students. This study informs educators, parents, and students themselves about how to best leverage technology to build a strong and lasting vocabulary foundation.

Theoretical Framework

According to Krashen's input hypothesis, "we acquire language by understanding messages, that 'comprehensible input' (CI) is the essential environmental ingredient in language acquisition" (Krashen, 1992, p. 409). Following Krashen, students need exposure to comprehensible language input to acquire new vocabulary (Krashen, 1992, p. 409). As a result, apps can provide this by offering rich multimedia elements, context, and opportunities for

repeated exposure. Based on interaction hypothesis proposed by Michael Long (1981) in the development of speaking skills, Namaziandost et al. indicate that “interactive activities played a significant role in the classroom since students were able to improve their speaking skill in the classroom atmosphere.” (Namaziandost et al., 2019, p. 218). By paraphrasing Namaziandost et al., meaningful interaction with language facilitates learning and apps can promote interaction through activities such as games, peer-to-peer learning features, and discussions (Namaziandost et al., 2019). 127). Based on Bartlett's (1932) schema theory, Iran-Nejad et al. point out that “The primary factor responsible for the new development was interest in the influence of prior knowledge in perception, comprehension, and remembering.” (Iran-Nejad et al., 2000, p.5). New information is integrated with existing knowledge and then apps can effectively utilize this by connecting new vocabulary to familiar concepts and providing visual aids (Iran-Nejad et al., 2000). According to Deci et al., “Self-determination theory (SDT) is an empirically derived theory of human motivation and personality in social contexts that differentiates motivation in terms of being autonomous and controlled.” (Deci et al., 2012). Learning is enhanced by autonomy, competence, and relatedness. Apps can promote autonomy by offering personalized learning paths and choice in activities. Also, they can foster competence through immediate feedback and gamified elements that reward progress. Relatedness can be addressed through social learning features that connect students with peers or experts (Deci et al., 2012). Furthermore, the framework of mobile assisted language learning (MALL) explores the capabilities of mobile devices for language learning with its accessibility and portability because apps allow students to learn anywhere and anytime. With its multimedia integration, apps can combine audio, video, images, and text for a richer learning experience. With its engagement and

interactivity, apps can leverage games, quizzes, and other interactive features to keep students motivated.

By integrating these theoretical perspectives, we can develop a comprehensive framework to evaluate the effectiveness of educational apps in boosting vocabulary acquisition among high school students in general and at Bayonne High School students in New Jersey singularly. This framework allows us to analyze how app design features align with established learning principles and ultimately impact vocabulary knowledge and retention.

Research Question

Our research question is: Does using a specific educational app designed for vocabulary learning improve vocabulary knowledge in high school students compared to traditional methods?

Null Hypothesis

The null hypothesis (H_0) for our research question is:

H_0: There is no significant difference in vocabulary knowledge between high school students who use the specific educational app designed for vocabulary learning and those who use traditional methods.

Our null hypothesis assumes that the specific educational app won't have any meaningful impact on students' vocabulary knowledge compared to the traditional methods currently used. Its alternative is the research hypothesis.

Research Hypothesis

The research hypothesis (H_1) for our research question is:

H_1: There is a significant difference in vocabulary knowledge between high school students who use the specific educational app designed for vocabulary learning and those who use traditional methods, with students using the app showing greater improvement in vocabulary knowledge.

Our research hypothesis states the opposite of the null hypothesis. It predicts that the specific educational app will lead to a positive difference in vocabulary knowledge for students who use it compared to those who rely on traditional methods.

Significance of the Study

Our study is important because it finds that the intervention group (students who receive access and instruction on using the educational vocabulary app for a designated period for instance, ten weeks) using the educational app shows a statistically significant increase in vocabulary knowledge compared to the control group (students who continue with their traditional vocabulary learning methods for example, textbooks and flashcards for the same period). We do this study to make recommendation for the use and implementation of educational apps for vocabulary learning and teaching in High School and beyond. Our study suggests the app's effectiveness in enhancing vocabulary learning for high school students. Our study contributes to the body of knowledge and makes an impact in the field of educational technology leadership because it helps to implement educational apps for vocabulary learning in high school.

