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## Exploratory Factors and Reliability Analysis of Active Learning Techniques Instruments to Assess Business Subjects of Secondary School Students in Malaysia

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**Abstract:** Active learning (AL) techniques invite students to participate actively, either physically or mentally, in the learning process so that they can change their behavior efficiently to achieve great achievement. Still, there is insufficient knowledge concerning the dimensions of AL techniques for business subjects of secondary school students in Malaysia. Thus, the research's goal is to assist in the determination of the instruments' reliability to measure the AL techniques measurement scale for business subjects' students using exploratory factor analysis (EFA) as well as reliability analysis. Moreover, this research conducted a self-administered survey among secondary school students who have taken business subjects as their elective subjects. From secondary schools in Negeri Sembilan, Malaysia, 123 respondents were randomly chosen for the sample. To measure the AL constructs, the study retained 30 items developed because no items have been omitted since the factor loading turned out higher than the 0.50 cut-off point and was used as a tool for data collection. Essentially, this research empirically validates the dimension which helps lead to AL techniques in business subjects that are improved, and the findings are particularly beneficial to secondary school students in Malaysia.

**Keywords:** *Active learning, business subject, exploratory factor analysis, reliability analysis.*

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### Introduction

The government has taken several measures in order to ensure that the level of education in this country becomes more meaningful through the implementation of the 4th Sustainable Development Goals (SDGs), which is in the category of 'Quality Education'. Along with that, the evolution of the business subjects curriculum in secondary school is an initiative to help in providing human capital which is comprehensive, balanced, noble, creative, critical, innovative, as well as practices a professional culture in facing 21st century's challenges (Curriculum Development Division, Ministry of Education Malaysia, 2016). Learning business subjects prepares students as human capital that will make a business a career, reduce dependence on the government and be able to compete at the global level. Emphasis is also given to the development of students' talents, interests, personalities, attitudes, values, higher education specialization, and careers (Curriculum Development Division, Ministry of Education Malaysia, 2016).

Business subjects also allow students to hone their entrepreneurial talents before venturing into business in the future. In line with that desire, the development of the business subject's curriculum is a government initiative to prepare students who can face the 21st century's challenges in line with the development of technology in the industry towards achieving the SDGs. Students participate in active learning (AL), which they define as doing something in order to grasp the material, learn and discover new knowledge, attempt new ideas to find solutions, engage in group discussions as directed by the teacher, clear up any confusion with other teachers or students whenever they are unsure of the issue and lastly share their thinking results with other teachers or friends (Syaparuddin et al., 2020).

Furthermore, various AL techniques create an active educational environment where students can acquire knowledge directly with the support and guidance of appropriate teachers at each cognitive level. Practices of AL techniques will

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help students understand their roles and responsibilities through various social groups, for instance, religion, local community, school, friends, as well as family, including global and national groups (Azid@Aziz et al., 2016). Modern society is developing faster; thus, it needs individuals who are creative and active, and able to handle various circumstances. Future students will have to deal with challenging issues as a result of the constant shift in a global society. To address this issue, the education system needs AL that actively engages students in expanding their knowledge which results in the improvement in their learning achievement, and it becomes more meaningful and lasts throughout life (Suherman et al., 2021).

The latest research performs a thorough verification of the three AL dimensions (think-pair-share, cooperative learning, as well as gamification) utilizing Exploratory Factor Analysis (EFA) and reliability to further clarify the dimensions that are relevant in evaluating the AL constructs found among Malaysian secondary school students. After five years of implementation of business subjects, students' learning techniques should also change to active learning. However, student learning techniques in implementing the curriculum are still teacher-centered (Ariff & Zaid, 2020). The traditional learning techniques in the classroom cause students to feel bored compared to active learning techniques (Ariff & Zaid, 2020). Moreover, conventional learning methods are unable to provide a dynamic and innovative learning environment and do not even encourage thinking skills among students (Abdullah et al., 2021).

