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Validity of Kirkpatrick Evaluation Model Instrument for Drug Prevention Education Programs in Primary School

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Abstract

One of the evaluation models generally used in prevention programs is the Kirkpatrick evaluation. The model is used to escort the evaluation program closer to its effectiveness. Kirkpatrick's framework consists of four levels: reaction, learning, behaviour, and result. The purpose of the current research was to assess the validity of the Kirkpatrick evaluation model instrument for drug prevention programs in primary school students in Malaysia. This study used a survey research design by involving 692 primary school students in Malaysia. Three procedures were used to analyse the data in this research, namely Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Cronbach Alpha. EFA revealed the structure of the Kirkpatrick evaluation model which the reaction level has 12 items, the learning level has 8 items, the behaviour level has 6 items, and the result level has 6 items. At the same time, the CFA results showed that the model fit indices established a four-factor structure. Finally, the evaluation model has Cronbach's alpha value of .952, which exceeds the standard (.70 or above). It can be concluded that the Kirkpatrick evaluation model instrument was acceptable and reliable to assess the level of drug prevention programs among primary school students in Malaysia.

Keywords: confirmatory factor analysis, kirkpatrick model, exploratory factor analysis

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INTRODUCTION

Southeast Asian countries, including Malaysia, play a central role in the growing number of drug commerce and abuse globally (Du et al., 2020). In Malaysia, 129,604 drug users were recorded in 2021. This number declined to 108,220 in 2022. The number of drug users has decreased, but the number of drug suppliers has increased from 14,823 in 2012 to 16,629 in 2022 (Department of Statistics Malaysia, 2022). Malaysian, through National Anti-Drug Agency (NADA), attempt to confront this problem. Malaysian response to drug cases has largely been in the criminal justice

system (Kamarulzalam, 2009). Drug prevention programs were also initiated to educate society about the drug. An example of a drug prevention program conducted is Program *Gerak Gempur Dadah* (GEMPADAH) which was launched to coincide with National Drug Day in Malaysia. The program aims to clean up several cities in Malaysia of drug abuse (Ghazali et al., 2019). *Sayangi Hidup Elak Derita Selamanya* (SHIELD) is also one of the examples of a drug prevention program conducted by NADA. This program aims to spread awareness about drug abuse among students in Malaysia (Walid et al., 2021).

Despite all prevention programs conducted, drug users are still growing (Tan et al., 2018). Therefore, there is a need to evaluate the implementation of the drug prevention program. The evaluation is vital to obtain essential information, assess its effectiveness, and provide continuous improvement (Kirkpatrick, 2016). It will also help formulate the appropriate law enforcement policies and provide an evidence-based public database about drug users (Du et al., 2020). The drug prevention program offers a promising program that can help achieve prevention goals; this was accomplished through a researcher and evaluator who systematically examined the program (Stephen et al., 2017).

One evaluation model generally used in prevention programs is the Kirkpatrick evaluation model. The model is used to escort the evaluation program closer to its effectiveness and utility of the program (Nunoo, 2019). The model has a straightforward system for analyzing the program outcome and assessing whether the program achieved the intended goal (Miller, 2018; Vinther, 2021). As the evaluation procedure, the Kirkpatrick evaluation model proposes a framework of assessment questions and the criteria that might be appropriate for the evaluation (Ruiz & Scnoeck, 2018). Kirkpatrick's framework consists of four levels: reaction, learning, behaviour and result.

