

Case Study of Continuous Activation of Students' Interest and Reflections in Large-Group Lectures

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Abstract: This study aimed to explore how text-mining can be utilized as a method for students to actively improve the knowledge and skills prerequisites for activities in large-group lectures as pre- and post-assignments. Additionally, through a practical study, the study clarifies how it is used effectively in some instances. A trial study in 2022 and a confirmatory study in 2023 were conducted for a large-group lecture on media theory. Interest in media was significant after a t-test, with correspondence between the starting and ending points. The results of the self-assessment by the students on a 5-point scale showed that "knowledge and skills" were above 4.0, and "thinking, judgment, and expression skills" were also close to 4.0. One of the comments on the lectures was as follows: "As feedback, it was useful to visualize the changes before and after the lecture."

Introduction

In large-group lectures, it is challenging to sustain the interests of undergraduate students and develop their specialty-related knowledge and skills. Active learning methods have been incorporated into large group lectures in higher education. Learning management systems (LMS) and e-portfolios have also been devised as lecture support systems. Previous studies on what is required to make learning activities effective in large-group lectures have pointed out the following: Jerez et al. (2021) identified five themes that emerged as conditions that facilitate the effectiveness of large-group learning activities: (1) student-teacher and student-student interaction, (2) implementation of active learning strategies, (3) classroom management, (4) students' motivation and commitment, and (5) the use of online teaching resources. McCoy et al. (2018) analyzed Learner-Centered Education (LCE) from the following five perspectives: (1) world relevance, (2) competency-based, (3) collaboration, (4) deliberating practices, and (5) technology/multimedia and found that the five-point review process of the lectures led to a curriculum inventory and prompted faculty to reach consensus, set goals, identify gaps in practice, and consider ways to improve instruction.

By referring to the findings of the previous studies mentioned above, we have attempted to design learner-centered learning activities by incorporating real-world, authentic topics for students, pair and group activities in face-to-face large-group lectures, and utilizing technology. However, although pair and group discussion activities in face-to-face and large-group lectures seemed to lead to active learning, the content discussed here was often not sufficiently deep.

Therefore, we decided to introduce text-mining as a new method. The research question was whether showing students the results of their learning each time using this method would make them aware of the learning trends and individual learning outcomes of all participants and have an effective impact on sustaining students' interest and reflecting on their learning.

The purpose of this study was to clarify how the educational method of incorporating time for students to visualize and perceive the changes in the whole class and individual students before and after a lecture using text-mining can change the level of participation, interest, learning outcomes, and depth of learning of students in large-group lectures.

Methods

The collaborators for this trial study were 251 second to fourth-year undergraduate students who participated in 15 lectures on media from April to July 2022. Based on the results of the trial study, a second study to confirm the teaching methods and examine the results of the improved methods was conducted in 15 lectures from April to July 2023 with 554 collaborators from second to fourth-year students. The purpose and objectives of this study were explained to the students, and the statements of the students who provided their consent were included in the analysis.

Regarding the procedures and methods of this study, the undergraduate students were required to read a pre-assignment on the basic concepts and analytical methods to be covered in the following lecture. At the beginning of the lecture, they were asked to answer a quiz on their understanding of them in writing using Google Forms. During the lecture, students were assigned to analyze media use using the expertise and basic knowledge explained in the pre-assignment materials. For example, "What are the differences between the layouts of print and digital newspapers? Take a case study, analyze it, and explain why" or "Compare the reliability of TV news and online news" will be assigned. Students were asked to discuss and think about this in pairs or groups. After the lecture, the students were asked to write what they thought about the lecture on LMS during the five-day post-assignment period. The quiz questions asked pre- and post-assignments were identical. Since the questions were descriptive and asked for explanations, the purpose was to confirm the depth of pre- and post-assignment for both teachers and students. A rubric with four gradations of figures was then presented to inform the students about what kind of description was an excellent reflection statement.

The pre-and post-assignment writing results were text-mined and shown to the students at the beginning of each lecture as a review of the previous session to show what changes had occurred. In this case, we decided that it would be appropriate to compare the "summary sentences" of the pre-assignment and post-assignment and present them to the students using an automatic summarization function that extracts sentences that contain many important words and are highly similar to other sentences. Therefore, we used UserLocal AI text-mining with this function (<https://textmining.userlocal.jp/>).

