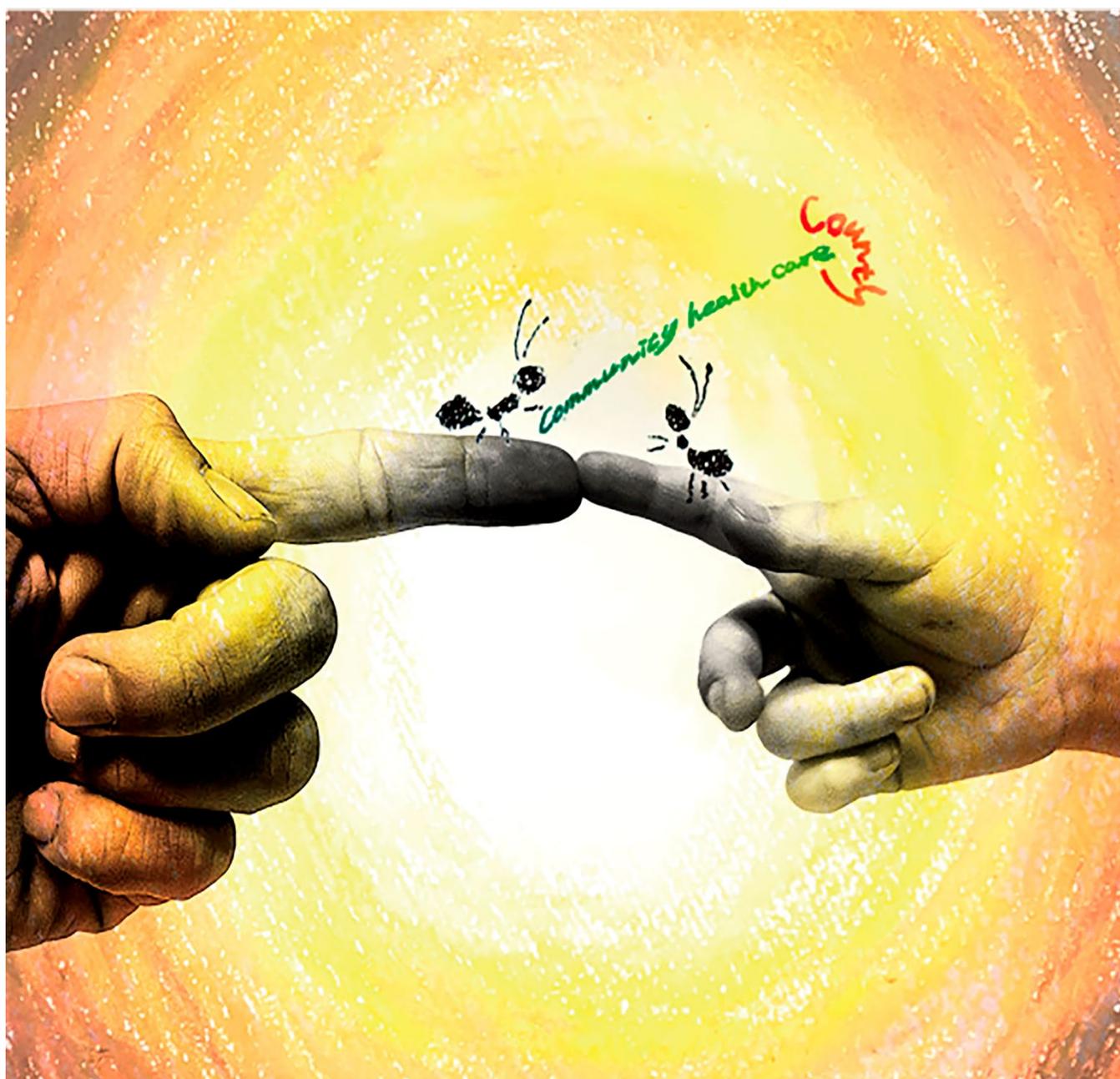


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ORIGINAL ARTICLE

The Verification of Reliability and Validity of Shimonoseki City University Lecturer Evaluation Scale (SLES)

