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Planning a Course: Lecturers' Understanding of Design Components in Constructive Alignment

Intan Afida[1*], Rozana Ismail[2], Raja Putri Melissa Raja Mustaffa[3], Husna Hafiza R. Azami[3]
1. Department of Geomatics and Built Environment, School of Professional and Continuing Education, UTMSPACE, Kuala Lumpur, Malaysia
2. Department of Computer Science and Services, School of Professional and Continuing Education, UTMSPACE, Kuala Lumpur, Malaysia
3. Department of Engineering, School of Professional and Continuing Education, UTMSPACE, Kuala Lumpur, Malaysia

Abstract
The purpose of this study is to assess the lecturers' understanding of design components in constructive alignment. The design components are the intended learning outcomes, teaching methods, and assessment methods. For intended learning outcomes, the lecturers' understanding of programme learning outcomes, graduate attributes, and learning taxonomy domains are assessed. For the teaching and assessment methods, the lecturers' understanding are assessed for each learning taxonomy domain. A survey method was used in this study. The data were collected by using online questionnaires from 61 lecturers at one of the public universities in Malaysia. Data were analysed using descriptive statistics such as frequency, percentage, and inferential statistics, namely Kruskal-Wallis Test. This study found that the majority of lecturers had a good understanding of programme learning outcomes; a fair understanding of graduate attributes; a fair understanding and a good understanding of Bloom's cognitive domain; and a low understanding of Simpson's psychomotor domain and Krathwohl's affective domain. There are elements of design components in constructive alignment that have significant differences in terms of the level of understanding according to lecturers' teaching experience. Nevertheless, some elements have no significant difference in terms of the level of understanding according to lecturers' teaching experience. This study provides an opportunity for the faculty and university to take appropriate measures to enhance the lecturers' understanding of the design components in constructive alignment in the future. This study has contributed to the research literature on the topic in the world generally and Malaysia specifically.
Keywords: Constructive alignment, Graduate attributes, Learning taxonomy, Outcome-based education, Programme learning outcomes
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1. Introduction

Outcome-based education (OBE) is an approach that emphasises student-centered learning (Basavaiah *et al*., 2021). All intended learning outcomes (ILOs) planned at the university, programmes, or courses level will place students as the axis of planning (Biggs & Tang 2011). All these ILOs need to be aligned to ensure connectivity and complement each other at all levels. The ILOs will focus on the knowledge and skills that each student needs to master at the end of their learning at the university (Biggs & Tang 2015). With OBE, the university will be able to produce holistic students in terms of knowledge achievement, motor skills, and attitudes (Mohayidin *et al*. 2008).

OBE and constructive alignment (CA) are inseparable. By aligning teaching and assessment methods to ILOs for each course, lecturers and students will be able to systematically know the teaching and learning process that will apply to the course (Ali 2018). CA is designed to support students' deep learning (Wang *et al*. 2013). Students become more responsible and strive to take the initiative in their learning (Kaliannan & Chandran 2012), while lecturers act as facilitators to students in providing an encouraging learning environment (Dames 2012). With CA, both lecturers and students can give the best focus and commitment in the teaching and learning process. Lecturers can figure out how to plan their respective courses systematically and focusedly (Zakaria *et al*. 2020). Students can know the actions that need to be taken and as well as they need to take such action to ensure that each ILOs is achieved either at the end of learning a course or at the end of the programme (Biggs & Tang 2011).

1.1 Problem Statement

The knowledge of how to align all the design components namely ILOs, teaching methods, and assessment methods needs to be understood and mastered by all lecturers in the university. A well-planned course will provide a more effective teaching and learning experiences for lecturers and students. (Hailikari *et al.* 2021).
Generally, there are many studies on how the implementation of the CA in teaching and learning is either at the

university level (Aaltonen 2021; Lasrado & Kaul 2020; Ruge *et al.* 2019; Thian *et al.* 2018), lecturers or academic staffs level (Alfauzan & Tarchouna 2017; Jideani & Jideani 2012; Pretorius *et al.* 2013; Simper 2020), and students level (Angel 2021; Hailikari *et al.* 2021; Jaiswal 2019; Zakaria *et al.* 2020).

However, studies on the level of understanding of lecturers on the design components in CA have yet to receive significant attention from academic scholars. A thorough understanding of each element consideration in designing ILOs at the course level, namely the programme learning outcomes (PLOs), graduate attributes (GAs), and learning taxonomy domains is essential for a lecturer. The understanding of how to align teaching methods and assessment methods with ILOs also needs to be mastered by lecturers. A good comprehension of all these will help lecturers plan their respective courses effectively so that students can enjoy a more transparent and meaningful learning experience.

