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The Study of APIPA Model Concept Development through the Application of Analytical Hierarchy Process (AHP)

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Abstract

Improving the quality of teacher performance programs certainly requires the important role of teachers and school leaders. The role of teachers can be seen in the implementation of performance programs which require systematic and structured evaluation of performance programs. The results of the evaluation and monitoring of the implementation of the teacher performance program by school leaders are used as material for consideration in making decisions about the quality level of the teacher performance program. Making this decision is very difficult for a school leader in evaluating teacher performance programs. In this case, a modified program evaluation was developed by the CIPP model program evaluation with ALKIN model program evaluation. The research used Development Research (R&D) using 4D design (Define, Design, Development, Dissemination). The ***Define*** *stage conducts a literature review regarding weaknesses in the CIPP and ALKIN model program evaluation syntax. The* ***Design*** *stage prepares the topology related to the main ideas of the program evaluation development syntax. The* ***Development*** *stage carries out operational definitions and indicators for each program evaluation syntax. The d****issemination*** *stage carries out an expert judgment or assessment of the experts who are analyzed using the analytical Hierarchical Process (AHP) to determine the consistency of the program evaluation development concept. The results using AHP are consistent with the concept of developing the APIPA model program evaluation which has the syntax Assessment, Planning, Implementation, Product, and Appreciation for evaluating teacher performance programs.*

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1. INTRODUCTION

Science, Technology, Engineering, and Math (STEM) education is increasingly attracting attention because it is often associated with the development of superior human resources and economic growth.(Montgomery & Fernández-Cárdenas, 2018). In addition, mastery and knowledge in the field of mathematics have long been considered the most relevant for students' future educational development and work careers(Onion, 2004). Mathematics is considered the "Queen of Knowledge" because almost all fields of science are supported by mathematics (Evendi & Verawati, 2021). Mathematics is one of the most important subjects in human life(Raj Acharya, 2017).

the ability to understand the obstacles and challenges in implementing evaluations, the importance of creating a relationship of mutual trust on the impact of evaluations through continuous involvement and communication, as well as planning evaluations carefully and according to methodology. (Taut & Alkin, 2003).The use of information in decision-making in schools is carried out using surveys and interviews by decision-makers so that a better

understanding of context evaluation and input evaluation is needed to increase the use of evaluation results in schools.(MC Alkin & Stecher, 1983). Alkin found 5 syntaxes in evaluating a program, namely Assessment System, Planning Program, Implementation Program, Improvement Program, and Certification Program. The system and program evaluation developed by Alkin, et al. is that the difference between **Education System Evaluation** includes the Assessment System and Program Planning. **Evaluation of Learning Programs** includes Implementation programs, Improvement Programs, and Certification programs. (Alkin & Woolley, 1969).

Understanding evaluation requires an understanding of methods, uses, and assessments in carrying out program evaluation. (MC Alkin & Christie, Christina, 2004). Evaluation theories can be classified based on how they focus on method, utility, or assessment; These three approaches are the main part of forming this understanding. (Davidson, 2006).

Improve performance and support policy decision-making. (Christie & Alkin, 2008). There is a need for evaluation analysis to develop more comprehensive knowledge and documentation regarding broader evaluation development in the field of evaluation in countries with low economic value. (Carden & Alkin, 2012). Parent training program guidelines have been developed within the framework of the Context, Input, Process, Product (CIPP) model by Stufflebeam. The guidelines emphasize that components must be implemented before, during, and after the implementation of any training program. The program content and training methods used must be based on sound theoretical principles and evidence of effectiveness. It was also explained that several indirect and direct actions were recommended as a result of the behavior of parents and children(Matthews & Hudson, 2001).

Evaluating the program is determining the quality and value of the program, the importance of program information, generalization of program knowledge, determining the impact of the program, accountability of the program, improving the program, consistency of the program, and effectiveness of the program. (M. Alkin & Christie, 2012). Evaluations indicating the type of function are entrusted to professionals as assessment agents. The uniqueness of the development of functional diversity, and the conditioning or limitations faced by professionals can evaluate their daily work so that it can be a possible solution to overcome these problems.(Muñoz-Cantero et al., 2017). Research and evaluation in education that integrates a variety of quantitative, qualitative, and mixed methods has perspectives from various research paradigms on student psychology(Mertens, 2020). Evaluation and decision-making are conceptual and operational forms that have evolved in response to criticism, application, research, and parallel developments and continue to be referenced and applied in other fields. (Stufflebeam, 1983). Evaluation research carried out to evaluate the Engineering education curriculum explained that the curriculum evaluation assessment matrix was an initial requirement in developing the Engineering education curriculum and program.(Tseng et al., 2010).

evaluate a good program before the program starts (assessing the alignment of context and input) and after the program is finished (evaluating how well the process has been implemented and whether the resulting product meets needs. meets standards). The flexibility of the model is a major strength. In the field of language teaching, this model is very relevant to curriculum development and can be applied both at the course and program level(Sopha & Nanni, 2019). To generalize data universally, qualitative descriptive research is carried out, namely collecting, classifying, interpreting, and concluding. The content, processes, and learning products of the Distance Education Program (e-learning) are shown in the results of

respondents with a score of 85.71%, which is very effective and efficient, thus having a positive impact on the performance of lecturers in learning aspects during the Covid-19 pandemic. Meanwhile, the percentage of ineffectiveness in e-learning applications has a value of 23.75%, this is due to users' lack of familiarity with e-learning applications, which has a negative impact on the Distance Education Program (e-learning) on the performance of lecturers in learning aspects during the Covid-19 pandemic. , this was caused by respondents who gave poor responses or did not agree with using e-learning as a distance learning medium because it was still new and needed adaptation (Syahrir et al., 2021).

