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A Study of Smart Convergence Design of English Vocabulary Learning Contents Applying the Periodic Repetitive Method

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주기적 반복법을 적용한 영단어 학습콘텐츠 스마트 융합 설계 연구

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Abstract This paper suggests designing how to acquire English vocabularies on the smart devices based on the research that a ground-breaking English Vocabulary Learning Contents needs developing. The method makes it possible to develop the contents which helps the learners to master English vocabularies effectively on the smart phone. The core idea of this paper is as in the following: 1) English learners learn 30 vocabularies for three minutes 10 times (one is for a new learning and the other nine ones are for reviews about the first learning) a day. 2) Considering Ebbinghaus Forgetting Curve, the reflection study proposes to provide the learners with three times' reviews: one day, 10days, and 30days later from which they learn the first 30 vocabularies. This contents is mainly made up of 5 developing sections ①to generate App ID, ②to access App, ③to set up Alarm, ④to process Word learning, and ⑤to monitor the result of learning. This proposed idea is optimized to enhance the memory by Ebbinghaus Periodic Repetitive Method, which makes the learners satisfied with their English vocabulary learning.

• Key Words : Smart Convergence, UI, Repetitive Method, Ebbinghaus Forgetting Curve, Reflection

요 약 본 연구에서는 영단어 학습 콘텐츠 개발 필요에 따른 새로운 스마트 영단어 암기방법을 설계 제안한다. 이 방법은 스마트 폰에서 효과적으로 영단어 학습을 지원하는 콘텐츠로 개발 가능하다. 본 연구의 핵심 아이디어는 첫째, 30개의 단어를 하루에 3분씩 10회(학습 1회 및 복습 9회)로 나누어 학습한다. 둘째, 망각주기를 고려하여 최초학습 1일 후, 10일 후, 30일 후 등의 3회 반추 복습을 제안한다. 본 콘텐츠의 개발과정은 크게 앱ID 생성부, 앱 접속부, 알람 설정부, 단어학습 처리부, 학습결과 모니터링부 등 5개의 단계로 이루어져 있다. 제안된 방법은 에빙하우스 주기적 반복 학습전략으로 최적화되어 있어 사용자의 영단어 학습 만족도를 높일 수 있다.

• 주제어 : 스마트 융합, 사용자인터페이스, 반복법, 망각곡선, 반추복습

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1. Introduction

Nowadays English competence has had an important role in a national and an individual competition for politics, economy, industry, and so on. It is vocabularies that should be the most essential and basic element to learn English efficiently. Although many professionals have asserted the importance of attaining vocabularies in learning a language, there has rarely been the strategic study for how to instruct learners in achieving vocabularies effectively. Since the late 1980s, there have appeared a variety of arguments as well as academic interests to improve the way of the effective vocabulary learning[1].

It is the vocabularies that make it difficult to learn a language now that they are characterized by their massive amount and their polysemy, the existence of several meanings in a single word. Unsurprisingly, English learners in EFL(English as a Foreign Language) have difficulty in mastering the language without memorizing the vocabularies[2]. In addition, the learners would be restricted in speaking English if they didn't have enough practical training, using what they learn. In common English class, vocabulary learning is just suggested as a cramming method of teaching, which causes the learners not to apply their knowledge to English activities or not to keep the knowledge long lasting[3].

When a learner wants to acquire a foreign language in his or her own hometown, he or she need to memorize its vocabularies functionally because the learner have few chances to experience the foreign circumstances, where it is very difficult to plan and manage a favorable learning method systematically and effectively[4]. There have been studied many kinds of teaching-learning method and their learning aids to solve these problems.

Mobile learning enables a learner to study and review what to attain wherever and whenever he or she wants at once, which reduces the learner's burden. Specifically, popularizing the smart devices provides the desirable opportunity to learn English vocabularies with self-directed attitude for the learner.

As seen in the cases both that a research experiments to make sure if a portable English words learning device has a practical effect and why it has a poor influence on English learning by comparison verification[5] and that a study suggests taking advantage of smart application(App) for underachieving learners to increase their vocabulary[6], a range of solutions have been proposed which plan to build up the effect of learning.

This paper suggests the design of an effective contents that helps a learner acquire vocabularies efficiently on the basis of the education demand survey which needs to develop English vocabulary learning contents.

The contents allows a learner to set the alarm ten times a day when he can study, and to learn 30 words for 3 minutes 10 times a day repeatedly in each different learning form. Moreover it provides periodic reflection, one-day, ten-day, and 30-day later review, which helps to memorize the words in the long run. This contents has a Push service to tell where the learner perform the learning mission to the learner himself or his colleague.

