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Automatic Quiz Generator and Use of Open Educational Web Videos for English as General Academic Purpose

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Abstract: This paper reports on the attempts of flipped learning utilizing an updated version of e-Learning tool, a game-based courseware involving open-source movie contents and automatic quiz generation. This paper also explores the relationship between learners' proficiency levels and their learning behavior by using authentic video materials and paying attention to learning logs that record "repetition" and "failure." The video content is from the Khan Academy, an organization that provides open source contents, and is one of YouTube's many rich resources. After examining the usefulness and effectiveness of re-using open source contents for flipped learning materials from both social and academic perspectives, we obtained the results of our pilot experiment. The main findings are that the participants with a higher proficiency feel the courseware is motivating, comfortable to use, and benefits their foreign language studies. Our log data show that learners with a lower proficiency have a tendency that they do not grasp sentences easily; they repeatedly try to answer the questions. These findings imply future possibilities for exploring the relationship between learning strategies and behavior in terms of learning analytics, the end goal being to improve the current system that can be used effectively for flipped classrooms.

Keywords: automatic quiz generation, open-source contents, English for general academic purposes (EGAP), Khan Academy

1. Introduction

Instructors and researchers generally agree that using authentic materials enhances students' willingness to learn. Content-based Language Learning (CBLL) is a method in which both linguistic skills and content knowledge can be taught simultaneously using materials that focus on the content of the students' academic interest (Brinton, Snow, and Wesche, 2003). The authors thought that video clips would serve as suitable material for this purpose, because exploiting visual and/or audio information helps learners understand content by directly using the target language. Research suggests that CBLL is effective, regardless of learners' proficiency level (Yoshida, Aoyagi, and Yoshida, 2011). This method also directly relates to the field of teaching English for Academic Purposes (EAP) in university English courses.

It has become much easier to access open-source materials on the Web due to the open-source movement (Nakajima and Ono, 2015); such materials include YouTube video clips provided for educational use. However, the problem is that it is sometimes difficult to convert these YouTube resources into teaching materials; we must change or modify them so that they can be used as course materials. IT is sometimes difficult for instructors to do this because of unfamiliarity or time regulation. Thus, we highly expect to have a tool in the future that automatically converts such web resources into e-Learning courseware.

For example, Nakajima and Tomimatsu (2013) conducted a trial using an auto-assignment generator, a tool that automatically converts TED video clips into courseware involving "watch and type" game tasks. In order to familiarize the users with the structure of the language used in the video clips, we added a new task called "rearrangement" to the courseware.

In the following sections, we review the backgrounds of our research in terms of curricula, the free culture movement, and the possibilities for using flipped classroom models. We describe our

system with special reference to two modes: "type" and "touch." Then, we report the results of the pilot experiment conducted at our university.

2. Background

Before describing our system outline, we will introduce some conceptual issues regarding the use of the proposed system, with special reference to the fundamental ideas of one curriculum framework for foreign language teaching, the free culture movement, the Kahn Academy, and flipped classroom models.

2.1 English for General Academic Purposes (EGAP)

We start our discussion by reviewing the concept of "English for Academic Purposes" (EAP) in a university EFL curriculum design. Tajino (2005) divides the concept of "EAP" into "English for General Academic Purposes" (EGAP) and "English for Specific Academic Purposes" (ESAP) (Blue, 1988; Jordan, 1997). Both strategies aim to improve academic linguistic skills, but their focuses are crucially different. The former places more emphasis on "general" academic linguistic skills, which are common in whatever academic major students belong to, while the latter highlights "specific" advanced language use for graduate school students or upper-year students in university in general. Naturally, these two approaches have different teaching strategies. For EGAP courses, not all students are familiar with the content of teaching materials because they have different academic backgrounds. On the other hand, in ESAP courses, students are expected to possess basic knowledge and skills for their academic goals in graduate school. In the case of EGAP courses, we have to examine material by carefully considering the students' proficiency level and knowledge of the topic. In the case of ESAP courses, we can choose advanced, frontier topics of literature in the students' field of study.