Factors that have influenced the development of evaluation theory are modification factors, adaptation, and insight into the relationship between personal history and perspectives such as personal experience, training, interaction with colleagues, field experience, and interaction with academic colleagues. (MC Alkin & Patton, 2020). The traditional game (Cublak-Cublak Suweng) was evaluated using the ALKIN model program evaluation which looks effective with 5 (five) ALKIN stages, namely Assessment, Planning, Implementation, Improvement, and Certification so that the impact of the game becomes a formal, legal traditional game in one of the learning areas. school.(Lindarti & Hasanudin, 2021). Alkin classifies which are very useful in teaching theory by classifying theories and models based on method, value, and use with the metaphor of the "Evaluation Theory Tree" which is put forward practically and has developed the Center for Evaluation Research (CSE) Model which is a useful model in contexts where decision to be taken. This research aims to determine the feasibility of developing modifications to the CIPP model program evaluation using the ALKIN model to become an APIPA model program evaluation to evaluate teacher performance programs.

2. RESEARCH METHOD

This research was carried out from July 2023 to January 2024. This research used development research using 4D design (Define, Design, Development, Dissemination). The collected feasibility validation questionnaire distribution data was analyzed using the Analytical Hierarchy Process (AHP) to determine the feasibility of the APIPA model program evaluation syntax from the modified CIPP model program evaluation with the ALKIN model program evaluation. The subject of this feasibility test was carried out by 5 (five) educational evaluation experts who were determined based on the profession of educational evaluation lecturer, minimum master's educational qualification, the field of educational evaluation science, and experience in the field of educational program evaluation. The APIPA model program evaluation development feasibility questionnaire consists of 46 question items. The questionnaire uses answer choices using a Likert scale as below.

Table 1. Likert scale of answer options for questionnaire questions

Score	Answer choices
5	Very suitable
4	In accordance
3	Not Appropriate
2	It is not in accordance with
1	Very inappropriate

Table 2. The basic scale of pairwise comparisons

Intensity of Interest	Information
1	Both elements are equally important.
3	One element is slightly more important than the other elements.
5	One element is absolutely more important than the other elements.
2, 4	Values between two values of adjacent considerations.

Determining the development feasibility category. Evaluation of the APIPA model program is ranked according to the consistency ratio value using the Analytical Hierarchy Process (AHP).

3. RESULTS AND DISCUSSION

A. *Define Stage*

This stage analyzes empirical studies of relevant research on each program evaluation and examines weaknesses as the main idea for modifying the program evaluation. The results can be seen in the table below.

Table 3. Analysis of Weaknesses in CIPP Model Program Evaluation

No.	Syntax	Indicator	Weakness
1.	Context	• Program background depiction • Provides program objectives and needs analysis of a system • Determine program targets • Determine the extent to which this offer is responsive to identified needs	• Don't pass judgment • There is no set initial standard
2.	Inputs	• Determine existing resources, • What alternative to take? • Plans and strategies to achieve needs, • Working procedures to achieve it	• Does not determine HR standards
3.	Process	• What the Program does • Who implements the program • When will the program be implemented?	• Does not determine the level of HR quality • Does not have a socialization program
4.	Product	• Whether the program objectives are met • Has the needs analysis been fulfilled?	

Source: Results of author's literature analysis

Table 4. Analysis of Weaknesses in ALKIN Model Program Evaluation

No.	Syntax	Indicator	Weakness
1.	Assessment	• Provides information about the state or position of a program	• Does not analyze system requirements
2.	Planning	• Selection of certain programs that are likely to be successful in meeting program evaluation needs through internal and external information	• Does not determine HR standards • Choose a program that is ready to be evaluated
3.	Implementation	• Prepare information on whether a program has been introduced to certain groups appropriately as planned	
4.	Improvements	Provides information about how a program can function, work, or run.	
5.	Certification	Provide information about the value or benefits of a program.	Doesn't give rewards

Source: results of author's literature analysis.

Based on the results of this definition, it can be concluded that the combination of program evaluations is as in the table below.

Table 5. Combined Evaluation Results of the CIPP and ALKIN model programs.

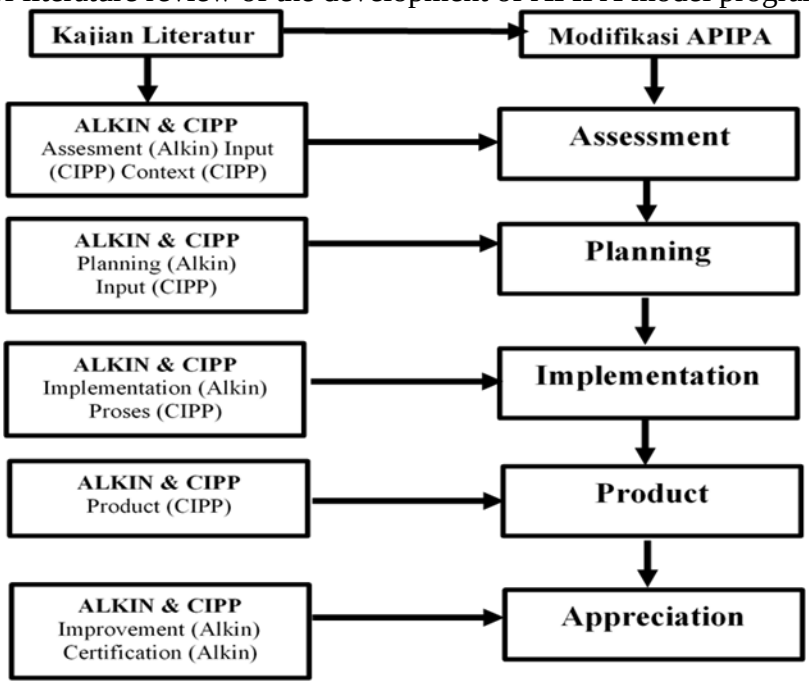
Syntax	**Indicator**
Assessment (A)	• Analyze program system requirements • Determining Program Readiness • Determining program objectives • Determine program targets, namely the resources to be evaluated, and evaluate the program. • Understand and ensure program regulations are implemented. • Determine program resource standards • Determining recommendations from the analysis of program resource standards.
Planning (P)	• Analyze program system requirements using a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis pattern for the program. • Select specific program activities that meet program needs through internal and external information. • Plans and strategies to achieve needs.