Taking into consideration the usage of active learning, this way of teaching and learning has a necessary importance in the 21st century (Moktar et al., 2018). However, we were unable to locate any scales or instruments that directly evaluated learners' active learning practices in specific business subject related field. No previously developed scale or comprehensive instrument has been discovered in the body of literature that specifically measures the extent to which students perceive their active learning techniques in the specifically three AL dimensions think-pair-share, cooperative learning, and gamification of secondary school students in Malaysia. Despite there have been numerous studies and scale development on the other subjects like biology, mathematics, English, science, chemistry, Arabic language and more. The active learning techniques instruments to assess business subjects, which is specifically created to validates learners in 3 dimensions of AL in business subjects as part of this study to fill the gaps in the existing instruments. Given this hole in the study literature, it is important to create an instrument, and doing so would greatly advance our knowledge of the processes by which students adopt active learning practices in the business subject. The development of an instrument may also aid research aiming to gain a thorough and informed understanding of the underlying mechanisms supporting compelling active learning contexts, where learners can apply the three active learning techniques in business subject.

## Literature Review

### *Learning Techniques*

Student academic achievement is often linked to various internal and external factors such as personality, gender, family environment, socioeconomic status, interest, attitude, motivation, teaching technique, and also learning techniques (Widyahening, 2018). However, the main factor that contributes to the failure of students to achieve excellent academic achievement is the student's learning technique. This is because student academic achievement is closely related to student learning techniques (Widyahening, 2018). Conventional learning techniques are traditional learning that has long been practiced by students from various levels. A study by (Ishak et al., 2018) states that conventional methods that are solely teacher-centered, without a variety of learning techniques, will limit the learning process and students' ability to gain knowledge. The memorization technique applied by students will erode critical and creative thinking skills among students (Chung et al., 2017). To solve the problem, teachers should have more flexibility to design their lessons in a creative way, along with solving issues that arise during the learning process (Aprianti & Sahid, 2020).

### *Active Learning*

Active learning (AL) theory is built from traditional educational theories such as constructivism and cognitivism, where students develop their abilities through problem-solving, reasoning, and perception (Strikwerda, 2018). AL is important for students to achieve learning objectives by involving them in the learning process via discussions or activities in class according to different learning styles (Hasbullah, 2020). AL techniques are widely used and encouraged throughout schools in the United States, as well as a large amount of research shows the benefits of using AL strategies (Deslauriers et al., 2019). However, teacher-centered learning consists of lectures, reading assignments, and teacher presentations. As a result, students are only able to memorize up to 30% of the learning content. Besides, with strategies that are not controlled by the teacher, students are able to memorize as much as 50%. If students are allowed to do something, they can remember as much as 75%. However, AL techniques cause them to be able to remember 90% of the learning content (Eliyanti & Nurlita, 2018).

### *Active Learning and Student Achievement*

There is a movement to adopt AL to raise student achievement, according to a review of the scholarly literature (Cattaneo, 2017). As a consequence, AL may help each student reach their full capacity and provide satisfying learning outcomes

(Stevani & Fradani, 2019). Students who practice traditional learning are 1.5 times more prone to failing compared to students who implement AL. So, the reported data has shown that AL can improve exam performance.

Next, Miller et al. (2021) in his study has made a difference between the two groups that use AL and also traditional learning. The results of the test were found to be better for the group that practiced AL, with a relatively large difference in achievement between the two groups. The effect of AL compared to conventional methods in Wiliawanto et al. (2019) study proves that AL is highly efficient in enhancing students' understanding of a subject and can subsequently help improve student performance in those subjects. Studies by Moktar et al. (2018) have found that students' continuous development from time to time in the classroom may be identified via the application of AL as well as systematic classroom evaluation. Thus, learning techniques that are not in line with the development of the latest technology and are not student-centered will end up in poor exam results (Hui et al., 2021).

### *Active Learning Techniques*

AL was initially described by Bonwell and Eison (1991) as "anything that encourages students to engage in activities while also reflecting on those activities". The study findings by Mohamad Ali et al. (2018) claimed that the usage of captivating AL techniques in the classroom might establish better effective learning and an interesting environment and can increase student participation and involvement. Most students like to memorize what the teacher teaches without understanding the real concept (Ishak et al., 2018). Therefore, many students are found unable to relate to the concepts learned in real life. To overcome this problem, TnL business subjects must always be linked to real situations and concrete examples through AL techniques. The AL techniques used by students will indirectly encourage students to actively engage in learning business subjects. The methods can be carried out more effectively and interactively through gamification techniques, cooperative learning techniques, and think-pair-share techniques.

From the previous studies, we identify active learning techniques by learner interaction and engagement, cognitive process (i.e., higher-level thought processes), learning orientation (i.e., value towards the learning process), and learning motivation (i.e., attitude towards the learning process) based on a thorough and systematic review of the existing literature and instruments validation conducted on active learning of the various instructional approaches that align with learners' active learning techniques. However, previous research in developing instruments doesn't measure the techniques used to lead AL techniques of a business subject.