An EGAP curriculum is generally for first-year students when they begin their research careers and includes the following components: (1) Academic reading, (2) Academic writing, (3) Lectures and note taking, (4) Presentations for academic purposes, (5) Literature searches, and (6) Skills for testing academic skills (i.e., TOEFL) (Tajino, 2005). We will focus on components (1)-(3) since these are more related to the aims of this paper. Naturally, elements (1) and (2) are directly involved in our course, because our course tries to facilitate understanding and reading fluency of the materials, followed by discussions in the classroom, and the task of output activities such as presentations concerning the materials. Item (3) is strongly connected to the use of lecture video clips, because a great number of such open-source video clips are available for free online. Examples of these educational resources include YouTube, Ted.com, and iTunes U. Most of the video clips offer English scripts, which are edited and incorporated into the video. Sometimes they are very helpful for students who are less familiar with the topic at hand. Needless to say, most of the videos are equipped with visual assistance (e.g., translations, animation, emphasis, sound, and video) to clarify the points of the lecture. The use of such video clips is helpful when students are first trying to learn the material in a university course, and for broadening the possibilities of developing EGAP curriculum design.

2.2 The Free Culture Movement

Nakajima and Ono (2015) reviewed the history of free culture and the process leading to the acknowledgement of Creative Commons and Change of Paradigm in educational systems. Around 1960-70, the free movement started as free speech, followed by a paradigm shift in production systems, which resulted in shared knowledge, programs and software. Since the 1990s, with the popularization of PCs and then the introduction of broadband network systems, the Internet became widely used among people of different ages and backgrounds. Web 2.0 let specialists and amateur users alike share, re-mix, and distribute content much more easily.

This movement has had a crucial impact on various educational fields. Diverse kinds of OpenCourseWare (OCW) have been created and posted online for anyone in the world to share. The most recent and influential are massive open online courses (MOOCs), which supposedly allow an unlimited number of people to participate in courses via the Web. In addition to video lectures, learners

can take part in interactive user forums to support community interactions among students, professors, and teaching assistants.

2.3 Using Khan Academy

Khan Academy is a non-profit educational organization created in 2006 by educator Salman Khan to provide "a free, world-class education for anyone, anywhere." The organization produces micro lectures in the form of YouTube videos. The fields cover elementary school to university, and the topics offered include physics, biology, science, and programming. Since most of the video clips are short, they are suitable for pre-studying a subject in the classroom using flipped classroom models. Moreover, the video images make it seem like the information is being written down on a blackboard with various pieces of colorful chalk; this makes it easier for the students to access the lecture in terms of cognitive load. More than 3,000 free resources are available to anyone in the world.

2.4 Possibilities for a Flipped Classroom Framework

The flipped classroom focuses on a student-centered learning environment, however "not just flipping the classroom as lecture at home and homework at school" (Cockrum, 2014: 9). In the case of foreign language teaching, pre-studying at home is almost compulsory, even using the traditional grammar-translation method in Japan. The difference between a traditional model and recent flipped classroom model is clear, however. The recent trend of the flipped classroom is the availability to effectively guide online instruction. Funamori (2014) calls this the use of "online modules." In a sense, providing a lecture video for homework might work, but is clearly insufficient to prepare for in-class discussions. These considerations lead us to develop game-based courseware for automatic quiz generation. Given the proper video clips for flipped learning models, and an easy-to-use system to change them into courseware, instructors can enhance the quality of in-class discussions or other related tasks. The merits of using Khan Academy for the EGAP flipped classroom can be summarized as follows:

- Video clips are nearly ready to re-use, without needing any modification. We can thus save time and effort when creating anything new.
- Videos are rather brief for one class. They outline the basic principles of some concepts with visual aids on a black screen, and are useful for students who are not familiar with the topic at hand.
- Since most videos are YouTube clips, it is much easier to incorporate them into the surface of Learning Management System (LMS), as we are doing in our system.
- Scripts are shown optionally on the screen, so that learners less familiar with the subject can use this function.
- Since students watch the video beforehand, class time is freed up for student-centered learning, individual tutoring, collaborative activities, and other active learning tasks. We can try to use more advanced ESAP materials in the classroom for greater academic understanding.