One other study that is similar to our study is “The Effectiveness of Quizlet Application towards Students’ Motivation in Learning Vocabulary” by M. Rizky Setiawan and Pangesti Wiedart in 2020. The quantitative study done by Setiawan and Wiedarti was a

quasi-experimental method where the participants were divided into two groups: experimental group and control group. In the experimental group, the participants should study the vocabulary materials through the Quizlet Application via a smartphone, while the other group learned them without using it meaning the other group used paper-based vocabulary for study (Setiawan et, al., 2020. p.89).

Research Design

In our quantitative study, we are going to collect our data (primary data) by using an experiment. An experiment is one of the primary data collection methods. In experiment, treatments are applied in controlled conditions.

Research Method

Our research method is a randomized controlled experiment with two groups of high school students at Bayonne High School:

First group is the intervention group. In the intervention group, students receive access and instruction on using the educational vocabulary app for a designated period (for instance, ten weeks).

Second group is the control group. In this group, students continue with their traditional vocabulary learning methods (for example, textbooks, flashcards) for the same period (ten weeks, for instance).

To collect our data, we assign a pre-test and a post-test to both groups. For the pre-test, both groups complete a standardized vocabulary test before the intervention period to establish a baseline. For the post-test, both groups complete the same vocabulary test again after the intervention period to measure learning gains.

In our analysis, we compare the average vocabulary test scores between the intervention and control groups before and after the intervention. We use statistical methods to assess if the difference in vocabulary improvement between the app group and the traditional method group is statistically significant. The statistical methods that we could used in our quantitative analysis are descriptive statistics (descriptive statistics consist of describing and summarizing the main features of a data set) and inferential statistics (inferential statistics are used to make inferences or predictions about a population based on a sample of data). In the descriptive statistics, we calculate the three measurements of central tendency such as the mean (the arithmetic average) vocabulary test scores, the median (the middle value of a dataset when they are arranged in order), and the mode (the value that appears most commonly). In the inferential statistics, we use the common inferential techniques such as Analysis of Variance (ANOVA) and Correlation Analysis. We can use Excel software to do the Analysis of Variance (ANOVA) and run a correlation analysis. In our study, we may also use ANOVA with Excel for reasons: First, ANOVA is used to compare the means of three or more groups to determine if there are statistically significant differences among them. Second, it is commonly used in educational research to compare the effects of different teaching methods or interventions.

Definition of Terms

Effectiveness: The ability of something to produce the results we want. It also refers to the capability of producing a desired result or the ability to produce the output we want. When something is effective, it means it is successful in reaching its intended goal.

Educational Apps: They are software applications designed to facilitate and support learning. They are essentially tools that can be used by learners of all ages to acquire new knowledge and skills. Their primary purpose is to be educational. They can cover a wide range of subjects, from

basic literacy and numeracy to complex scientific concepts. They can be downloaded on mobile devices or accessed through computers, making learning more accessible and convenient. They often incorporate interactive elements like games, simulations, quizzes, and multimedia content to make learning more engaging and enjoyable. Some educational apps can be personalized to satisfy to individual learning styles and paces. Educational apps are typically seen as complementary tools to traditional classroom learning, but they can also be used for independent learning or remote education. Few examples of educational apps are Duolingo (a fun and popular app for learning new languages. It uses gamification techniques to make language learning engaging, with bite-sized lessons and rewards for completing activities. It is one of the language learning apps), Epic! (a subscription-based app that offers a vast library of children's books. It allows kids to explore different genres and reading levels, while also providing features to help them improve their reading skills. It is one of the reading apps), Khan Academy Kids (a free app designed for young children, offering a variety of interactive activities and games to help them learn basic math concepts like counting, shapes, and addition/subtraction. It is one of the popular math apps), NASA (a great app for anyone interested in space exploration. It provides users with access to a wealth of information about NASA missions, spacecraft, and astronomical phenomena. It’s one of the popular science apps), and Lightbot: Code Hour (an app that introduces users to the basics of coding in a fun and accessible way. It uses puzzles where players need to program a robot to complete tasks, helping them learn fundamental coding concepts. It is one of the coding apps). There are many other educational apps available to explore and learn something new. Also, the educational apps cater to different ages, subjects, and learning styles. Some educational apps that can help high school students expand their vocabulary in a fun and engaging way are Magoosh Vocabulary Builder (an app that offers daily

vocabulary lessons with challenging words and practice quizzes to test understanding. It also helps students prepare for standardized tests such as the SAT or ACT), WordUp (it focuses on helping students learn the most commonly used words in English. It uses a four-step approach that includes a personalized learning plan, engaging activities, and spaced repetition to ensure long-term retention), Quizlet (it is a classic flashcards app that allows students to create their own flashcards or study from millions of pre-made sets. It offers various study modes, including flashcards, practice tests, and games like "Scatter"), and Anki (it uses spaced repetition, a scientifically proven method for memorizing information. Students can create decks of flashcards with words, definitions, and even images or audio pronunciations. Anki schedules reviews based on how well the student remembers each card, optimizing learning efficiency).

