International Journal of Educational Research Excellence (IJERE)
https://ejournal.ipinternasional.com/index.php/ijere
Volume 02, Issue 01, June 2023
e-ISSN: 2830-7933
DOI: 10.55299/ijere.v2i1.394

The Reliability and Validity of an Instrument to Evaluate the Implementation of Professional Learning Communities (PLC)

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Article history: received May 15, 2023; revised May 27, 2023; accepted June 30, 2023

Abstract. The implementation of Profesional Learning Communities (PLC) among secondary school teachers can enhance school capacity and excellence. To assess the execution of PLC, a reliable and valid instrument is necessary. This research aimed to develop and validate such an instrument, which was distributed to 69 secondary school teachers in the form of a questionnaire. The Context, Input, Process and Product (CIPP) Evaluation Model, established by Daniel Stufflebeam, served as the foundation for the instrument. The content validity of the instrument was examined by experts, while the construct validity was assessed using internal consistency reliability or Cronbach Alpha. The pilot study findings suggest that the instrument is both reliable and valid, with 87 out of 91 items retained.

Keywords: CIPP model, Evaluation, Exploratory Factor Analysis, PLC

1. INTRODUCTION

The Malaysian Education Blueprint (PPPM) 2013-2025 Thrust 4 aims to elevate the teaching profession to be preferred profession [12]. To ensure the continuity of techer quality, the Teacher Education Division (BPG) implemented several initiatives, including the Profesional Learning Community (PLC).

The profesional Learning Community (PLC) is a school improvement process that involves collaborative efforts from school leadership and community members to generate knowledge and share information to enhance student performance [1]. Today's scholars recognize PLC as a critical element capable of transforming educational practices and enhancing the quality of teaching and student performance [13]

Implementing the Profesional Learning Community (PLC) in schools can foster the development of learning values through a collaborative process that promotes dynamic learning among teachers, students, principals, parents and the community. Futhermore, PLC serves as as agent to optimize the potential and skills of techers by enhancing the quality of the teaching and learning process and encouraging parental and community involvement in ensuring student success [11]

PLC is composed of five significant dimensions: i) shared and supportive leadership, ii) shared values, norms, missions and vision, iii) collective learning and application, iv) personel sharing practices and v) supportive conditions concerning relationships and structure. These five dimensions have a mutually reinforcing effect in ensuring that teacher learning takes place continuously, thereby enhancing student performance in school [7][9]

2. METHODS

The objective of this study was to assess the implementation of the Profesional Learning Community (PLC) and to establish the validity and reliability of the instrument used in the evaluation process. A questionnaire was utilized as the survey instrument, featuring a seven point

Volume 02, Issue 01, June 2023
e-ISSN: 2830-7933
DOI: 10.55299/ijere.v2i1.394

Likert scale ranging from 'strongly disagree' to 'strongly agree'. The questionnaire was distributed to 69 secondary school teachers in one of the Malaysian states.

The development of the instrument was executed in several stages. The researchers initially conducted an extensive literature search across various theories. Next, the researches utilized Stufflebeam's Context, Input, Process and Product (CIPP) Model to design the instrument. Futhermore, they referred to past instrumets and constructs developed by the ministry in its documents to aid in the design process. The researchers also sought the assistance of eight field specialists, including evaluation, subject matter, language, institutional and department experts to evaluate the instrument's content validity. Correction and improvements were made based on the experts' comments and suggestions. After completing the final draft, the researches submitted it to the academic advisor for finalization before conducting a pilot study to assess the instrument's validity and reliability criteria.

3. RESEARCH RESULT AND DISCUSSION

The results presented in this study are organized based on two fundamental characteristics: the reliability and validity of the instruments used. A survey administered in this study resulted in 87 original items being retained out of the initial 91 items, based on the assessments of validity and reliability.

3.1. Reliability and Validity for Context Evaluation

The dimension of context evaluation consists of three constructs: teachers' perspectives on the National Education Philosophy's goals, teachers' views on the Malaysia education Blueprint (2013–2025) and teachers' assessment of the objective PLC. Each construct is comprised of a total of twelve items with four items for the first construct, three items for the second construct and five items for the third construct. Table 1 displays the utilization of Cronbach's Alpha to assess the internal consistency reliability of each construct. Accoding to the pilot study results that shows in Table 1, the Cronbach's Alpha reliability coefficient for the context evaluation dimension was found to be high. The results suggest that all items in the context evaluation dimension have a minimum value above 0.60, which indicates that the items are acceptable and possess good reliability. Thus, the items in this particular construct can be deemed suitable for use in field studies based on their high reliability coefficients,

Table 1. Cronbach's Alpha values if items are deleted and overall Cronbach's Alpha coeffiecient for constructs in context evaluation dimension