2.5 Possibilities for a Flipped Classroom Framework

The relationship between learning attitude and learning logs is not necessarily clear. For example, our system employs a "skip" function so students can avoid being annoyed by the difficulty of a question. One theory about the relationship between proficiency and skip might be that less proficient learners tend to use more skips to proceed. However, we found that some good learners use skip just to "procrastinate." Most of the issues relating to learning logs and learning behavior remain unexamined, left for future research to resolve, yet this paper explores the relationship between proficiency and learning logs.

3. System Descriptions

3.1 Nakajima and Tomimatsu (2013)

Nakajima and Tomimatsu (2013) created the first version of a quiz generator. Since their study focused on the use of TED movie clips, they named the first version "TED NOTE." With the advent of Web.

2.0, technical circumstances developed to favor the use of qualified open content, the architecture of the semantic web, and API. This first quiz generator had five core functions.

1. Loading and conversation function
2. Game function
3. Self-study management function
4. SNS function
5. User generated assignment editor system (UGC function)

The outline of these functions is given in Figure 1 below.

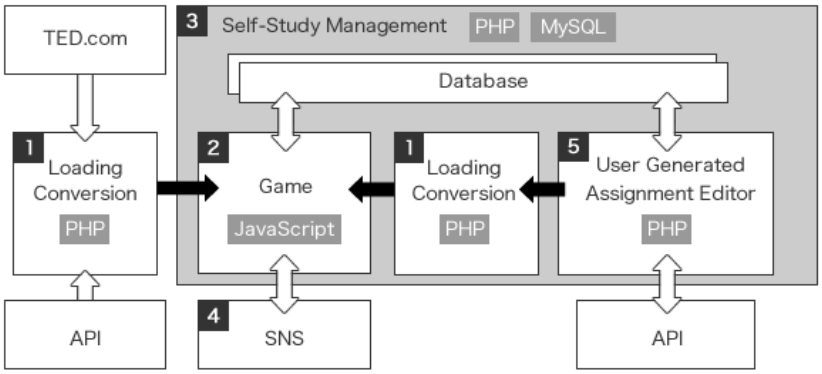

Figure 1. System outline

We established the loading and conversion function using PHP. The game function operates via JavaScript. Ajax and APIs were related to the dictionary assistant. MySQL was used for the database.

The home screen is on the game's interface. Users have to watch a video during the game and carefully listen to the English in it. When one statement is finished, the video automatically stops. Users are allowed to repeat the statement again and again until they can understand it. Below is a screenshot of the interface and functions.

①. Title & Link of the presentation
②. Buttons for "How to play" & "Set up"
③. Presentation Video Monitor
④. Subtitles (Translation)
⑤. Information & Score Monitor
⑥. Timeline Buttons
⑦. Replay Button
⑧. Game Space

