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Developing Instruments using CIPP Evaluation Model in the Implementation of Portfolio Assessment in Science Learning

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ABSTRACT

The aim of this study is to develop an instrument of evaluation constructed using the CIPP model in the implementation of portfolio in science learning. Тхис study used research and development (R&D) method, adapting 4-D development model integrated with the development of non-test instruments. The subjects of this study were science teachers and 8th grade students of Junior High School in Yogyakarta. The validity test was analyzed by using V'aikens formula. Reliability is analyzed by using Interclass Correlation Coefficient (ICC) technique.The results of this study shows the instrument is valid. The Aiken's V coefficient ranged from 0.900 to 1.00. The Cronbach's Alpha coefficient is above 0.800 so the instrument is considered reliable. The practicality was obtained in a very practical category.The instrument of evaluation used to evaluate the implementation of portfolio assessment and the results shows that the implementation of portfolio assessment in Junior High Schools in Yogyakarta is in a good category.

KEYWORDS
evaluation instrument, CIPP model, portfolio assessment

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Introduction

The implementation of authentic assessment in the 2013 Curriculum implies significantly to teacher appraisal activities. Assessment is said to be authentic when the assessment is done to the students' performance and work which is done directly (Wiggins, 1990:1). Pantowati (2013: 5) asserts that "*Authentic assessment is designed to complete standardized test*", which means that an authentic assessment also needs to be used by teachers to complement the standardized test types. Authentic assessment as defined in the Regulation

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of the Minister of Education and Culture (Permendikbud) no. 104 of 2014 is a type of assessment which requires the learners to display attitudes, use skills gained from performing tasks in real-life situations. The assessment system of educational outcomes is further described in Permendikbud no. 23 of 2016 on Education Assessment Standards which requires that assessment of learners' learning outcomes including attitude, knowledge, and skills aspects.

Skill assessment is divided into several types, such as performance appraisal, project appraisal, and product appraisal, written assessment, and portfolio assessment. The Department of Education and Culture (2014:20) describes that portfolio assessment is an assessment of students' individual work in one certain period of a subject. Portfolio assessment can be done both by teachers and students to see the progress of work collected over time. Zhang (2009:99) states that portfolio is a part of alternative assessment, which includes learners' achievement records or their best documented assignments in the learning process. Ali (2014:1) adds that portfolio is not a mere collection of learners' documents or files, but it can also be used to show their progress in acquiring competence in one or more learning targets.

Learners' works to be collected into portfolio assessment can take various forms. Kaur (2013:100) states that learners' portfolio may contain learners' information, photograph, learning outcomes, best work samples; self-assessment and self-reflection; and internet-based materials and student-made magazines. Rakayani (2015:1) adds that mind mapping is one of the works which can be assessed in a portfolio assessment. In addition, the Ministry of National Education (Depdiknas) (2014:20) classifies students' research reports as one of the works that can be assessed as learners' portfolio.

Natural Science is one of the subjects which demands learners' skill. One of the skills in science is critical thinking skill. Bailin (2002: 362-363) argues that critical thinking is often conceptualized in the process or skill aspects. In addition, Wilujeng, et. al., (2010:355) add that science learning in secondary school is best equipped with critical thinking and creative activities so that it is not limited to rote learning. However, facts revealed from the interviews with teachers in the field show that critical thinking skill is not yet measured.

Portfolio assessment is an appropriate type of assessment to measure and assess learners' critical thinking skills at schools. The suitability of the portfolio assessment to measure critical thinking skills has been proven by Esmiyati (2016) who developed an instrument for portfolio assessment to measure critical thinking skill in science learning on the theme of Fluid Pressure. The instrument for portfolio assessment to measure critical thinking skills in science learning material on Fluid Pressure has been declared valid, reliable and practical to be used in the field. Consequently, the instrument is declared valid to be used to measure learners' critical thinking skill through portfolio assessment. The availability and ability of the portfolio assessment instrument to measure critical thinking skill should bring benefits to teachers so that the assessment activities can proceed optimally. However, the instrument is not used extensively by the junior high school science teachers.

The dissemination of the portfolio assessment instrument to be used extensively is one of the efforts so that the instrument designed by Esmiyati (2016) can be useful and helpful for teachers in implementing portfolio

assessment activities to measure critical thinking skills. In the dissemination of assessment instruments, evaluation activities should be done. The evaluation activity is intended to determine the achievement of learning outcomes and the implementation of the instrument of portfolio assessment. Msila & Setlhako (2013:323) assert that the implementation of evaluation needs to be done to influence the decision making to ensure that the evaluation being conducted is able to improve the program in the future. Huei –Mei, et.al., (2000:137) elaborate that evaluation is a means to understand, in which the criteria must be determined before the evaluation activity is carried out. In relation to that, to obtain the expected evaluation result and to be able to improve the program, a good and valid evaluation instrument is needed.