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ABSTRACT

Lecturer evaluation by students is one of the methods that are likely to provide important information in evaluating the “quality” of education. However, the current situation is that it is being promoted without investigation of reliability and validity. The purpose of this study is to verify the reliability, content validity, and construct validity of Shimonoseki city university Lecturer Evaluation Scale (SLES), which is a lecturer evaluation by students. The subjects were 1,286 students in the freshman to senior of economics. SLES is a comprehensive scale can be applied to three types of lectures: face-to-face lecture, simultaneous bidirectional lecture, and on-demand lecture. The reliability was verified using Cronbach’s α coefficient, and construct validity was verified using structural equation modeling. As a result of the analysis, the reliability was 0.912 for the face-to-face type, 0.930 for the simultaneous bidirectional type, and 0.919 for the on-demand type. In terms of construct validity, a high degree of suitability was shown in all lecture form. This study suggests that SLES can be used effectively with undergraduate students.

< Key-words >

Lecturer evaluation, undergraduate students, reliability, content validity, construct validity

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I. Introduction

Since the 1990s, Japanese universities have been promoting university reforms, and in particular, lecturer evaluation by students have been introduced with the aim of improving higher education centering on bachelor's programs¹⁾. According by the Ministry of Education, Culture, Sports, Science and Technology, the number of universities that conduct lecturer evaluation by students in FY2016 was 720 universities, accounting for approximately 95% of the total number of universities in Japan²⁾. Lecturer evaluation by students is one of the evaluation methods that is highly likely to provide extremely important information in evaluating the "quality" of education. It is because by having the students who are actually taking the lecture evaluated directly, it becomes possible to know what bad things and good things in that class is³⁾.

However, as explained above, although lecturer evaluation by students has been introduced as one of the measures to improve quality of education, the evaluation systems generally has not been established, and the current situation is that no general methods or evaluation items can be seen³⁾. On the other hand, student evaluations are not welcomed by all lecturers, and the reason is that student evaluations are unreliable. It has also been pointed out that question about the validity of lecturer evaluation by students are often subjective and do not always reflect the results⁴⁾. Although the lecturer evaluation by students is often conducted without statistical investigation in universities, there are rarely reported that have investigated the reliability and validity of lecturer evaluation by students⁵⁾. Reliability and validity were confirmed as a result with 467 university students of a municipal liberal arts university, which has four faculties of economics, management, humanities, and law, evaluate the teaching of the lecturer. However, this result has not been evaluated for all students from freshman to senior, and the construct validity has not been evaluated⁵⁾.

In addition, the spread of the coronavirus disease 2019 (COVID-19) pandemic became prolonged and the remote classes using digital technology were actively utilized so that students can learn anywhere at any time in universities and technical colleges. Remote classes are courses for participants in distant locations using two-way communication systems⁶⁾. Few studies have investigated the reliability and validity of lecturer evaluations for remote classes^{7,8)}. A number of studies focusing on analyzing lecturer evaluation questionnaires in universities including those for course using e-learning, have been reported, but there have been reported to analyze questionnaires conducted in individual class⁹⁾.

Therefore, it is necessary to establish the usefulness as a scale by verifying reliability and validity of lecturer evaluation in the face-to-face but also the simultaneous bidirectional and the on-demand lectures. This study aims to verify the reliability and validity of Shimonoseki city university Lecturer Evaluation Scale (SLES).

II. Methods

1. Procedures & participants

Participants of this study were 1,286 undergraduate students from freshman to senior at Shimonoseki City University's Faculty of Economics. The students answered question form about the impressions of lecturer's teaching after the lecture. In order to prevent the spread of COVID-19 pandemic, all participants have answered by Google forms which is a web-based survey administration software included as part of the free, web-based Google Docs Editors suite offered by Google. The response period was from January 19 to January 29, 2021 for face-to-face lectures, January 19 to January 30, 2021 for simultaneous bidirectional lectures, and January 19 to January 29, 2021 for on-demand lectures. When students took multiple lecture forms, all taken lectures were answered.