1.2 Significance of the study

This study is to assess the level of understanding of the lecturer on the design component in CA. All design components are crucial to be understood by lecturers to ensure that they can plan their courses by implementing the OBE effectively. The findings of this study will provide insights to the faculty and the university on the extent of the lecturers' level of understanding of design components in CA. The findings of this study will also assist the faculty and university to plan appropriate courses and workshops related to design components in CA and OBE to strengthen the lecturers' understanding, thus improving the teaching and learning process in the classroom. In addition, the results of this study will open up opportunities for the faculty and university to develop teaching and learning tools to facilitate lecturers in exploring all the design components in CA in more detail in the future.

2. Literature review

2.1 Constructive alignment (CA)

CA is an outcome-based approach in teaching where intended learning outcomes are designed first before the teaching and assessment methods are designed to ensure the achievement of ILOs by each student at the end of learning a course (Biggs 2014). With CA, students have the optimal opportunity to learn and know how well they are doing for what they have learn (Biggs & Tang 2011). CA consists of two main aspects. The first aspect is 'constructive' which means students will construct their meaning or understand something they learn through learning activities conducted (Biggs 2003). Therefore, well-designed learning activities by lecturers are essential to enable students to have accurate and correct meanings about what is learned. To achieve effective learning, lecturers need to ensure that students are involved in all planned learning activities for each course (Shuell 1986; Hartikainen *et al.* 2019). Effective teaching will be a catalyst to gaining students' highest level of understanding and the knowledge learned will be remembered for a long time.

The second aspect is ‘alignment’ which means alignment between all components that can support an effective learning environment and experiences for students (Biggs 2003). The components that need to be well-aligned are ILOs, teaching methods and assessment methods (Biggs & Tang 2011; Hall 2002). Teaching methods and assessment methods need to be planned well to help towards the achievement of ILOs for a course (Reeves 2006; Sewagegn 2020).

2.2 Design components in constructive alignment

There are three design components in constructive alignment, namely ILOs, teaching methods, and assessment methods. ILOs are written statements that indicate the performance that every student needs to achieve in terms of knowledge and skills after undergoing teaching and learning experiences (Biggs & Tang 2015). Teaching methods are the teaching and learning activities used in a course to enable students to acquire effective learning experiences in order to achieve the established ILOs (Biggs & Tang 2011). The selection of teaching methods is dependent on the ILOs designed for each course (Bakhru 2018; Patel & Moxham 2008).

Assessment methods are assessment tasks performed by students throughout the course to enable lecturers to measure their achievements for each ILO (Mekonen & Fitiavana 2021). There are two types of assessment that can be used to measure students' achievement which are formative assessment and summative assessment (Bacquet 2020). Each of the assessment methods used will have an assessment criteria to enable students’ achievement to be measured accurately (Lawrence 2019).

According to Biggs & Tang (2011), there are three levels of ILOs. The first level is the university ILO known as graduate outcomes or GAs, the second level is the programme ILO known as PLOs, and the third level is the course ILO known as CLOs. All ILOs need to be aligned with each other. PLOs need to be aligned with GAs and CLOs need to be aligned with PLOs (Biggs & Tang 2011). GAs are statements on the quality of students that a university wish to produce in terms of self-skills (Oliver & de St Jorre 2018). PLOs are statements on the quality of students that a programme wish to produce in terms of knowledge and skills (Nasrallah 2014). CLOs are statements on the level of knowledge and skills that need to be mastered by students at the end of

learning a course (Keshavarz 2011). The well-designed CLOs will allow students to know the actions that need to be taken and how far they need to take such action to achieve the prescribed CLOs (Biggs & Tang 2011).

Lecturers need to have detailed knowledge of PLOs, GAs, and learning taxonomies in order for CLOs to be well prepared for each course (Biggs 2014). There are three learning taxonomy domains which are cognitive, psychomotor, and affective. The cognitive domain involves knowledge and intellectual skills (Anderson *et al*. 2014), the psychomotor domain involves physical movement and motor skills (Simpson 1966), and the affective domain involves attitudes, feelings, and emotions (Geisert 1972). A detailed understanding of these three learning taxonomy domains is a challenge to many lecturers around the world (Martin & Reigeluth 1999).

