

Identifying Students' Pre-Classroom Behaviors toward Learning Media in a Flipped Learning Environment

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Abstract. Advancements in Information Technology have lead the world to new ways of life including in the education field. Nowadays we have various types of computer and Internet-assisted learning. With the booming of blended learning, here comes the flipped classroom environment, where students are expected to learn even before the conventional class meetings started. In this study, we address the question of how students behave toward various learning materials packaged in 3 types of media: text and images, slide shows with audio narration, and slide shows with the appearance of the lecturer. Based on our samples the findings are surprising: some students never made access before the class; and on the other hand, the text-and-image-based learning materials have the highest number of pre-classroom access.

1. Introduction

Technology advancement within the past few decades bring forth new ways of life for human. Education is a field that highly affected and evolved by these advancements. Academic stakeholders in the present era for sure have some knowledge about the use of technologies in assisting learning, which known as e-Learning. However, it is not only e-Learning that is arising nowadays. In [1], e-Learning is considered as the utilization of CDs that delivered through the postal system. Beside e-Learning, Moore et al. in [1] also studied the common consensus regarding online learning, which emphasizes the lack of official meetings; and the blended learning scenario that makes use of the technologies but also has several conventional classroom meetings.

The implementation of the technology-assisted-learning is up to the institution itself. For example, there is a public higher education institution that limits the number of pure online meetings to 25% of the whole course [2]. However, the regulation itself does not mention specific limitations on the utilization of lecture materials. It means, for such instance, the lecturers/instructors are free to use the learning management system as long as the number of conventional meetings still more than 75%. For such cases, blended learning with flipped classrooms should be considered as a scenario for improvement.

As defined earlier, blended learning is a learning situation where the lecture materials are available in a Learning Management System (LMS) that accessible online, students might also interact with the instructor by using this system, even working on assignments and quizzes



online, but also have conventional classroom meetings [1]. Blended learning clearly brings evolutions in higher education, due to its flexibility that provides users with the chance to maximize a myriad of positive education functions [3–5]. In this scenario, lecturers/instructors may use the online platform to disseminate materials, and the students may get the interactions they need in conventional meetings [6]. This condition leads to the development of the flipped classroom scenario, where the class is "flipped". Instead of listening to the lecturer during class time, the students might learn from the pre-recorded lecture videos or other forms of lecture materials and then use the class time for activities, such as discussion, workshop, or guided exercise. This situation was proven to be helpful for the students [7], and also for the lecturers [8].

No matter what the technologies used, lecture material is an inseparable part of the learning environment. Present-day lecture materials can take many forms, from simple slide shows to pre-recorded videos. In the past, we studied the students' preferences toward 3 types of lecture material: text and images, slide shows with audio narration, and slide shows with the appearance of the lecturer/instructor [9,10]. Specifically, in [10], we found that students responded differently toward each type of learning media. However, these former studies only analyzed how the students accessed the media. To gain a more comprehensive knowledge within this particular field, the study is extended to answer the question that very related the students behaviors: when was a student accessed the media? How long it was before the classroom meeting/session?

This paper is a report from our study to answer such questions. The rest of this paper is organized as follow: in Section 2 we present the former studies in within this particular field of blended learning; Section 3 presents the methodology used in this study; Section 4 contains the findings as well as some discussion and finally, in Section 5 this paper is concluded.

2. Related Works

Blended learning implementation was found to be very positive for the students' achievement [3–5], yields higher gain for the students with high academic performance [11], and highly favored by students [12]. Contrarily, the use of learning materials is compulsory in every kind of learning. Moreover, it is proven that by using various types of learning media, the learners could be more triggered to learn [13]. The millennials are very open to the digital learning sources, eventhough the primary sources are ones that provided by the lecturers/instructors [14].