Context Evaluation Constructs	Item	Cronbach's Alpha if Item Deleted	Overall Value Cronbach's Alpha
Teachers' views on National Education Philosophy	B1	0.941	0.946
	B2	0.940	
	B3	0.942	
	B4	0.939	
Teachers' views on MEB (2013-2025)	B5	0.938	
	B6	0.942	
	B7	0.942	
Teachers' views on objective PLC	B8	0.941	
	B9	0.941	

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e-ISSN: 2830-7933
DOI: 10.55299/ijere.v2i1.394

	B10	0.944
	B11	0.942
	B12	0.942

Principal componen analysis (PCA) with Varimax rotation was performed on the questionnaire using IBM SPSS software with eigenvalues greater than one being extracted by factors. However, interpretation of results with double loading was done with caution, as recommended by [3]. The Varimax with Kaiser Normalization method was used for rotation and the analysis extracted factors from the context evaluation dimension components. The types of items contributing to the factors were found to be consistent with the earlier theory. The findings of the factor analysis using Varimax rotation for context assessment dimension are presented in Table 2.

Table 2. Factor analysis findings with Varimax rotation for context evaluation dimension components

	Component Matrix		
Item	**1**	**2**	**3**
B5	0.889		
B4	0.840		
B2	0.816		
B9	0.800		
B1	0.797		
B8	0.793		
B7	0.788		
B12	0.778		
B11	0.776		
B3	0.766		
B6	0.759		
B10	0.711		

Based on Table 2, three factors extracted from context evaluation dimension component. The first factor comprises three items related to teachers' view on the National Education Philosphy (Items B1-B3), the seond factor comprises three items on teachers' views on the Malaysian Education Blueprint (2013-2025) (Items B4-B6) and the third factor comprises five items on teachers' view on the objective of PLC (items B7-B12). All items in the three constructs of context evaluation were retained, indicating their significance in assessing the implementation of PLC among secondary school teachers.

3.2. Reliability and Validity for Input Evaluation

The input evaluation dimension, includes three constructs: teachers' views on Design Action Share (DAS) Strategy, teachers' views on PLC Kit and teachers' view on PLC implementation facility. The pilot study found that the Cronbach's Alpha values for all items in each construct more than 0.90. which suggests acceptable to very good reliability. There is no need to repeat the pilot study before administering the instrument to the actual sample [4]. Therefore, the items in this construct can be used in field studies. Additionaly. Table 3 displays the Cronbach's Alpha values if the items are eliminated, as well as the overall Cronbach's Alpha for input assessment dimension constructs.

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Table 3. Cronbach's Alpha values if items are deleted and overall Cronbach's Alpha for input assessment dimension constructs

Input Evaluation Constructs	Item	Cronbach's Alpha if Item Deleted	Overall Value Cronbach's Alpha
Teachers' views on Design Action Share (DAS) Strategy	C1	0.966	0.967
	C2	0.966	
	C3	0.966	
	C4	0.966	
	C5	0.966	
	C6	0.966	
	C7	0.967	
	C8	0.967	
	C9	0.965	
	C10	0.966	
Teachers' views on PLC Kit	C11	0.966	
	C12	0.966	
	C13	0.966	
	C14	0.966	
	C15	0.965	
	C16	0.966	
	C17	0.966	
	C18	0.965	
	C19	0.965	
	C20	0.966	
	C21	0.967	
	C22	0.966	
	C23	0.966	
	C24	0.966	
	C25	0.967	
Teachers' views on PLC implementation facility	C26	0,966	
	C27	0.966	
	C28	0.966	
	C29	0,969	

Based on table 4, the analysis revealed three factors that were extracted from components. The factors are: (a) teachers' views Design, Action and Share (DAS) Strategy (10 Items : Items C1-C10) including ten items, (b) teachers' views on PLC Kit (15 Items : Items C11-C25) involving fifteen items, and (c) teachers' views on PLC implementation facility (4 Items : Items C26-C29) comprising four items. Nevertheless, values factor loading for item C29 was less than 0.60. The researcher deleted item C29 from the questionnaire.

Table 4. Results of Varimax rotation factor analysis for input evaluation dimension components

	Component Matrix		
Item	**1**	**2**	**3**
C18	0.865		
C19	0.836		
C15	0.833		
C9	0.827		
C2	0.804		

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C22	0.795
C13	0.782
C5	0.777
C20	0.767
C17	0.760
C3	0.756
C16	0.748
C1	0.738
C26	0.732
C4	0.732
C24	0.731
C27	0.728
C11	0.724
C10	0.722
C23	0.706
C6	0.705
C12	0.692
C25	0.676
C28	0,674
C14	0.667
C8	0.653
C7	0.643
C21	0.637
C29	0.534

3.3. Reliability and Validity for Process Evaluation

The process evaluation dimension comprises four constructs; teachers' attitudes in implementing the PLC, teachers' knowledge of the PLC, the application frequency of collabotrative tools and cooperation of administrators in the PLC implementation. The pilot study found a high Cronbach's Alpha value for the process evaluation dimension, which more than 0.60, indicating acceptable to very good reliability. Therefore, the pilot study does not need to be repeated before administering the instrument to the actual sample and the items in this construct can be used in field studies. Table 5 provides a clear and concise overall Cronbach's Alpha for the process assessment dimension construct and the value of Cronbach's Alpha if the items are removed.