Syntax	Indicator
	• Determine the schedule of program activities • Determine work procedures for program activities
Implementation (I)	• Socialize the program activities used • What activities does the program carry out • Who is involved in program activities • When will program activities be implemented? • Collect evaluation documents of program activities.
Product (P)	• Measuring the achievement of program activities in the form of assessment results of the program activity process • Analyze the needs of the results of program activities that are met in the form of mapping program success.
Appreciation (A)	• Determine the category of achievement of program activities in the form of program activity certificates. • Providing information on the implementation of program activities in program activity reports. • Providing rewards for program activities to program implementers in the form of program certificates. • Recommendations for program activities

B. Design Stage

Based on the results of the literature review and analysis of the weaknesses of each program evaluation, it can be concluded that the APIPA Model program evaluation topology is as shown in the chart below.

Chart 1. Topology of literature review of the development of APIPA model program evaluation



C. Development *Stage*

Based on the results of scientific Define and Design as well as relevant research studies, the evaluation of the APIPA model program (Assessment, Planning, Implementation, Product, Appreciation) has 5 (five) syntax stages that can be defined operationally as follows:

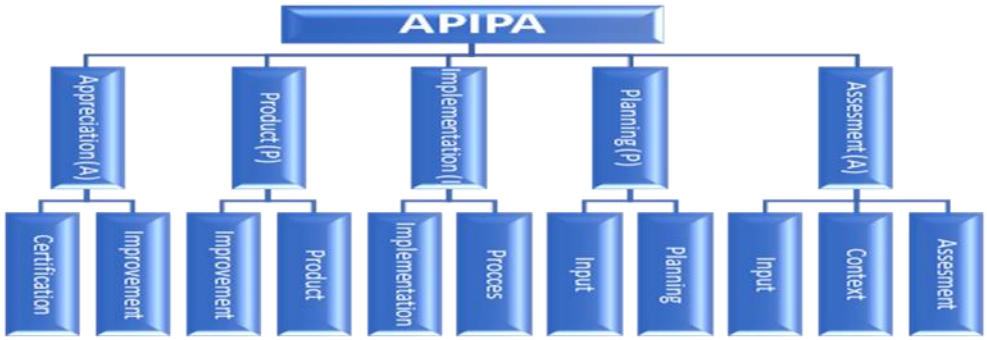
1. *Assessment* is information that includes analysis of program system needs, determining program readiness, determining program objectives, determining program targets and standards, namely the resources to be evaluated and evaluating the program, understanding and ensuring program regulations are implemented, and determining recommendations for the results of standard analysis of program resources.
2. *Planning* which is an analysis of program system needs using a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis pattern for the program, selecting certain program activities to meet program needs through internal and external information, determining effective work procedures and program activity schedules and efficiency.
3. *Implementation* is the activity of socializing the what, who, and when of program activities to program policy stakeholders and implementers as well as documenting the forms of program activities that have been implemented.
4. *Products* is a measurement of achievement and information on the usefulness of program activities that have been implemented effectively and efficiently as well as analyzing the needs of the results of program activities that have been met in the form of mapping program success.
5. *Appreciation* is an interpretation of achievement categories, providing information on implementation, providing rewards, providing information on benefits, and recommendations for program activities that have been implemented for making program policy decisions.

D. Dissemination

To ensure the feasibility of the development process, dissemination is carried out, namely expert judgment, to experts using a material expert validation questionnaire related to program evaluation. The results of the analysis of quantitative and qualitative data collected in determining the feasibility of developing modifications to the CIPP model program evaluation with the ALKIN model program evaluation to become an APIPA model program evaluation. The data was analyzed using the Analytical Hierarchy Process (AHP) steps as follows.

1. Defining and Identifying Problems

Chart 2. Identification of the APIPA model program evaluation hierarchy



2. Determining Priority of Syntax Elements

Determining the priority of syntax elements in the pairwise comparison matrix, namely comparing syntax elements in pairs according to the elements given in the table below.

Table 6. Mean pairwise comparison of APIPA model program evaluation syntax

Syntax	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	Average
Assessment	0.513	0.526	0.526	0.411	0.439	0.483
Planning	0.122	0.123	0.123	0.118	0.193	0.136
Implementation	0.178	0.154	0.154	0.164	0.149	0.160
Products	0.090	0.096	0.096	0.116	0.083	0.096
Appreciation	0.098	0.100	0.100	0.191	0.135	0.125

Graph 1. Logic for determining pairwise comparisons of the APIPA model program evaluation syntax

