Using Flashcards via a Voice Assistant

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The term "academic success" is one that every student is familiar with. From striving for academic success to being expected to achieve it, this concept is the ultimate goal for many students and teachers. One way to achieve academic success is through effective study habits, or "regular tendencies… that one depicts during the process gaining information through learning" (Kumar, 2015). The most common form of studying is rereading materials and notes. Flashcards are also a common study habit used to self-test while retaining information and strengthening weak spots within the studying material. This technique works by actively retrieving memories from the user's brain during the learning process, also known as active recall. Speaking aloud has been found beneficial when it comes to retaining information. A study observed superior memory for reading aloud oneself vs. hearing another person read. The study concludes "The production effect represents a simple but quite powerful mechanism for improving memory for selected information." (MacLeod, 2010) Virtual assistants are growing in daily life use by producing "smart" homes. With the advancement of technology, it is no surprise that online flashcards have become a study tool for this tech-savvy generation. Although the Internet of Things (IoT) has grown in popularity, there is not much of its presence in the education market.

This study examines the effectiveness of self-testing online flashcards via a virtual voice assistant and solely reading materials. Prior research has shown that repeated testing exhibits better retention and higher marks on the final test than repeated studying. Researchers have measured student success by examining academic retention between self-testing and self-studying and identified that students who exercised repeated testing scored higher than students who practiced self-studying. The traditional use of flashcards has demonstrated to be more productive than self-studying. A research study conducted in Munich observed 80 students, half of whom participated in self-studying while the other half participated in self-testing. The research concluded that "In the context of using electronic flashcards, repetitive testing is a more potent learning strategy than repetitive studying for short-term but not long-term knowledge retention in clinical medical students." (Schmidmaier, 2011)

In this research, an app developed to create online flashcards will be integrated into the Google Home virtual voice assistant using Google's Flash Cards Action template. This enables students to have a user-friendly and conversational experience while self-testing. Google's FlashCards Action template includes a customizable Google Sheets where users add their own data of questions and answers which is designed and integrated onto the Google Home Assistant. With the machine learning model created, the virtual voice assistant will extract data from the flashcard app and test the user. For example, one side of the flashcard would say, "What year was the first world war?" and the other side would say, "1914". The software will match the intent, which in this case is, "1914" and move on to the next question. The user can word the answers in different ways such as "the year 1914", "I think 1914", or "is it 1914?" and the voice

assistant will acknowledge the user's intent. If the user incorrectly answers the question, it will be repeated in the end. The user will have to answer the same question twice correctly for that flashcard to be marked "mastered" and will not be asked again. The flashcards that have not been answered correctly twice will continue being presented to the user. This device and method will repeat until the predetermined condition is met. There will also be a timer feature, which the user will use to manage their time and set how long they would like to study a set of questions and create break times. The app will offer a friendly user interface for students to utilize Google Home Assistant's actions more conveniently.

To measure the effectiveness of the proposed voice-based flashcard app, the experiment is conducted as follows; There will be twenty participants that will be given a historical article, one group of ten will self-study using the article, while on the other hand, the other half will be given the same reading material in addition with an online flashcard set. Both groups will be tested with ten multiple-choice questions. The data will be measuring correctness and the duration of completion.

Flashcards are one of the most commonly used studying/memorization techniques for tests and quizzes. Creating online flashcards is a convenient way to help students study with just their phone without requiring a physical pencil and paper. Students will not have to worry about misplacing their flashcard sets. Also, students will be able to engage in a conversational study experience without a study partner. Students will be actively engaging their minds with oral production which is more beneficial than simply reading.

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