Table 5. Cronbach's Alpha values if items are eliminated and overall Cronbach's Alpha for process evaluation dimension construct

Process Evaluation Constructs	Item	Cronbach's Alpha if Item Deleted	Overall Value Cronbach's Alpha
Teachers' attitudes towards implementing the PLC	D1	0.965	
	D2	0.965	
	D3	0.965	
	D4	0.965	
	D5	0.965	
	D6	0.965	
Teachers' knowledge improvement by imoplementing PLC	D7	0.965	
	D8	0.965	
	D9	0.966	
	D10	0.966	
	D11	0.965	

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Application frequency of collaborative tools	D12	0.965	0.967
	D13	0.966	
	D14	0.965	
	D15	0.966	
	D16	0.966	
	D17	0.966	
	D18	0.966	
	D19	0.966	
	D20	0.965	
	D21	0.965	
	D22	0.966	
	D23	0.966	
Cooperation of administrators in the PLC implementation	D24	0.966	
	D25	0.965	
	D26	0.966	
	D27	0.965	
	D28	0.965	
	D29	0.965	
	D30	0.965	
	D31	0.965	

Table 6 revealed three factors that were extracted from the components. The factors are: (a) teachers' attitudes in implementing the PLC (6 Items: Items D1-D6) (b) teachers' knowledge of the PLC (5 Items: D7-D11) (c) application frequency of collaborative tools (12 Items: D12-D23) (d) cooperation of administrators in the PLC implementation (8 Items: D24-D31) Nevertheless, values factor loading for items D18, D22 and D24 were less than 0.60. The researcher deleted items D18, D22 and D24 from questionnaire.

Table 6. Factor analysis findings with Varimax rotation for process evaluation dimension components

Component Matrix				
Item	**1**	**2**	**3**	**4**
D4	0.822			
D7	0.813			
D30	0.795			
D12	0.789			
D6	0.787			
D31	0.776			
D5	0.760			
D1	0.756			
D27	0.755			
D25	0.754			
D28	0.753			
D11	0.751			
D8	0.750			
D3	0.732			
D29	0.732			
D21	0.724			

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D9	0.722
D20	0.722
D2	0.717
D14	0.699
D26	0.687
D15	0.679
D10	0.673
D16	0.649
D13	0.640
D19	0.638
D23	0.635
D17	0,610
D22	0.573
D18	0.570
D24	0.564

3.3. Reliability and Validity for Product Evaluation

The product evaluation dimension consists of three constructs, namely teachers' teaching skill improvement by implementing PLC, collaborative culture among teachers, and improving students' achievement by implementing PLC. Table 7 shows the results of using Cronbach's Alpha to measure the internal consistency and reliability of each construct. The pilot study found a high value of Cronbach's Alpha for the product evaluation dimension. These findings suggest that all items in the construct have a minimum value of more than 0.60, which indicate acceptable to very good reliability. There is no need to repeat the pilot study before administering the instrument to the actual sample. Therefore. the items in this construct can be used in the field study.

Table 7 shows the Cronbach's Alpha values if the items are eliminated and the overall Cronbach's Alpha for the product evaluation dimension construct.

Product Evaluation Constructs	**Item**	**Cronbach's Alpha if Item Deleted**	**Overall Value Cronbach's Alpha**
Teachers' view on teaching skill improvement by implementing PLC	E1	0.970	0.972
	E2	0.971	
	E3	0.970	
	E4	0.970	
	E5	0.970	
Teachers' views on collaborative culture among teachers	E6	0.970	
	E7	0.969	
	E8	0.970	
	E9	0.970	
	E10	0.970	
	E11	0.970	
	E12	0.972	
	E13	0.970	
Teachers' views on improving students' achievement by implementing PLC	E14	0.970	
	E15	0.970	
	E16	0.970	
	E17	0.970	

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	E18	0.970
	E19	0.970

Table 8 presents the factor results for the product evaluation dimension component obtained through the Varimax (Rotated Component Matrix0 method with normality (Varimax with Kaiser Normalisation), which revealed four factors from the extracted product components.