As the evaluation model, an instrument used in the Kirkpatrick evaluation model should be valid and reliable to ensure the evaluation assesses what should be assessed. In this case, Ruiz & Scnoeck (2018) suggest proposing specific instruments at each level. The instruments used in the Kirkpatrick evaluation model are a feedback form, a questionnaire test, an interview, and an observation sheet (Tripathi & Artibansal, 2017). In implementing the Kirkpatrick evaluation model, instrument measurement is commonly conducted to explain the adaptation of the Kirkpatrick evaluation model within the research context. The discussion about the adaptation of the Kirkpatrick model in each research is the key point of the appropriateness of the model to be used in the research. In this part, researchers commonly used a qualitative approach by matching and comparing the literature with the Kirkpatrick evaluation model. For example, research by Dalimunthe (2022). Other researchers used a quantitative approach. For example, Aryadoust (2016) used the RASCH model, t-test, and MFRM to evaluate the Kirkpatrick evaluation model instrument, and Alsalamah and Callinan (2021) used expert validation and Cronbach alpha to test the validity and reliability of the instrument. The use of MFRM is to assess the numbers of discrepancies among raters (Govindasamy et al., 2018) and more to the performance assessment (Uto & Ueno, 2020; Valente et al., 2022), it does not specifically validate the framework of the instrument.

Meanwhile, the Kirkpatrick evaluation model has a big framework with four constructs: reaction, learning, behaviour and result. Exploratory and confirmatory factor analysis seems perfect to validate the Kirkpatrick evaluation model instrument since (EFA) is used to frame the structure of the instrument (Mindrila, 2017; Livingston et al., 2020). Moreover, CFA is used to validate the structure of a model, and CFA help to identify a model frame (Schreiber et al., 2006; Jackson et al., 2009). Therefore, this research intends to validate the Kirkpatrick evaluation model using EFA and CFA.

The objective of study is to test the Kirkpatrick evaluation model to measure the effectiveness of drug prevention program in Malaysian public schools` context. The study has research question: Is the adapted Kirkpatrick evaluation model instrument valid and reliable for evaluating drug prevention programs in primary school students?

METHODS

Research Design and Sample

This study used a survey research design as its approach. In order to examine the validity and reliability of the Kirkpatrick evaluation model instrument for primary school students in Malaysia, we used a cross-sectional survey study method. A cross-sectional study examines a group of people at one particular time (Campbell et al., 2007). The population of the current research was primary school students in Malaysia. Because of the nature of the research, convenience sampling techniques were used to assess who had completed the online survey. Participants in this study were 692 primary school students in Malaysia. The participant ratio with the variables was 20:1, which exceeds the acceptable ratio for factorial analysis (Yong & Pearce, 2013; Watkins, 2018). The questionnaires were distributed to all students over a period of four weeks and had been obtained permission with informed consent form from all students` parents. In addition, prior to the data collection for this study, the ethics permission has been approved by Professor Dr. Rahmattullah Khan Abdul Wahab Khan from The Human Research Ethics Committee Sultan Idris Education University.

Instrument

Data was collected via an online survey distributed via Google Forms and sent via the WhatsApp group application. The survey includes 36 Likert scale items about drug prevention programs with a 5-point scale (1 = strongly disagree, 5 = strongly agree) (Koning et al., 2021). This instrument has four constructs: reaction level, learning level, behavioural level, and result level. These thirty-six items were classified into thirteen items of reaction level, eight items of learning level, eight items of behaviour level, and seven items of result level. The full items are listed in the table 1 below.

Table 1. Classification of Survey Items

Construct	Item No	Items
Reaction Level	X1	Students believe that the program is appropriate for them.
	X2	Students love participating in the program.
	X3	Students like where the program was held.
	X4	Students like the way program were implemented.
	X5	Students agree about the period of time the program implemented.
	X6	Students believe that the program provides a meaningful experience for them.
	X7	Students think that the program is not wasting time.
	X8	Students were easy to participate in the program.
	X9	Overall, students are satisfied with the program.
	X10	Students believe that the program benefits them.
	X11	Students believe that the program helps them to stay away from the symptoms of drug abuse.
	X12	The program has an interesting approach.
	X13	Students willing to join the program one more time.
Learning Level	X14	Students understand the purpose of the drug-free school implementation.
	X15	Students understand the importance of the drug prevention program implementation.
	X16	Students can gain knowledge about drug prevention after the program.
	X17	Students hate drugs after joining the program.
	X18	Students could rediscuss the knowledge gained regarding drug prevention after participating in the program.
	X19	Students can implement what has been learned in the program.
	X20	Students know the negative effect of engaging in symptoms of drug abuse.
	X21	Students learned information about drugs through the program.
Behavior Level	X22	Students can use the relevant skills acquired in the program.
	X23	Students can use the relevant knowledge obtained in the program.