Lecturers need to have an in-depth understanding of these three learning taxonomy domains in terms of taxonomy levels, taxonomy categories, illustrative verbs for each taxonomy level, appropriate teaching and assessment methods for each taxonomy level (Anderson *et al*. 2014; Geisert 1972; Kennedy 2006; Simpson 1966). This is to ensure that CLOs can be designed comprehensively (Keshavarz 2011), the teaching methods used can help provide meaningful learning experiences for CLOs achievement (Bourner 1997), and the assessment methods used can assess the students' mastery of knowledge and skills accurately for each established CLOs (Kasilingam *et al.* 2014).

Knowledge of learning taxonomies is essential for lecturers in determining the illustrative verbs to be used in a CLO (Biggs & Tang 2010). Illustrative verbs used in CLOs will show the level of performance that students need to achieve at the end of the learning of each course (Biggs & Tang 2011). The results of the students' achievements throughout the course will enable lecturers and students to know the extent of the student's mastery of knowledge and skills (Harden 2007). Students will be able to continuously improve their way of learning while lecturers will be able to enhance their courses if necessary in terms of course content, teaching methods, and assessment methods used (Sikander *et al.* 2017). This is to strengthen the course as a whole and enhance the quality of teaching and learning of both lecturers and students.

3. Research methodology

3.1 Survey instrument

A structured questionnaire provided in the Google Form was utilised in this study. Part A of the questionnaire is about lecturers' profiles and Part B is about lecturers' understanding of design components in CA. Part A consists of multiple-choice questions and Part B consists of Likert scale questions using five points where 1 = very low understanding; 2 = below average understanding; 3 = average understanding; 4 = above average understanding; and 5 = very high understanding. Cronbach's Alpha Values were calculated to ensure the reliability of the Likert scale questions used in the questionnaire. The alpha value obtained is within 0.93 to 0.95 which is considered very good (George & Mallery 2016). These indicate that the questions provided reliably measure all design components in CA consistently.

3.2 Data collection

The data were collected through an online survey. Lecturers have been invited to answer this questionnaire via email and Whatsapp. Lecturers have been informed of the study objectives, the declaration of the intended use of the information given in the questionnaire, and the estimated time duration to complete the questionnaire. Lecturers were given three days to complete the questionnaires. This survey was conducted anonymously to enhance lecturers' confidence to answer all questions honestly.

3.3 Samples

A total of 61 lecturers from one of the public universities in Malaysia participated in this study. The lecturers who participated in the study consisted of lecturers from the engineering and non-engineering department. There are three categories of lecturers' teaching experience which are below 5 years, 5 to 10 years, and more than 10 years.

3.4 Data analysis

Data were analysed using IBM SPSS Statistics version 27. Descriptive statistics, namely frequency, percentage and inferential statistics, namely Kruskal-Wallis Test were used in this study.

4. Results and discussion

4.1 Lecturers' profiles

The findings revealed out of 61 lecturers who participated in this study 44 (72.1%) were female lecturers and 17 (27.9%) were male lecturers. A total of 40 (65.6%) were lecturers from the non-engineering department and 21 (34.4%) were lecturers from the engineering department. In terms of post at the faculty, 22 (36.1%) each were academic executives and lecturers while another 17 (27.8%) were senior lecturers. A total of 28 (45.9%) lecturers had a teaching experience for below 5 years, 24 (39.3%) lecturers had teaching experience for more

than 10 years, and another 9 (14.8%) lecturers had teaching experience between 5 and 10 years (refer Table 1).

Table 1: Lecturers' profiles

Variables	***f***	**%**
Gender		
Male	17	27.9
Female	44	72.1
Department		
Engineering	21	34.4
Non-engineering	40	65.6
Designation		
Academic executive	22	36.1
Lecturer	22	36.1
Senior lecturer	17	27.8
Teaching experience		
Below 5 years	28	45.9
5 to 10 years	9	14.8
More than 10 years	24	39.3

n=61

4.2 Lecturers' understanding of design components in constructive alignment

There are three design components in CA, namely the ILOs, teaching methods, and assessment methods. For ILOs, the lecturers' understanding of PLOs, GAs, and learning taxonomy domains (Bloom's cognitive domain, Simpson's psychomotor domain, and Krathwohl's affective domain) are assessed. For the teaching and assessment methods, the lecturers' understanding are assessed for each learning taxonomy domain.

There are three categories of lecturers' understanding, namely low understanding, fair understanding, and good understanding. Low understanding consists of very low understanding and below average understanding responses. Fair understanding consists of average understanding responses. Good understanding consists of above average understanding and very high understanding responses.