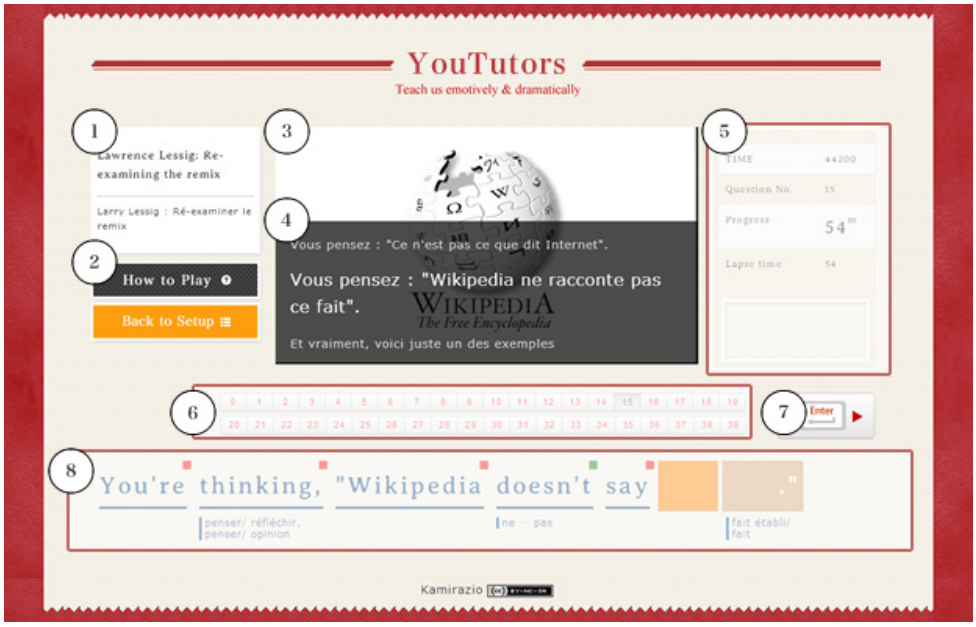

Figure 2. Interface

The game mode adopted here is the "fill-in-the-blank" mode, which we can also call "typing" mode. In this game, users listen to the video and have to type the same letters of the words they hear. The first version has two additional distinctive modes; however, we will skip these because they are less relevant to our research goal. Figure 3 displays a screenshot of typing mode below.

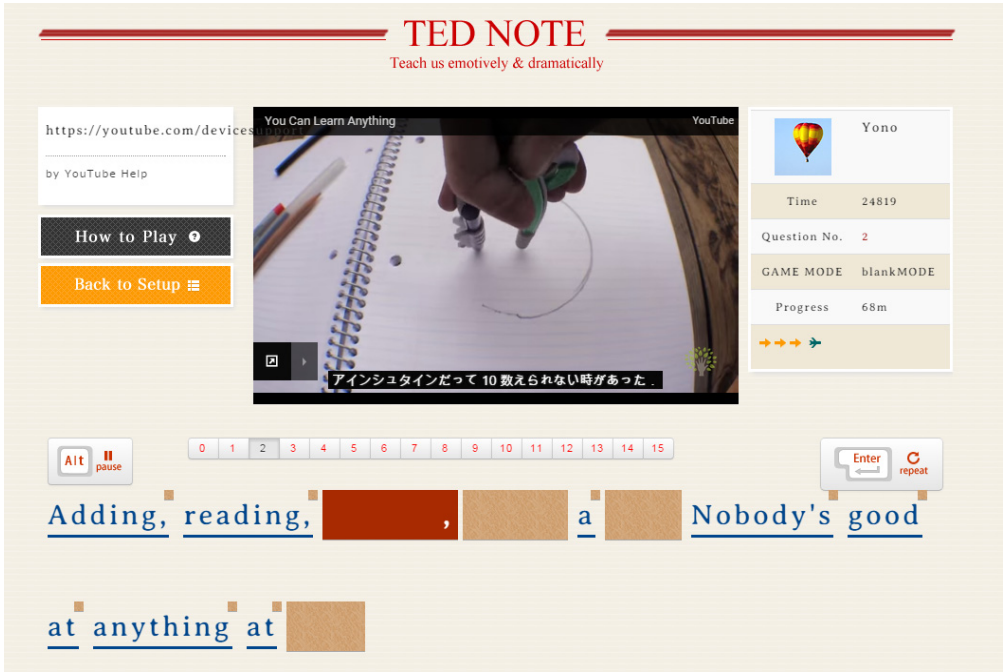

Figure 3. Typing Mode

The system can record users' learning logs in the database, including time, the number of clicks for "Enter" (repeat) and "Space" (next line), learning scores, failures (typos), and game scores, which we later analyzed to explain users' learning behavior.

If users complete the task without typing any errors, they will get high scores. We classified the vocabulary into three levels according to the difficulty parameter. The parameter adopted here is JACET 8000 Level Checker. If users correctly type the letters of the word at a high level, they will get a higher score. The player's achievement is visualized as a total score on the screen.