2. Lecture Form

1) Face to face lecture

The lecturer carried out thorough infection control by alcohol disinfection and temperature measurement to reduce the risks for COVID-19 for all students who took the lecture. In addition, lecturers and students were obliged to wear masks during lectures, and a small number of face-to-face lectures were held, such as devising diversification by grouping.

2) Simultaneous bidirectional lecture

The lecturer communicated remotely with students using a cloud-based group video conferencing services provided by Zoom Video Communications, and students can take lectures at home using a computer or tablet.

3) On-demand lecture

The lecturer recorded the lecture content in advance using PowerPoint with audio. The students attend the lectures through the internet at any time and for anywhere during the course period.

3. Shimonoseki city university Lecturer Evaluation Scale (SLES)

SLES is a lecturer evaluation scale developed by the authors to improve the quality of education. SLES is a comprehensive scale that can evaluate three types of lectures: face-to-face lecture, simultaneous bidirectional lecture, and on-demand lecture. Each type of lectures consists of 10 items in three domains: "Overall satisfaction", "use of teaching materials" and "teaching methods". Participants are rated on a five-point scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The total score is 100 points, and the higher the score, the higher the rating for the lectures.

4. SLES process and statistical analyses

1) Collection of questions

The scale items were created according to the following procedures. Completed the scale by referring to the other lecturer evaluation scale conducted at 67 national and public universities where the Faculty of Economics is established in Japan excluding Shimonoseki City University^{10,11}.

2) Verification of content validity

For the verification of the content validity, the opinion investigation by interview was carried out for 2 teaching staffs of Shimonoseki City educational and research institute. One of teaching staff included those who had more than a decade of experience in scale development. In order to evaluate lecturer's teaching from the student's point of view, they asked whether domains and question items were appropriate, and they freely stated their opinions on the content of the question items and the notation of words. After that, 2 university students enrolled at Shimonoseki city university were asked to give answers, and they were also asked to freely state their opinions on the contents of question items and the notation of words.

3) Verification of reliability

The validation of the reliability examined the internal consistency by calculating the Cronbach α value. The α value was more than 0.7, it is considered highly reliable¹².

4) Verification of construct validity

Structural-equation modelling (SEM) is used to verify the construct validity of SLES. Comparative Fit Index (CFI), Tucker-Levis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) were used as goodness-of-fit for the SEM according to previous studies. When analyzed SEM, it is up to researcher's judgement to determine which goodness-of-fit indicators to focus on. Generally, it is a good model when two or more indicators including RMSEA meets the standard value¹³. The maximum likelihood method was used to estimate the parameters.

5) Statistical analysis

For descriptive statistics, the chi-square test was performed for the relationship between lecture types and academic year and sex, and one-way analysis of variance (ANOVA) was performed for the relationship between lecture types and the scale's domain score and overall score. All statistical analysis was used by IBM SPSS ver.25.0 and Amos ver.25.0.

III. Results

1. Summary of lecturer evaluation questionnaires at other universities

We unified the questionnaire items on the lecturer evaluation which is carried out at present in national and public universities, there was a tendency to be divided into four question types related to student itself, lecturer, teaching materials, and overall impression in face-to-face lecture, simultaneous bidirectional lecture and on-demand lecture (Tables 1 to 3).

<Table 1> Content of questionnaire on face-to-face lecture
conducted at national and public universities.

1. Questions related to students	Attendance, preparation and review, reasons for taking lecture, attitude to study, recommendations to juniors, achievement of study goals, degree of interest, what they learned the most, what they disappointed things, what they want to know it in future, and acquisition of new knowledge
2. Questions related to lecturer	Lecturer's teaching skills, feedback for questions and opinions of students, lecture time allocation, consideration for whisper, confirmation of student understanding, enthusiasm about teaching, communication with students, and promotion of learning motivation
3. Questions related to teaching materials	Appropriateness of using the letters and figures in teaching materials, appropriateness of handouts and textbooks, and understanding of board writing and presentations
4. Overall impression	Overall satisfaction, achievement of syllabus goals, amount of lecture content, adherence to lecture time, and preparation of lecture

<Table 2> Content of questionnaire on simultaneous bidirectional lecture conducted at national and public universities.

