Temporal Aspect Analysis of Video Log on Flipped Classroom

Yasuhisa TAMURA [a*], Izumi HORIKOSHI[b], Masaaki MURAKAMI[c], Yasuhiro WADA[d] & Keiichi TEZUKA[e]
[a]*Faculty of Science & Engineering, Sophia University, Japan*
[b]*Graduate School of Science & Engineering, Sophia University, Japan*
[c]*Software Engineer Association, Japan*
[d]*Audio Visual Communicationss Ltd., Japan*
[e]*Panopto Asia Pacific, Japan*
*ytamura@sophia.ac.jp

1. Introduction

In this paper we indicate some preliminary analysis results of lecture video log on real "flipped classroom" activities, focusing on when and how long these videos were watched.

Lage et al. (2000) defined the flipped classroom as "Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa". Also, Bishop & Verleger (2013) showed a survey of flipped classroom research. They indicated a table that lectures and exercises are reversely located on traditional style and flipped style classroom activities.

At the moment of watching lecture videos, a streaming video server records detailed log including information when, who, what and how long the contents were watched (sort of logged information depend on servers). It is still under research process what information are useful to identify learners' status and helpful to give useful feedback to them.

There are some preceding researches. Watanabe (2014) utilized YouTube to deliver video contents, which is often impossible to identify watchers. In order to grasp learners' video watching, he used questionnaire. More automatically, Dorn et al. (2015) calculated session numbers of learners from video server log. Marchand et al. (2014) calculated average viewing time of the contents from server log. Phillips et al. (2016) evaluated student perception and time spent on asynchronous online lectures in a blended learning environment. He extracted time stamps from a local video server and assessed time spent on the uploaded video contents.

The goal of this paper is to report collection and analysis of video server logs on real flipped classroom activities, including when, who, what and how long the contents were watched. As a result, quantitative and objective video viewing tendency has been clarified. Also, some problems of flipped classrooms have been exposed.

2. Method

2.1 Target Class and Units

The target class of this experiment is named "Learning Technology", a specialized class for third-year students of Department of Information and Communication Sciences, Sophia University, Japan. In this class, the authors picked up three units indicated in Table 1. It also shows length of lecture videos.

Table 1: Target Units and their Video Contents

Unit	Unit Title	Date Operated	Video Length (min)
Unit 1	Introduction of Learning Technology Research	June 6, 2017	33
Unit 2	Investigation of Preceding Researches	June 13, 2017	45
Unit 3	Originate your Research Idea	June 20, 2017	33

2.2 Technical Setup

The authors utilize Moodle, a major LMS. All learners were pre-registered on the Moodle at the time of entrance of the university, with attribute of student numbers. Also, we adopted a streaming server of Panopto, bundled with video recording client software. Both Moodle and Panopto have independent authentication schemes, but it is troublesome to link their logs. In order to do that, we utilized LTI communication scheme. LTI (Learning Tools Interoperability) is a set of server function and HTTP-based communication / information exchange scheme between network connected servers. LTI specification has been published from IMS Global Learning Consortium, and now version 1.2 specification is available in public. Because LTI is publicly available, some LMSs and video servers have started to support LTI. In this experiment, this LTI communication scheme was implemented and activated on both Moodle and Panopto. Because both Moodle and Panopto support LTI, Panopto is able to know the student number from Moodle when logged-in, via LTI-based information exchange.

Panopto server provides a simple Dashboard to show summary of its video logs. However it is insufficient for fine-grained analysis. In order to do this, Panopto also provides Web API interface to pick up log information. So we utilized this Web API, which is downloadable from GitHub.

3. Results and Discussions

3.1 Video View Counts

For the three units described in Section 2.1, we executed flipped classroom activities. Video view counts of these units are shown in Table 2. Checking the log, there was no one to view the videos more than 2 times. So, the View Count numbers in Table 2 are equal to number of learners to view the videos. Since registered student number of this class is 79, we can calculate the percentage of learners who viewed the contents. Unit 1 shows high percentage, but Unit 2 and 3 are low.

This number implies a mistake of unit elements on Moodle. We disclosed links to video contents and PowerPoint slides, which were used in the video. The learners might learn that they need not view the video to understand whole contents, but just to check PowerPoint slides.

Table 2: View Count

Unit	View Count	% of Learners Viewed
Unit 1	60	75.9%
Unit 2	27	34.2%
Unit 3	26	32.9%

3.2 Remaining Day(s) and View Count

Next we analyzed when learners watched videos. Logs show that all learners watched videos only once, so starting dates were equal to finished dates. An instructor always indicated the videos and assignments in the previous units (7 days beforehand), so learners had 7 days to view videos. Resulted distribution is shown in Figure 1.