4.2.1 Programme learning outcomes (PLOs)

There were four elements related to PLOs assessed in this study. The PLO descriptions according to Malaysian Qualifications Framework (MQF) 2.0, the skill types for each PLO, the taxonomy levels for each PLO, and the GAs for each PLO. Overall, the majority of lecturers have a good understanding for three elements assessed related to PLOs which are the skill types for each PLO, the taxonomy levels for each PLO, and the GAs for each PLO. The results are shown according to the category of lecturers' teaching experience in Table 2.

Table 2: PLOs understanding according to lecturers' teaching experience

Programme learning outcomes (PLOs)	**Lecturers' level of understanding**	**Teaching experience**			
		Below 5 years (%)	**5 to 10 years (%)**	**More than 10 years (%)**	**Total (%)**
PLO descriptions according to Malaysian Qualifications Framework 2.0	Low understanding	6.6	0.0	0.0	6.6
	Fair understanding	27.9	6.6	13.1	47.6
	Good understanding	11.5	8.2	26.2	45.9
Skill types for each PLO	Low understanding	8.2	1.6	0.0	9.8
	Fair understanding	19.7	3.3	14.8	37.8
	Good understanding	18.0	9.8	24.6	52.4
Taxonomy levels for each PLO	Low understanding	13.1	1.6	0.0	14.7
	Fair understanding	18.0	3.3	14.8	36.1
	Good understanding	14.8	9.9	24.6	49.3
GAs for each PLO	Low understanding	14.7	0.0	0.0	14.7
	Fair understanding	18.0	8.2	16.4	42.6
	Good understanding	13.1	6.6	22.9	42.6

n=61

The majority of 29 (47.6%) lecturers had a fair understanding, followed by 28 (45.9%) lecturers had a good understanding, and 4 (6.6%) lecturers had a low understanding of the *PLO descriptions according to* the *Malaysian Qualifications Framework 2.0*. The majority of 32 (52.4%) lecturers had a good understanding, 23 (37.8%) lecturers had a fair understanding, and the remaining 6 (9.8%) lecturers had a low understanding of the *skill types for each PLO* (refer Table 2).

The majority of 30 (49.3%) lecturers had a good understanding, 22 (36.1%) lecturers had a fair understanding, and 9 (14.7%) lecturers had a low understanding of the *taxonomy levels for each PLO*. A total of 26 (42.6%) lecturers each had a fair and a good understanding, and another 9 (14.7%) lecturers had a low understanding of the *GAs for each PLO* (refer Table 2). As shown in Table 2, none of the lecturers with teaching experience of more than 10 years had a low understanding of all four elements assessed. Some lecturers with teaching experience below 5 years had a low understanding of the four elements assessed in this study.

The results from the Kruskal-Wallis Test showed significant differences in the lecturers' understanding according to the teaching experience for all four elements assessed (refer Table 3).

Table 3: Significant differences in lecturers' understanding of PLOs according to the teaching experience

Programme learning outcomes (PLOs)	**n**	**Mean rank**	**df**	**Chi-square**	***p***
PLO descriptions according to Malaysian Qualifications Framework 2.0					
Below 5 years	28	23.14	2	12.151	.002
5 to 10 years	9	36.56			
More than 10 years	24	38.08			
Skills types for each PLO					
Below 5 years	28	25.04	2	6.916	.031
5 to 10 years	9	38.06			
More than 10 years	24	35.31			
Taxonomy levels for each PLO					
Below 5 years	28	23.61	2	10.855	.004
5 to 10 years	9	41.17			
More than 10 years	24	35.81			
GA for each PLO					
Below 5 years	28	23.59	2	10.353	.006
5 to 10 years	9	35.83			
More than 10 years	24	37.83			

n=61

4.2.2 Graduate attributes (GAs)

There was only one element related to GAs assessed in this study, *GA descriptions*. The results are shown according to the category of lecturers' teaching experience in Table 4.

Table 4: GAs understanding according to lecturers' teaching experience

Graduate attributes (GAs)	**Lecturers' level of understanding**	**Teaching experience**			
		Below 5 years (%)	**5 to 10 years (%)**	**More than 10 years (%)**	**Total (%)**
GA descriptions	Low understanding	19.7	0.0	1.6	21.3
	Fair understanding	21.3	9.8	19.7	50.8
	Good understanding	4.9	4.9	18.1	27.9

n=61

The majority of 31 (50.8%) lecturers had a fair understanding, 17 (27.9%) lecturers had a good understanding, and 13 (21.3%) lecturers had a low understanding of this element. As shown in Table 4, there were lecturers with teaching experience of more than 10 years who had a low understanding and there were lecturers with teaching experience below 5 years who had a good understanding of this element.