This paper is comprised of the following: Chapter 2 introduces the theoretical background of English vocabulary learning and its research trend. Chapter 3 shows the structure and design of the learning contents proposed from this thesis in detail. Chapter 4 suggests the conclusion and the vision.

2. Related Works

2.1 Demand Analysis

[Fig. 1] shows the flow of English vocabulary learner's interest using NAVER Trends' Search Result of English Vocabulary Learning Connection from June 2015 to May 2016. There has been little change of the interest before 2016, however, most notably, there were surges in January and March 2016.

[Fig. 1] NAVER Trends' Search Result of English Vocabulary Learning Connection

There are many difficulties for learners to study English: They are likely to forget the vocabularies the next day even if they make a great effort to memorize them everyday. It is tedious and inefficient to focus on simple and mechanical learning for more than 30 minutes. There is no proper system to make sure if the learner memorizes what they study.

2.2 Research Trend

Thanks to the rapid advance of smart devices and It technology, various learning aids and contents are released in English education. Lee showed that at a smart education model school, learners with smart devices positively resulted in raising their learning interest and effect[7].

Hong experimented how Word Spell introducing the coded strategy which provides word and its simple illustration to improve vocabulary increased the efficiency, as compared to commercial Word Sketch[8].

Yang insisted that the learners should have at least 4 reviews (right after class, in the evening, one week later, and one month later from class) on the basis of the period showing serious oblivion on the Forgetting Curve[9].

Kim suggested a learning system in which the learners use linguistically functioning memory in simple task learning[10].

Youm developed English vocabulary memorization system, using the forgetting curve, in order to adjust the vocabulary difficulty automatically depending on learner's level[11,12].

The result of analyzing research trend shows the frequency, the period, and the way of review are most critical in English vocabulary learning. As a whole, these studies have a common feature that suggests repeated learning by Ebbinghaus' Forgetting Curve as it is. However, when the learner has a different review cycle depending on the state of mastering vocabulary[7], or when the system adjust the vocabulary difficulty automatically depending on learner's level[12], it is difficult to get the best effect out of an iterative learning because the system doesn't optimize the repeated frequency and the review cycle.

2.3 Ebbinghaus' Forgetting Curve

Ebbinghaus' Forgetting Curve presented by Hermann Ebbinghaus indicates forgetting rates as time passes after learning. He studied the amount of human's oblivion with meaningless spellings.

Ebbinghaus discovered that learners tended to forget the words they memorized as time passed and put forth the formula(1)[13]. Li peng et. al[14] researched a new Crowdsourcing fraud detection method using Ebbinghaus' Forgetting Curve [Fig. 2].

$$SavingScore = \frac{OriginalLearning - ReLearning}{OriginalLearning} \quad (1)$$

[Fig. 2] Ebbinghaus' Forgetting Curve

Kwon et. al cited [Fig. 2] and explained that memorized content begins decreasing from right after learning: learners forget 42% of their memorized content twenty minutes later, its 56% one hour later, and then its 79% one month later[15].

Learners who have no chance to experience the English environment in their country are not familiar English words and cannot impress on themselves what the words mean, which is the same as Ebbinghaus gets the result from the experiment with meaningless spellings. Therefore, the cycle of two forgetting curves cannot make any difference even though the forgetting rates for the foreign language slow down a little more than those for the meaningless spellings. In addition, it is critically appropriate to apply Ebbinghaus' Forgetting Curve to this paper as far as learners concern the correlation between the time needed to attain English vocabulary and their memory.

3. The Proposed Method

3.1 Concept

English vocabulary learning contents should focus on constructing review frequency, its cycle, and how to repeat in harmony in order to attract the most interest of learners. This paper proposes that the first review should be taken up one hour later from learning at first and after that set up the other 8 times of the review (1 learning and 9 times' review a day) so as to sustain the memory for the words as much as possible. Every round gives 3 minutes to make the optimal immersion and concentration. This paper also insists that there should be the new memorizing method, the periodical review system made up of 3 times such as one day, ten days, and thirty days later from the first day completing one learning and nine times' review with the strategy of Periodic Repetitive Method based on'reflection' that cognitive psychology suggests.

3.2 Necessity Analysis

To analyze the effectiveness of this idea, the demand for English vocabulary learning has been surveyed. The respondents consist of high school graduates from 8 schools including J high school et al. The investigation period was from April 4th to sixth, 2016.

The result of the survey is analyzed like <Table 1> : 1) It takes 6~30 seconds to memorize one English word. 2) It is difficult to pay attention to learning English words for 30 minutes in a row a day. 3) It is difficult to memorize over 30 words a day. 4) In a week since learning new 30 English words, 10~12 words or more are usually kept in mind. 5) Many learners say that they check on the progress of English vocabulary learning for themselves, which implies the need of monitoring how the study activities are completed.