### *Gamification*

Gamification is known as the usage of game design elements in a context that is non-game and provides a form of play experience to support overall value creation (Ragavan et al., 2021). A study by Pakinee and Puritat (2021) also stated that gamification is associated with the act of using the mechanical elements of the game to provide practical solutions. In more detail, gamification is defined as a concept that utilizes aesthetics and game thinking to influence people, game-based mechanics, facilitate action, advance learning as well as solve problems (Nurtanto et al., 2021).

Additionally, these days, students might be drawn in by the usage of animation techniques in games. This is a result of their exposure to cutting-edge communication devices, for instance, iPad, tablets, smartphones, as well as many more interactive gadgets (Ali et al., 2021). Besides that, the learning pattern of Generation Z is more towards an approach in the form of digital technology where students can access gamification materials at anytime and anywhere, individually or in groups (Dichev & Dicheva, 2017).

Relevant literatures are studied for the active learning techniques, a scale was developed by Lutfi et al., (2021) aimed gamification techniques in chemistry subjects and found that the usage of gamification made it simpler for students to understand the subject content as well as proved that interest in chemistry subjects increased due to the interactive learning method. Febrianto et al., (2021) developed a scale on the usage of gamification for biology subjects and found that the use of gamification can improve the mastery of subjects well. Moreover, a scale by Abdul Rahman et al., (2018) is related to the gamification approach in mathematics subjects and proves that there is a substantial disparity in the score outcome among students who use the gamification approach which increased the level of thinking skills. However, previous research in developing instruments doesn't measure the effectiveness of gamification technique to the business subject.

### *Cooperative Learning*

Cooperative learning is active learning that occurs in a small group so that students can work in a group to augment their learning and battle among themselves for grades and attention (Antonucci, 2019). Hence, through cooperative learning, students can help each other to master the content of the lesson, solve problems, understand an issue more deeply, have the opportunity to contribute individually, and then be responsible for giving opinions or knowledge to other friends (Ehlert, 2020). While pursuing a common objective, students can be active learners by cooperating in small, controlled groups (Hamzah & Nasri, 2020). Cooperative learning benefits students' academic learning and builds connections among students of all cultural and ethnic backgrounds.

This Cooperative learning technique also produces many quality students with accountability, empathy, as well as social skills (Baloche & Brody, 2017). Success in cooperative learning can improve several skills among students, including leadership skills, building trust with each other, communicating effectively, actively participating, daring to make decisions, and resolving conflicts effectively (Somasudram & Mahamod, 2017). Besides helping students improve performance, it also improves positive interpersonal relationships and self-esteem, and it is always ready to accept opinions (Hadi & Wahab, 2021).

Previous study by Hossain et al., (2012) has been developed a scale that shows cooperative learning is a successful learning technique and has been applied in various subjects, including science, mathematics, linguistic development, engineering, and so on. Nevertheless, previous research in developing instruments doesn't measure the effectiveness of cooperative learning techniques to the business subject.

### *Think-Pair-Share*

The think-pair-share technique is among the active learning strategies that require students to interact with their peers by sharing views and how to solve a problem within a certain period. The think-pair-share technique is built to distinguish the direction by giving students time to think from the worksheets given and then allowing them to formulate individually and share those views with a partner (Jack, 2015). The effectiveness of the think-pair-share technique can ensure almost 100% student involvement and allow all students to share ideas, opinions, arguments, and views and listen to arguments from other friends to build their ideas (Ariff & Zaid, 2020). This learning technique stimulates interaction by encouraging student response. Thus, students can discuss problems and their solutions, compare learning notes and evaluate assignments or quizzes with their pairs (Aziza et al., 2019).

There are many previous studies that show the effectiveness of think-pair-share technique in many subjects except for business subject. Research by Dr. Ribhi Khaleel Ahmad Hamdan (2017) scale shows how the think-pair-share strategy can improve learning achievement for topics requiring high-level thinking in science subject. Hence, a scale by Hidayah and Faishol (2019) has examined the effectiveness of the technique in improving the subject of Arabic. A study by Setiawan et al., (2020) includes high achievement in the subject of Biology and a study by Wahyuning et al., (2019) shows that think-pair-share learning technique in chemistry learning can improve the argumentation skills and students' learning motivation. However, previous research in developing instruments doesn't measure the effectiveness of think-pair-share technique to the business subject as well.

