Which Is More Effective for Learning German and Japanese Language, Paper or Digital?

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Abstract. Recently, many people often say how practical is the digital media. Moreover, there are many researches on this topic that compare the use of paper and the digital media, but unfortunately, only the moment in which the user is actually using one of these two media is taken into account. We researched a group of Japanese and German subjects about their ability to remember some words on the next day, three days later and a week after they first tried to memorize them. The results demonstrated that users who want to learn in a short term should use digital media, only if they have a lot of experience using digital media in general. But if the user wants to learn something in a long term, might prefer to use Paper.

Keywords: paper digital learning memorizing language.

1 Paper vs. Digital

Digital media, especially electronic books, has been brought to public attention recently. This is not only in Japan but also in the world. The electronic media has more to offer other than photo and music. People are now considering to study using tablet-type devices. We have known paper for a long time, but many people are not thinking about the importance of paper. The learning curve of paper and digital needs to be examined in detail era. The hidden charm of paper can cause favorable effects for learning, so the reason why this is so effective deserves careful attention.

We based our research on testing with the method of flash cards for learning and memorizing. Many Japanese and German students use paper for learning, but digital flash cards Applications are also rising as well as the use of the Smartphone is spreading. Several comparative studies have been made on learning curve of paper and digital media, but apparently there has been no study that tried to see the results in the long run. In this article, we would like to see comparatively the learning curve after one day, three days and one week that can be offered with paper or with digital media.

Many people feel that they can memorize better using paper than using digital media. The learning curve with paper seems to be better than with digital in the long run and there are not only differences from paper and digital media but also among languages. The factor can be their mother tongue (naturally learned) and a foreign language (knowledge acquired through taking lessons).

P. Zaphiris and A. Ioannou (Eds.): LCT 2014, Part II, LNCS 8524, pp. 309–318, 2014.

2 Experimental Methods

Japanese subjects have been tested from 15th July 2011 to 29th July 2011. German subjects have been tested from 5th July 2013 to 26th July 2013. The term for testing each subject was eight days.

2.1 Japanese Subjects

20 students were tested. They all belonged to Keio University in Japan. The number of women and men were equal. The average age of subjects were 20.1 years old. The youngest person was 18 years old and the oldest person was 24 years old. None of the subject had eyesight problems. The average length of experience time using Smartphone was 22.8 months. Three people had never used Smartphone. The largest experience time using Smartphone was 84 months. The average experience using PC was 8.22 years. The shortest was 3 years and the largest was 15 years. In Japan, the English study program begins generally over the age of 12. The average time for learning English was 7.1 years. Two people of the tested users studied English abroad.

2.2 German Subjects

The number of students was the same as in the test in Japan, but they belonged to Martin-Luther University Halle-Wittenberg in Germany. The number of women and men was equal too. A range of age was 19 to 31 years old. The average of age was 22.25 years old. As the Japanese users, the German users did not have eyesight problems either. The average time of experience using Smartphone was 11.95 months. Seven people had never used Smartphone. The largest experience was 48 months. The average experience time using PC was 8.992 years. The shortest was 8 months and the largest was 15 years. In Germany, the English study program begins generally over the age of 10. The average time for learning English is 13.25 years.

2.3 Methodology for Testing

It was investigated the influence of digital as well as paper media by testing how the students remembered the words on the following day, three days later and a week later. This means that the test was conducted several times, in order to verify how well the knowledge was learned after having used the paper or the digital media.

One part of the experiment was made on paper, and the other was made in an Apple iPod touch, but the designs had the same character size. Subjects who took the experiment used both media.

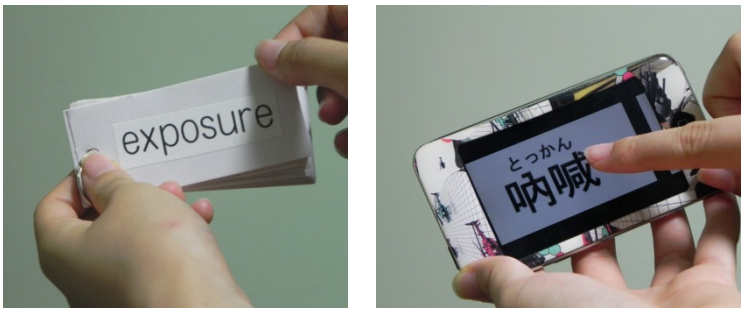


Fig. 1. Vocabulary flash cards ground by a ring (Paper), iPod (Digital)

2.4 Contents of Flash Cards

Each flash card set (in paper and digital media) had 10 words in English and 10 words in their mother tongue (Japanese words for Japanese subjects and German words for German subjects).

