Pegem Journal of Education and Instruction, Vol. 13, No. 4 , 2023 (pp. 208-213)

RESEARCH ARTICLE WWW.PEGEGOG.NET

Learning Behaviors and Learning Effects in On-Line Pre-Recorded Video Lecture

Byoungho Jun*

[1]College of General Education, Seoul Women's University, 621 Hwarang-ro, Nowon-gu, Seoul 01797, South Korea

Abstract

On-line learning has been adopted as a major educational technique and method due to the COVID-19 pandemic. Even though COVID-19 led to many problems such as faculty's burden and stress during the early stage of COVID-19, both students and faculties have gradually become familiar with on-line educational environment. The high technology development and social requirement for new educational methods have paved the way for on-line education as well. Therefore, on-line learning or blended learning will be likely to go on after the end of COVID-19 pandemic. It seems that college will use both traditional in-person class and on-line class and develop various types of classes aligning them. In accordance with those social change and requirement of on-line education, it is necessary to prepare guidelines for effective utilizing on-line learning. The main purpose of this study is to examine the learning behaviors of the students in on-line learning and analyze the learning effects by comparing with learning behaviors in higher education. Given the lack of research on how online learning behaviors and patterns affect academic performance, this study will analyze the academic achievement by comparing with learning behaviors such as the number and duration of on-line learning sessions. The study includes theory classes and computer practical classes. The findings of empirical analysis will provide insights that the effective planning and designing on-line classes based on learning behaviors are key to enhancing learning effects and learner's satisfaction.

Keywords: COVID-19 pandemic, On-line learning, On-line pre-recorded video lecture, Learning behaviors, Learning effects

Introduction

The pandemic of COVID-19 has given rise to severe impact on daily life, especially on education (Wang, Lin, & Su, 2021). Covid-19 pandemic has made an on-line education as compulsory way across the world, making students out of the classroom (Chang and Chou, 2021; Inan Karagul, Sker, & Aykut, 2021; Jun B. H., 2021). Even though on-line education has been recognized as one of the effective educational methods due to its ubiquitous and flexible educational environments, it has been used but only as a supplementary way of in-class learning before COVID-19 pandemic (Kim J. S. et al, 2021).

Quick move to on-line education caused by the sudden attack of the COVID-19 led to many problems such as faculty's burden and stress from the planning and designing suitable for on-line classes, technology system problems for both students and faculty and students' complaints of the low quality of education in an early phase (Seo et al., 2020). Experiencing on-line learning during the COVID-19 pandemic, however, both students and faculties have gradually become familiar with on-line educational environment. Class satisfaction is back and better than ever and preference for on-line class is also increasing (Jun B. H., 2021). From the perspective of school management, the on-line education environment under emergency management has provide a good turning point in promoting the development of online learning (Wang, Lin, & Su, 2021). There is a very strong possibility that on-line learning will go on as an important educational method after the COVID-19 (Park et al., 2021; Lee et al., 2020; Hong S. Y., 2020; Aristovnik et al., 2020). Experience of COVID-19 pandemic let government and school authorities have significant technical and educational capabilities. The advance of science and technology led by 4th industrial revolution and social change and requirement for innovative education lay groundwork for on-line learning as well. That is, COVID-19 pandemic give lessons for the importance and necessity of on-line education in higher education (Kim et al., 2021).

It seems that college will use both traditional in-person class and on-line class and develop various types of classes aligning them. In accordance with those social change and requirement of on-line education, it is necessary to prepare guidelines for effective utilizing on-line learning in higher education. With the continuous growth of on-line learning and on-line classes offered by universities, the issues relevant to the quality and effectiveness of on-line learning are highlighted as well. Online learning provides a wide variety of advantages for learners, but it works differently for different leaners.

Corresponding Author e-mail: bojun00@swu.ac.kr

https://orcid.org/0000-0001-6681-2915

How to cite this article: Byoungho Jun. Learning Behaviors and Learning Effects in On-Line Pre-Recorded Video Lecture. Pegem Journal of Education and Instruction, Vol. 13, No. 4, 2023 208 - 213.

Source of support: None

Conflict of interest: Nil.