As can be seen, all these studies above are not directly related to the subject of research in business subject among secondary school students in Malaysia. Therefore, a new scale has been developed to serve the purpose. This is necessary given the lack of agreement on adequate instruments for AL among Malaysian secondary school students for business subjects. It is thought that this scale will make important contributions to literature since it will be the first scale in this subject.

### **Methodology**

In order to find reliable measures for active learning (AL) construct in the business subject among secondary school students in Malaysia, this research used a survey. Moreover, the quantitative data were gathered using self-administered survey questionnaires. This research included a thorough literature evaluation in determining the items employed to gauge the relevant AL constructs as well. One hundred twenty-three students were chosen based on stratified random sampling and simple random sampling. Based on 125 schools throughout the Malaysian state of Negeri Sembilan schools that offer business subject were included in the sample for the factor analysis. They were chosen at random prior to the self-administered questionnaire distribution. They answered all 30 questions on the questionnaire, and none were left blank or omitted, so the EFA could use all of the items. The data were then evaluated employing EFA in IBM Statistics 26 software, as well as reliability was used in measuring the extent of the items with regards to the dimension of gamification, cooperative learning as well as think-pair-share to express the connection between AL along with business subjects of secondary school.

The criteria for obtaining the findings of the investigation using EFA have been categorized into numerous interests. This includes maintaining items having a relationship or correlation with the items examined based on the findings of the Kaiser-Meyer-Olkin (KMO) as well as Bartlett test, with criteria  $p < .05$  and KMO value  $> .50$ . This also includes items that have been maintained, which may be utilized for subsequent analysis using the eigenvalues results as well as obtained as well as factor loadings, with total eigenvalues criteria of greater than 1 and a criteria percentage variance eigenvalue of  $\pm 60\%$ . Moreover, Cronbach's alpha values in each construct with factor loadings criteria of  $\pm .50$  (Hair et al., 2010).

### *Research Instrument*

The scholars created a structured questionnaire with 30 items that examined AL in students utilizing a 7-point interval scale which ranges from 1, indicating that respondents "strongly disagree," to 7, indicating "strongly agree." The measurement of gamification used 10 items that were adopted (Ali et al., 2021). The evaluation of cooperative learning

included 10 items developed (Vaniya, 2019). Finally, the think-pair-share was tested utilizing 10 items that were adopted (Lowe, 2015).

#### *Expert Content Validation*

Pre-tests have been performed in order that have verified the instruments which have been developed for this investigation, which used the AL measuring instruments from earlier research that have been created to be utilized with various ages, cultures, populations, subjects, education levels, or from different industries (Bahkia et al., 2019; Ehido et al., 2020; Hoque et al., 2018; Rahlin et al., 2019). After designing the questionnaire, the assessment of the instrument was given to three experts who are professors and senior lecturers with skills in the relevant field to evaluate how well an instrument covers all relevant parts of the construct. This is to ensure that the content was appropriate and met the goals of the study. The validity of the content is conducted to check aspects of language, structure, and a set of items sufficient to measure the concept and arrangement of sentences. Finally, the meaning of the items asked.

Hence, to ensure adequacy with regard to the scales being used to assess the data in the statistical analysis, the criterion validity has been checked by three experts. The experts also provided pertinent feedback on several questions that should be revised and rephrased to prevent two-tier questions. Three research university experts additionally assessed the questionnaire after it had been amended in accordance with their feedback. Before the uniformity of their responses was assessed, these experts were requested to analyze the questionnaire in light of its reliability, validity, relevance, as well as clarity.

#### *Exploratory Factor Analysis*

For the EFA process, this research received a minimum of 123 responses. EFA is unable to be assessed directly and yet is portrayed as a group of items and shows the underlying connection between the variables within the investigation (Hair et al., 2014). When it is uncertain how many variables constitute a set of variables, EFA has been utilized (Nayak & Sahoo, 2015). The significant data was quantified into new factors in smaller sets using EFA to minimize the loss of information in this research (Hair et al., 2010, 2014; Hoque et al., 2018; Rahlin et al., 2019).