In the case of Japanese subjects, difficult ideograms were chosen for the test. In Japan, the Japan Aptitude Kanji Test is an examination in which is questioned how many and how complete is one's knowledge of Japanese Characters. For our test, we used ideograms that had the same level of difficulty as in that examination.

In the case of German subjects, the selected words were technical vocabulary from various fields. This was made to preserve the same level of difficulty as in the case of Japanese words for Japanese people.

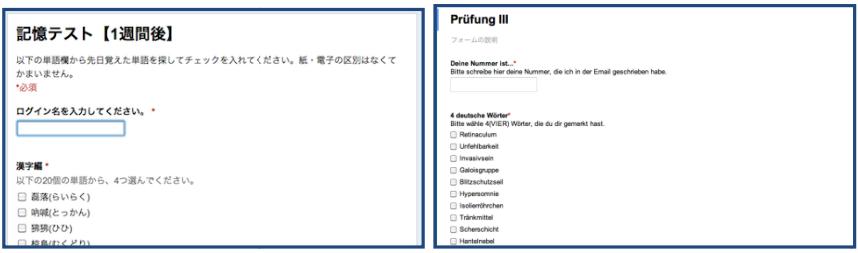
2.5 Process

Subjects were given 2 minutes to learn 20 words in each media; 10 subjects started to learn with digital media, and the other 10 subjects started to learn with Paper. There were a set of rules: first, “The user has to see all of the words at least once in 2 minutes” following this rule, there is no difference between the amount of time dedicated to each word. Second, “The user can not take off the ring of paper flash cards”. When the users do not use a ring to ground the cards, they can use the flash cards with too many directions. Third, “The user must use the iPod touch only in horizontal position”, because when the user uses iPod touch vertical direction, the letter size gets smaller to fit the screen size.

There were some subjects who have never used digital media, so before beginning the experiments, they trained in how to use the digital flash cards. In case of the German subjects, they had to practice also how to use the paper flash cards. In figure 2, it is shown how normal flash cards are in Germany. They use paper flash cards without a ring.

Fig. 2. Paper flash cards in Germany

On the next day, three days later and a week after memorizing words, subjects received a mail with the test. This test consisted in 20 words: 2 that belonged to the group of the 10 already learned in paper and 2 to the group of words learned in the digital media. Those 4 words among the group of 20 were known for them. The rest 16 words were new vocabulary.



(a) In Japanese (b) In German

Fig. 3. Test

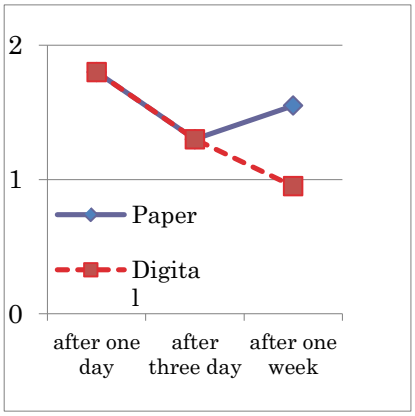
3 Results

Each word was given a score of 1 point. The number of subjects is 20 and each subject can have maximal 2 points. In brief, the maximal scores are 40 points. The graphs below show the results with average scores.

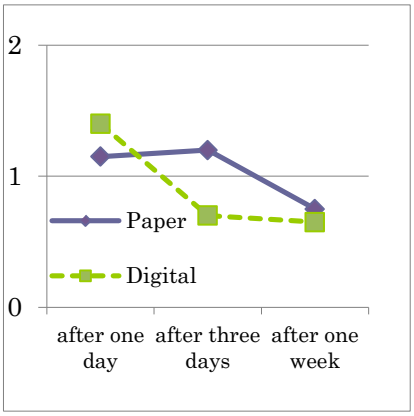
3.1 Results of Japanese Subjects

The results show that subjects could memorize more words in Japanese or English when using paper flash cards than when using digital media as a learning tool.