DOI: 10.47750/pegegog.13.04.25

Received: 19.01.2022

Accepted: 19.09.2023 **Publication:** 01.1 0.2023

As learners in on-line learning initiate, plan, and conduct their studies by themselves, it is important to understand on-line learner's learning behaviors and patterns (Ye and Pennisi, 2022). İt is, therefore, necessary to investigate the important factors in terms of individual learning behaviors to improve the effectiveness of on-line learning. Learner's learning behaviors and patterns can be traced by LMS (Learning management systems). At present, most universities use LMS and LMS provide a good way to monitor learner's behaviors and progress in on-line learning (You, 2016). Analyzing LMS data allows to find meaningful patterns and to prepare effective learning guidelines.

Purpose of study and research questions

The primary purpose of this study is to examine the learning effects and achievement in terms of learning behaviors and patterns by using LMS data. It focuses on the on-line pre-recorded video lecture. Recent researches have shown that MZ generation nowadays live with technological comfort and tends to prefer on-line pre-recorded video lecture to on-line real-time class (Park et al., 2021; Sung et al., 2021). Flexible and ubiquitous learning environment can be more incorporated in on-line pre-recorded video lecture rather than on-line real-time class. This study includes theory classes and computer practical classes.

Given the lack of research on how online learning behaviors and patterns affect academic performance, this study will analyze the academic achievement by comparing with learning behaviors such as the number and duration of on-line learning sessions. Therefore, the research questions are as follows:

RQ1: Is Learning time significantly related to the on-line course achievement?

RQ2: Is frequency significantly related to the on-line course achievement?

RQ3: Does on-line course achievement is significantly different from device types?

The findings of empirical analysis will provide insights that the effective planning and designing on-line classes based on learning behaviors are key to enhancing learning effects and learner's satisfaction.

Literature review

On-line learning

With the rapid growth of the internet and digital technologies caused by 4th industrial revolution, recent trends in educational spheres are moving towards online and hybrid courses (Ghani, 2019; Khan, 2010). Specifically, COVID-19 pandemic has led to a greater concern and need for on-line learning to cater to the socio-technical needs.

The term 'on-line learning' has been used with e-learning, internet learning, distance learning, distributed learning, virtual learning, network learning, web-based learning, computer-assisted learning and so on interchangeably. All those terminologies imply that on-line learning encompass the use of various electronic media and communication technologies to attain educational goal (Muljana and Luo, 2019). İn on-line learning, instructors deliver the instructions via on-line planform like LMS and learners access learning contents and interact with instructors with using same virtual means geographically remoted (Anderson. 2008). That is, on-line learning is an innovative way for delivering well-designed, learner-centered, interactive, and facilitated learning environment without restriction on time and space utilizing various digital technologies along with other forms of learning materials suited for on-line learning environment (Khan, 2010).

The most important features of on-line leaning are flexibility and ubiquity, as it allows flexible and easy access to learning materials without being limited by time and space. Compared to traditional face-to-face learning, on-line learning provides a higher level of flexibility and free access to enormous amounts of contents and information, which is powerful (Sitzmann, Kraiger, Stewart, & Wisher, 2006). On-line learning enables learners to access the most up-to-date and relevant learning contents ubiquitously not having time-space restrictions (Driscoll, Jicha, Hunt, Tichavsky, & Thompson, 2012). Especially learners have the free option to learn at their own pace due to the asynchronous characteristic of on-line learning. İf necessary, learners can interact with classmates, instructors using synchronous means. Therefore, learners study at their most comfortable time and place with multiple web technologies. As accessibility and convenience offers attracts learners, on-line learning has gained a significant foothold on a global basis (Odeta and Colin, 2022).

During the covid-19 pandemic on-line leaning was inevitable. COVID-19 pandemic has resulted in colleges being shut all across the world and colleges rapidly have shifted from the face-to-face delivery mode to the on-line delivery mode (Jun, 2021). Courses are conducted on-line via different platforms, including its internal on-line classroom system, video conferencing and open on-line education platforms. Even though the sudden attack of the COVID-19 led to many problems for both students and instructors in early period, the situation gradually has been stable due to the effort and support of school and government authorities. As students and faculties have gradually become familiar with on-line educational environment, class satisfaction is back and better than ever and preference for on-line class is also increasing (Jun, 2021). On-line learning or blended learning will be likely to go on as an important educational method after the end of COVID-19 pandemic (Park et al., 2021; Lee et al., 2020; Hong S. Y., 2020; Aristovnik et al., 2020).