Gamification: Use of game to improve learning and teaching. In today's digital generation, gamification has become a popular tactic to encourage specific behaviors, and increase motivation and engagement (Hsin-Yuan Huang et al., 2013, p.5).

Quantitative Study (quantitative research): According to Creswell and Creswell, quantitative research involves testing objective theories by analyzing connections between variables or comparing different groups. These variables are usually measurable through instruments, allowing for numerical data analysis using statistical methods. "The researcher measures these variables using statistical procedures and the final written report has a set structure comprising the introduction, literature and theory, methods, results, and discussion" (Creswell et. al., 2022, p.267). The standard structure of a quantitative research report includes sections such as introduction, methods, results, and discussion. Researchers in this paradigm employ deductive reasoning, incorporate safeguards against bias, consider alternative explanations, and aim to generalize and replicate their findings (Creswell et. al., 2022, p.5). Furthermore, it involves the

systematic investigation of phenomena using numerical data and statistical analysis. It focuses on gathering measurable data and analyzing it to understand patterns, relationships, and trends within a population or sample. This approach aims to provide objective and replicable findings, often through controlled experiments, surveys, or observational studies. It is widely used in various fields, including education, economics, psychology, sociology, and health sciences. It provides valuable insights into complex phenomena, informs decision-making processes, and contributes to the advancement of knowledge in diverse domains.

Quantitative data: Quantitative data use numerical values to describe something of interest either by measuring it (such as its weight, height, or distance), we call this continuous data, or by counting it (such as the number of customers or repeat customers a business receives or the number of children or defects per hour)- we call this discrete data (Donnelly, JR, 2019, p.7). Following Donnelly (2019), quantitative data use numerical values while qualitative data rely on descriptive terms to describe something of interest.

Primary data: According to Donnelly, JR, primary data are data that you have collected for your own use (Donnelly, JR, 2019, p.6). Following Donnelly, JR, they are data collected by the person or organization that eventually uses the data. This type of data can be expensive to acquire, but the main advantage of primary data is that the data are yours, and you have nobody else to blame but yourself if you make a mess of it. You can obtain primary data in many ways, such as by direct observation, via experiments, or through surveys (Donnelly, JR, 2019, p.6).

Experiment: "An experiment is a method of gathering primary data by exposing subjects to certain treatments and recording the data of interest." (Donnelly, JR, 2019, p.6).

Focus Group: "Is a direct observation technique whereby individuals are often paid to discuss their attitudes toward products or services in a group setting controlled by a moderator. For

example, Fisher Price heavily relies on focus groups of both adults and children to obtain valuable feedback on new toy ideas. The participants are aware they are being observed (Donnelly, JR, 2019, p.6).

Baseline: According to Oxford Advanced Learner's Dictionary, a baseline is a line or measurement that is used as a starting point when comparing facts. For example, the figures for 1999 were used as a baseline for the study (Hornby, 2000, p.88). Baseline is also referred to point of reference used for comparison. It is a set of initial data or a measurement established before something is introduced or changed. It can be a specific value or set of values used as a benchmark to assess progress or change. For example, we might measure students' reading level at the beginning of the school year to establish a baseline. Then, we can compare their reading level later in the year to see how much they have improved. Economists often track economic indicators such as Gross Domestic Product (GDP) or unemployment rate to establish a baseline. This helps them understand how the economy is performing over time. In essence, a baseline helps us understand where we stand at the beginning and provides a reference point to measure change or improvement.