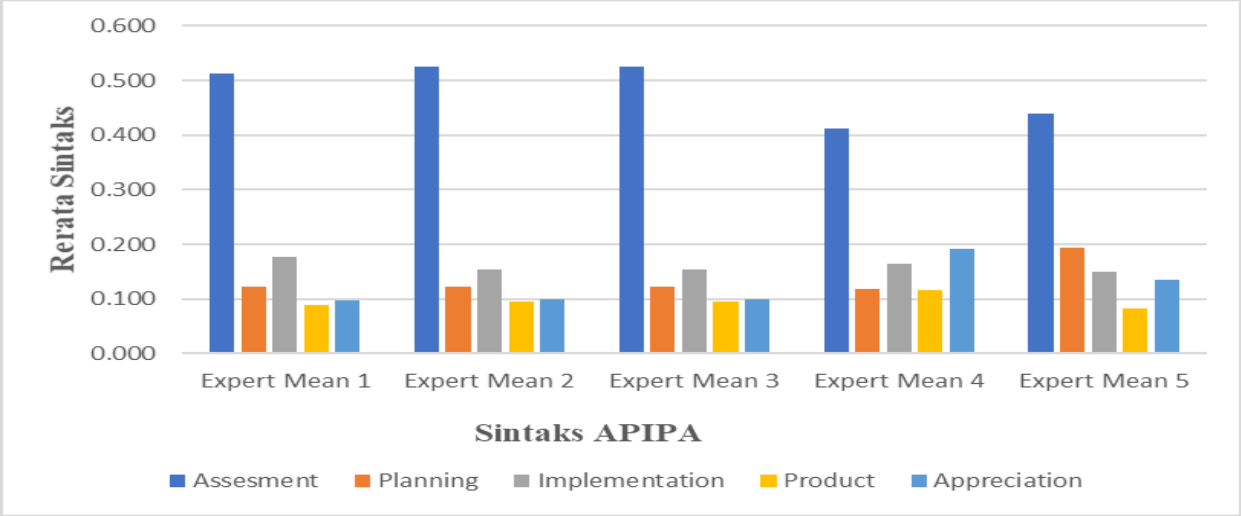


Table 7. Average pairwise comparison of alternative assessment syntax in APIPA model program evaluation

Alternative Syntax	Assessment Syntax					Average
	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	
Assessment	**0.354**	**0.333**	**0.337**	**0.346**	**0.347**	**0.343**
Planning	0.062	0.049	0.063	0.083	0.056	0.063
Implementation	0.061	0.066	0.072	0.096	0.079	0.075
Improvements	0.071	0.047	0.072	0.077	0.085	0.070
Certification	0.057	0.046	0.062	0.053	0.061	0.056
Context	**0.159**	**0.228**	**0.134**	**0.105**	**0.113**	**0.148**
Inputs	**0.120**	**0.136**	**0.131**	**0.129**	**0.151**	**0.133**
Process	0.059	0.049	0.058	0.053	0.053	0.054
Products	0.058	0.046	0.071	0.058	0.056	0.058

Graph 2. Pairwise comparison of alternative assessment syntax in APIPA model program evaluation

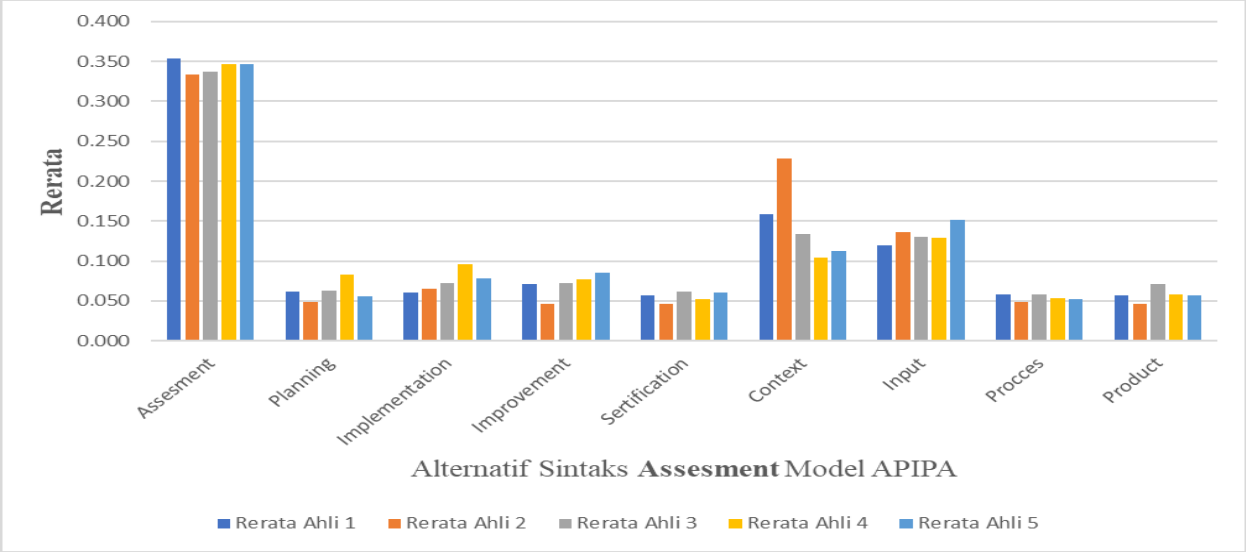


Table 8. Mean pairwise comparison of Planning syntax alternatives in the APIPA model program evaluation

Alternative Syntax	**Planning Syntax**					Average
	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	
Assessment	0.064	0.061	0.064	0.061	0.062	0.063
Planning	**0.337**	**0.334**	**0.342**	**0.335**	**0.335**	**0.337**
Implementation	0.046	0.047	0.053	0.046	0.048	0.048
Improvements	0.053	0.052	0.050	0.052	0.052	0.052
Certification	0.053	0.058	0.051	0.053	0.053	0.054
Context	0.132	0.095	0.127	0.108	0.098	0.112
Inputs	**0.209**	**0.247**	**0.207**	**0.240**	**0.248**	**0.230**
Process	0.053	0.052	0.053	0.052	0.052	0.053
Products	0.053	0.052	0.053	0.052	0.052	0.053