Since unit 1 was the first time to introduce this flipped classroom activity, many learners were interested to view videos during the previous unit. However, gradually they learned that their video viewings were enough just before the target units.
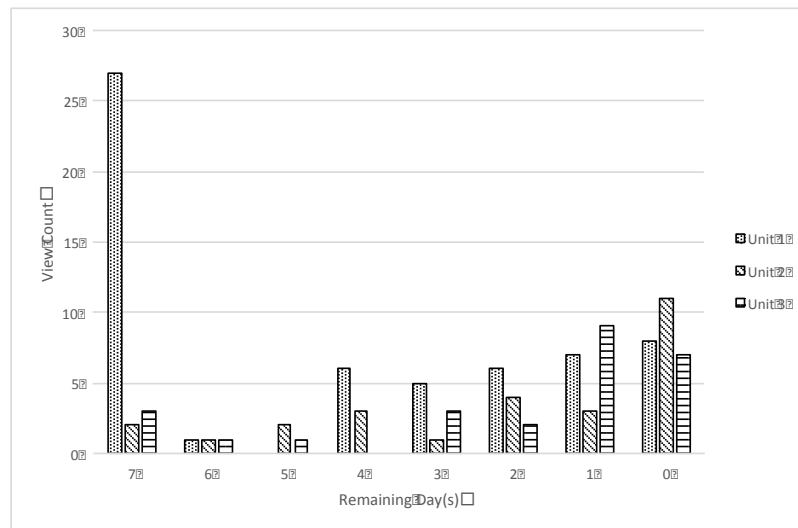

Figure 1. View Counts per Remaining Day(s)

3.3 "% Viewed" per Remaining Day(s)

Next, we focused on how long the learners viewed the video contents. The number "% Viewed" means 100% when a learner watched full length of the video. When he stopped watching at 10 minutes for full length of 40 minutes contents, the number would be 25%.

We set a hypothesis: when a deadline of video watching was approaching, many learners would cut short their viewing. If so, average % viewed will decrease according to remaining day(s). The result is shown in Figure 2. From the figure, there is no obvious tendency to support the hypothesis.
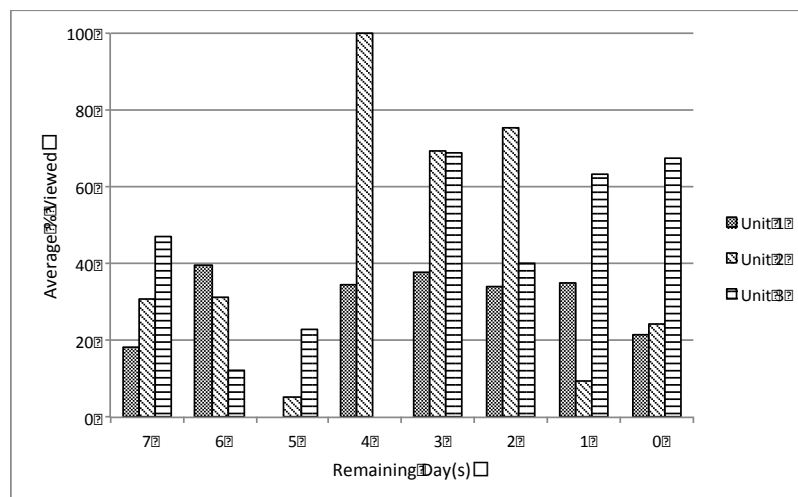

Figure 2. Average % Viewed per Remaining Day(s)

Then we proceeded detailed analysis: we drew graphs the distributions and assessed the correlations between remaining day(s) and % viewed. Figure 3 shows the results of distributions.