	X24	Students notice a change in themselves after joining the program.
	X25	Students have better performances after joining the program.
	X26	Students can discuss the implementation of drug prevention after participating in the program.
	X27	Students can put what they have learned in the program to use.
	X28	Students know that not getting involved with drugs increases after joining the program.
	X29	Students believe that the program is helping them develop their character.
Result Level	X30	Students did not want to be involved in the symptoms of drug abuse.
	X31	The program helped students achieve their school goals.
	X32	Students were willing to share the knowledge they gained in the program with their friends.
	X33	Students tried to influence their friends through the knowledge they had obtained in the program.
	X34	Student's friends noticed the change in the student's attitude after joining the program.
	X35	Students could share what they learned from the program with their friends.
	X36	Students' friends believed the students when they talked about drugs.

Data Analysis

The data were identified and analyzed using the statistical package for social science (SPSS) version 26.0. in validity analysis, two procedures were used to analyze the data: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA was used to frame the structure of the Kirkpatrick evaluation model for primary students in Malaysia (Mindrila, 2017). EFA helps identify the internal attribute or the construct underlying the data. EFA investigates the measured variable's correlation and models the relationship (Mindrila, 2017; Anggraini et al., 2022). Secondly, CFA was performed to test the model framed in EFA (Jackson et al., 2009; Schreiber et al., 2006). Both models of testing were suitable for confirming the structure model, where EFA was applied to identify the factor structure, and confirmatory factor analysis was used to test the factor of the model (Mindrila, 2017). In reliability analysis, analysis of Cronbach alpha performed to see its value, mean and standard deviation.

The appropriateness of the data used in EFA was tested by the assumption test, namely the Barlett test of sphericity and Kaiser-Meyer-Olkin. According to (Watkins, 2021; Sarte et al., 2021), both tests help to assess the adequately large relationship of the data to be performed in EFA. Specifically, Bartlett's test of sphericity was used to see if the data was suitable for factor analysis, and Kaiser-Meyer-Olkin was used to determine the sampling adequacy. If the value of Bartlett's test of sphericity was significant ($p < .0001$), indicating the data was not an identity matrix (Watkins, 2018). The value of the Kaiser-Meyer-Olkin test ranged from 0 to 1, with an acceptable value was .60 and above (Howard, 2016; Watson, 2017; Khairunnisa et al., 2022).

In this research, EFA was performed with the method of Principal axis factorial. This method helps to determine the number of common factors that reflect a common variance within a correlation matrix (Howard, 2016). The method used to construct the model and determine which factor to retain was by considering the number of eigenvalues and Scree plot. The acceptable value of eigenvalue was one or above. The factor with eigenvalue one and above was retained in the analysis and vice versa (Larsen & Warne, 2010). The Scree plot will support this assumption. The researchers perform varimax in rotating the factor. It was to achieve the closest estimation to the simple structure because it optimizes the variance beyond all the factors. The interpretation for each item was done by considering the value of commonalities and factor loading. The acceptable items should have commonalities between .40 to 1.0. (Watson, 2017; Arwin et al., 2022). Furthermore, factor loading was above .50 (Watkins, 2018). If the items achieve the standard values, the items remain in the structure; if not, the items were deleted from the structure.