### **Results**

In the factor analysis, questionnaires comprised 30 items in the active learning (AL) construct items, which were examined and also divided relying on 3 dimensions. Specifically, this includes 10 items in the dimension for the gamification coded as GF1 to GF10, 10 items in the cooperative learning dimension coded as PKO1 to PKO10, 10 items in the think-pair-share dimension coded as FBB1 to FBB10. The results for EFA are displayed in Table 3 below, showing the KMO as well as Bartlett's tests as well as eigenvalues, factor loading, and, lastly, Cronbach's alpha score in each dimension.

Table 1 displays the descriptive statistics for each item. Each item has a mean value that falls between 4.35 and 5.19, and the standard deviation falls between 1.505 and 1.826.

*Table 1. Descriptive Statistics for the Items Measuring AL Constructs*

Item	Statement	Mean	Std. Deviation
<i>Gamification</i>			
GF1	I am enthusiastic about learning business using gamification techniques.	4.35	1.589
GF2	Gamification techniques help me understand the content of business lessons more easily.	4.63	1.548
GF3	I feel happy throughout the implementation of learning using gamification techniques.	4.75	1.505
GF4	Gamification techniques exposed me to the problem-solving process.	4.67	1.632
GF5	I was allowed to experience learning through gamification techniques.	4.65	1.535
GF6	Gamification techniques create a more enjoyable learning environment.	5.13	1.604
GF7	I am actively involved in the learning process if it involves gamification techniques.	4.71	1.565
GF8	I like and am interested in business subjects if gamification techniques are used.	4.82	1.572
GF9	I am excited to wait for the next activity to be introduced through gamification techniques.	4.91	1.699
GF10	Gamification techniques create healthy competition between my friends and me.	5.03	1.683
<b>Total Score Mean for Construct (Gamification)</b>		<b>47.69</b>	

Table 2. Continued

Item	Statement	Mean	Std. Deviation
<b><i>Cooperative Learning</i></b>			
PKO1	I understood the concept of business when it was explained by my peers.	5.00	1.722
PKO2	I like working with other friends because it makes learning business subjects more fun.	4.99	1.601
PKO3	I like to share ideas and knowledge with other friends.	4.92	1.630
PKO4	Cooperative learning creates an atmosphere of healthy competition.	5.19	1.642
PKO5	I am interested in participating in every level of group activity willingly.	5.03	1.509
PKO6	I like to help provide solutions and constructive feedback to colleagues in the group.	4.90	1.554
PKO7	I like to build new ideas from the ideas of other friends in the group.	5.13	1.670
PKO8	Perform the role assigned to me in the group more responsibly.	5.00	1.676
PKO9	I can improve my understanding by helping complete the task of a friend in a group.	4.61	1.826
PKO10	I was able to improve my communication skills with teammates and build self-confidence.	5.00	1.688
<b>Total Score Mean for Construct (Cooperative Learning)</b>		<b>49.81</b>	
<b><i>Think-pair-share</i></b>			
FBB1	I understand the content of the lesson more easily with the help of friends.	4.95	1.782
FBB2	The 'think-pair-share' technique can help me remember the content of the lesson faster through interaction with friends.	4.95	1.678
FBB3	The 'think-pair-share' technique can help me improve my performance level better in each assessment.	4.82	1.602
FBB4	Through this 'think-pair-share' technique, I was able to increase my confidence by actively participating in the presentation.	4.65	1.638
FBB5	I can concentrate on teaching and learning with this 'think-pair-share' technique.	4.68	1.600
FBB6	I regularly participate and maximize my participation in any activity because I feel committed to my friends.	4.60	1.720
FBB7	I have time to think and formulate certain topics.	4.69	1.541
FBB8	I can share the learning problems encountered with my friends better.	4.78	1.728
FBB9	I can find the best solution in learning through discussions with my friends.	4.91	1.632
FBB10	I can generate ideas better when discussing them with my friends.	5.13	1.731
<b>Total Score Mean for Construct (Think-Pair-Share)</b>		<b>48.21</b>	

*Kaiser-Meyer Olkin (KMO) and Bartlett's Tests*

Principal Component Analysis (PCA) with Varimax Rotation has been utilized during the EFA method using 30 items. The findings in Table 2 suggested that Bartlett's Test of Sphericity is significant ( $p$ -Value < .05). Moreover since they are greater than the minimum value of .60, the findings of the KMO measure of sample adequacy, which was .918, .947, and .951, were satisfactory (Awang, 2012; Bahkia et al., 2019; Rahlin et al., 2019). The two findings show that there is enough data to proceed with the reduction of data strategy (Awang & Mohamad, 2015; Hoque et al., 2018; Shkeer & Awang, 2019). All components of the AL construct may be employed as a tool for collecting data based on the outcomes.

