# Reliability analysis of the learning effectiveness scale in team-teaching for engineering courses in Universiti Teknikal Malaysia Melaka (UTeM)

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**Keywords**: Team-Teaching; Learning Effectiveness; Pearson's Correlation

**ABSTRACT** –This paper presents the reliability analysis of the Learning Effectiveness scale to evaluate the effectiveness of the teaching team in disseminating knowledge to engineering undergraduates. The Learning Effectiveness scale was developed and distributed to various undergraduate engineering students through three different courses. A Pearson's correlation is used to determine the strength and direction of a linear relationship of the Likert-items in the scale. Significant correlation was found for all the items. Participants believed that the satisfaction of overall learning experience were attributed to the varied knowledge and experience of the teaching team.

## 1. INTRODUCTION

The quality of teaching technique in higher education largely influences the student's learning experience. Innovation in teaching method are explored extensively to improve the quality of teaching. One common practice is utilizing 'team-teaching'. The innovation of teaching practice known as team-teaching technique was proposed as early as in 1957 in elementary school [1]. The implementation of this teaching technique encompasses a variety of requirements involving not only from the teacher's perspective but also the students' experience and the effectiveness towards the learning experience.

A large and growing body of literature has broadly explained the term 'team-teaching'. Money and Coughlan summarized that in the existing literature [2], the term 'team teaching' can broadly be associated with one of three forms: (1) simultaneously taught content which involves two or more academic practitioners present during each session (*co-teaching approach*); (2) one academic practitioner being present in each session, but taking it in turns to deliver sessions between two or more people over the duration of the course (*tag rotation approach*); and (3) a combination these two models (*hybrid approach*).

The tag rotation approach (TRA) outlines that the academics should have the ability to align the content delivery as close to the academics' expertise and existing knowledge base. Thus, the gap between the academics can be minimized and giving more benefits to the students. TRA appeals to the academics in higher education because it can enrich the knowledge base and help to minimize the time constraint that they have to fulfil other academic obligations.

Previously, the effectiveness of the team-teaching technique was conducted in a large undergraduate class of social sciences [3]. However, reported studies on assessing the effectiveness of team-teaching approach for engineering courses are very limited. Thus, this paper proposed the reliability analysis of learning effectiveness scale to evaluate team-teaching method for engineering courses in UTeM.

In this work, only the learning experience was used as a dependent parameter to the learning effectiveness of team-teaching. The online survey is distributed to UTeM undergraduates enrolling in three team-taught engineering courses. The finding of this study helps to interpret the learning effectiveness of the team teaching method in engineering courses.

## 2. METHODOLOGY

An online form was created to enable participants to log on and answer the survey. The "Learning Effectiveness" scale is comprised of five Likert-Item Questions as tabulated in Table 1. The rating scale is ranged from 1 to 5; 1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree [4].

The participants were recruited from three team-taught engineering courses which are BMFB 3233-Material Selection, BEKC 4753- PLC & Automation and BEKU 2333-Electric Circuit 2. In each of the courses, more than one lecturer delivered the content of the courses according to the topics stated in the respective syllabus for 14 weeks of academic teaching semester.

A total of 111 from 327 students participate in this survey. This sample assured that the result of the analysis will be accurate within 7.38 percentage points at 95% confidence level according to the calculation presented by Kadam and Bhalerao [5].

A Pearson's product-moment correlation is used to determine the strength and direction of a linear relationship between each Likert-item to the outcome of the Learning Effectiveness scale. Each Likert-item score is combined into a single composite score to provide a quantitative measure for the Learning Effectiveness scale. The Likert response items are then analysed based on its central tendency (median) and variability (frequency) [6]. Then, a Pearson's correlation is evaluated for each pair of the item and its corresponding scale rating.

Table 1 Learning effectiveness Likert-scale

| Item | Description | Rating Scale | | | | |
|---|---|---|---|---|---|---|
| 1 | The different lecturers deliver the content with their personal and work experience, thus increases the varied knowledge. | 1 | 2 | 3 | 4 | 5 |
| 2 | I understood the subject better because it was team-taught | 1 | 2 | 3 | 4 | 5 |
| 3 | I prefer team-teaching style than having only one lecturer for this subject | 1 | 2 | 3 | 4 | 5 |
| 4 | I hope team-teaching style is also introduced to other subjects | 1 | 2 | 3 | 4 | 5 |
| 5 | Overall, I was satisfied with my learning experience | 1 | 2 | 3 | 4 | 5 |

## 3. RESULTS

Table 2 presents the result of the correlation analysis. It is evident that all of the statements (Likert Items) are strongly correlated with the scores of learning effectiveness scale with highly significant results. All of the items were strongly associated with the outcome of the scale and can be used to define the learning effectiveness in the team-taught courses.

Table 2 Pearson's correlation for Likert items to the learning effectiveness scale

| Item | Pearson's Correlation | Median | Frequency |
|---|---|---|---|
| 1 | 0.724* | 4 (Agree) | 66 (59.5%) |
| 2 | 0.860* | 3 (Neutral) | 46 (41.4%) |
| 3 | 0.819* | 3 (Neutral) | 50 (45.0%) |
| 4 | 0.823* | 3 (Neutral) | 47 (42.3%) |
| 5 | 0.733* | 4 (Agree) | 65 (58.6%) |

* Correlation is significant at the 0.01 level (2-tailed test).

Item 1 focuses on the different experiences possessed by the teaching team. The participants in this study agreed that the variation of the teaching team's experiences enhanced the knowledge that they had for these courses. Previous study in a marketing course for large undergraduates also obtained similar result [3].

However, they were significantly neutral in Item 2, 3 and 4 on the learning effectiveness scale. Based on the response of Item 2 and 3, it could be deduced that, in terms of the understanding of the course, the participants were indifferent whether the courses are delivered through team-teaching or individual teaching. Money and Coughlan in their study [2], pointed out that the team-taught style has the advantages of better insight while the individual teaching style has the advantages of being consistent, familiar and continuous. However, in this study, the benefit of better insight was not justified due to these neutral responses.

Moreover, the participants were also impartial in terms of adopting the team-taught style for other courses as evident in the result of Item 4. This showed that the participants may not able to weigh in the benefit of the team-taught style for other courses.

Surprisingly, for Item 5 which related to the overall learning experience, the participants agreed that they were satisfied. Therefore, it can be concluded that their satisfaction in learning experience may stem from better insights in their knowledge earned as specified by Item 1. This warrants further studies to find the traits that composes a good teaching team.

## 4. CONCLUSION

In this study, the reliability of the learning effectiveness scale was evaluated. This study indicates that all the items have high correlation to the outcome of the scale. Therefore, it can be used to define the learning effectiveness in the team-taught courses. The results showed that the learning effectiveness scale is applicable to deduce the learning experience of engineering undergraduate students that were taught using team teaching. The finding also suggests that further study should be conducted to investigate the composition of a good teaching team to harness the advantage of having a better insight throughout their learning experience.

## 5. ACKNOWLEDGEMENT

This work was performed under the financial support from Universiti Teknikal Malaysia Melaka through short term grant, PJP/2018/FKE(7D).

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