In the current research, the researchers use CFA to examine if the Kirkpatrick evaluation model instrument's structure can fit with an observed data set utilizing IBM SPSS Amos version

24. In order to validate the model. The CFA was analyzed by checking the goodness of fit. The evaluation of the goodness of fit was done using a range of model of fit indices such as Root Means Square Error of Approximation (RMSEA) (<.06 to .08) (Schreiber et al., 2006), the comparative fit index (CFI) (≥.90) and Tucker Lewis Index (TLI) (≥.90) (Shek & Yu, 2014), chi-square test (p), x2/ degrees of freedom (<.50).

FINDINGS

Exploratory Factor Analysis

The researchers start EFA by considering 36 items of the Kirkpatrick evaluation model instrument, which has four levels. The first level represented 13 items, the second level represented eight items, the third level represented eight items, and the fourth level represented seven items. The acceptability of using EFA for this research was displayed in the results of the KMO and Bartlett's test of sphericity. The KMO value was 0.963, which indicates the appropriateness of the items for factorial analysis (Watkins, 2018); this was strengthened by the significant (<0.000) value of Barlett's test of sphericity, which rejects the null hypothesis and indicates the correlation matrix was not an identity matrix. The explanation of factorial analysis was concluded in the table 2 below.

Table 2. Factorial Analysis Explanation

Factor	Dimension	Items	Communalities	Eigenvalue	% of Variance	Components			
						1	2	3	4
Kirckpatrick evaluation model	Reaction Level	X1	.560	14.524	40.345	.709			
		X2	.629			.764			
		X3	.487			.629			
		X4	.579			.691			
		X5	.494			.632			
		X6	.514			.600			
		X7	.442			.549			
		X8	.533			.674			
		X9	.567			.649			
		X10	.491			.548			
		X11	.536			.398			
		X12	.469			.556			
		X13	.460			.582			
	Learning Level	X14	.502	2.178	6.051		.541		
		X15	.534				.480		
		X16	.576					.531	
		X17	.576					.741	
		X18	.532				.555		
		X19	.526				.534		
		X20	.642					.725	
		X21	.493				.448		
	Behaviour Level	X22	.637	1.991	5.529		.680		
		X23	.628				.655		
		X24	.489				.522		
		X25	.452				.486		
		X26	.568				.561		
		X27	.579				.545		
		X28	.543					.616	
		X29	.519					.517	
	Result Level	X30	.580	1.128	3.133			.654	
		X31	.536						.508
		X32	.610						.682

	X33	.666	.689
	X34	.556	.642
	X35	.663	.690
	X36	.654	.736

Let us first look at what each item has in common. The items should have a value of commonalities of at least 0.40. Less of that should be dropped from further analysis (Watson, 2017). All items in the current study have acceptable commonalities ranging from 0.442 to 0.666, indicating that no item was eliminated. Secondly, let us see the value of the eigenvalue for each factor. The value should be one or above. The data showed that all four constructs have acceptable eigenvalues, where the first construct has an eigenvalue of 14.524 (explaining 40.345 % of the variance) correlated to reaction level, the second construct has an eigenvalue of 2.178 (explaining 6.051 % of the variance) correlated to learning level, the third construct has an eigenvalue of 1.991 (explaining 5.529 % of the variance) correlated to behaviour level, and the fourth construct has an eigenvalue of 1.128 (explaining 3.133 % of the variance) correlated with resulting level. All factors have acceptable eigenvalues, indicating that all constructs were retained in the analysis. It was emphasized by the scree plot (Figure 1).