1. Questions related to students	Attendance, lecturer's preparation, ease-to-use video conferencing tools, and lecturer's handling mistakes video conferencing tools
2. Questions related to lecturer	Communication with students, tension about teaching, assignment presentation, building relationship of the study group, and response to students' physical and psychological stress
3. Questions related to teaching materials	Build-up of internet environment, use of video conferencing tools, support for information literacy, and appropriateness of screen sharing
4. Overall impression	Concentration on online lecture, desire to attend online lecture in the future, and overall satisfaction

<Table 3> Content of questionnaire on on-demand lecture conducted at national and public universities.

1. Questions related to students	Attendance, preparation and review, attitude to study, acquisition of new knowledge, degree of interest after the end of lecture, and attendance on-demand lecture in the future
2. Questions related to lecturer	Systematic content of lecture, lecturer's teaching way, lecturer's communication skills, and provision of lecture materials for ease-to-understand
3. Questions related to teaching materials	Defects in video and audio materials, and confirmation of typographical errors in teaching materials
4. Overall impression	Appropriateness of lecture progress, explanation of grade evaluation method, achievement of syllabus goals, understanding of learning goals, overall satisfaction

2. Demographic characteristics

Of the 1,286 students, 481 students responded (response rate 37.4%). In regard to the face-to-face, the sophomore was the most frequent (89.2%), and the freshman was the most frequent in the simultaneous bidirectional and on-demand (63.4%, 56.6%) ($p < 0.001$). In addition, male students accounted for more than 55% in all lecture types. There was no

significant difference between the score of the overall satisfaction and lecture types in three domains of the SLES, but also no relationship between the score of the use of teaching materials and lecture types. On the other hand, there was the significant difference between the score of the teaching methods and lecture types ($p < 0.001$). There was no significant difference between the total score of the SLES and the lecture types (Table 4).

<Table 4> Characteristics of the sample (n = 481)

	Face-to-face (n=139)	Simultaneous bidirectional (n=159)	On-demand (n=183)	p*
Grade, person (%)				
Freshman	0 (0.0)	90 (56.6)	116 (63.4)	
Sophomore	124 (89.2)	49 (30.8)	44 (24.0)	
Junior	12 (8.6)	19 (11.9)	15 (8.2)	<0.001
Senior†	3 (2.2)	1 (0.6)	7 (3.8)	
Other‡	0 (0.0)	0 (0.0)	1 (0.5)	
Sex, person (%)				
Male	77 (55.4)	92 (57.9)	104 (56.8)	
Female	61 (43.9)	67 (42.1)	79 (43.2)	0.628
Both	1 (0.7)	0 (0.0)	0 (0.0)	
lectures, n (%)				
Computer utilization I · II	139 (100)	0	0	
Introduction to Mathematics	0	62 (39.0)	0	
Literature B	0	48 (30.2)	0	
Mathematics for Liberal Arts B	0	49 (30.8)	0	
Psychology B	0	0	119 (65.0)	
Introduction to Internal Economics	0	0	64 (35.0)	
Overall satisfaction, score, mean (SD)	26.8 (3.5)	26.0 (4.5)	26.7 (4.2)	0.154
Use of teaching materials, score, mean (SD)	26.6 (4.0)	26.5 (4.2)	26.2 (3.8)	0.734
Teaching methods, score, mean (SD)	34.0 (6.4)	33.7 (6.5)	36.4 (5.1)	<0.001
Total score, mean (SD)	87.3 (12.8)	86.2 (14.0)	89.4 (11.8)	0.063

† Senior includes professional.

‡ Other means students who were course students and special auditing students.

* The Chi-square test was performed to determine every relationship between participants and lecture types and sex and lecture types. The one-way ANOVA was performed to determine every relationship between each domain and lecture types and total score and lecture types.