Table 1: Types of on-line learning

Type	*Class operation*
On-line pre-recorded video lecture	• Class by on-line pre-recorded video lecture • Check class progress, feedback, and discussion vis LMS
On-line real time lecture	• Class by on-line real time by using video conferencing • Real time discussion and feedback
On-line hybrid lecture	• Class by both two types

The types of on-line learning are as in Table 1.

When we usually refer to 'on-line learning', then it means online pre-recorded video lecture. This paper focuses on online pre-recorded video lecture as well. Even though on-line real time lecture has advantage on a real sense and quick interaction, many students more prefer on-line pre-recorded video lecture rather than on-line real time lecture. İt is due to flexibility and ubiquity of on-line learning. Students can study anytime and anywhere at their own pace. Research result also supports this preference. Learning understanding and satisfaction of on-line pre-recorded video lecture were found to be more significantly higher than on-line real time lecture (Sung et al., 2021). İt is should be considered that college students these days, which is called MZ, have grown up in on-line learning environment.

On-line learning has become a common mode of learning especially in higher education due to the COVID-19 pandemic (Ye et al., 2022). Many advantages of on-line learning has attracted students and provides alternative learning opportunities. İts major advantages include time-space flexibility, uniquitious accessibility. However it seems that not all students equally receive the benefits of on-line learning. It is, therefore, necassary to invistigate the learning patterns and the effectiveness of on-line learning.

Learning behaviors and learning effects

As on-line learning has become an important learning mode due to the COVID-19 pandemic, the issues relevant to the quality and effectiveness of on-line learning are highlighted. Many researches asserted that on-line learning is more student-centered, less intimidating, and encourage greater class concentration resulting in higher learning understanding and satisfaction (Markova et al., 2017). However, it is still a controversial issue whether on-line learning is likely to influence the learning effectiveness. While supporters of on-line learning argue that on-line learning holds a wide variety of advantages for learners and then can be more effective than in-class learning, opponents express concerns that students in on-line environment tend to feel more confused, isolated, and frustrated resulting in lower satisfaction and effectiveness (Markova et al., 2017).

While an increasing number of universities are offering on-line learning, various educational data have been generated from on-line learning environment (Lee et al., 2018). Especially student's learning behaviors are automatically recorded by LMS. LMS can monitor meaningful patterns such as the number of contents view and the time spent viewing contents. Most universities use LMS and LMS provide useful ways to monitor learning participation and progress (Lee Y. S., 2020). İt enables to data-driven educational decision making resulting in resolving academic problems and enhancing learner's performance (You, 2016).

As considerable learning behavioral data have become available in the on-line education field by using LMS, the attention to utilizing those data to improve academic success has increased. According to the result of researches which have attempted to use LMS data to examine on-line learning success, there is a significant relationship between learner's active participation and academic performance (Asarta and Schmidt, 2012; Ye and Pennisi, 2022; You, 2016). Those researches have shown that participation indicators and patterns are strongly correlated with academic achievement. They use the number of content views, the frequency of logins, and the time spent reading pages as typical measures of individual differences in on-line learning. Regular and timely study is one of the important factors in on-line learning.

Research Method

Participants and context

The main purpose of this study is to investigate the on-line learning behavioral indicators which may predict learning effectiveness and achievement by using LMS data.

The data used in this study were collected at S women's university in Korea. They include two on-line classes during the COVID-19 pandemic. One is a computer-based practice class which is prerequisite for freshman and the other is a theory class which anyone can take. Each 35 and 47 undergraduate students were registered. Classes information and demographic information are as shown in Table 2.

On-line classes were mainly done by pre-recorded video lectures except orientation and exams. At the beginning of

Table 2: Demographic information

		Class 1 (computer practice class)	*Class 2 (theory class)*
grade	First-year student	32	19
	Sophomore	-	11
	Junior	-	7
	Senior	3	10
Sub total		35	47
Total		82	

each week, on-line pre-recorded video lectures were uploaded and students were required to learn them during the assigned week for checking attendance. Students could repeat on-line lectures as many times as they wanted after the assigned week. Students were able to ask questions using Q&A board of LMS, email, and live chat. That is, all learning activities were done in on-line environment.