3.2 Modifications

As Nakajima and Tomimatsu (2013) state, the burden of the typing task for users is one negative piece of feedback in the typing mode, which the authors collected based on participants' performance. Users have to concentrate on typing too much to follow the meaning of the video. In order to reduce the burden on users, we devised a new mode for the system: the "rearrangement" task. We can also call it "touch" mode. In this task, the sentence is provided with some blanks, which look the same as in typing mode. Below the game space on the screen, the words for filling in the blanks are listed on each card. Users simply touch the card on the screen to fill in the blank. In this case, if the user wrongly touches the card to the black space, it counts as a "failure" (wrongly touched). A screen shot is shown below.

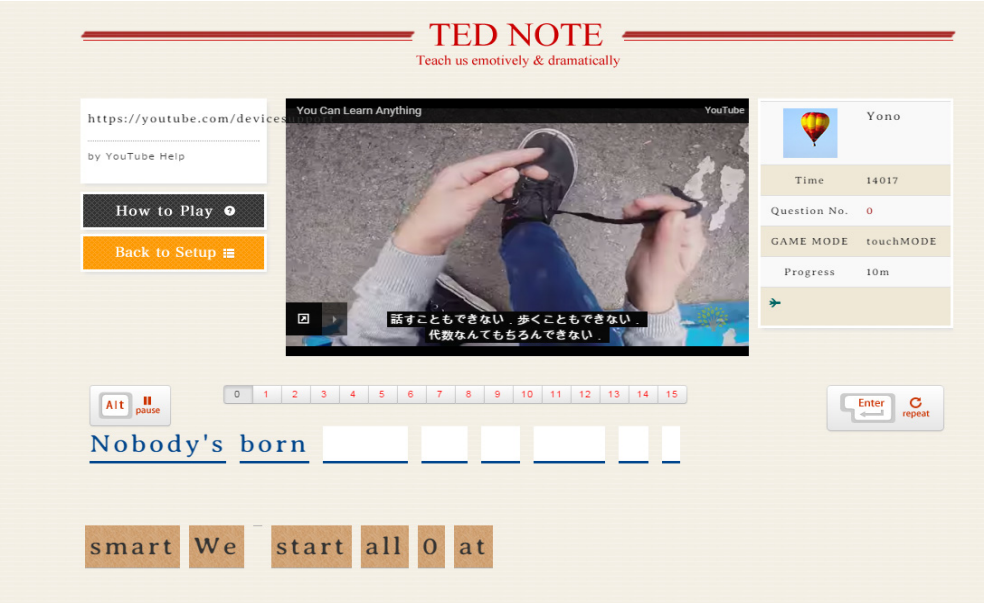

Figure 4. Touch Mode

4. Pilot Experiment

We conducted a pilot experiment on the usability and motivational effects of the system's two game modes. In addition, we analyzed the relationship between participants' proficiency levels and their learning behavior based on log data and time stamps.

4.1 Material for Experiments

We obtained the video (6 min 42 sec long) from Khan Academy. Since the participants are students in the human sciences, we selected the following video clips from Khan Academy for the course's EGAP materials.

●Material
"Divided attention, selective attention, inattentional blindness, & change blindness"

(https://www.khanacademy.org/science/health-and-medicine/executive%20systems%20of%20the%20brain/attention-language-2014-03-27T18:40:12.306Z/v/divided-selective-attention-inattentional-change-blindness)

Table 1 shows the characteristics of the vocabulary used in the material, checked by JACET 8000 Level Checker (http://www.tcp-ip.or.jp/~shim/). This web tool analyzes each word's level (levels 1–8) according to the Word Level List. More than 80 percent of the vocabulary in this material is included in Word Level 1000; this means that the vocabulary is rather basic, thus indicating the expected appropriateness of EGAP materials.

Table 1: Information in the vocabulary

Word List Tag	Word Level	Freq.	%
	Unknown	119	9.55
1	1000	1010	81.06
2	2000	56	4.49
3	3000	19	1.52
4	4000	23	1.85
5	5000	5	0.4
6	6000	11	0.88
7	7000	3	0.24
TOTAL		1246	100

Table 2 shows a statistical description of the material's vocabulary. The score of the Flesch-Kincaid Reading Ease test (67.6) indicates that 13-to-15-year-old students best understand the test, which again shows that the text is appropriate for the EGAP material in our course.