Only comparing the results of English vocabulary after one day, points scored for digital media were higher. But this is believed that happened if the users had many years of experience using digital media. During the next tests, having more experience or not having experience at all, did not make any difference: the results showed that paper flash cards resulted more effective.



(a) Japanese words



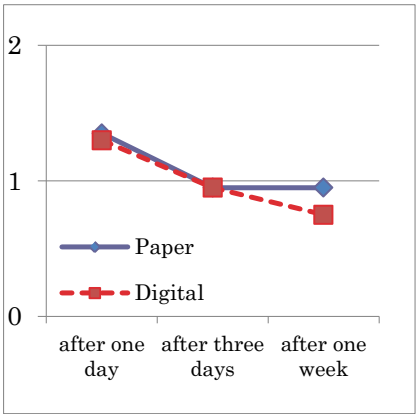
(b)English words

Fig. 4. Results with Japanese subjects

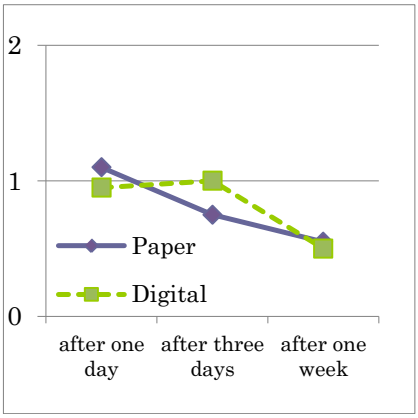
3.2 Results of German Subjects

The results of German words with German subjects are similar to the results of Japanese words with Japanese subjects. But the results of English words with German subjects are somehow different from the same test but with Japanese subjects.

Graph 3: Results of German word (left) / Graph 4: Results of English word (right)



(a) German words



(b) English words

Fig. 5. Results with German subjects

3.3 Individual Results

Patterns for individual results. We made five patterns for analyzing individual results.

First type is “Keep”. Subjects in this pattern collected always same point on the following day, three days later and a week later. Ex) (1 point, 1 point, 1 point) or (2 points, 2 points, 2 points). Usually, memory decrease gradually, that is why this pattern is called positive pattern. When subjects couldn’t any points, it showed a negative pattern, so we separated this from “Keep” type.

Second type is “Reborn”. Subjects in this pattern collected once bad results on three days after memorizing the words, but results on a week later is the same as in the first test. Ex) (2 points, 1 point, 2 points), (1 point, 0 point, 1 point). This pattern is also considered a positive pattern.

Third type is “Little Increase”. Result is rising on three days later or on a week later. Ex) (1 point, 1 point, 2 points), (1 point, 2 points, 2 points). Those three patterns are positive pattern.