Table 3. The KMO and Bartlett's Test

<b>KMO and Bartlett's Test (Gamification)</b>	
KMO Measure of Sampling Adequacy.	.918
Bartlett's Test of Sphericity (Approx. Chi-Square)	969.860
df	45
Sig.	0.000
<b>KMO and Bartlett's Test (Cooperative Learning)</b>	
KMO Measure of Sampling Adequacy.	.914
Bartlett's Test of Sphericity (Approx. Chi-Square)	1147.349
df	45
Sig.	.000

Table 4. Continued

<b>KMO and Bartlett's Test (Think-pair-share)</b>	
KMO Measure of Sampling Adequacy.	.951
Bartlett's Test of Sphericity (Approx. Chi-Square)	1299.234
df	45
Sig.	0.000

*Eigenvalues*

The elements of EFA based on Eigenvalues greater than 1.0 are displayed in Table 3. Gamification (75.379%), cooperative learning (76.096%), and think-pair-share (76.193) all explained more variance than the required 60% (Yahaya et al., 2018).

Table 5. Components and Total Variance Explained for Active Learning

<b>Construct</b>	<b>Component</b>	<b>Initial Eigenvalues</b>		
		<b>Total %</b>	<b>Variance %</b>	<b>Cumulative %</b>
Gamification	1	6.527	65.269	65.269
	2	1.011	10.110	75.379
Cooperative Learning	1	7.610	76.096	76.096
Think-Pair-Share	1	7.619	76.193	76.193

*Factor Loading*

One indicator, the gamification dimension, produces two components that make up the total variance produced. Nevertheless, only 1 component could be considered for the loading factor on the component matrix since this indication only has 2 orders and no sub-indicators. Hence, while all other items have a factor loading of around  $\pm .50$ , the factors loading of the items for the dimensions of gamification, cooperative learning, and think-pair-share are  $>.50$ ; hence, they meet the test criteria (Table 4).

Table 6. Components and Items Used in The Study

<b>Construct</b>	<b>Item Code</b>	<b>Loading 1</b>
Gamification	GF1	.915
	GF2	.848
	GF3	.887
	GF4	.820
	GF5	.813
	GF6	.868
	GF7	.832
	GF8	.866
	GF9	.828
	GF10	.830
Cooperative Learning	PKO1	.716
	PKO2	.807
	PKO3	.869
	PKO4	.865
	PKO5	.812
	PKO6	.892
	PKO7	.820
	PKO8	.860
	PKO9	.867
	PKO10	.868
Think-Pair-Share	FBB1	.756
	FBB2	.885
	FBB3	.901
	FBB4	.841
	FBB5	.899
	FBB6	.895
	FBB7	.844
	FBB8	.891
	FBB9	.899
	FBB10	.906

*Cronbach's Alpha*

Cronbach's alpha value has been computed to determine the internal reliability of the component which evaluates AL constructs and to investigate the consistency of findings throughout items for a related construct. Moreover, each item in the AL construct has a Cronbach's alpha value  $> .60$ . Cronbach's alpha for the GF code is specifically .935, followed by the PKO code with .964 and the FBB code with .965. As a result, each instrument in the construct has a high dependability value since each indicator's Cronbach's Alpha value is more than .60, so all items in the indicator also have a high probability of different questions because the CA value is on the index that passes the minimum requirement of  $.70 < r_{11} < .90$  which confirms the internal consistency of each item and have high differentiating power (Table 5). Therefore, the measurement instrument for each construct is valid, reliable, and eligible to be used for further testing (Pallant, 2016).

Table 7. Reliability Analysis of the Items for Educational Awareness

No	Construct	Code	No of Items	Cronbach's Alpha	Discrimination Index	Interpretation of Differentiating Power
1	Gamification	GF	10	.935	$.70 < r_{11} < .90$	High Reliability
2	Cooperative Learning	PKO	10	.964	$.70 < r_{11} < .90$	High Reliability
3	Think-Pair-Share	FBB	10	.965	$.70 < r_{11} < .90$	High Reliability

The EFA results are summarized in Table 6. The KMO and Bartlett tests, eigenvalues, loading factor, and Cronbach's alpha values all show that the EFA results match the criteria. Therefore, none of the 30 items across 3 dimensions were excluded from being utilized as a tool for data collection. Given every item that satisfies the criteria, the items were used to measure the AL techniques of business subjects for secondary school students.