Effective evaluation instruments will produce valid information to be used to make decisions regarding the activities to follow up the implementation of the instruments in the portfolio assessment to measure critical thinking skills. Good evaluation activities which are able to produce the right information would require a valid instrument. However, a viable evaluation instrument to evaluate the application of a portfolio assessment instruments for critical thinking skills is not available yet. Thus, it is necessary to develop a valid, reliable and practical evaluation instrument.

This evaluation will be developed according to the CIPP evaluation model. This evaluation model is considered appropriate to be used, as proposed by Mohebbi et al. (2011: 3286) who state that the purpose of evaluation is to assess the quality of a program which includes input, process and output components. The CIPP evaluation model includes the three minimum aspects proposed by Mohebbi, et al. The components of the system to be evaluated with the CIPP model are as follows: 1) *Context*, context evaluation focuses on the evaluation activities related to the needs analysis, either the needs that have been achieved or not achieved. This analysis is also examined in more detail by finding reasons for the fulfillment of those needs. In addition to determining the needs of the program, context evaluation can also determine the purpose of the program, 2) *Input*. Input evaluation relates to what strategies to be used to achieve the unattained needs. The strategy can come from teachers as educators through teaching skills and the use of learning media, and comes from students who show their spirit to learn, concentration, and understanding. 3) *Process*. Process evaluation is an evaluation activity that focuses on the implementation of the system or program being evaluated. 4) *Product*, product evaluation is related to the analysis of the results of system or program implementation. The information obtained in the process evaluation can show the results which have been achieved so that the information can determine the next steps to follow up the implementation of the system or program in the future.

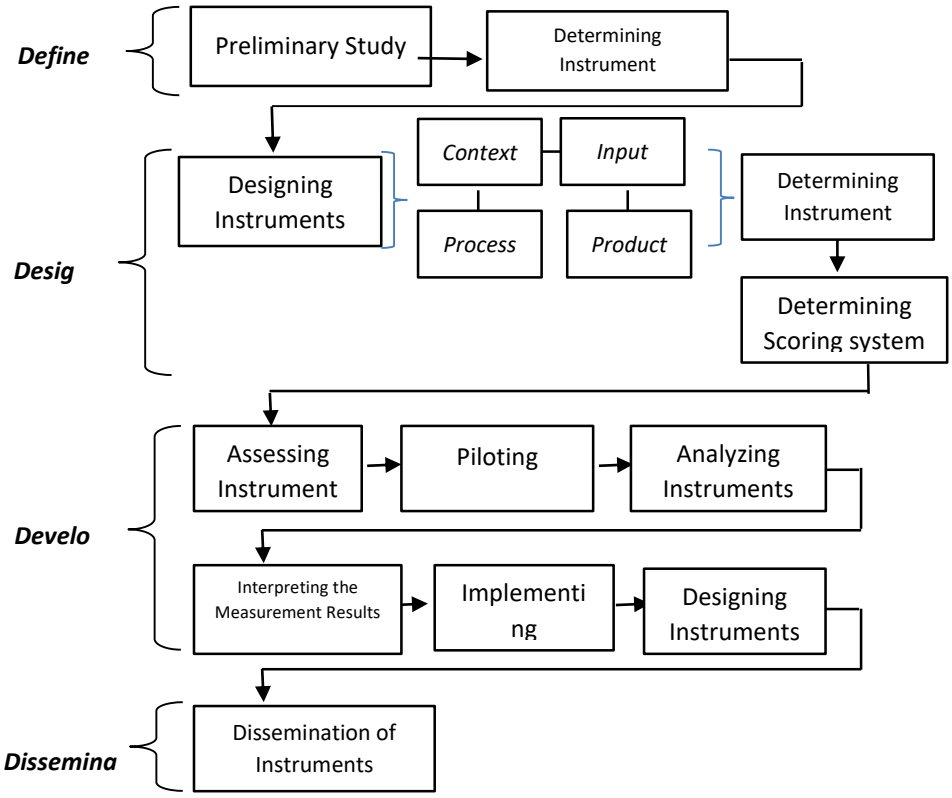
Research Objectives

The study aims to produce a feasible evaluation instrument using CIPP model to be used to evaluate the implementation of portfolio assessment in science learning based on valid, reliable and practical criteria.

Research Methods

The procedure to develop the CIPP model evaluation instrument for portfolio implementation follows the 4-D development model designed by

Thiagarajan et al. (1974) and integrated with the development of non-test instrument developed by Mardapi (2012: 149). The procedure to develop the CIPP model evaluation instrument is presented in Figure 1.