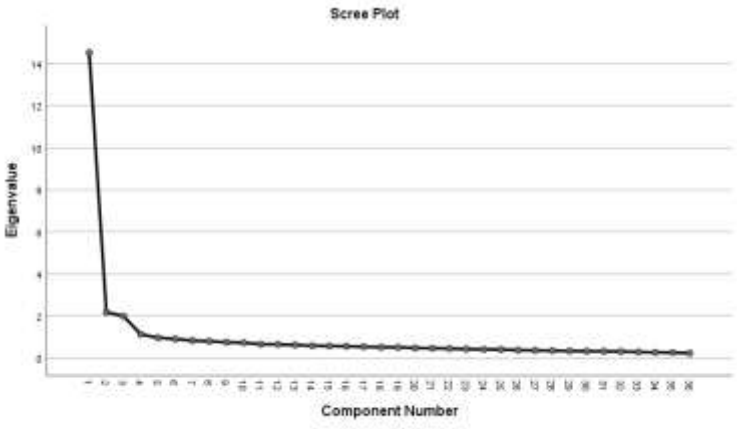

Figure 1. Scree Plot on all constructs in the analysis

The analysis of each item further explains the value of factor loading. Factor loading explains how much the items contribute to the factor (Yong & Pearce, 2013). The finding showed that many items did not achieve the standard of factor loading (.50), and many items were not appropriate to explain it. It means the items were not correlated to the construct or overlap with others' constructs. In the first construct (reaction level), the value of factor loading ranged from 0.398 to 0.764, with one item (X11) eliminated from analysis because it has a value of factor loading below standard (0.398). In this construct, no item overlaps with another construct. In the second construct (learning level), the factor loading value ranged from 0.448 to 0.741, with two items eliminated from the analysis because they had a factor loading value below standard (item X21: 0.448 and item X15: 0.480). In this construct, three items overlap or correlate with construct no. 3 (Behaviour level), namely X16, X17, and X20. In the third construct (Behaviour level), the value of factor loading ranged from 0.486 to 0.680, with one item (X25) eliminated from the analysis because it has a value of factor loading below standard (0.486). In this construct, five items overlap or correlate with construct no. 2 (learning level), namely items X22, X23, X24, X26, and X27. In the fourth construct (Result level), all items have an acceptable factor loading value ranging from 0.508 to 0.736. In this construct, one item overlaps or correlates with construct no. 3 (Behaviour level), namely X30.

Based on the analysis, all constructs have an acceptable eigenvalue and commonalities, but according to the analysis of factor loading, several items were eliminated and overlap with another

construct. Based on the EFA analysis, there were modifications to the Kirkpatrick evaluation model instrument structure for primary students in Malaysia. The details are displayed in table 3.

Table 3. Kirkpatrick Evaluation Model Instrument Structure for Primary Students in Malaysia

Factor	Dimension	Items	Communalities	Eigenvalue	% of Variance	Components			
						1	2	3	4
Kirckpatrick evaluation model	Reaction Level	X1	.560	14.524	40.345	.709			
		X2	.629			.764			
		X3	.487			.629			
		X4	.579			.691			
		X5	.494			.632			
		X6	.514			.600			
		X7	.442			.549			
		X8	.533			.674			
		X9	.567			.649			
		X10	.491			.548			
		X12	.469			.556			
		X13	.460			.582			
	Learning Level	X14	.502	2.178	6.051		.541		
		X18	.532				.555		
		X19	.526				.534		
		X22	.637				.680		
		X23	.628				.655		
		X24	.489				.522		
		X26	.568				.561		
		X27	.579				.545		
	Behaviour Level	X16	.576					.531	
		X17	.576					.741	
		X20	.642					.725	
		X28	.543					.616	
		X29	.519					.517	
		X30	.580					.654	
	Result Level	X31	.536						.508
		X32	.610						.682
		X33	.666						.689
		X34	.556						.642
		X35	.663						.690
		X36	.654						.736

Confirmatory Factor Analysis

The result of EFA suggests the structure of the Kirkpatrick evaluation model for a primary student in Malaysia. The reaction level has 12 items, the learning level has eight items, the behaviour level has six items, and the resulting level has six items. A CFA was then conducted to validate the structure. According to Alavi et al. (2020), CFA helps assess how much the covariance within the items captured in the structure varies. CFA was performed with four Kirkpatrick evaluation models, namely reaction level, learning level, behaviour level, and result level, adopted based on the result of EFA. The reaction level has 12 items, the learning level has eight items, the behaviour level has six items, and the resulting level has six items.