Data Collection

The data used in this study were collected from LMS with the exception of course achievement. The measures from the LMS data used in this study are learning time, frequency and device types as the on-line learning behavioral indicators. Each measure is explained as follows.

First, learning time was divided into two types; total learning time and learning time after the assigned period. Total learning time was measured by the total time spent on learning all lectures, and learning time after the assigned period was measured by the time spent on after the assigned period for checking attendance.

Second, frequency refers to the total number of access for each lecture regardless of assigned period and after it. İt simply counts the number of access to each lecture. İf each session was less than 1 minutes, then it was not counted.

Course achievement was measured by the final score and it depends on the classes. Course grading of class1 was based on two exams and team assignment. Class2 was evaluated in terms of two exams, one assignment, and quizzes. When it comes to attendance score, 5-point was deducted if total attendance rate was below 90%.

Findings

To examine the research questions, descriptive statistics, regression, and ANOVA were performed.

Descriptive statistics

The descriptive statistics of the study are presented in Table 3. While class 1 consisted of 27 on-line lectures and the sum of the length of them was 910.07 minutes, class 2 had 32 on-line lectures and total time was 2284.26 minutes. Students of class 1 spent on 2086.33 minutes and students of class 2 did 2284.26 minutes on average. Both students group spent on twice of the total length of on-line lectures. Students of class 1 took about three times per each on-line lecture and students of class 2 took about two times per each on-line lecture. It implicated that student took more time and effort to take on-line class than required. When it comes to device, students usually used PC to take on-line classes and they mixed PC and mobile device in many cases (Table 3).

Table 3: Descriptive statistics of the study (n = 82)

		Class 1 (computer practice class)	Class 2 (theory class)
Number and total time of on-line lectures		27 lectures, 910.07 mins	32 lectures, 1151.53 mins
Total learning time (mean)		2086.33 mins	2284.26 mins
Frequency (mean)		79.23	81.36
Device	PC	21	31
	Mobile	2	10
	PC-Mobile	12	6

Learning time and course achievement

According to the regression analysis, learning time did not significantly predict the course achievement as shown in Table 4.

Both total learning time and learning time after the assigned period were both not shown to predict the course achievement and it happened same as two classes. Unlike in-class learning, nobody cares whether students concentrate on class except by themselves. According to the LMS data, some students even spent more than 5 hours just for 30-40 minutes on-line lecture. It seemed that they just accessed on-line lecture for checking attendance and did other irrelevant things to class. Those happenings could be found by several students.

Frequency and course achievement

The result of regression showed that frequency was the significant predictor of on-line learning (class 1: t=1.833, p=0.075*, class 2: t=2.357, p=0.029**). Many accesses to each on-line lecture means the degree of enthusiasm, sincerity, and even completeness (Table 5).

Device types and course achievement

Students usually used PC to take on-line learning, but they often mixed PC and mobile devices. While course achievement was little higher using PC in class1 and mixing PC-mobile

Table 4. Regression analysis results on course achievement by learning time

	Class 1 (computer practice class)		*Class 2 (theory class)*	
	t	*p*	*t*	*p*
Total learning time	1.004	0.323	1.209	0.233
Learning time after the assigned period	0.856	0.397	0.860	0.394

Table 5. Regression analysis results on course achievement by frequency (* < 0.1, ** < 0.05)

	Class 1 (computer practice class)		*Class 2 (theory class)*	
	t	*p*	*t*	*p*
Frequency	1.833	0.075*	2.357	0.029**

Table 6. ANOVA analysis results on course achievement by device types

		Class 1 (computer practice class)		*Class 2 (theory class)*	
Number		*Achievement*	*Number*	*Achievement*	
Device	PC	21	77.29	31	85.07
	Mobile	2	65.27	10	87.26
	PC-Mobile	12	84.95	6	92.45
		f=1.283, p=0.291		f=2.014, p=0.145	

in class 2, the difference was not significant according to the ANOVA results as shown in Table 6.