<Table 1> The Result of Necessity Analysis

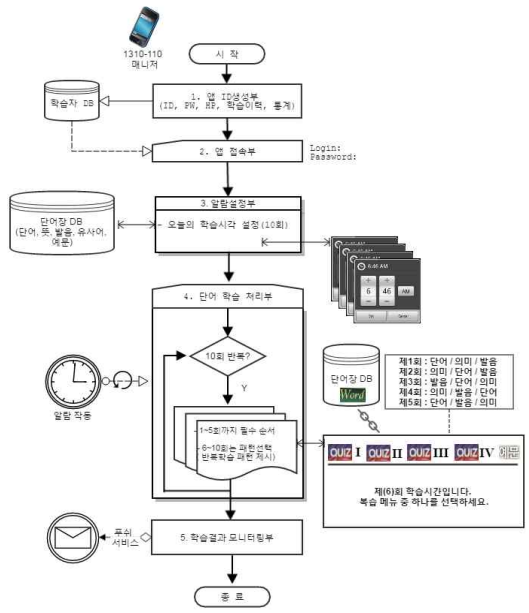
Item Contents	Elements	Ratio. of Res.
How long it takes to memorize 1 English word	under 6sec.	18.2%
	6~30sec.	**40.9%**
	31sec.~1min.	31.8%
	1~2min.	0.0%
	over 2min	9.1%
How many words you memorize English words a day	under 10	13.6%
	11~30	**40.9%**
	31~50	22.7%
	51~100	13.6%
	over 100	9.1%
How long you are immersed in memorizing English words a day	under 10min.	9.1%
	10~30min.	**50.0%**
	30min.~1h	31.8%
	1~2h	9.1%
	over 2h	0.0%
A tool or a method to memorize English words	textbook	72.7%
	learning machine	4.5%
	smart device	0.0%
	self word list	22.7%
	others	0.0%
How many words you remember in a week after memorizing new 30 words	under 3	4.5%
	4~6	13.6%
	7~9	27.3%
	10~12	**36.4%**
	over 12	22.7%
When it is proper to review what you study (plural response possible)	within 1h	18.2%
	1~2 h. later	13.6%
	1day later	**63.6%**
	10days later	**31.8%**
	others	0.0%

3.3 Configuration and UI(User Interface) Design

UIs enables between users and the system to interact with each other naturally by using devices, software, smart phone touches and others technologies[16].

Recently it has been reported that the human's attention(8 seconds) is shorter than that of a goldfish(9 seconds)[17].

The most popular social media are likely to deal with simple and concise contents like Twitter or Facebook, which leads to the short attention of human beings. Specifically called digital natives prefer contents that makes it easy for them to understand at once.



[Fig. 3] Configuration of the Proposed Method

This paper suggests a dispersed word learning method (studying for 3 minutes 10 times a day) on the basis on human's short concentration. It is six-second long word learning system for each word and provides 30 words for 3 minutes, and then the other 9 times' review. Furthermore, reflection review proposes 3 times' learning: one day, 10 ten days, and 30 days later.

This contents is mainly made up of 5 developing sections ①to generate App ID, ②to access App, ③to set up alarm, ④to process Word learning, and ⑤to monitor the result of learning.

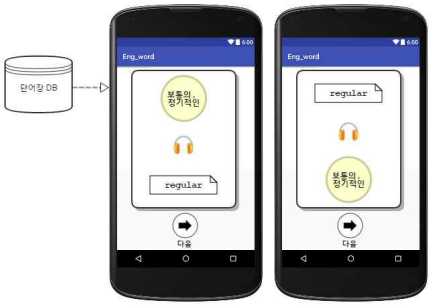
The section of generating App ID makes a learner his/her own App ID when a learner executes the App for the first time. The learner's own ID is saved, his/her learning history is accumulated and then the statistics of connection and learning result is stored.

The section of accessing App is turned into the department of generating App ID and a toggle style. A learner who makes App ID can enter the user's DB(database) punching ID and its password.

The section of setting up alarm enables a learner to designate learning time for today's words from the first to the tenth round. The second is supposed to be set up after one hour according to Ebbinghaus' Forgetting Curve. Setting up the other reviews from the third to the tenth in a day is the same as the way of fixing learning time on a smart phone used as usual. It is possible to set up the time not only by the day but also by the week. Once designated, the alarm indicates the time as it is set up automatically. The learner can change learning time whenever he/she wants.