3. Content validity

As a result of examining the content validity, question items were revised. The scale distributed consisted of three domains were completed: "Overall satisfaction", "Use of teaching materials", and "teaching methods". In the domain of overall satisfaction, three question items were completed: "Q1. Was the lecture satisfactory overall?", "Q2. Was the lecturer teaching with sincerity?" and "Q3. Do you think the goals indicated in the syllabus were achieved?". In the domain of use of teaching materials, the following three questions were completed: "Q4. Did the textbooks and references properly used to understand the lecture content?", "Q5. Did the resumes and materials properly used to understand the lecture content?", and "Q6. Was it easy to read materials such as board writing and presentation such as PowerPoint?". In the domain of teaching methods, the following four question items were completed: "Q7. Was the lecturer's teaching speed appropriate?", "Q8. Were you able to communicate interactively between the lecturer and the student?", "Q9. Was the lecturer's teaching easy to understand?" and finally, "Q10. Was the lecturer's instruction and how to present the issues appropriate?".

4. Reliability

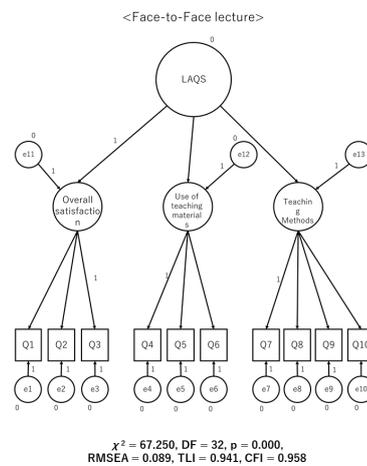
Table 5 shows the results of reliability. The Chronbach coefficient was very high more than 0.9 in all lecture forms of face-to-face, simultaneous bidirectional lecture, and on-demand. In regard to each domain, the overall satisfaction was 0.845, the use of teaching material was 0.782, and the teaching methods was 0.812 in the face-to-face lecture. In the simultaneous bidirectional lecture, the overall satisfaction was 0.836, the use of teaching material was 0.819, and the teaching methods was 0.854. In the on-demand lecture, the overall satisfaction was 0.837, the use of teaching material was 0.718, and teaching methods was 0.882 (Table 5).

<Table 5> The results of reliability in SLES

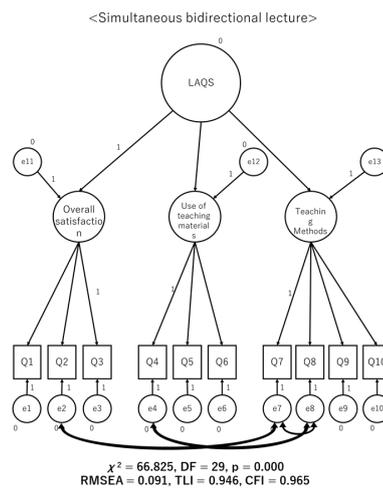
	Face-to-Face	Simultaneous bidirectional	On-demand
	α	α	α
Overall satisfaction (Q1~Q3)	0.845	0.836	0.837
Use of teaching materials (Q4~Q6)	0.782	0.819	0.718
Teaching methods (Q7~Q10)	0.812	0.854	0.882
Total	0.912	0.930	0.919

5. Construct validity

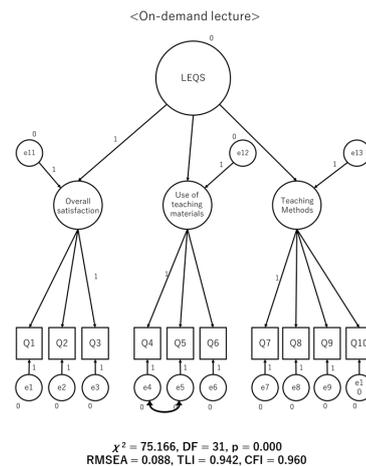
Figure 1 shows the results of the construct validity of the face-to-face lecture. Higher goodness-of-fit was shown in the 3 domains and 10 items ($\chi^2 = 67.250$; RMSEA= 0.089; TLI=0.941; and CFI= 0.958) (Figure 1). Figure 2 shows the results of verification of the simultaneous bidirectional lecture. Higher goodness-of-fit was also shown in the 3 domains and 10 items ($\chi^2= 66.825$; RMSEA= 0.091; TLI=0.942; and CFI= 0.960) (Figure 2). Figure 3 shows the results of the on-demand lecture. Higher goodness-of-fit was also shown in the 3 domains and 10 items ($\chi^2 = 75.166$; RMSEA= 0.088; TLI=0.942; and CFI= 0.960) (Figure 3).