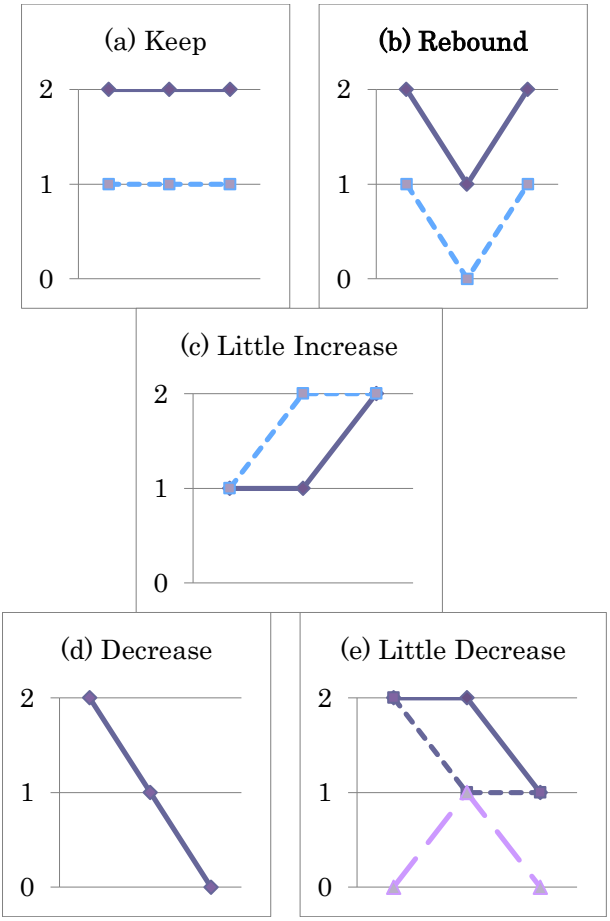


Fig. 6. Five patterns for analyzing individual results

Forth type is “Decrease”. This pattern occurs when the result fall rapidly. Subject that follow this pattern collected 2 points on the following day, but 1 point on three days later and no point on a week later. It’s a negative pattern.

Fifth type is “Little Decrease”. Result shows a decrease three days later or on a week later. Ex) (2 point, 1 point, 1 points), (1 point, 2 points, 1 points). Those two patterns are negative patterns.

Individual results of Japanese subjects. We used patterns that are written in section “Patterns for individual results”.

In the case of Japanese words with Japanese subject, type “Little Decrease” is majority by both media. But in the case of paper, many subjects were included in positive patterns. 13 of 20 subjects were in the “Keep”, “Reborn” or “Little Increase” group. In the case of digital, only 4 subjects followed a positive pattern. No one is “Decrease” by using paper, but there were 4 subjects in “Decrease” by using digital.

In the case of English words with Japanese subject, “Little Decrease” were majority. This graph shows that there is not a large difference between paper and digital. 2 subjects couldn’t any points by using digital media. This shows us that the use of digital could be poorer than paper.

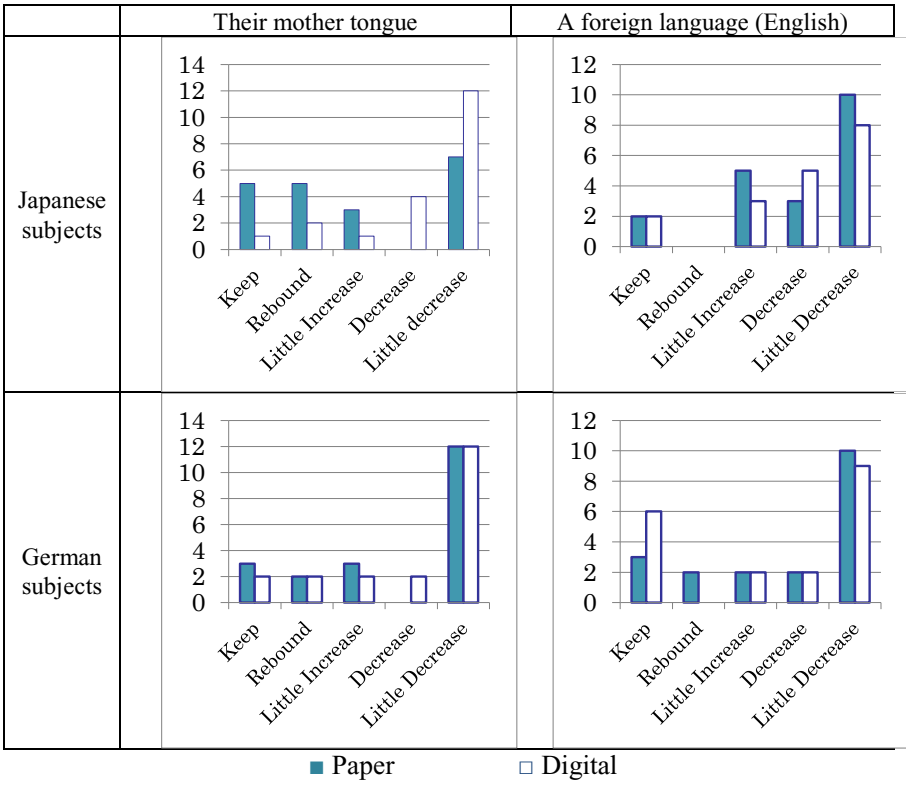


Fig. 7. Individual Results

In the case of German words with German subjects, taking into account positive patterns, paper and digital seem to be similar. But only in digital, subjects were included “Decrease” pattern. Same numbers of subjects were included in “Keep”, “Reborn”, “Little Increase” and “Decrease” by digital.