The results of the Kruskal-Wallis Test showed significant difference in terms of lecturers' understanding according to the teaching experience of the element assessed (refer Table 5).

Table 5: Significant differences in lecturers' understanding of GAs according to the teaching experience

Graduate attributes (GAs)	**n**	**Mean rank**	**df**	**Chi-square**	***p***
GA descriptions					
Below 5 years	28	22.00	2	15.863	.000
5 to 10 years	9	36.67			
More than 10 years	24	39.38			

n = 61

4.2.3 Learning taxonomy – Bloom's cognitive domain

There were five elements related to Bloom's cognitive domain assessed in this study. The description of six levels of taxonomy, the description of 19 categories of taxonomy, the illustrative verbs for each level of taxonomy, the appropriate teaching methods for each level of taxonomy, and the appropriate assessment methods for each level of taxonomy. Overall, the majority of lecturers had a good understanding of only two of the five elements assessed, namely the *description of six levels of taxonomy* and *appropriate teaching methods*

for each level of taxonomy. The results are shown according to the category of lecturers' teaching experience in Table 6.

Table 6: Bloom's cognitive domain understanding according to lecturers' teaching experience

Bloom's cognitive domain	**Lecturers' level of understanding**	**Teaching experience**			
		Below 5 years (%)	**5 to 10 years (%)**	**More than 10 years (%)**	**Total (%)**
Description of 6 levels	Low understanding	8.2	0.0	1.6	9.8
	Fair understanding	26.2	3.3	9.8	39.3
	Good understanding	11.4	11.4	27.8	50.6
Description of 19 categories	Low understanding	26.2	3.3	16.4	45.9
	Fair understanding	9.8	1.6	8.2	19.6
	Good understanding	9.8	9.8	14.8	34.4
Illustrative verbs	Low understanding	19.6	0.0	0.0	19.6
	Fair understanding	13.2	4.9	23.0	41.1
	Good understanding	13.2	9.8	16.5	39.5
Appropriate teaching methods	Low understanding	19.7	3.2	6.6	29.5
	Fair understanding	14.8	1.6	18.0	34.4
	Good understanding	11.5	9.8	14.8	36.1
Appropriate assessment methods	Low understanding	19.6	3.2	6.6	29.4
	Fair understanding	14.8	3.3	19.7	37.8
	Good understanding	11.5	8.2	13.1	32.8

n = 61

The majority of 31 (50.6%) lecturers had a good understanding, 24 (39.3%) lecturers had a fair understanding, and 6 (9.8%) lecturers had a low understanding of the *description of six levels of taxonomy*. The majority of 28 (45.9%) lecturers had a low understanding, 21 (34.4%) lecturers had a good understanding, and 12 (19.6%) lecturers had a fair understanding of the *description of 19 categories of taxonomy* (refer Table 6).

The majority of 25 (41.1%) lecturers had a fair understanding, 24 (39.5%) lecturers had a good understanding, and 12 (19.6%) lecturers had a low understanding of the *illustrative verbs for each level of taxonomy*. The majority of 22 (36.1%) lecturers had a good understanding, 21 (34.4%) lecturers had a fair understanding, and 18 (29.5%) lecturers had a low understanding of the *appropriate teaching methods for each level of taxonomy*. The majority of 23 (37.8%) lecturers had a fair understanding, 20 (32.8%) lecturers had a good understanding, and 18 (29.4%) lecturers had a low understanding of the *appropriate assessment methods for each level of taxonomy* (refer Table 6).

The results of the Kruskal-Wallis Test showed significant differences in lecturers' understanding according to the teaching experience of four of the five elements assessed. One element that does not have a significant difference according to the lecturers' teaching experience was the *description of 19 categories of taxonomy* (refer Table 7).