Table 8. Summary of Exploratory Factor Analysis (EFA) and Reliability Analysis Results

Item Description		Exploratory Factor Analysis Result				Reliability Test (Cronbach's Alpha)
		Factor Loading	KMO	Eigenvalues (EV)	% Of Variance (TVE)	
Gamification						
GF1	I am enthusiastic about learning business using gamification techniques.	.915	.918	7.538	75.379	.935
GF2	Gamification techniques help me understand the content of business lessons more easily.	.848				
GF3	I feel happy throughout the implementation of learning using gamification techniques.	.887				
GF4	Gamification techniques exposed me to the problem-solving process.	.82				
GF5	I was allowed to experience learning through gamification techniques.	.813				
GF6	Gamification techniques create a more enjoyable learning environment.	.868				
GF7	I am actively involved in the learning process if it involves gamification techniques.	.832				
GF8	I like and am interested in business subjects if gamification techniques are used.	.866				
GF9	I am excited to wait for the next activity to be introduced through gamification techniques.	.828				
GF10	Gamification techniques create healthy competition between me and my friends.	.83				



Table 9. Continued

Item Description		Exploratory Factor Analysis Result				Reliability Test (Cronbach's Alpha)
		Factor Loading	KMO	Eigenvalues (EV)	% Of Variance (TVE)	
Cooperative Learning						
PKO1	I understood the concept of Business when it was explained by my peers.	.716	.914	7.61	76.096	.964
PKO2	I like working with other friends because it makes learning business subjects more fun.	.807				
PKO3	I like to share ideas and knowledge with other friends.	.869				
PKO4	Cooperative learning creates an atmosphere of healthy competition.	.865				
PKO5	I am interested in participating in every level of group activity	.812				
PKO6	I like to help provide solutions and constructive feedback to colleagues in the group.	.892				
PKO7	I like to build new ideas from the ideas of other friends in the group.	.82				
PKO8	Perform the role assigned to me in the group more responsibly.	.86				
PKO9	I can improve my understanding by helping complete the task of a friend in a group.	.867				
PKO10	I was able to improve my communication skills with teammates and build self-confidence.	.868				
Think-Pair-Share						
FBB1	I understand the content of the lesson more easily with the help of friends.	.756	.951	7.619	76.193	.965
FBB2	The 'think-pair-share' technique can help me remember the content of the lesson faster through interaction with friends.	.885				
FBB3	The 'think-pair-share' technique can help me improve my performance level better in each assessment.	.901				
FBB4	Through this 'think-pair-share' technique, I was able to increase my confidence by actively participating in the presentation.	.841				
FBB5	I can concentrate on teaching and learning with this 'think-pair-share' technique.	.899				
FBB6	I regularly participate and maximize my participation in any activity because I feel committed to my friends.	.895				
FBB7	I have time to think and formulate certain topics.	.844				
FBB8	I can share the learning problems encountered with my friends better.	.891				
FBB9	I can find the best solution in learning through discussions with my friends.	.899				
FBB10	I can generate ideas even better when discussing them with my friends.	.906				

### Discussion

This research utilized the EFA method to evaluate the three active learning (AL) constructs among secondary school students studying business in Malaysia. A 7-point interval scale was utilized because, in comparison to a 5-point scale, it enables higher precision for the measurement model and has a wider range of options. Depending on the EFA findings, the component measuring AL constructs explained that all the items have relationships or correlations among them. The component's reliability was also high (Cronbach's alpha ranking between .935 and .965) and it shows the ability of this instrument to perform its role in a protocol as expected. Due to the factor loading being below .50, the final questionnaire's 30 items were retained. This is due to Hair et al. (2010) and Pallant (2016)'s opinions, indicating that the items for the research instrument in factor analysis are supposed to have a .05 loading factor. Finally, the component measuring AL constructs was established in this study, and the sample size of 123 students from Malaysian secondary schools was adequate for EFA (Bahkia et al., 2019; Hair et al., 2010; Rahlin et al., 2019; Shkeer & Awang, 2019).

Applying active learning techniques in the classroom, such as giving students time to reflect on what is being studied, giving brief demonstrations or exercises without assessment followed by discussions with friends to increase student involvement, creating small groups to stimulate creativity, discussing learning content and using gamification to involve students interactively in learning and thinking process (Rasli et al., 2018). Therefore, AL can be carried out more effectively and interactively through gamification, cooperative learning, and think-pair-share techniques to improve student's performance and achievements.