The procedures to develop the CIPP model evaluation instruments in the implementation of portfolio assessments include: 1) Define, which includes the preliminary study and determining instrument specification. The steps to determine the specification of the instrument include determining the purpose of measurement, designing the instrument indicators, selecting the shape and format of the instrument and determining the length of the instrument. 2) Design, which includes designing instruments, determining the instrument scale and scoring systems. 3) Develop, which includes the stage of assessing, piloting, analyzing, assembling the instrument, carrying out measurements, and interpreting the measurement result, and 4) Disseminate, which covers the stage of disseminating assessment instruments developed by the evaluator at the junior high school level as well as the publication in the form of seminars and scientific journals. The indicators of the CIPP model evaluation instrument to be developed is presented in Table 1.

Table 1. Indicators of the CIPP Evaluation Model Instrument

No.	Aspect	Components	Indicators
1.	Context	Suitability of the portfolio assessment instruments and the Core Competency and Basic Competency	1. The assessment instrument being presented is in accordance with the core competency of the 2013 Curriculum.

No.	Aspect	Components	Indicators
			2. The materials in the assessment instruments are in accordance with the basic competency.
			3. Indicators in the assessment instruments are in accordance with the achievement of basic competency being used.
2.	Input	a. Teachers' Competence and Comprehension	1. Pedagogical Competence
			a. Understand learners' characteristics
			b. Communicate effectively, empathetically, and politely to the learners.
			c. Conduct assessment and evaluation of the learning process and outcomes.
			2. Personality Competence
			a. Act in accordance with the cultural, religious and legal norms of Indonesia.
			b. Display oneself as an honest and dignified human being.
			3. Professional Competence
			a. Master the materials and scientific concepts supporting the subjects being taught.
			b. Master the standard competence and basic competence of the subjects being taught.
			c. Develop the subjects being taught.
		b. School Environment	1. The availability of facilities and infrastructure to support science learning.
			2. The availability of Science Laboratory equipped with instruments to support experiments on Liquid Pressure.
			3. The availability of a Science Laboratory completed with the materials to conduct experiments on Liquid Pressure.
3.	Process	a. Implementation of Instruments	1. Inform the learners about the aspects to be evaluated and the criteria of achievement in the beginning of the session.
			2. Teacher informs to the learners the evaluation procedure and the type of evaluation at the beginning of the session.
			3. Teacher conducts skill assessment using an experiment activity.

No.	Aspect	Components	Indicators
			4. Learners conduct a practicum using the Students Worksheets for Portfolio Assessment.
			5. The instrument of portfolio assessment is filled out truthfully based on the real conditions.
			6. Learners report the results of the experiments in the form of experiment reports.
			7. Learners communicate the results of group experiments.
3	Process	b. Learners' Responses to Learning in the Students' Worksheets portfolio on the theme Liquid Pressure	1. Learners respond to the learning process using Learners' Worksheets on the theme Liquid Pressure.
			2. Foster critical, scientific, and cooperative attitudes.
			3. Learners conduct the learning process based on Students' Worksheets.
			4. Learners have courage to ask questions to teachers and classmates.
4	Product	Results of the Implementation of portfolio assessment	1. Instruments of portfolio assessment to map out learners' critical thinking.
			2. The assessment instruments can reveal the degree of learners' mastery of the materials.
			3. To obtain information on critical thinking skills according to the objectives of portfolio assessment instruments.
			4. Portfolio assessment instruments can be used to determine the learners' mastery based on the Minimum Mastery Criteria of the Basic Competence.

Findings and Discussions

Validity Analysis

Validation analysis is conducted to know the validity of the instrument developed as one of the requirements of product feasibility. The instrument validation in this study involved seven validators, consisting of two lecturers as evaluation experts, two science teachers as practitioners, and three colleagues from the Science Education Study Program. The data obtained at the content validation stage includes the assessment data and input from the validators. Each validator gives a check mark on each item of statements contained in the developed CIPP model evaluation instrument. The overall score given by the validators is then analyzed using the Aiken's V formula. The Aiken's V Formula is used to find out the validity coefficient of the statement items represented by

V. The assessment of the seven validators to the CIPP model evaluation instrument covers aspects of assessment such as substance, construction and language.

The CIPP model evaluation instrument developed consists of an observation sheet and a questionnaire. The observation sheet was developed for the *input and process* aspects while the questionnaire was developed for *context, process and product* aspects. The value of the Aiken's V coefficient generated by each item on the observation sheet and the questionnaire was confirmed by the limit in the Aiken's V table for the number of categories in four intervals and seven raters, i.e. 0.86 (Aiken 1985: 134). The results obtained from the Aiken's V content validation analysis by the seven raters/validators show the range of 0.90-1. The results of the assessments obtained are then converted into four categories proposed by Lynn (1986). These categories include (1) the items are accepted well, (2) the items are accepted but need to be revised, (3) the items need revising, and (4) the items are omitted. The result of Aiken's V validation analysis can be seen in table 2.