Table 7: Significant differences in lecturers' understanding of Bloom's cognitive domain according to the teaching experience

Bloom's cognitive domain	**n**	**Mean rank**	**df**	**Chi-square**	***p***
Descriptions of 6 levels					
Below 5 years	28	22.88	2	13.186	.001
5 to 10 years	9	40.44			
More than 10 years	24	36.94			
Descriptions of 19 categories					
Below 5 years	28	26.75	2	5.135	.077
5 to 10 years	9	41.11			
More than 10 years	24	32.17			
Illustrative verbs					
Below 5 years	28	23.64	2	10.917	.004
5 to 10 years	9	41.67			
More than 10 years	24	35.58			
Appropriate teaching methods					
Below 5 years	28	24.79	2	7.309	.026
5 to 10 years	9	39.44			
More than 10 years	24	35.08			

Bloom's cognitive domain	n	Mean rank	df	Chi-square	*p*
Appropriate assessment methods					
Below 5 years	28	25.13	2	6.509	.039
5 to 10 years	9	38.83			
More than 10 years	24	34.92			

n = 61

4.2.4 Learning taxonomy – Simpson's psychomotor domain

There were five elements related to Simpson's psychomotor domain assessed in this study. The description of seven levels of taxonomy, the description of 10 categories of taxonomy, the illustrative verbs for each levels of taxonomy, the appropriate teaching methods for each level of taxonomy, and the appropriate assessment methods for each level of taxonomy. Overall, the majority of lecturers had a good understanding of only one of the five elements assessed, namely the *description of seven levels of taxonomy*. The results are shown according to the category of lecturers' teaching experience in Table 8.

The majority of 26 (42.6%) lecturers had a good understanding, 21 (34.5%) lecturers had a fair understanding, and 14 (22.9%) lecturers had a low understanding of the *description of seven levels of taxonomy*. The majority of 33 (54.1%) lecturers had a low understanding, 16 (26.2%) lecturers had a good understanding, and 12 (19.7%) lecturers had a fair understanding of the *description of 10 categories of taxonomy* (refer Table 8).

Table 8: Simpson's psychomotor domain understanding according to lecturers' teaching experience

Simpson's psychomotor domain	Lecturers' level of understanding	Teaching experience			
		Below 5 years (%)	5 to 10 years (%)	More than 10 years (%)	Total (%)
Description of 7 levels	Low understanding	16.4	0.0	6.5	22.9
	Fair understanding	23.0	4.9	6.6	34.5
	Good understanding	6.6	9.8	26.2	42.6
Description of 10 categories	Low understanding	29.5	3.3	21.3	54.1
	Fair understanding	8.2	3.3	8.2	19.7
	Good understanding	8.2	8.2	9.8	26.2
Illustrative verbs	Low understanding	24.6	1.6	6.5	32.7
	Fair understanding	13.1	4.9	21.3	39.3
	Good understanding	8.2	8.2	11.5	27.9
Appropriate teaching methods	Low understanding	26.3	4.9	13.1	44.3
	Fair understanding	11.5	1.6	18.0	31.1
	Good understanding	8.2	8.2	8.2	24.6
Appropriate assessment methods	Low understanding	26.3	4.9	13.1	44.3
	Fair understanding	14.8	1.6	18.0	34.4
	Good understanding	4.9	8.2	8.2	21.3

n=61

The majority of 24 (39.3%) lecturers had a fair understanding, 20 (32.8%) lecturers had a low understanding, and 17 (27.9%) lecturers had a good understanding of the *illustrative verbs for each level of taxonomy*. The majority of 27 (44.3%) lecturers had a low understanding, 19 (31.1%) lecturers had a fair understanding, and 15 (24.6%) lecturers had a good understanding of the *appropriate teaching methods for each level of taxonomy*. The majority of 27 (44.3%) lecturers had a low understanding, 21 (34.4%) lecturers had a fair understanding, and 13 (21.3%) lecturers had a good understanding of the *appropriate assessment methods for each level of taxonomy* (refer Table 8).

The results of the Kruskal-Wallis Test showed significant differences in lecturers' understanding according to the teaching experience of four of the five elements assessed. One element that does not have a significant difference according to the teaching experience was the *description of 10 categories of taxonomy* (refer Table 9).

Table 9: Significant differences in lecturers' understanding of Simpson's psychomotor domain according to the teaching experience

Simpson's psychomotor domain	n	Mean rank	df	Chi-square	*p*
Descriptions of 7 levels					
Below 5 years	28	22.43	2	13.896	.001
5 to 10 years	9	40.67			
More than 10 years	24	37.38			
Descriptions of 10 categories					
Below 5 years	28	28.02			