Graph 3. Pairwise comparison of alternative Planning syntax in APIPA model program evaluation

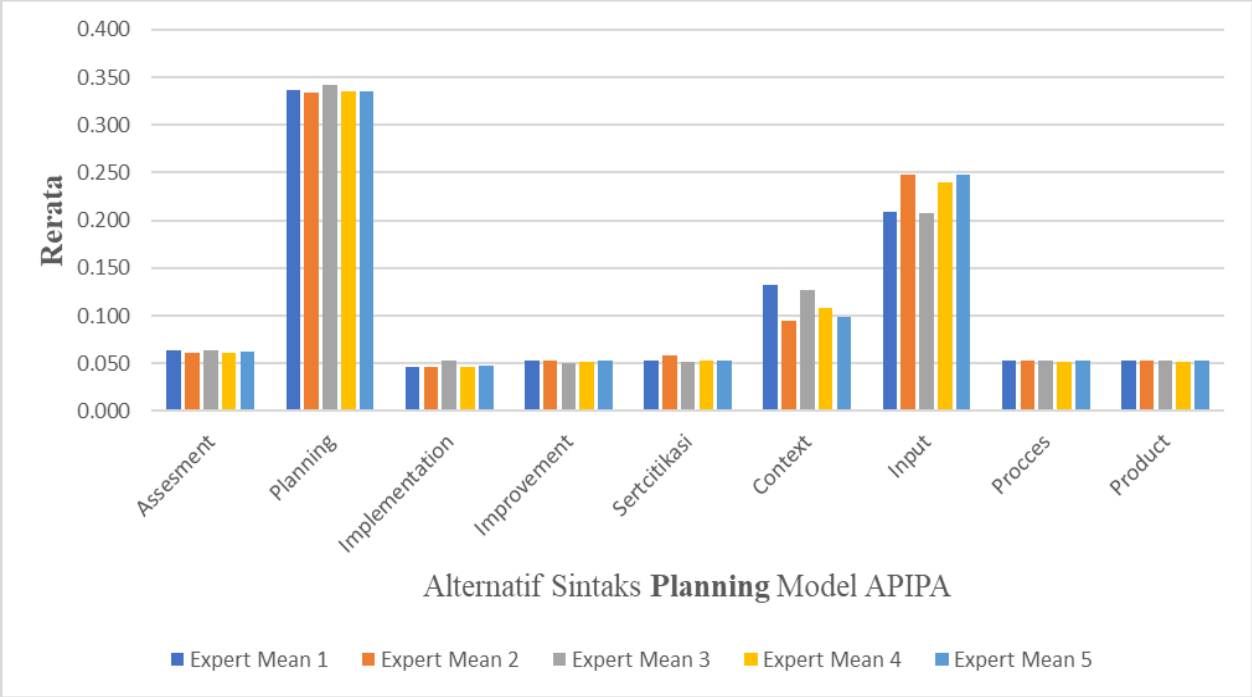


Table 9. Mean pairwise comparison of Implementation syntax alternatives in APIPA model program evaluation

Alternative Syntax	Implementation Syntax					Average
	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	
Assessment	0.056	0.057	0.056	0.057	0.061	0.057
Planning	0.086	0.087	0.087	0.086	0.091	0.087
Implementation	**0.333**	**0.335**	**0.334**	**0.332**	**0.324**	**0.332**
Improvements	0.052	0.053	0.052	0.052	0.053	0.052
Certification	0.045	0.046	0.045	0.045	0.047	0.046
Context	0.076	0.077	0.077	0.075	0.077	0.077
Inputs	0.070	0.071	0.071	0.070	0.073	0.071
Process	**0.238**	**0.229**	**0.234**	**0.239**	**0.228**	**0.234**
Products	0.044	0.044	0.044	0.044	0.046	0.044

Graph 4. Pairwise comparison of alternative implementation syntax in evaluating the APIPA model program