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Results

Pre- and post-lecture writing assignments, introduced as part of the design of teaching methods for large-group lectures, were reasonable for the students. Before 2021, the average number of characters in a student's post-assignment never exceeded 150, even though the student knew this was related to the evaluation. Table 1 shows the number of letters submitted for pre-assignments (posting to Google Forms within the lecture) and post-assignments (submission to LMS within five days after the end of the lecture) for lectures 2022 and 2023. The results of the 2022 trial survey and 2023 practice confirmed that students' participation in the lectures was maintained and developed as far as the results of the writing assignments were concerned.

Table 1. Number of words written by students for pre-assignments and post-assignments in 2022 and 2023

	2022 Answers to Pre Assignments														
	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	average
Contributor	226	220	214	219	213	223	216	219	217	217	221	216	215	215	218
Word count	15442	34149	24915	30993	35749	33041	27759	45148	42445	45055	39262	38919	31385	31353	33973
Number of characters	15500	34236	25202	31346	35772	33148	28053	45288	43411	45936	39331	39452	31797	31419	34278
Average number of characters	68.58	155.62	117.77	143.13	167.94	148.65	129.88	206.79	200.05	211.69	177.97	182.65	147.89	146.13	157.48
	2022 Answers to Post Assignments														
	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	average
Contributor	205	207	199	213	213	226	213	210	206	203	208	211	211	222	211
Word count	39455	40849	51098	50240	62071	56764	54496	54692	59553	66235	50607	56053	49019	97848	56356
Number of characters	39576	40908	51358	51281	62565	57018	54604	54903	60453	68743	50692	56707	49182	99098	56935
Average number of characters	193.05	197.62	258.08	240.76	293.73	252.29	256.36	261.44	293.46	338.64	243.71	268.75	233.09	446.39	269.81
	2023 Answers to Pre Assignments														
	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	average
Contributor	492	479	463	467	476	481	474	480	463	482	459	399	466	458	467
Word count	64227	88539	54928	81400	104281	93458	91573	89585	96860	94409	96766	101891	98527	105597	90146
Number of characters	64320	88767	55691	81146	105938	93750	94467	90943	99210	103116	99251	101925	101093	105701	91808
Average number of characters	130.73	185.32	120.28	173.76	222.56	194.91	199.30	189.46	214.28	213.93	216.23	255.45	216.94	230.79	197.42
	2023 Answers to Post Assignments														
	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	average
Contributor	443	440	370	433	443	431	399	427	426	439	439	416	431	443	427
Word count	95707	144883	108489	118186	126389	153936	162833	145942	137629	180453	167243	149596	168003	229107	149171
Number of characters	96140	145331	109256	118602	126731	154410	165686	147952	141760	189154	168078	150881	168517	232579	151077
Average number of characters	217.02	330.30	295.29	273.91	286.07	358.26	415.25	346.49	332.77	430.87	382.87	362.69	390.99	525.01	353.41

Next, we examined how large-group lecture teaching methods using text-mining in 2022 and 2023 affect students' grades (results), interests, and responses to the lecture self-assessments. The contents of the lectures handled before the improvement of this teaching method did not change. The students were asked about their interest in the lecture, "On a scale of 1 to 10, how high would you say your current media interest is?" at the first lecture as the "starting point," and at the 15th lecture, as the "endpoint." A

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comparison of the results is shown in Table 2. In all 14 sessions, except for the first session, 170 respondents from 251 registrants (68%) in 2022 and 370 respondents from 553 registrants (67%) in 2023 responded to pre- and post-assignments. Question items Q1-Q6 were asked on a 5-point scale, whereas Q7 and Q8 were rated on a 10-point scale.

As shown in Table 2, the means of the grades (results) in 2022 and 2023 were almost equal, and concerning interest, there was an increase at the endpoint relative to the starting point in both 2022 and 2023. Comparing 2022 and 2023, however, interest changed more from the starting point to the endpoint in 2022. In addition, the responses to self-assessment items Q1–Q6 were higher in 2022. However, the responses to self-assessment items Q7 and Q8 was higher by 2023.