Intervention Group: In a research study, it is the group of participants who receive the treatment, program, or strategy that is being investigated. This is the group where researchers aim to observe the effects of the intervention. Interventions can be anything from medications and medical procedures to behavioral therapies and educational programs. Intervention group is often compared to a control group, which does not receive the intervention. This comparison helps researchers isolate the effects of the intervention being studied. An example of intervention group could be the following: Imagine a study investigating a new medication for treating a specific disease. The participants would be divided into two groups. The intervention group

would receive the new medication, while the control group might receive a placebo (a sugar pill with no active ingredient). By comparing the health outcomes of both groups, researchers can assess the effectiveness of the new medication.

Control Group: In a scientific experiment, a control group is the standard for comparison. It is a group that does not receive the treatment, program, or variable being investigated by the experiment. It doesn't receive the independent variable being tested. The independent variable being tested could be a new medication, a training program, a specific learning method, or any other factor the experiment aims to study. The results of the intervention group (the group receiving the treatment) are then compared to the control group to isolate the effects of the independent variable. The control group provides a baseline measurement to compare against the intervention group. This allows researchers to see if the intervention caused any changes or effects. To illustrate the concept of control group, we have the following example: Imagine a study on the effectiveness of a new fertilizer for plant growth. The plants would be divided into two groups. Intervention Group**:** These plants would receive the new fertilizer. Control Group: These plants would not receive the new fertilizer. They might be given the standard fertilizer or no fertilizer at all (depending on the specific experiment). By comparing the growth of the plants in both groups, researchers can determine if the new fertilizer has a significant impact on plant growth. The control group helps to isolate the effect of the fertilizer and account for other factors that might influence plant growth (like sunlight, water, or soil quality).

Pre-test: An initial assessment given before something is introduced or implemented. A pre-test can be used to gauge participants' existing knowledge or skills in a particular area. It can be helpful in educational settings to determine a student's baseline understanding before starting a new unit or course. A pre-test is a valuable tool for educators, researchers, and anyone who

wants to assess knowledge, skills, or readiness before implementing something new. Most importantly, pre-test is often used in conjunction with post-test. A post-test is a similar assessment given after the intervention (a course, training, or treatment, for instance) has been completed. By comparing the results of the pre-test and post-test, researchers can evaluate the effectiveness of the intervention and see if it produced any changes or improvements.

Post-test: An assessment administered after a period of instruction, intervention, or treatment. It is designed to measure the outcomes or effects of what was implemented. The purpose of post-test is to assess the learning, improvement, or change that occurred as a result of the intervention. Post-test is often used in conjunction with pre-test. Recall that a pre-test is an assessment given before the intervention. By comparing the results of both tests, researchers or educators can evaluate the effectiveness of the intervention. The following example illustrates the concept of post-test: Imagine instructor Pougaza implements a new teaching method in his financial literacy class. He might give a pre-test at the beginning of the unit to assess students' prior knowledge about a specific financial literacy topic. Then, after teaching the unit using the new method, he would administer a post-test on the same topic. By comparing the pre-test and post-test results, the instructor Pougaza can see how much the students learned and whether the new teaching method was effective. Overall, post-test is a crucial tool for evaluating the impact of educational programs, training interventions, medical treatments, and various other initiatives. It provides valuable data to assess learning, improvement, and the overall effectiveness of what was implemented.

Limitations, Delimitations, and Assumptions

Limitations

We are going to collect primary data. Primary can be expensive and time-consuming to gather. Also, some students may miss class the day we start the experiment and the day we end it. Language teacher or English teacher may be on leave during the ten weeks of the experiment. It may cost money or membership may be needed to get the educational app.

Delimitations

We limit our study to high school students learning English language particularly Bayonne High students. We are familiar with the school and the district. We plan to enlarge our study to other schools and districts in the United States and countries in Africa specially in the French speaking countries where students are also learning English as second language. The recommendations of our study will also benefit these countries where the students need to be proficient in English, which is one the skills they need to acquire to be competitive in the labor market in this era of globalization.

Assumptions

We assume that teachers and students in intervention and control groups were equally well prepared and motivated.

Chapter Summary

Building critical reading and writing skills, and a strong vocabulary is essential for the success of high school students. Our proposal highlights some quantitative aspects in educational technology research. Our quantitative study isolates the impact of a particular educational app because it focuses on a specific technology. Our research design ensures a comparison to existing practices (traditional methods) to evaluate the app’s effectiveness for vocabulary learning in high school. Using standardized measures, vocabulary tests provide a quantifiable measure of learning outcomes related to the app's purpose.

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