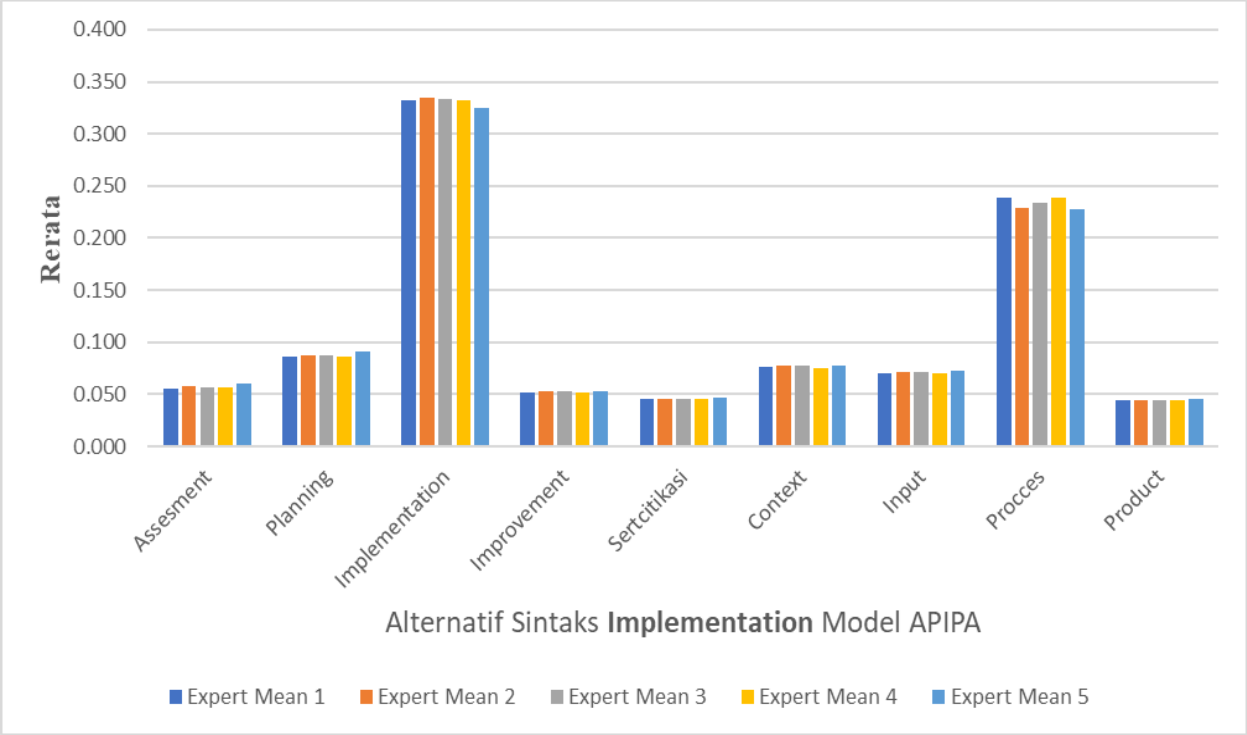


Table 10. Average pairwise comparison of Product syntax alternatives in the APIPA model program evaluation

Alternative Syntax	Product Syntax					Average
	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	
Assessment	0.075	0.081	0.126	0.120	0.088	0.098
Planning	0.081	0.074	0.113	0.069	0.095	0.086
Implementation	0.075	0.089	0.067	0.089	0.082	0.081
Improvements	0.075	0.077	0.067	0.071	0.124	0.083
Certification	0.066	0.060	0.051	0.055	0.092	0.065
Context	0.105	0.066	0.093	0.088	0.079	0.086
Inputs	0.089	0.115	0.077	0.087	0.101	0.094
Process	0.060	0.065	0.050	0.056	0.059	0.058
Products	**0.374**	**0.371**	**0.355**	**0.366**	**0.280**	**0.349**

Graph 5. Pairwise comparison of Product syntax alternatives in the APIPA model program evaluation

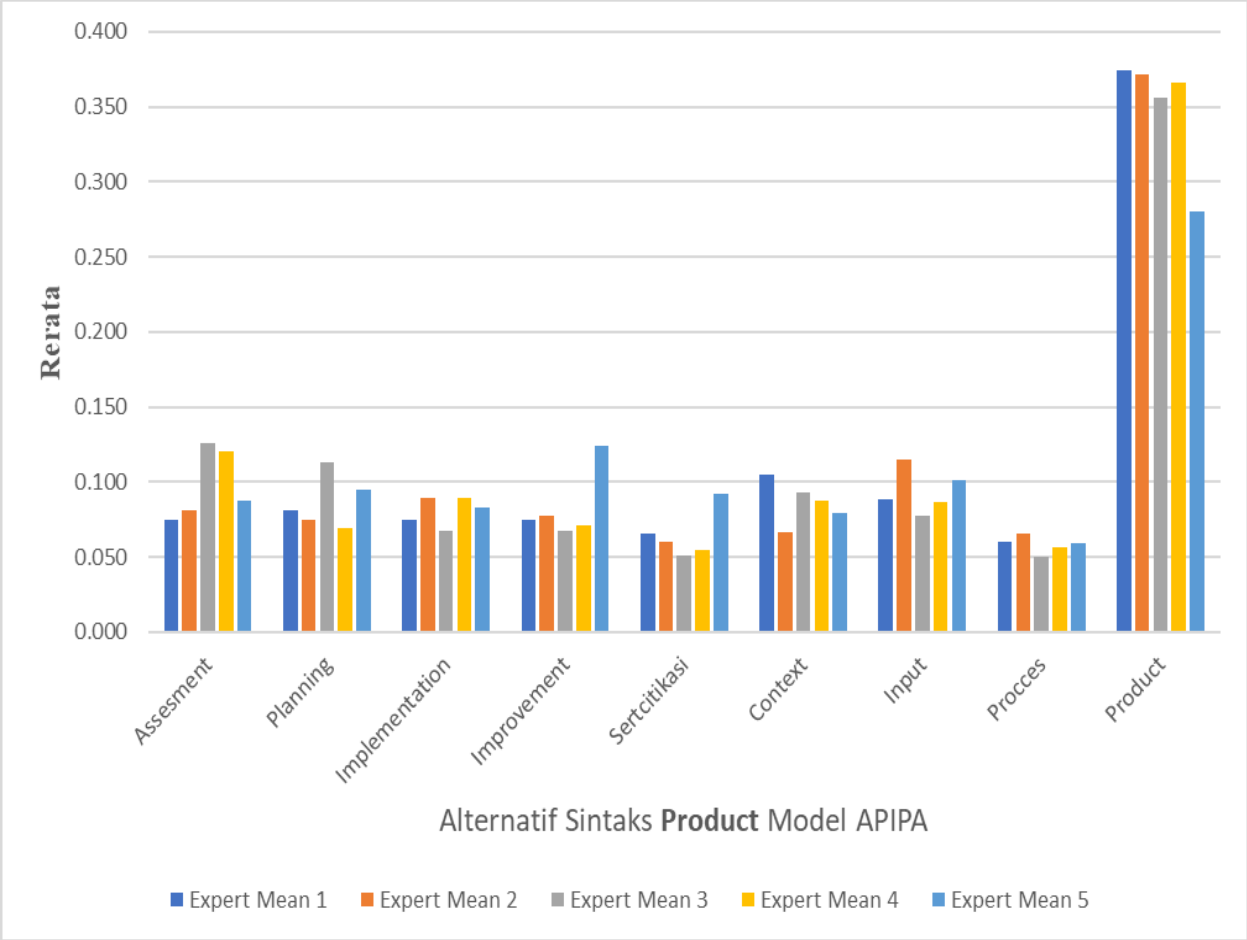
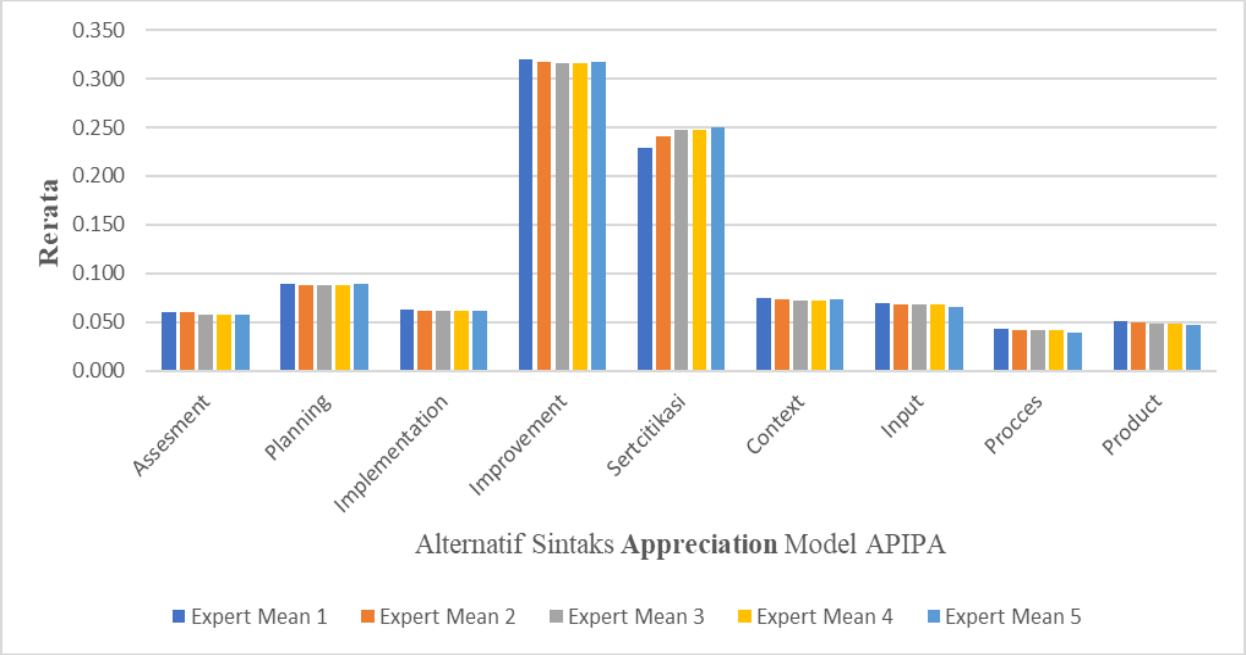