Table 2: Statistics about the material

Total Number of Words	1246
Total Number of Word Types	331
Average Sentence Length	20.0
Average Word Length	4.5
Average Word Level	1.35347
Variance	1.42490
Standard Deviation	1.19369
Flesch-Kincaid Grade Level (Readability)	8.3
Flesch-Kincaid Reading Ease Test (Readability)	67.5

4.2 Research Questions

As an experimental pilot study, we set up the following research questions to measure the usefulness of the two modes.

Q1: How do the participants feel about each mode in the system?
Q2: Do learners' proficiency levels affect the results?

In order to explore the possibility of examining the relationship between learning logs and learning behavior, we created the following additional questions.

Q3: How many "repeat" buttons did the participants click and how many "mistakes" did they make during our study of the system?
Q4: Did learners' proficiency levels affect the results?

4.3 Procedures

Seventy-one first-year university students participated in the study. As for learners' proficiency, we used the scores from the online version of the shorter form of the TOEFL test, provided by a Japanese testing company. We divided the participants into two groups: upper and lower. On the day of the experiment, they did a 10-minute practice exercise using different materials to become familiar with how to operate the system. After the practice exercise, they tried using the material for 30 minutes. We also divided the participants into the "type" group and the "touch" group. We did not observe any

significant difference between the two groups in regards to the proficiency level of each group's participants. (t (72) = -.660, p = .510, *ns*). After the test, we conducted a questionnaire to ask them about the system's usability and their motivation on a 5-point Likert scale. Table 3 shows the question items below.

Table 3: Question items

1	Do you think English is necessary?	7	Do you think the system increases your vocabulary?
2	Do you study English hard?	8	Do you think the system improves your listening ability?
3	Are you aware of not being good at English?	9	Do you want to continue to use the system?
4	Do you think that the text is difficult?	10	Do you want to use the system for self-study?
5	Do you enjoy using the system?	11	Do you think that the "typing" mode is comfortable to use?
6	Do you think that the system is easy to use?	12	Do you think that the "touch" mode is comfortable to use?

As for questions Q3-4, we collected "repeats," "failures," and "time" logs from the database concerning the first five sentences of the video clip. Based on log data, we produced the average scores of these parameters in each sentence. We analyzed the sentences below.

Table 4: Sentences

No.	Sentence
1	*I'm going to start out with a challenge for you*
2	*I'm going to show you a series of shapes*
3	*and I want you to count the number of yellow stars*
4	*Also, count the number of red X's that pop up on the screen*
5	*and one for how many red X's come up on the screen*

4.4 Results

As for Questions 1-2, Figure 5 below shows the results. We observed high scores in both the high and low groups regarding the following questions: Q1 "Do you think English is necessary?", Q5 "Do you enjoy using the system?", Q6 "Do you think that the system is easy to use?", Q9 "Do you want to continue to use the system?", and Q10 "Do you want to use the system for self-study?" This suggests that the participants accepted the system positively and comfortably. We carried out a t-test, and three question items showed significance: Q8 "Do you think the system improves your listening ability?"(t (72) = -2.495, p = .015), Q11 "Do you think that 'typing' mode is comfortable to use?" (t (72) = -3.166, p = .002) and Q12 "Do you think that 'touch' mode is comfortable to use?" (t (72) = -2.288, p = .025). This seems to suggest that participants with higher proficiency found the system motivating and comfortable for practicing. Conversely, those with less proficiency only found it average, which provides us with the necessary information to modify the current system.