The finding shows that the initial goodness of fit for the model was Chi-square = 1564,039, TLI =.893, CFI =.901, GFI =.871 and RMSEA =.060. The factorial items for the model varied from .758 to 1.556, where all the factor loading exceeded .50. The covariance between the factor ranged from .188 to .391.

Table 4. Findings of the Study

Goodness of fit	Criterion	Model
Chi- square		1564,039
TLI	≥.90	.893
GFI	≥.90	.871
CFI	≥.90	.901
RMSEA	<.06 to .08	.060

Based on table 4, the value of CFI achieves the standard value (.901). TLI and GFI values were below the standard.90 (.893 and.871), but Anwar (2018) considers a value above.80 to be acceptable. The acceptable value from RMSE was between .06 to .80. In this research; the model achieves the standard value of RMSE (.060). Besides, the coefficient value between the factors, which was less than 0.8, indicates adequate validity for the proposed four-factor model (Chandrasekaran et al., 2021). As shown in the table 5 below:

Table 5. Estimatation of Validity

			Estimate	S.E.	C.R.	P	Label
F1	<-->	F2	,193	,019	9,929	***	
F1	<-->	F3	,391	,031	12,490	***	
F1	<-->	F4	,306	,027	11,389	***	
F2	<-->	F3	,188	,020	9,600	***	
F2	<-->	F4	,159	,017	9,241	***	
F3	<-->	F4	,284	,027	10,716	***	

Based on the analysis, the model constructed in EFA achieves the CFA validation standard. Several measurement standards show less value than expected but were not far from standardization and were still acceptable. In conclusion, the CFA model portrayed in figure 2 was the final model, which depicts the structure of the Kirkpatrick evaluation model instrument after being validated through EFA and CFA.

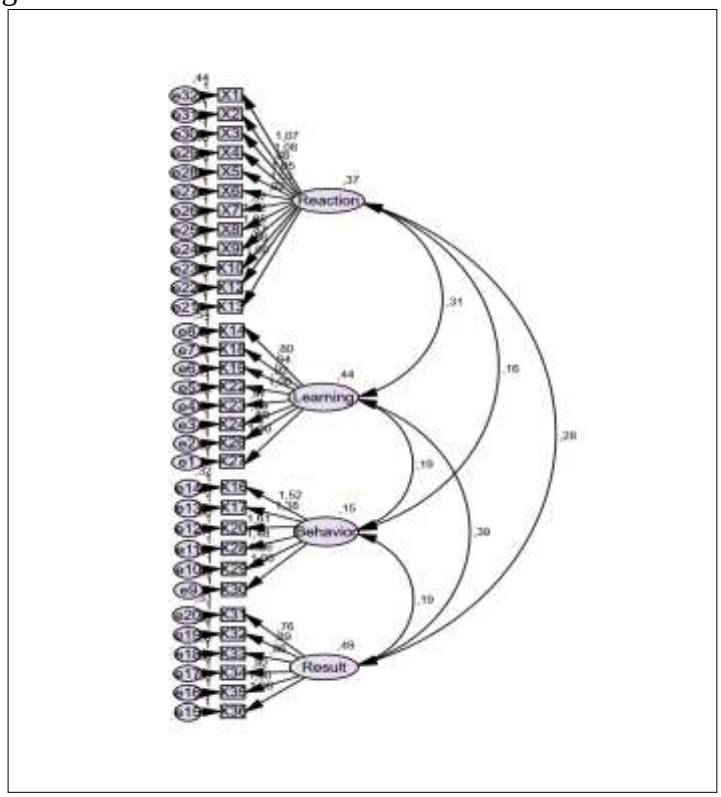

Figure 2. The CFA Model

After validating the structure, the researchers measure the model's reliability by conducting a reliability analysis in SPSS. The items deleted in the validation analysis (EFA and CFA) were excluded from this analysis. According to the finding, this model has Cronbach's alpha value of .952, which exceeds the standard (.70 or above). The mean ranged from 3.90 to 4.66, and the standard deviation ranged from 0.732 to 0.947. The finding shows that this model was reliable.