Table 11. Mean pairwise comparison of Appreciation syntax alternatives in the APIPA model program evaluation

Alternative Syntax	Appreciation Syntax					Average
	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	
Assessment	0.060	0.060	0.057	0.057	0.057	0.058
Planning	0.090	0.088	0.088	0.088	0.089	0.089
Implementation	0.063	0.061	0.061	0.061	0.062	0.062
Improvements	**0.320**	**0.318**	**0.316**	**0.316**	**0.317**	**0.317**
Certification	**0.228**	**0.240**	**0.248**	**0.248**	**0.250**	**0.243**
Context	0.074	0.073	0.072	0.072	0.073	0.073
Inputs	0.070	0.068	0.068	0.068	0.066	0.068
Process	0.044	0.042	0.041	0.041	0.039	0.042
Products	0.051	0.049	0.049	0.049	0.047	0.049

Graph 6. Pairwise comparison of **Appreciation** syntax alternatives in APIPA model program evaluation



3. Consistency Index (CI) Value

The results of each Consistency Index calculation use the following formula. Consistency Index (CI) value: where n is the number of elements measured. For the Consistency Index (CI) value, the comparison of pairs of syntax elements evaluating the APIPA model program for each expert assessor is as follows. $\frac{(\lambda_{Max}-n)}{n-1}$

Table 12. Index Consistency Values for Syntax Elements for APIPA Model Program Evaluation

APIPA	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	Average
Consistency Index (CI)	0.101	0.051	0.051	0.093	0.040	0.067

For the Consistency Index (CI) value, the comparison of pairs of alternative elements, the APIPA model program evaluation syntax for each expert assessor is as follows.

Table 13. Consistency Value Index for alternative syntax elements for APIPA model program evaluation

APIPA Syntax	Consistency Index (CI)					Average
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	
Assessment	0.109	0.142	0.125	0.112	0.100	0.118
Planning	0.121	0.114	0.122	0.110	0.108	0.115
Implementation	0.133	0.127	0.130	0.136	0.126	0.130
Products	0.042	0.052	0.084	0.051	0.136	0.073
Appreciation	0.105	0.130	0.107	0.107	0.091	0.108

4. Consistency Ratio (CR) Value

For the Consistency Ratio (CR) value of the comparison of pairs of syntax elements for evaluating the APIPA model program for each expert assessor, used the formula Consistency Ratio (CR) value =. $\frac{\text{Consistency Indeks (CI)}}{Indeks\ Random\ Consistency}$ The calculation results can be seen in the table are as follows.