Table 8. Factor results with Varimax rotation for product evaluation dimension components

Component Matrix			
Item	**1**	**2**	**3**
E7	0,874		
E13	0.850		
E18	0.848		
E3	0.848		
E19	0.840		
E6	0.836		
E17	0.834		
E14	0.834		
E16	0.821		
E15	0.816		
E4	0.811		
E1	0.808		
E8	0,801		
E10	0.800		
E9	0,795		
E11	0.794		
E5	0,794		
E2	0.777		
E12	0,690		

Based on Table 8, three factors from the product evaluation dimension components were extracted. The factors are (a)teachers' teaching skill improvement by implementing PLC (5 Items: Items E1-E5), (b) collaborative culture among teachers (8 Items: Items E6-E13), (c) improving students' achievement by implementing PLC (6 Items: Items E14- E19). The conclusion is all items in the three constructs of product evaluation were retained.

Table 9. shows all items in CIPP evaluation dimensions and items after the validity and reliability process.

Context evaluation construct	**Items before the validity and reliability**	**Item after the validity and reliability**
Teachers' views on		
a) National Education Philosophy	B1, B2, B3, B4	B1, B2, B3, B4
b) MEB (2013-2025)	B5, B6, B7	B5, B6, B7
c) objective PLC	B8, B9, B10, B11, B12	B8, B9, B10, B11, B12
Input evaluation construct	**Items before the validity and reliability**	**Item after the validity and reliability**
Teachers' views on		

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a) Design Action Share (DAS) Strategy	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10
b) PLC Kit	C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25	C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25
c) PLC implementation facility	C26, C27, C28, C29	C26, C27, C28
Process evaluation construct	**Items before the validity and reliability**	**Item after the validity and reliability**
Teachers' views on		
a) attitudes of teachers towards implementing the PLC	D1, D2. D3, D4, D5, D6	D1, D2. D3, D4, D5, D6
a) teachers' knowledge improvement by implementing PLC	D7, D8, D9, D10, D11	D7, D8, D9, D10, D11
b) application frequency of collaborative tools	D12, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23	D12, D13, D14, D15, D16, D17, D19, D20, D21, D23
c) cooperation of administrators in the PLC implementation	D24, D25, D26, D27, D28, D29, D30, D31	D25, D26, D27, D28, D29, D30, D31
Product evaluation construct	**Items before the validity and reliability**	**Item after the validity and reliability**
Teachers' views on		
a) teaching skill improvement by implementing PLC	E1, E2, E3, E4, E5	E1, E2, E3, E4, E5
b) collaborative culture among teachers	E6, E7, E8, E9, E10, E11, E12, E13	E6, E7, E8, E9, E10, E11, E12, E13
c) improving students' achievement by implementing PLC	E14, E15, E16, E17, E18, E19	E14, E15, E16, E17, E18, E19
TOTAL ITEMS	**91 items**	**87 items**

The aim of this research was to develop a framework for evaluating the implementation of PLC in Malaysia. The efficacy of the proposed framework is contingent upon the quality of the study conducted. Currently, limited tools are available to assess the implementation of PLC. Therefore. an instrument to evaluate teachers' perceptions of PLC implementation was developed and tested. The study emphasized the importance of displaying the reliability and validity values of a questionnaire to inspire confidence in the quality of data collected by fellow researchers. The instrument was developed through literature reviews and previous instruments from PLC. The study found Cronbach Alpha to be between 0.946 and 0.972, which is considered acceptable for internal concistency, as the value must be above 0.7 [6] and a value higher than 0,80 is considered good [11]. Items with a factor loading value of less than 0.6 are not significant to the construct measurement and can be removed [14]. Moreover, a factor loading value exceeding the minimum limit (0.6) is essential to identify the items used for one component, as suggested by [6] and [8].

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e-ISSN: 2830-7933
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Additionally, the relatively high factor loading value provides vital information on construct validity. The researchers' relevant interpretations were also evaluated.

4. CONCLUSION

Overall, this study contributes to the improvement on detailed methods to test the level of questionnaire instrument in order to have high validity and reliability to be used in evaluating the implementation of PLC in schools. The instrument for evaluating the implementation of Profesional Learning Community has been tested and identified during the pilot study. Consequently, the study can be proceeded to the next stage, which involves administering the instrument to 400 teachers in national secondary schools in the state of Selangor, Malaysia. To obtain, more comprehensive formative and summative evaluations, it is essential to gather perspectives from diverse samples, especially from administration groups, headteachers, ministry officers and students.

ACKNOWLEDGEMENTS

The broad scope of disciplines involved in Evaluation Researck makes it essential for authors to receive significant support in preparing their work for publication. I am immensely grateful to my supervisor and colleagues for their valuable contributions, thoughtful insights and timely responses to my requests for feedback and guidance. Their support has been instrumental in easing the burden of writing and publishing this work. I would like to take this opportunity to express my gratitude and acknowledge their invaluable assistance.

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