Table 2. Comparison of 2022 and 2023 grades (results), interests, and self-assessment response

Year		Respondent (N)	Average	Standard deviation	Standard error of the mean
Results	2022	170	78.08	10.755	0.825
	2023	370	78.12	11.292	0.587
Starting Point Interests	2022	170	7.22	1.358	0.104
	2023	370	7.30	1.806	0.094
End point interests	2022	170	8.48	1.342	0.103
	2023	370	8.13	1.478	0.077
Q1. I have an understanding of what media literacy is.	2022	170	4.31	0.616	0.047
	2023	370	4.21	0.773	0.040
Q2. I have a good understanding of what is a media-specific method of expression	2022	170	4.36	0.675	0.052
	2023	370	4.17	0.728	0.038
Q3. I understand the process of media production.	2022	170	4.29	0.719	0.055
	2023	370	4.04	0.800	0.042
Q4. I can explain to others what media expression means to the receiver and the creator.	2022	170	3.94	0.830	0.064
	2023	370	3.97	0.844	0.044
Q5. I can explain the media's techniques of presentation in a way that is easy for others to understand and persuasive.	2022	170	3.91	0.842	0.065
	2023	370	3.94	0.827	0.043
Q6. I can explain why the process of media production requires certain procedures to be followed.	2022	170	3.99	0.810	0.062
	2023	370	3.89	0.830	0.043
Q7. How did I tackle your pre-assignment?	2022	170	7.82	1.434	0.110
	2023	370	8.04	1.513	0.079
Q8. How did I tackle the post-project issues?	2022	170	7.89	1.521	0.117
	2023	370	8.26	1.560	0.081

Interest in 2022 was significant ($t(169) = 10.538, p < 0.01, d = 1.350$) as a result of a t-test with correspondence between the starting and ending points. Interest in 2023 was significant ($t(369) = 8.328, p < 0.01, d = 1.929$) as a result of a t-test with correspondence between the starting and ending points.

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The results of the students on a 5-point scale showed that the results for knowledge and skills (Q1-Q3) were above 4.0, and for thinking, judgment, and expression skills (Q4-Q6) were close to 4.0.

The results of the free evaluation of the lectures in 2022 were as follows: 1) For feedback on assignments, it would be interesting to summarize the overall trends. 2) We hope you will continue to provide feedback. 3) It was good to know the opinions of various people on the bulletin boards. 4) The lecture using an analysis sheet was easy to understand. 5) I had had the chance to analyze, so I enjoyed it. (6) It is difficult to write.

In 2023, the following two questions were used to examine student acceptance of the course's teaching method, relating to interest and knowledge understanding: Q1. Which factors have positively influenced your interest in media representation techniques? Q2. What positively influenced your knowledge and understanding of media representation techniques?

Regarding Q1, 457 out of 553 registrants responded: 1: Time to analyze in lecture (10.3%), 2: Time to discuss in lecture (12.5%), 3: Topics covered in lecture (28.4%), 4: Materials shared in the LMS (12.3%), 5: Other students' writing in the LMS (post-assignment) (18.6%), 6: Own writing in the LMS (post-assignment) (7.7%), 7: Reflection on the previous lecture shown at the beginning of the lecture including talk of changes in learning before and after (2.8%), and 8: pre-assignment (6.6%), 9: other (0.8%).

Regarding Q2, 457 out of 553 registrants responded: 1: Time to analyze in lecture (11.4%), 2: Time to discuss in lecture (6.8%), 3: Topics covered in lecture (23.9%), 4: Materials shared in the LMS (17.3%), 5: Other students' writing in the LMS (post-assignment) (15.5%), 6: Own writing in the LMS (post-assignment) (9.6%), 7: Reflection on the previous lecture shown at the beginning of the lecture including talk of changes in learning before and after (7.4%), and 8: pre-assignment (7.7%), 9: other (0.4%).

These results indicate that ideas before and after the lecture using text-mining results as a teaching method in large-group lectures effectively encourages students to express their ideas in detail before and after lectures (as evidenced by the increased number of letters). It also effectively maintained and increased students' interest by the end of the lecture. It was found that presenting information on changes in expertise, views, and ideas before and after the lecture using text-mining results is meaningful regarding knowledge understanding.

Conclusion

The 2022 and 2023 efforts using text-mining were found to have the potential to be meaningful improvements in teaching methods, based on the "pre- and post-project description results," "interest change results," "learning outcome self-assessment results," and "class evaluation results."

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Concerning the description of reflections and the deepening of learning, the students' comments also showed the significance of using pre-assignments and enhancing analytical activities within the lectures and discussions, even with many students.

We also confirmed that the questions posed to the students (what topics were used and how they were asked to analyze them) impacted the students' interest and the activation of their thinking when asked to think in groups or pairs.

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