DISCUSSION

The instrument tested in this research relates to the Kirkpatrick evaluation model used to evaluate the drug prevention program. This model has four constructs: reaction level, learning level, behaviour level, and result level. In this research, items were deleted and moved to another construct because they overlap or were more correlated to others constructs. At the reaction level, no items were deleted and overlap with another construct. In the second construct (Learning level), two items were eliminated, namely items X21 and X15, and three items were moved to construct three (learning level) X16, X17 and X20. Item X16 stated, " Students can learn about drug prevention after the program.". Colloquially, this item was at the learning level as there was the word gain knowledge. However, participants of this research suggested that the item moved to the behaviour level. In literature, gaining knowledge was associated with behaviour, where behaviour results from learning that have not been carried out (Wulandari et al., 2021; Greer et al., 2022). This was in line with Item X20, "Students know the negative effect of engaging in symptoms of drug abuse". In this case, Moreira et al. (2009) stated that to change people's behaviour as drug users, improving their knowledge about the drug should be the main concern. Giving abusers knowledge about the negative effects of the drug could motivate them to avoid drug consumption habits (Moreira et al., 2009; Sicam et al., 2021). It was in line with item X30 in the resulting level, which also moved to a behavioural level and stated, "Students did not want to be involved in the symptoms of drug abuse". Other than that, Schrader and Lawless (2004) stated that there was a strong correlation between cognitive, affective, and psychomotor. Cognitive was associated with knowledge, an affective area was associated with attitude, and psychomotor was associated with behaviour. With much knowledge gained, students hate drugs after joining the program (Item X17). This indicates a change in the behaviour of the participants.

In the third construct, one item was eliminated, item X25, and five items were moved to construct two (learning level), namely items X22, X23, X24, X26, and X27. Item X22 (students can use the relevant skills acquired in the program), X23 (students can use the relevant knowledge obtained in the program), and X27 (students can put what they have learned in the program to use) moved to the learning level. All of the items were associated with using the acquired knowledge and skills. The highest level of learning, for example, for the craftsman, was the ability to use or implement knowledge and skill in a practical order (Ingersoll et al., 2018; Ibrahim et al., 2024). After reaching the highest level of learning, which can do something based on knowledge, students will notice a change in themselves (Item X24). It was emphasized by Mahajan and Singh (2017), who state that the outcome of learning was to know, understand, and be able to demonstrate knowledge. Demonstrating means being able to exhibit something practically. It means the ability to use or practically exhibit something as the result of a learning activity, indicating it was still part of the learning level.

Furthermore, the last item moved from the behaviour level to the learning level was item X26, which stated, "Students can discuss the implementation of drug prevention after participating in the program". Being able to have a discussion was a learning characteristic. Drachsler and Kirschner (2012) explain that one of the learning characteristics was a cognitive characteristic, including how the student perceives, remembers, thinks, and delivers or discusses the knowledge. This was emphasized by Richland et al. (2016), who define cognition as the ability to elaborate on the reason.

CONCLUSION

The purpose of this research was to test the validity and reliability of the Kirkpatrick evaluation model instrument. The participants were limited to elementary school students in Malaysia. In this research, EFA and CFA were performed to validate the structure, and the reliability analysis in SPSS was performed to find the Cronbach alpha, which indicates the instrument's reliability. The findings of this research show that, according to elementary school students in Malaysia, the Kirkpatrick evaluation model instrument was acceptable and reliable. The instrument was internally consistent and captures four main aspects of the Kirkpatrick evaluation model. Other than that, the value of Cronbach's alpha confirmed the instrument's reliability. It can be concluded that the Kirkpatrick evaluation model instrument can be widely used in analyzing the effectiveness program, specifically in evaluating drug prevention programs among students in elementary school.

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