Discussion and Conclusion

On-line learning has been playing a key role in higher education during the COVID-19 pandemic and it seems to be likely to go on after the end of COVID-19 pandemic. As on-line learning has been a prominent mode of learning in higher education, the issues of effectiveness of are raised. Even though on-line learning has many advantages for learners especially such as flexibility and ubiquity, not all learners are equally successful in getting good achievement. While several factors have been studied for important factors of on-line learning such as contents, instructors, and learners, this study has focused on learners' learning behavioral perspectives. Because learners in on-line environment initiate, plan, and conduct their studies by themselves, learners' behavioral traits are particularly important. If they fail to study regularly, it leads to procrastination and bad achievement (You, 2016). Therefore, self-regulated learners' learning behavior have been studied identified as one of the most important factors in on-line learning (Ye and Pennisi, 2022; You, 2016).

The primary purpose of this study is to examine on-line learning behavioral indicators by LMS data and their effect on course achievement. The results revealed that frequency was the significant predictor of course achievement, but learning time was not. It means that frequent access to on-line lectures repeatedly provide more chances to have learning materials and leads to good achievement. Learning time, however, should be approached carefully with frequency. Some strange and funny phenomena were identified. Some students spent more than five hours even for 30-40 min lecture, which means that they just accessed to on-line lecture for checking attendance and did other irrelevant things to class. Therefore, it is necessary to prepare short and fun on-line video lectures and put some hidden way for checking attendance to avoid those happenings. The difference of device types also was not found to predict to course achievement. There is a drift towards mixing PC and mobile device to take on-line learning in higher education. On-line-lectures should be prepared and provided through not only PC and but also mobile devices without any problems.

Limitation and Suggestion

This paper has the originality and value in that it examines the on-line learning behaviors and their effect on course achievement by using LMS data. This study will help indicate how LMS data can be used enhance on-line learning effectiveness. However, it has some limitations. Further study should expand target samplings and use behavioral indicators more elaborately. For example, frequency should be counted dividing assigned period and after it and align with learning time. Frequency is a crucial for monitoring learners' consistency, completeness, enthusiasm, sincerity. Other self-regulated behavioral indicators also should be included for more sophisticated analysis such as checking whether students read posted information and download learning materials, counting interactive activities like created messages in the Q&A section and discussion board.

Acknowledgement

This paper is a revised and expanded version of a paper which presented at ICLEL 2022.

This work was supported by a research grant from Seoul Women's University (2022-0162).

References

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. *Sustainability*, 12(20), 8438. https://doi.org/10.3390/su12208438

Asarta C. J. and Schmidt J. R. (2012). Access Patterns of Online Materials in a Blended Course. Decision Sciences *Journal of Innovative Education*, 11(1), 107-123. https://doi.org/10.1111/j.1540-4609.2012.00366.x

Chang, D. F. and Chou, W. C. (2021). Detecting the Institutional Mediation of Push–Pull Factors on International Students' Satisfaction during the COVID-19 Pandemic. *Sustainability*, 13, 11405. https://doi.org/10.3390/su132011405

Driscoll, A., Jicha, K., Hunt, A. N., Tichavsky, L., & Thompson, G. (2012). Can online courses deliver in-class results?: A comparison of student performance and satisfaction in an online versus a face-to-face introductory sociology course. *Teaching Sociology*, 40(4), 312–331. https://doi.org/10.1177/0092055X12446624

Ghani S. K. (2019). *Role of Learning Management Systems for Formative Assessment in Higher Education*. Doctoral dissertation, University of Ottawa.

Hong S. Y. (2020). Teaching Reflection on the General Education Courses in Non-Face-to-face Environment Due to the Covid-19 Pandemic. *Korean Journal of General Education*, 14(6), 283-298, https://doi.org/10.46392/kjge.2020.14.6.283

Inan Karagul, B., Seker, M. & Aykut, C. (2020). Investigating Students' Digital Literacy Levels during Online Education Due to COVID-19 Pandemic. *Sustainability*, 13, 11878. https://doi.org/10.3390/su132111878

Jun B. H. (2021). A Study on the Learner's Satisfaction of on-line PBL classes in Korean College. *Cypriot Journal of Educational*

Science. 16(6), 3353-3362. https://doi.org/10.18844/cjes.v16i6.6382

Jun B. H. (2021). A Study on the Learner's Satisfaction of on-line Classes in Liberal Arts course – Focusing on on-line recorded video lecture. *Journal of the Korea Society of Digital Industry and Information Management*, 17(4), 197-207. https://doi.org/10.17662/ksdim.2021.17.4.197

Khan B. (2010). The Global e-learning framework.