The results of English words seem not to be a lot of changes from the results of German words. But by using paper, the number subjects who were included in the pattern “Decrease” raised, and by digital, the users who follow the pattern “Keep” increased.

4 Discussion

4.1 Learning Curve in the Long Run

In the case of Japanese words with Japanese subjects and German words with German subjects, results on a week later by paper were better than by digital. (Paper: Digital) = (32, 18), (19, 15). In the case of English words with Japanese subjects or German subjects, results on a week later were same. (Paper: Digital) = (13, 13), (11, 10).

Japanese words for Japanese subjects and German words for German subjects were their mother tongue. English was a foreign language for both subjects. When we use foreign language, this is translated into our mother tongue by the brain. There are some differences on how the brain does it. So, it is demonstrated that using paper was better than using digital media for learning in the long run, when the users want to memorize words in their mother tongue. In the case of a foreign language, there were some subjects who could not learn any words or whose memory of new words decreased rapidly.

4.2 Learning Curve After a Short Time

After a short time, some subjects could memorize using digital media better than using paper. But this is believed that happened if the users had many years of experience using digital media. In the future, the users will have more years of experience using digital media, so it is likely that more users can memorize more using digital media than using paper in a short time.

If you have to memorize words for test on tomorrow, you should consider how large is your experience using digital media. If you have large experience using digital media, you had better to use digital flash cards. When you do not, you had better to use paper flash cards. But in the long run, you can learn more steady using paper than using digital media.

4.3 The Reason Why Japanese People Think That English Is Their Weak Point

It is often said that Japanese people are not good at English because of three reasons. First, the construction of English language and the characters are very different from Japanese. On the other hand, is also said that the English education in Japan is not good because they only teach grammar.

It is quite likely to believe that is not good for learning that people is under the impression “I am not good at English”.

The results of Japanese words with Japanese subjects were better than the results of English words test. The reason why this happens is because not only Japanese is their mother tongue, but also because Japanese words are ideograms. Japanese ideograms have many meaning. For example, the ideogram 清 (sei) is constructed by two parts: left part is “water” and right part is “blue”. The meaning of the ideogram is “clean” or “pure”. People can grasp the meaning just by seeing the parts of the ideogram. But English for Japanese people is a foreign language and the letters itself do not have a meaning. Those aspects make the difference.

In the case of German subjects, the results of English words were similar to the results of English words in the case of Japanese subjects. But the results of German words are not as well as the results of Japanese words, this is believed to happen because German letters itself do not contain a meaning.

It has been recognized that when a person has negative awareness, the learning curve can be lower than with a positive awareness.

5 Conclusion

We conducted research with Japanese and German subjects. They memorized 10 words in their mother tongue and 10 words in English. On the next day, three days later and a week after memorizing words, the subjects took a test. It was demonstrated that users who want to learn in a short term should use digital media, but only if they have a lot of experience using digital media in general. In the case that the user wants to learn something in a long term, might prefer to use Paper. That was a common point between Japanese subjects and German subjects, not only the average results but also the individual results show that evidence. Positive patterns became visible when the participants used paper flash cards, and negative patterns often appeared when using the digital media, especially when subjects wanted to learn more vocabulary their mother tongue.

There are differences not only on the selected medium, but also in the language. The results of Japanese words with Japanese subjects were better than the results of German words with German subjects. Japanese words and German words were in their own mother tongue, however we could observe why the results of Japanese vocabulary have so many points compared to the German results: first, Japanese is the mother tongue for Japanese people. Second, in English as in German, each letter itself has no meaning; but in Japanese (in the case of this experiments) each letter itself has a certain meaning.

In the future, we want to make new set of flash cards so that people can memorize more words and enjoy studying. For the new set of flash cards and enhancing the accuracy of the experiments, we had better to make more iterations and test in various situations.

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