Gutmann et al. in [14] also argues that there is a need to discover which type of learning media that associated with the best learning achievements. This issue of media is a shared concern between researchers. For instance, the visual media that was developed as studied in [15] showed a positive improvement to the learners' ability of critical thinking. Therefore in [9,10] we examined the use of various learning in several courses. The findings are insightful, however there are some parts that left in the dark. With the adoption of flipped classroom, then it is expected that the students accessed the learning media prior to the conventional classroom meetings [7]. Courses in [9,10,16] as well as several other courses in the same institution are designed with this philosophy. Unfortunately, [10] contains only the evaluation of the access behavior, while [16] only discusses students assessment toward learning media, but both articles provide no information regarding the behaviors of the students especially about how long before the conventional classroom meeting, a particular student accessed provided learning media.

3. Research Design

To gain the knowledge of students' pre-classroom behavior, a course was designed as a flipped learning environment. As described in Section 1, this paper specifically addressed the use of text and images (TIM), slide shows with audio narration (SAD), and slide shows with the appearance of the lecturer/instructor (VID) as formerly discussed in [9,10]. To ensure the randomness, the sequence of media was randomly generated again with different seed, hence there were 6 weeks,

each with 3 (permuted) types of learning media. Each media is used to deliver a module. The scheduled meeting was scheduled weekly and the learning materials were given in advance. Each scheduled meeting then could be considered as a "deadline" for the students to access given materials for the particular meeting.

This study was applied to the Wireless Data Communications course in the Undergraduate Programs of Informatics in our institution. There were in total 29 participants in this course. During these 6 weeks of lectures, there were 21 modules that consist of 7 text and images, 8 slide shows with audio narration, and 6 slide shows with the appearance of the lecturer/instructor. Each video-based media are hosted in YouTube then a link was given in the LMS while the text and image materials are natively hosted in the LMS provided by the university¹.

4. Results and Discussion

Instead of using questionnaire to measure the access as we done in [10], in this paper we use the access logs as provided the LMS that powered by Moodle [17]. Therefore, what measured are based on the assumption that accesses were made only through the LMS. This section consists of 2 parts, Subsection 4.1 discusses the frequency (number of access made by students) toward learning media, and Subsection 4.2 discusses the pre-classroom behavior in terms of the first access related to the number of hours before scheduled lecture.

4.1. Access Frequency

Figure 1 shows the number of access to each modules, colored by the media type. The first week of lecture received most attention, indicated by the number of accesses of Module 1.1 to 1.3. It seems that there was a huge difference with between the first of lecture and second ones onward. This trend is explainable by consulting Figure 2 that shows the access frequency of each student. This figure clearly shown that there were few students who accessed not even quarter of the modules. Returning to Figure 1, it can be seen that every module did not receive same attention from the students. In terms of the media used, TIM-based modules are commonly the most accessed module for the particular lecture week. Contrarily, based on this barplot, the difference between access frequency to the SAD-based modules and VID-based module is unclear.

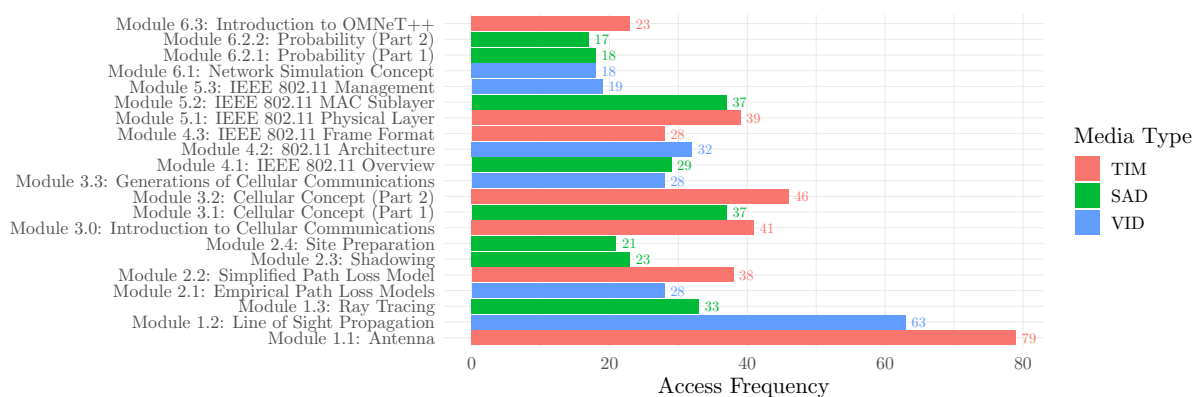


Figure 1. Module, media type, and access frequency.