Kim D. I., Lim J. E., Woo Y. J., Han D. S., Lee J. W. & Yun J. M. (2021). Components of Online Class Influencing the Effectiveness of Online Undergraduate Theory Classes. *CNU Journal of Educational Studies*, 42(2), 35-60. https://doi.org/10.18612/cnujes.2021.42.2.35

Lee H. D. and Nam M. W. (2018). The Analysis of Academic Achievement based on Spatio-Temporal Data Relate to e-Learning Patterns of University e-Learning Learners. *Journal of Convergence for Information Technology*, 8(4), 247-253, https://doi.org/10.22156/CS4SMB.2018.8.4.247

Lee Y. S. (2020). A study on the Correlation of between Online Learning Patterns and Learning Effects in the Non-face-to-face Learning Environment. *Korea Academy Industrial Cooperation Society*, 21(8), 557-562, https://doi.org/10.5762/KAIS.2020.21.8.557

Lee Y. S. and Shin D. K. (2020). An Investigation of the Implementation of Online Classes in the Untact Era Caused by the COVID-19 Pandemic. *The Journal of Curriculum and Evaluation*, 23(4), 39-57. https://doi.org/10.29221/jce.2020.23.4.39

Markova T. and Glazkova I. & Zaborova E. (2016). Quality issues of online distance learning. Procedia – Social and Behavioral Science, 237, 685-691. https://doi.org/10.1016/j.sbspro.2017.02.043

Muljana P. S. and Luo T. (2019). Factors contributing to student retention in online learning and recommended strategies for improvement: A systematic literature review. Journal of Information Technology Education: Research, 18, 19-57. https://doi.org/10.28945/4182.

Odeta GLUOKSNYTĖ and Colin WHITE (2022). Distance Learning: Methods and Factors for Effective Delivery of Educational Experience. *International Journal on Lifelong Education and Leadership*. 8(1). 1-21. https://doi.org/10.25233/ijlel.1096265

Park J. J. and Kim E. J. (2021). An Analysis of the Perception and Needs of Professors and Learners on the Online Classes: Focusing on the Case of P University. *The Journal of Educational Information and Media*. 27(1). 341-369. https://doi.org/10.15833/KAFEIAM.27.1.341

Seo Y. K., Kim S. Y., KO M. H., & Jun B. H. (2020). A Study on the Learner's Satisfaction of Untact On-line Classes in College. *Journal of the Korea Society of Digital Industry and Information Management*, 16(3), 83-94. http://dx.doi.org/10.17662/ksdim.2020.16.3.083

Sitzmann, T., Kraiger, K., Stewart, D., & Wisher, R. (2006). The comparative effectiveness of web-based and classroom instruction: A meta-analysis. *Personnel Psychology*, 59(3), 623–664. https://doi.org/10.1111/j.1744-6570.2006.00049.x

Sung J. H. and Kwon S. H. (2021). Comparison of students' perceptions of synchronous video conferencing lectures and asynchronous video-recorded lectures: Focusing on students' levels of concentration, understanding, and satisfaction. *Journal of Education and Culture*, 27(5), 239-267, https://doi.org/10.24159/joec.2021.27.5.239

Wang T., Lin C. L. & Su Y. S. (2021). Continuance Intention of University Students and Online Learning during the COVID-19 Pandemic: A Modified Expectation Confirmation Model Perspective. *Sustainability,* 13, 4586. https://doi.org/10.3390/su13084586

Y. S. Ye D. and Pennisi S. (2022). Using trace data to enhance Students' self-regulation: A learning analytics perspective. *The Internet and Higher Education*, 54, https://doi.org/10.1016/j.iheduc.2022.100855

You J. W. (2016). Identifying significant indicators using LMS data to predict course achievement in online learning, *The Internet and Higher Education*, 29, 23-30, http://dx.doi.org/10.1016/j.iheduc.2015.11.003