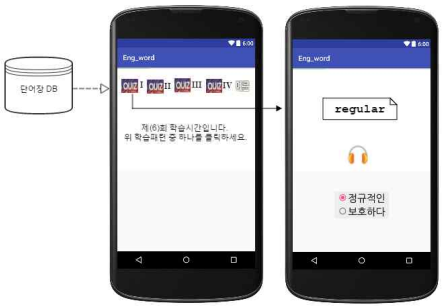
The section of processing Word learning is like the following: the first learning gives <*word*> / <*meaning*> / <*pronunciation*>. From the second to the fifth, there are reviews as seen in [Fig. 4] [Fig. 5]. The procedure from 6th to 10th review is made up of <Quiz I type> <Quiz II type> <Quiz III type> <Quiz IV type> and <Sample sentence> among which a learner can choose what he/she wants.

[Fig. 4] Instance of UI Design from 1st Learning to 3rd Learning



[Fig. 5] Instance of UI Design from 4th Learning to 5th Learning

When Quiz I type of [Fig. 6] is touched, the type shows two meanings of the given word (one is right and the other is wrong) and makes a learner choose one meaning. If a learner chooses a right one, it gives the pronunciation of the given word. Even if he/she chooses a wrong one in the restricted time, the learner can move on to the next word. The words which the learner fails to learn are stored in his/her history DB and learned again after the limited period. During a review, the system provides the words which the learner don't know on the screen at the beginning.

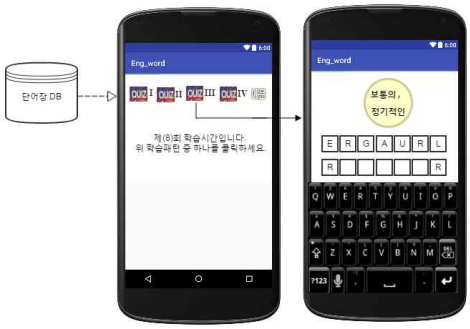


[Fig. 6] Instance of UI Design 6th Learning

On the Quiz II of [Fig. 7] when the pattern is touched, it supplies quiz useful to distinguish right one from a confusable word depending on the pronunciations [*a, e, o, i, u*] and [*ph, f, p, l, r*], which cause a learner to have difficulty in pronouncing and listening to the words. If a learner chooses a right one, it gives the pronunciation of the given word.

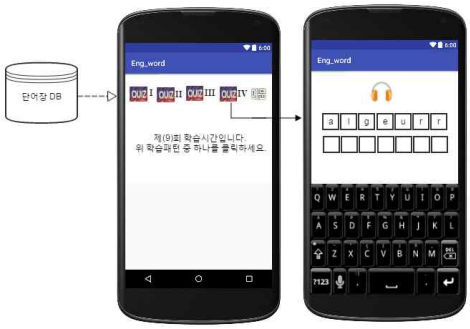
[Fig. 7] Instance of UI Design 7th Learning

On touching quiz III type of [Fig. 8], the meaning of a word is shown at first and then presents scrambled spellings in a random order. A learner punches the spelling in right order, when the first and the last spellings of the word are provided in advance as a hint.



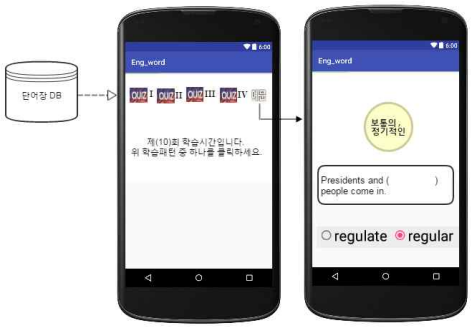
[Fig. 8] Instance of UI Design 8th Learning

The quiz IV type of [Fig. 9] provides the pronunciation of the word, shows a scrambled spellings, and the learner types each letter in right sequence.



[Fig. 9] Instance of UI Design 9th Learning

The sentence pattern of [Fig. 10] suggests example sentences including the words which are already learned. The learner is supposed to choose a proper word for the blank of the sentence.



[Fig. 10] Instance of 10th Learning

The section of monitoring the result of learning monitors learning completion and reports to the user the result about whether the learner finishes the learning normally through a smart device push service when the word learning is completed.

4. Conclusions

English vocabulary learning contents should play a key role in attracting the learners' interest. This paper suggests the design of effective English vocabulary learning contents using smart devices as the following: 1) Considering that it is difficult to pay attention to learning, it makes learners study and review 30 words for 3 minutes 10 times. 2) On the basis of forgetting curve, it forces learners to implement the three times' reflection after the first learning in order to maintain the least memory. 3) This system gives the chance that learners can study and review on the spot anytime anywhere, and that they are immersed in learning without burdens. 4) It also forms the frequencies, the cycle, and the strategies of review in harmony, which increases learner's satisfaction in English vocabulary learning.

A coming task will be that it continues to upgrade its functions to enhance the effectiveness and the value of the contents after developed.

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