Table 2. Results of Content Validation Analysis

No.	Components	Instruments	V	Notes
1.	*Context*	Users' Response Questionnaire	1.00	Valid
			0.95	
			0.90	
2.	*Input*	Teacher Competence Observation Sheets	1.00	Valid
			0.95	
			0.90	
		School Environment Observation Sheet	1.00	
			0.95	
			0.90	
3.	*Process*	Observation Sheet on the Instrument Implementation	1.00	Valid
			0.95	
			0.90	
		Learners' Questionnaire Responses	1.00	
			0.95	
			0.90	
4	*Product*	Users' Response Questionnaire	1,00	Valid
			0,95	
			0,90	

Reliability Analysis

The reliability analysis of the developed CIPP model evaluation instruments is done by inter-rater reliability method. Inter-rater analysis and calculations were conducted with the help of SPSS program with ICC (Intraclass Correlation Coefficient) technique. The value of the instrument reliability is indicated by the value of generated Cronbach's Alpha. The Cronbach's Alpha values generated in the reliability analysis of the CIPP model evaluation

instruments show numbers ranging from 0.80 to 0.90. The reliability category of this instrument is in both good and excellent category. Cronbach's Alpha coefficient categorization is in accordance with that proposed by Gliem & Gliem (2003: 87) who classify the Cronbach's Alpha coefficient category into 6, i.e. ≥ 0.9 (Excellent), ≥ (Good) ≥ 0.7, ≥ 0.6 (Questionable) , ≥ 0.5 (Poor), and <0.5 (Unacceptable). Based on the obtained results, it can be concluded that the developed instrument has fulfilled the reliability criterion as being good and very good. Thus, the developed instrument meets the valid and reliable criteria, so that it can be used for the next stage of operational field trials or measurements. The results of the reliability analysis of the CIPP model evaluation instruments are presented in Table 3.

Table 3. Reliability of the CIPP Model Evaluation Instruments

No.	Components	Instruments	Cronbach's Alpha Coefficient	Notes
1.	*Context*	Users' Response Questionnaire	0.920	Reliable
2.	*Input*	Teacher Competence Observation Sheets	0.898	
		School Environment Observation Sheet	0.891	
3.	*Process*	Observation Sheet on the Instrument Implementation	0.809	
		Learners' Questionnaire Responses	0.902	
4	*Product*	Users' Response Questionnaire	0.921	

Practicality Analysis

The practicality of the instrument was obtained based on the analysis of teacher's questionnaire and four observer's questionnaire. The portfolio assessment instruments are considered practical if> 60% (of observers) provide a positive response to the developed product. The result of the analysis of teacher's and observers' responses to the questionnaire to assess the developed instrument shows that 91.67% of the observers give positive appraisal. It means that the evaluation instruments developed in this study are very practical.

Results of Evaluation on the Implementation of Portfolio Assessment

The use of CIPP model evaluation instruments to evaluate the implementation of the portfolio assessment instrument to measure critical thinking skills is carried out by collecting evaluation data from context, input, process, and product components. The context component is analyzed based on the conformity aspect of the portfolio assessment instrument to the Core Competence and Basic Competence of the theme Liquid Pressure. The input components are analyzed from the aspects of teacher's competency and the school's support capacity in terms of facilities and infrastructure. The process components are analyzed from the implementation of the portfolio assessment instrument and the learner's response to the learning with practicum activities in accordance to the instrument of the implemented portfolio assessment.

Product components are analyzed from the aspect of the portfolio assessment results. The evaluation activities inform that the four aspects are in a good category.

The use of CIPP model evaluation instruments in the implementation of portfolio assessments to measure learners' critical thinking skills resulted in recommendations that portfolio assessment instruments be continued. In addition, it is also recommended that the instrument be disseminated to larger scopes where the learners' characteristics are more diverse. This decision is based on the findings obtained where the results of evaluation of the four components showed good results as expected. This is corroborated by Arikunto & Jabar (2014: 22) and Warju (2016: 41) who state that the program can be continued and disseminated if the program runs well as expected and bring benefits.

Conclusions

Based on the study results and discussion, it can be concluded that:

1. The developed CIPP model evaluation instruments were suitable to be used to evaluate the implementation of portfolio assessment to measure learners' critical thinking skills in science learning. The developed instrument has fulfilled the eligibility criteria as being valid, reliable and practical.
2. The evaluation activities using the developed instrument show that the implementation of portfolio assessment to measure critical thinking skills is classified as in a good category and has achieved the objectives determined in the evaluated portfolio assessment instruments

Disclosure statement

The Authors reported that no competing financial interest.

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