In Figure 3 the differences are clearer. There is an outlier in both TIM and VID access frequency. These outliers came from the access frequency in the first lecture, as shown in Figure

¹ <https://elearning.unsrat.ac.id>

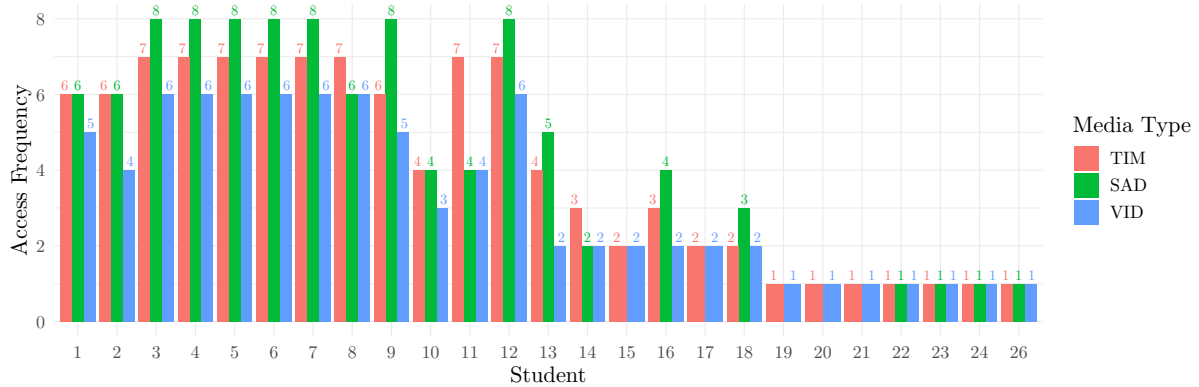


Figure 2. Access frequency for each student

1. By consulting Figure 3, and Table 1, the TIM-based modules are the most accessed modules, followed by VID-based modules and then the SAD.

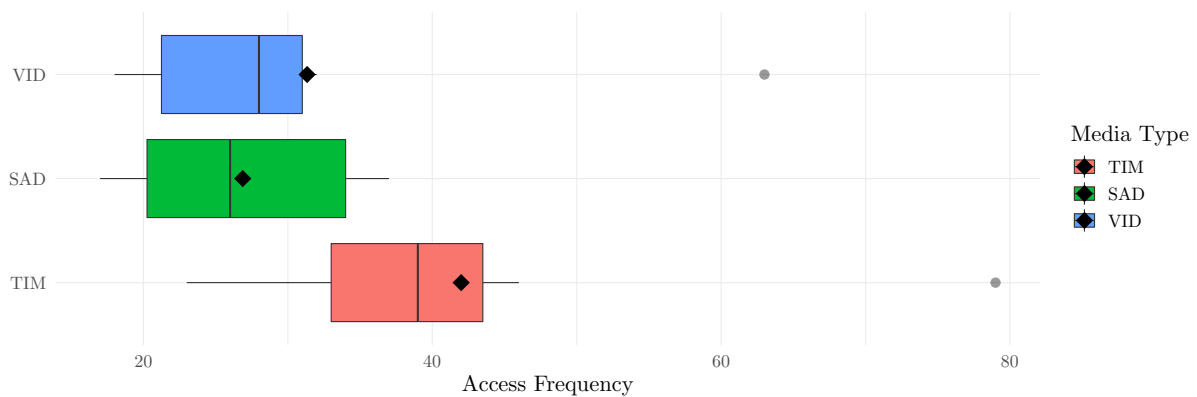


Figure 3. Boxplot of the access frequency for each media type. The diamond shape (◆) marks the location of the mean for each media type.