Simpson's psychomotor domain	n	Mean rank	df	Chi-square	*p*
5 to 10 years	9	41.83	2	4.808	.090
More than 10 years	24	30.42			
Illustrative verbs					
Below 5 years	28	24.82	2	8.270	.016
5 to 10 years	9	41.83			
More than 10 years	24	34.15			
Appropriate teaching methods					
Below 5 years	28	25.48	2	6.211	.045
5 to 10 years	9	40.11			
More than 10 years	24	34.02			
Appropriate assessment methods					
Below 5 years	28	24.50	2	8.371	.015
5 to 10 years	9	40.94			
More than 10 years	24	34.85			

n=61

4.2.5 Learning taxonomy – Krathwohl's affective domain

There were five elements related to Krathwohl's affective domain assessed in this study. The description of five levels of taxonomy, the description of 13 categories of taxonomy, the illustrative verbs for each levels of taxonomy, the appropriate teaching methods for each level of taxonomy, and the appropriate assessment methods for each level of taxonomy. Overall, the majority of lecturers have a good understanding of only one of the five elements assessed, namely the *description of five levels of taxonomy* The results are shown according to the category of lecturers' teaching experience in Table 10.

Table 10: Krathwohl's affective domain understanding according to lecturers' teaching experience

Krathwohl's affective domain	Lecturers' level of understanding	Teaching experience			
		Below 5 years (%)	5 to 10 years (%)	More than 10 years (%)	Total (%)
Description of 5 levels	Low understanding	18.0	1.6	8.2	27.8
	Fair understanding	19.7	6.6	6.6	32.9
	Good understanding	8.2	6.6	24.6	39.4
Description of 13 categories	Low understanding	29.5	4.9	24.6	59.0
	Fair understanding	8.2	4.9	6.6	19.7
	Good understanding	8.2	4.9	8.2	21.3
Illustrative verbs	Low understanding	27.9	4.9	8.2	41.0
	Fair understanding	9.8	4.9	21.3	36.0
	Good understanding	8.2	4.9	9.8	22.9
Appropriate teaching methods	Low understanding	27.9	6.5	14.8	49.2
	Fair understanding	11.5	3.3	18.0	32.8
	Good understanding	6.6	4.9	6.6	18.1
Appropriate assessment methods	Low understanding	27.9	6.5	14.8	49.2
	Fair understanding	11.5	3.3	18.0	32.8
	Good understanding	6.6	4.9	6.6	18.1

n=61

The majority of 24 (39.4%) lecturers had a good understanding, 20 (32.9%) lecturers had a fair understanding, and 17 (27.8%) lecturers had a low understanding of the *description of five levels of taxonomy*. The majority of lecturers with 36 people (59.0%) had a low understanding, 13 (21.3%) lecturers had a good understanding, and 12 (19.7%) lecturers had a fair understanding of the description of 13 categories of taxonomy (refer Table 10).

The majority of 25 (41.0%) lecturers had a low understanding, 22 (36.0%) lecturers had a fair understanding, and 14 (22.9%) lecturers had a good understanding of the illustrative verbs for each level of taxonomy. A total of 30 (49.2%) lecturers had a low understanding, 20 (32.8%) lecturers had a fair understanding, and 11 (18.1%) lecturers had a good understanding of each the appropriate teaching methods for each level of taxonomy and the appropriate assessment methods for each level of taxonomy (refer Table 10).

The results of the Kruskal-Wallis Test showed a significant difference in lecturers' understanding according to teaching experience for only one element assessed which is the *description of five levels of taxonomy*. The remaining four elements do not have a significant difference according to the teaching experience (refer Table 11).

Table 11: Significant differences in lecturers' understanding of Krathwohl's affective domain according to the teaching experience

Krathwohl's affective domain	n	Mean rank	df	Chi-square	*p*
Descriptions of 5 levels					
Below 5 years	28	24.63	2	7.459	.024
5 to 10 years	9	35.61			
More than 10 years	24	36.71			
Descriptions of 13 categories					
Below 5 years	28	29.30	2	2.924	.232
5 to 10 years	9	39.67			
More than 10 years	24	29.73			
Illustrative verbs					
Below 5 years	28	26.09	2	4.347	.114
5 to 10 years	9	36.00			
More than 10 years	24	34.85			
Appropriate teaching methods					
Below 5 years	28	26.04	2	4.491	.106
5 to 10 years	9	36.89			
More than 10 years	24	34.58			
Appropriate assessment methods					
Below 5 years	28	25.80	2	4.927	.085
5 to 10 years	9	37.11			
More than 10 years	24	34.77			

n= 61

4.3 Summary of the lecturers' level of understanding

The summary of lecturers' level of understanding and the significant differences in lecturers' understanding between the teaching experience of each element in design components in CA can be referred to in Table 12.