(a) Unit 1
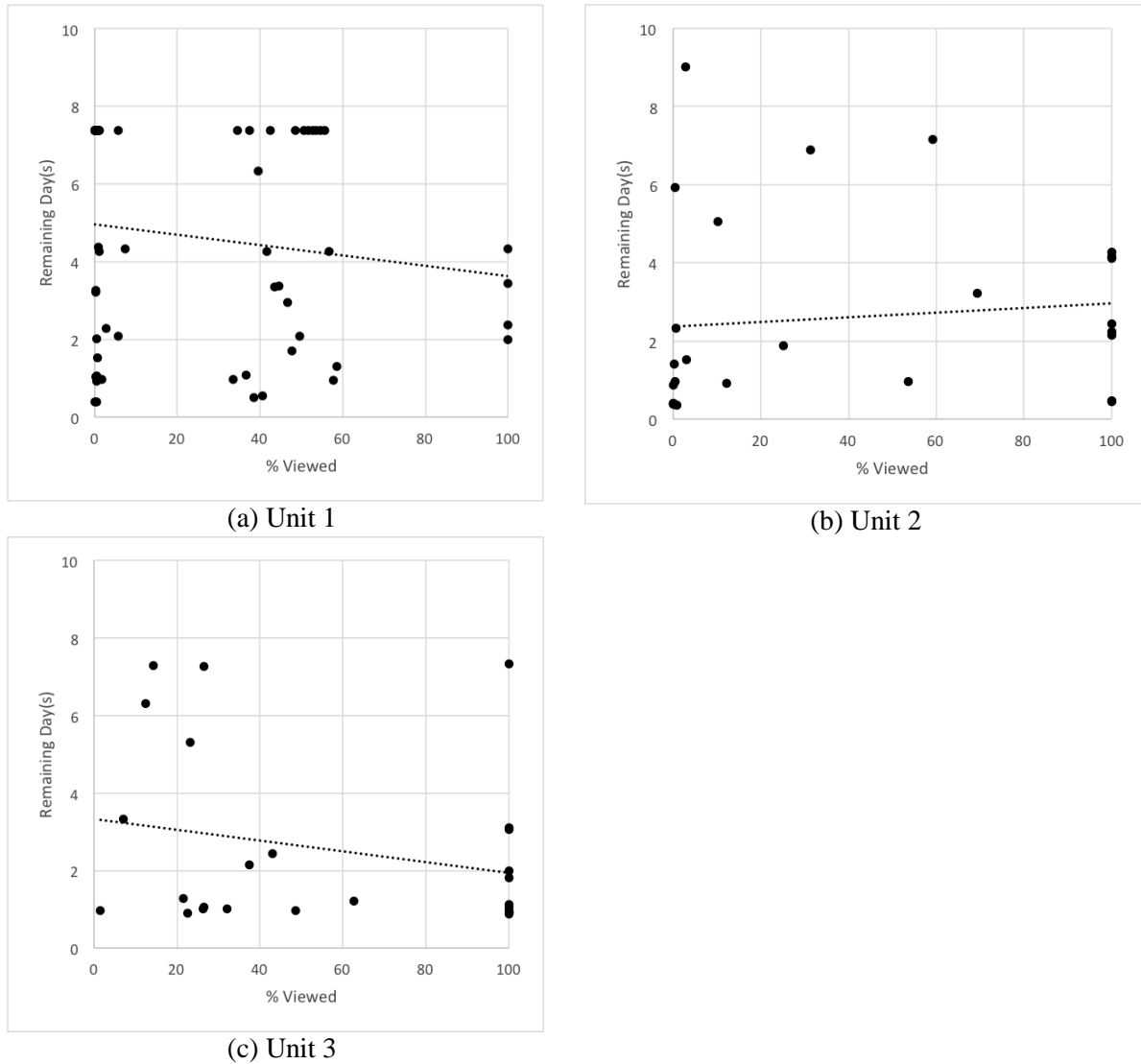

(b) Unit 2

(c) Unit 3

Figure 3. Distribution of % Viewed and Remaining Day(s)

From Figure 3 (a)-(c), we can find some signature. First, all units include many video logs which stopped viewing in 5%. At the same time, they include some logs with 100% viewing. Also, Unit 1 (Figure 3 (a)) shows a significant group of 35%-60% viewing. In order to clarify these tendencies, we drew a histogram in Figure 4. From this figure, except for Unit 1, we can see a polarized tendency, groups near 0% and the others near 100%.

Figure 3 also indicates approximate lines for the correlations. Coefficients of these correlations are shown in Table 3. Only Unit 1 showed significance for minus correlation of -0.2582. It means negative correlation for the hypothesis above.

4. Conclusion

In this paper, a preliminary video log analysis was indicated, including correlations between remaining days and % viewed. For "last minute" learners, metacognitive training to schedule their tasks might be useful. The possible next step is to consider other key aspects of learning (in-class activities, achievements etc.) beyond currently treated data items.
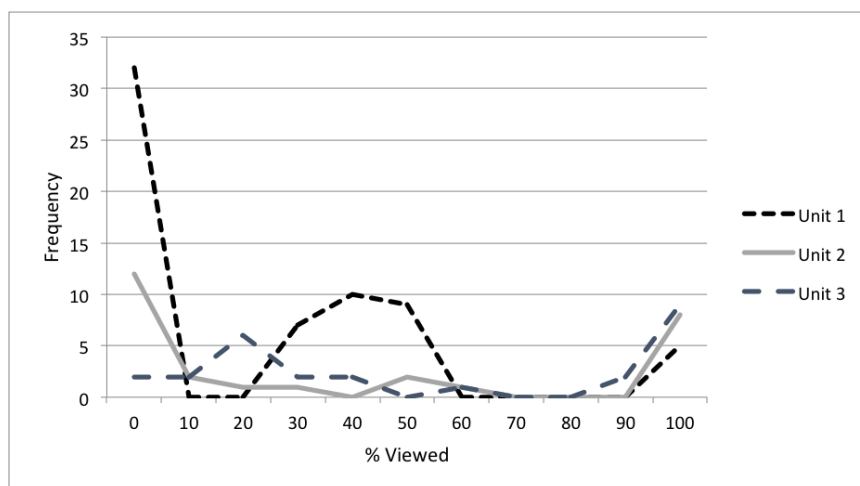
Figure 4. Histogram of % Viewed

Table 3: Coefficient of Correlation

Unit	Coefficient of Correlation	Significance Probability
Unit 1	-0.2582	0.0410
Unit 2	0.1081	0.5915
Unit 3	-0.2409	0.2358

Acknowledgements

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