Table 1. Statistical summary of the number of accesses made to each media type.

Media	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
TIM	23.000	33.000	39.000	42.000	43.500	79.000
SAD	17.000	20.250	26.000	26.875	34.000	37.000
VID	18.000	21.250	28.000	31.333	31.000	63.000

4.2. Pre-Classroom Behavior: Access Time before Scheduled Lecture

The spirit behind the implementation of flipped learning environment is that students attend the classroom meeting prepared, hence in the class students may discuss advanced topic with the lecturer. Therefore, the access to the learning media does matter. As shown in Figure 4,

the variations of the access time to media types are quite high, as indicated by the width of the boxplots. The width of the VID boxplot is cramped compared to the other two. However, it has higher number of outliers.

By comparing the information in Figure 4 and in Table 2, it can be seen that some students did the first access far more after the scheduled lecture. Currently there is no clear explanation of this behavior. Figure 4 and Table 2 indicate the same thing, the tendency to access the TIM-based module first is higher than the other two media types; on the other hand, the first access time toward SAD-based modules are slightly higher than VID-based modules, as can be seen from the positions of the means and medians.

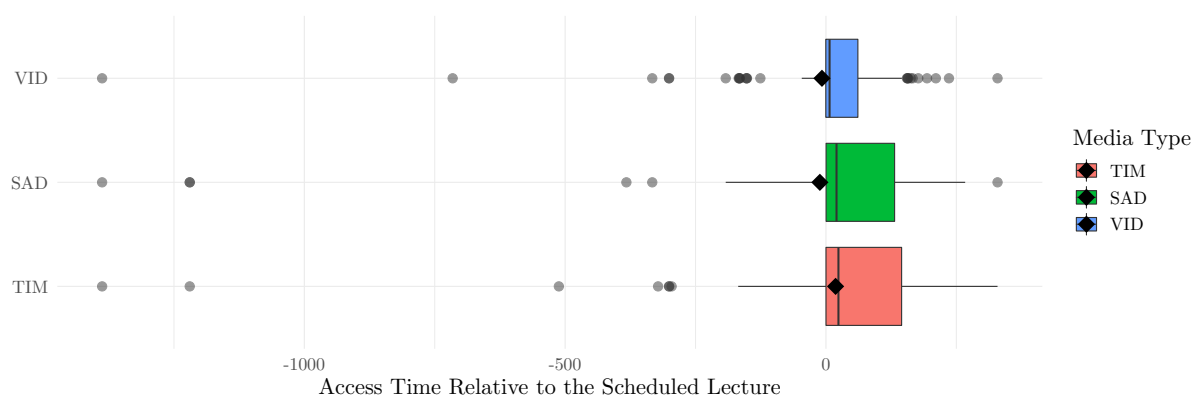


Figure 4. Boxplot of the first access time relative to the scheduled lecture/classroom meeting (in hours). The diamond shape (◆) marks the location of the mean for each media type.

Table 2. Statistical summary of the access time (in hours) before lecture for each type of media.

Media	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
TIM	-1387.700	0.100	23.967	18.454	145.083	328.967
SAD	-1387.750	0.313	20.258	-11.661	131.612	328.967
VID	-1387.750	-0.275	6.958	-7.644	61.221	328.933

5. Conclusion

In flipped learning environment, students are expected to learn from the provided materials before the classroom meeting. However, based on our samples, not all students did as expected, there were some students even made the first access after the scheduled lecture. In this study it seems that used media types have certain effects toward this behavior. As discussed in Section 4, students tend to access learning materials that consist of text and images first. This finding is quite unexpected compared with our previous study in [10] where the slide shows with the lecturer appearance sits as the most preferred media type. By comparing these, it is safe to assume that the students may have higher preference to slide shows with the lecturer appearance but tend to access the media that consists of text and images first. Therefore, this study needs to be expanded by adding more courses and students.

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