Using the EFA findings as a reference, a moderate three-dimensional milestone was achieved in this research. Furthermore, the instrument's validity was rigorously validated using the input of three experts, particularly during the first instrument development phase. As a result, everyone may utilize the AL instrument, not just academics, educators, as well as scholars but also by the higher education system to determine the highly recommended AL techniques. Moreover, this study can help students and teachers recognize which technique enhances their capability to participate in specific AL activities and improve their interest in teaching and learning to achieve business subject learning objectives. In this regard, it is anticipated that this research can give a preliminary reference with respect to future studies related to more AL techniques among students and educators in primary and tertiary-level education.

### Conclusion

The AL dimensions determined in the existing research are gamification, cooperative learning, and think-pair-share can be used to represent the connection between AL techniques among business subjects' secondary students using EFA. In this self-administered survey, 123 secondary school students in Negeri Sembilan, Malaysia, were randomly chosen as the sample for this factor analysis. The modified items from the literature used to measure the three dimensions, according to the findings of EFA, have a total of 30 relevant questions that account for over 60% of the total variance. Moreover, the results showed all 30 items for the AL construct, which have been dispersed in three dimensions, i.e., 10 items in the dimension of gamification, 10 items in the dimension of cooperative learning, and 10 items in the think-pair-share dimension. Additionally, the data were sufficient for this investigation because the KMO value turned out to be higher than the required minimum of .60.

Furthermore, the items also have outstanding internal reliability to assess the constructs. Thus, the measurement and validation procedures carried out in this research show the internal consistency and instrument reliability that can help increase AL techniques among business subjects' students in Malaysian secondary schools. The contribution to the literature is identifying the relationship between three AL dimensions (think-pair-share, cooperative learning, as well as gamification) with standard performance in business subject. Finally, the current work has designed and validated a reliable instrument for assessing AL constructs. Therefore, the result shows that AL techniques encourage students to learn concepts through hands-on practical application rather than passively listening or taking notes as the teacher presents. AL techniques often emphasize problem-solving, critical thinking, group work, improve students' retention of knowledge, and finally prepare them to be more successful than passive learning.

### Recommendations

In addition, since this research used a cross-sectional research design that has a single data collection over a brief period of time, subsequent scholars can examine the specified Active Learning techniques measures over a longer time to prepare students to improve their attitudes and perception in the learning process. Hence, the next study should be conducted in a comparative study between countries in Malaysia and other Asian countries. This is an effort to exchange knowledge and information about curriculum or education systems in other countries in order to improve TnL effectiveness of techniques in Malaysia.

Additionally, it is anticipated that the results of this research will be able to encourage as well as increase researchers' and professionals' interest in conducting a greater number of empirical studies regarding active learning techniques among students in other various subjects in school. Besides that, researchers used a fully quantitative research approach to measure AL techniques measurement scale for business subjects' students using EFA and reliability analysis due to time constraints and the cost of expenses. Hence, a research study utilizing mixed methods (quantitative and qualitative)

is recommended to validate the dimension that leads to improved AL techniques in the business subject more deeply through triangulation from both quantitative and qualitative research findings. This is because the development of a theory or concept needs to start with a qualitative approach as an effort to identify issues or phenomena that occur. Next, after the theory or concept has been identified, it needs to be tested or completed with a quantitative research approach to strengthen the theory or concept that has been developed.

### Limitations

Respondent bias is a challenge that the scholar cannot prevent during the process of data collection. It is caused by respondents' tight schedules or unwillingness in order to complete the questionnaire. Additionally, this research's highlight is primarily done on Malaysian secondary school students who are taking business subjects and extracted data from 123 randomly selected students. Since bigger samples can help in establishing the AL approach measures' validation, this research can be implemented comparably to various states and education levels. The next study can discover this limitation by incorporating other secondary school students in urban and rural regions.

### Ethics Statements

The studies involving human participants were reviewed and approved by the National University of Malaysia. The participants provided their written informed consent to participate in this study.

### Authorship Contribution Statement

Abdul Rahman: Concept and design manuscript, data analysis, drafting manuscript, critical revision of manuscript, editing and writing manuscript. Sahid: Revision of manuscript, reviewing, securing funding, supervision and final approval. Mohamad Nasri: Reviewing, supervision and final approval.

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