Table 12: Summary of lecturers' level of understanding and the significant differences in lecturers' understanding between teaching experience

Design component elements	Level of understanding	Significant differences of understanding between teaching experience
Programme learning outcomes (PLOs)		
PLO descriptions according to MQF 2.0	Fair	Yes
Skills types related to each PLO	Good	Yes
Taxonomy levels related to each PLO	Good	Yes
GA related to each PLO	Good	Yes
Graduate attributes (GAs)		
GA descriptions	Fair	Yes
Learning taxonomy domain - Bloom's cognitive domain		
Descriptions of 6 levels	Good	Yes
Descriptions of 19 categories	Low	No
Illustrative verbs	Fair	Yes
Appropriate teaching methods	Good	Yes
Appropriate assessment methods	Fair	Yes
Learning taxonomy domain - Simpson's psychomotor domain		
Descriptions of 7 levels	Good	Yes
Descriptions of 10 categories	Low	No
Illustrative verbs	Fair	Yes
Appropriate teaching methods	Low	Yes
Appropriate assessment methods	Low	Yes
Learning taxonomy domain - Krathwohl's affective domain		
Descriptions of 5 levels	Good	Yes
Descriptions of 13 categories	Low	No
Illustrative verbs	Low	No
Appropriate teaching methods	Low	No
Appropriate assessment methods	Low	No

The results of this study proved that the lecturer had difficulty understanding the elements in learning taxonomy domains well. Lecturers regardless of the teaching experience have a low understanding of the elements in the three learning taxonomy domains, namely Bloom's cognitive domain, Simpson's psychomotor domain, and Krathwohl's affective domains. There are some elements of design components in CA have no significant difference in terms of the level of understanding according to lecturers' teaching experience. The understanding of the design component in CA still needs to be improved by lecturers, especially for three learning taxonomy domains. A detailed understanding of these three learning taxonomy domains will enable lecturers to design their respective courses CLOs more effectively (Anderson *et al.* 2014; Biggs 2014; Geisert 1972; Kennedy 2006; Keshavarz 2011; Simpson 1966). The CLOs designed will be able to focus on achieving optimal knowledge and skills by students for each course (Biggs & Tang 2015). Teaching and assessment methods that can accurately measure student achievement can also be utilised in each course (Bourner 1997; Kasilingam *et al.* 2014). The teaching and learning process will be more transparent and meaningful to both lecturers and students (Biggs & Tang 2011; Zakaria *et al*. 2020). Students will also be able to undergo learning experiences that encourage them to achieve their optimal self-potential throughout their studies at the university.

5. Conclusion

This study assessed the extent of the lecturers' understanding of design components in CA, namely ILOs, teaching methods, and assessment methods. For the ILOs, the lecturers' understanding is studied in detail on PLOs, GAs, and three learning taxonomy domains, namely Bloom's cognitive domain, Simpson's psychomotor domain, and Krathwohl's affective domain. For the second and third design components in CA which are teaching methods and assessment methods, the lecturers' understanding is studied for each learning taxonomy domain. The lecturers' understanding has been divided into three categories, namely low understanding, fair understanding, and good understanding. As for the PLOs, the majority of lecturers have a good understanding. As for the GAs, the majority of lecturers have a fair understanding. As for Bloom's cognitive domain, the majority of lecturers have a fair and good understanding. As for Simpson's psychomotor domain and Krathwohl's affective domain, the majority of lecturers have a low understanding. There are elements of design components in CA that have significant differences in terms of the level of understanding according to lecturers' teaching experience. Nevertheless, some elements have no significant difference in terms of the level of understanding according to lecturers' teaching experience. The results of this study open up opportunities for the faculty and university to plan appropriate courses and workshops related to design components in CA to enhance the understanding of lecturers. In addition, the results of this study also open up opportunities for the faculty and university to develop teaching and learning tools that can help improve the understanding of lecturers on design components in CA. Teaching and learning tools can be designed so that they can be used not only during the early stage of planning a course but also during the re-planning stage of a course. A detailed understanding of the design components in CA will enable alignment to be done more effectively in a course. More effective teaching and learning will lead to a meaningful teaching and learning experiences.

6. Recommendations for further research

Below are some of the recommendations for further research:

(1) Study on the factors affecting lecturers' understanding of design components in CA; and
(2) Study on the development of teaching and learning tools that can help improve lecturers' understanding of each design components in CA specifically and in OBE generally

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