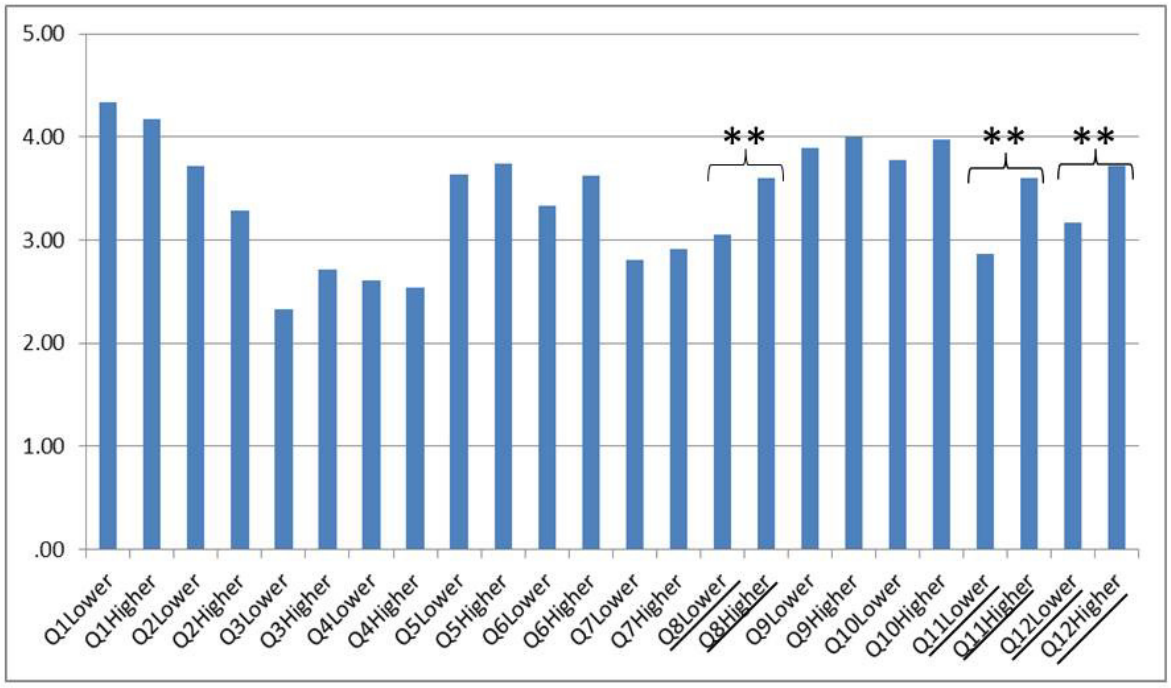

Figure 5. Results of the questionnaire

As for questions Q3-4, the results are shown below. Except for sentence 3, participants with higher proficiency completed the task in a shorter amount of time; the lower average scores are suggested by "repeats," "failures," and "time." It seems that participants with lower proficiency had difficulty typing or recognizing words to touch on the screen, reflected as larger numbers of error (FAILURES). Since it seems natural to assume that the difference in proficiency is somewhat connected to learning strategies or students' learning processes, these data encourage us to further explore the relationship between students' learning strategies and learning behavior in the near future, in order to support them with authentic video materials that they work on at home.

Table 5: Average scores from logs

	Group	REPETITIONS	FAILURES	TIME
Sentence 1	Lower	1.81	0.38	26.09
	Higher	0.69	0.06	22.91
Sentence 2	Lower	1.26	0.82	26.94
	Higher	0.59	0.00	23.34
Sentence 3	Lower	1.03	0.17	19.14
	Higher	0.68	0.23	23.30
Sentence 4	Lower	1.62	0.24	23.12
	Higher	1.25	0.20	20.16
Sentence 5	Lower	1.82	0.41	9.44
	Higher	1.51	0.05	8.64

5. Concluding Remarks

In this paper, we introduced e-Learning courseware involving open-source movie contents and automatic quiz generation, and explored the link between students' proficiency levels and their learning behavior via the courseware, with a focus on the learning logs of "repetitions" and "failures." The overall conclusion is that the system saves a lot of time and trouble creating online content by re-using online content from the Web. By employing the appropriate content, this platform has the potential to implement flipped learning models. In order to validate the usefulness of the proposed system, we have

to carry out a longitudinal study and examine learning outputs, along with the students' changes in learning behavior. The use of a mobile PC or a Tablet PC is definitely interesting in terms of the "touch" game. Thus far, the present research has some limitations. However, we believe that our approach of exploiting open source contents and automatic quiz generation leads to greater possibilities for future e-Learning design, which is worth pursuing in the near future.

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