Table 14. Consistency Ratio (CR) values for the APIPA model program evaluation syntax elements

	Expert Mean 1	Expert Mean 2	Expert Mean 3	Expert Mean 4	Expert Mean 5	Average
Consistency Ratio (CR)	0.090	0.046	0.046	0.083	0.036	0.060

For the value of Consistency Ratio (CR), the Comparison of pairs of alternative elements of the APIPA model program evaluation syntax for each expert assessor is as follows.

Table 15. Values of Consistency Ratio (CR)alternative elements of the APIPA model program evaluation syntax

APIPA Syntax	Consistency Ratio (CR)					Average
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	
Assessment	0.075	0.098	0.086	0.077	0.069	0.081
Planning	0.083	0.079	0.084	0.076	0.074	0.079
Implementation	0.092	0.088	0.089	0.094	0.087	0.090
Products	0.029	0.036	0.058	0.035	0.094	0.050
Appreciation	0.073	0.090	0.074	0.074	0.062	0.075

5. Checking Consistency

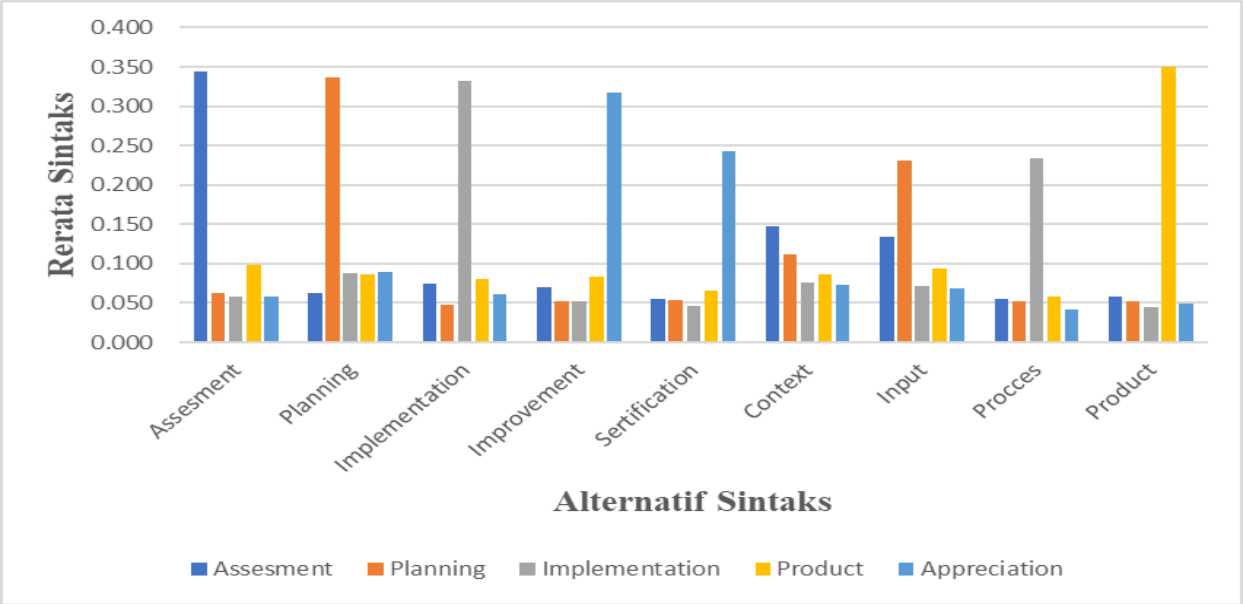
Based on the calculation results for each element and alternative syntax elements, evaluation of the APIPA model program as explained theoretically and the operational definition of each element shows that the **assessment** syntax is a combination of assessment, context, and input syntax; **planning** syntax is a combination of planning syntax, and input; **implementation** syntax is a combination of implementation syntax, and process. **product** syntax is combined from improvement syntax, with product. **Appreciation** syntax is combined from improvement syntax with certification. For this reason, it can be seen from the average value of the pairwise comparison of elements and alternative syntax elements for evaluating the APIPA model program as follows.

Table 16. Comparison of elements with alternative syntax elements for APIPA model program evaluation

Alternative Syntax	Assessment	Planning	Implementation	Products	Appreciation
Assessment	**0.343**	0.063	0.057	0.098	0.058
Planning	0.063	**0.337**	0.087	0.086	0.089
Implementation	0.075	0.048	**0.332**	0.081	0.062
Improvements	0.070	0.052	0.052	**0.183**	**0.317**
Certification	0.056	0.054	0.046	0.065	**0.243**
Context	**0.148**	0.062	0.077	0.086	0.073
Inputs	**0.133**	**0.230**	0.071	0.094	0.068
Process	0.054	0.053	**0.234**	0.058	0.042

Products	0.058	0.053	0.044	**0.349**	0.049

Graph 7. Comparison of elements with alternative syntax elements Evaluation of the APIPA model program



4. CONCLUSION

The development of the APIPA model program evaluation concept using the Analytical Hierarchy Process (AHP) has a consistency ratio (CR) value, namely 0.060, meaning no more than or equal to 0.1 random consistency index value. This explains that the APIPA model program evaluation can be used to evaluate teacher performance programs. The evaluation of the APIPA model program has the syntax Assessment, Planning, Implementation, Product, and Appreciation based on the results of the consistency test, each of which has a consistency ratio (CR) value of 0.081; 0.079; 0.090; 0.050; 0.075 means no more than or equal to 0.1 random consistency index value. This syntax is a stage of the APIPA model program evaluation in evaluating teacher performance programs.

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