<Figure 1> The construct validity of face-to-face lecture in SLES



<Figure 2> The construct validity of simultaneous lecture in SLES



<Figure 3> The construct validity of on-demand lecture in SLES

IV. Discussion

This study focuses on verifying the reliability and validity of SLES. As a result of the analysis, 3 domains and 10 question items of “overall satisfaction”, “use of teaching materials”, and “Teaching methods” were finally developed. In terms of the characteristics of the subjects, the students who responded were the most common in the sophomore students, and male students accounted for more than 55%. In addition, there was no relationship between all lecture forms and overall satisfaction and use of teaching materials, but there was a relationship between all lecture forms and teaching methods. There was no significant difference between the overall score of SLES and all lecture form.

To the best of our knowledge, this is the first study to evaluate the reliability and validity on the face-to-face lecture as the traditional form of lecture, and simultaneous bidirectional and on-demand lectures as online lecture. As a result of investigating the question items on the lecturer evaluation carried out in national public universities nationwide, there was a tendency to be divided into four: questions related to the students, questions related to lecturer, questions related to the teaching materials, and overall impressions. However, in this study, the lecturer evaluation is mainly conducted by students to evaluate the teaching of lecturers. Therefore, this study excludes questions related to students such as the status of students’ efforts, and focuses on the questions related to lecturer, the teaching materials and overall satisfaction. As a result of investigating the question item which is easy for students to answer through the confirmation of the content validity, 10 question items were summarized finally.

Regarding the reliability factor of SLES, it was 0.782 in the use of teaching materials which was the lowest in the face-to-face form, but it was more than 0.800 except for it. Regarding the simultaneous bidirectional form, the reliability coefficient was more than

0.800 in all domains. The reliability coefficient of use of teaching materials was 0.718 which was the lowest in the on-demand form, but it was more than 0.800 except for it. The reliability coefficient is more than 0.70, that means the scale is highly reliable¹²⁾. Therefore, SLES is considered to have been sufficiently reliable.

In this study, the fit of models investigated using chi-square, CFI, TLI, and RMSEA indices by the authors. The RMSEA of the models in the face-to-face form, the simultaneous bidirectional form, and on-demand form were 0.089, 0.091, and 0.088. RMSEA was interpreted as inappropriate if it had to be greater than or equal to 0.1¹¹⁾. RMSEA were found to be acceptable in all lecture form. In summary, the construct validity was verified in the face-to-face form.

On the other hand, construct validity was verified by using structural equation modeling for simultaneous bidirectional and on-demand lecturer evaluation for all university students. This study can contribute to a few studies on the validity of online lectures. This study also used Google Form for COVID-19 control. There are very few reports that students who are dislike in dealing with computers are inconvenient to evaluate online lecture, and that students' self-reports on online issues are not associated with the performance score. However, in this study, the reliability and validity were confirmed by conducting the lecturer evaluation by the on-line system.

This study has several limitations. First, the results of this study selected a few lectures among all faculty lectures and assessed the scales. In particular, there is a critical selective bias in the results of these reliability and validity. Secondly, the study is a test survey to verify the reliability and validity of SLES and therefore is not common for all outcomes. Due to the nature of testing and research, there are definitive limitations in subjects and outcome analyses. More sample sizes and longer-term surveys will be needed in the future. In the final third, this study evaluates lectures based on subjective perception of students and does not perform objective lecture evaluations. In the future, after ensuring the confidentiality of students' responses, it will be necessary to conduct objective lecture evaluations such as performance score. Nevertheless, in this study, lecturer evaluation was carried out from the first year to the fourth year, and high reliability and validity were able to be secured. This means that despite the different attitudes and attitudes to study in different years, the reliability and validity of the scales are verified and effective.

V. Conclusion

This study suggest that can verify the reliability, content validity, and construct validity of SLES in the face-to-face but also the simultaneous bidirectional and the on-demand lectures. Further investigation with large samples with larger sample size is recommended.

Acknowledgements

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