

Evaluation study of mathematics education master program curriculum

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Abstract

Curriculum is a very important component in implementing various programs. Therefore, it should be developed with the principles of relevance, effectiveness, efficiency, continuity, and flexibility. The objective of this research is to explore the incompatibility and compatibility of the Mathematics Education Master Program Curriculum with existing standards. This type of research is qualitative with evaluation method. Documents, alumni, students, and stakeholders (principal, head of university, head of Youth and Sports Office) are the sources of data used in this study. Data are collected using documentation study method, questionnaire, focus group discussion, with document filling form instrument, questionnaire, and record form. Research data is analyzed descriptively. The results of the research are: (1) Context, Input, Process, and Product models can be used to analyze the curriculum incompatibility that is implemented with existing standards or guidelines, (2) there is incompatibility between the courses given with the profile of graduates as a researcher, and the learning process is conducted with the characteristics of the learning process according to National Standards of Higher Education (NSHE), and (3) there is compatibility between: the courses given with the profile of educators and professionals; profile of graduates with level 8 of the National Qualification Framework of Indonesian (NQFI); lecturers' condition, the micro-level curriculum, facilities and infrastructures, and the number of students with the existing standards; and quality of graduates from aspect of Grade Point Average (GPA), study period, waiting period, and graduate performance with expectation

Keywords: *curriculum; context, input, process and product models; evaluation research*

Introduction

According to Law No. 20/2003, curriculum is a set of plans and arrangements regarding the objectives, contents, lesson materials and ways used as guidelines for the implementation of learning activities to achieve certain educational goals. Meanwhile, according to Ministerial Regulation of Research, Technology, and Higher Education No. 44/2015, curriculum is a set of plans and arrangements regarding graduate learning achievements, study materials, processes, and assessment used as guidelines for the implementation of study programs. In accordance with that understanding, the curriculum contains at least the purpose, content/material, means of delivery or implementation, and assessment or evaluation. The system of academic implementation in Master Program refers to Ministerial Decree of National Education No. 232/U/2000 leading to: (1) have the ability to develop science and technology; (2) have the ability to solve problems in the field of expertise through research and development activities based on scientific principles; and (3) have the ability to develop their professional performance. Related to the competence to be

achieved, Ministerial Decree of National Education No. 045 /U/2002 on the Core Curriculum of Higher Education provides confirmation that the competence of a study program consists of: (1) main competence, (2) supporting competence, (3) other specific competence and depending on the main competence.

The development of the course can be conducted through two approaches, namely inductive and deductive approaches. The inductive approach means referring to the competence to be achieved, what material should be given to achieve the competence, and being followed by giving the name of the course. Meanwhile, the deductive approach starts from the name of the course then followed by determining the course material. Development of Mathematics Education Master Program Curriculum Ganesha University of Education tends to use the deductive approach.

All this time, the assessment of Mathematics Education Master Curriculum has not been conducted. Questions arise such as whether the existing curriculum is relevant, whether it is in accordance with existing regulations, etc. Hussain et al. (2011) said that the essence of curriculum goal achievement depends on the evaluation process during development. If the process involves all related parties, then the product will be valid. There is no frequent evaluation of the curriculum being implemented, so there is no feedback to revise the curriculum. In relation to this, Harb (2017) says that the curriculum reconceptualist seeks to reshape the field of study and look from multiple perspectives. Research results of Handler (2010) and Öztürk (2011) are new paradigms of learning to bring a significant impact on teacher autonomy innovation, but the development of a new model curriculum fails to provide teachers with extensive scope for curriculum planning and implementation.

In order to provide better service as well as to produce qualified graduates, it is necessary to have a planned, systematic, directed and programmed curriculum review, to make curriculum improvement or development. A comprehensive review of context, input, process, and product becomes a necessity. Therefore, the problem solved in this research is how the incompatibility and compatibility of Mathematics Education Master Program Curriculum with the existing provision or regulation.

Curriculum development in college becomes the relevant university authority in accordance with the study program. Nevertheless, in its development, it has to pay attention to the principles of relevance, effectiveness, efficiency, sustainability, and flexibility (Abdullah, 2014). According to Postgraduate Program Curriculum Ganesha University of Education, the educational orientation of Master Program in accordance with Ministerial

Decree of National Education No. 232/U/2000, determines that the orientation of the master program is:

- a. having the ability to develop and update science, technology, and or art by mastering and understanding the scientific approach, method, and scientific rules accompanied by their application skills;
- b. having the ability to solve problems in the field of expertise through research and development activities based on scientific principles;
- c. having the ability to develop their professional performance which is demonstrated by the sharpness of problem analysis, comprehensiveness of review, similar problem solving or profession.

Referring to Ministerial Decree of National Education No. 232/U/2000, the provisions of the Master Program study load are as follows:

- a. The learning load of at least 36 credits and a maximum of 50 credits scheduled for 4 (four) semesters at the Postgraduate Program of Ganesha University of Education maximum load is 46 credits;
- b. The study load can be reached within 4 semesters and for the duration of 10 semesters including the preparation of the thesis, after the degree program.

In accordance with article 9, the level of depth and breadth of learning materials for each educational program is formulated with reference to the description of learning achievement of graduates from NQFI. In this context for the Master program is at level 8 which is formulated as follows.

- a. Able to develop knowledge, technology, and or art in their field of science or professional practice through research, to produce innovative and tested work.
- b. Able to solve the problems of science, technology, and or art in the field of science through inter or multidisciplinary approach.
- c. Able to manage research and development that benefits society and science, and able to gain national and international recognition.

Characteristics of the learning process in the master program consist of interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student-centered characters. Semester learning plan is defined and developed by lecturers independently or collectively in a group of experts in a field of science and/or technology in the course of study. The study load of the master program of at least 36 credits, with a maximum study period of 4 (four) academic years. In relation to the assessment, it includes

the educative, authentic, objective, accountable, and transparent principles that are conducted in an integrated manner.

Context, Input, Process, and Product (CIPP) model is one of the program evaluation models. This model is very popular and widely used. This model was first used by Stufflebeam (2003) to describe the success or failure of a program. The CIPP model has Context, Input, Process, and Product components. These four components are interrelated (Zhang et al., 2011). According to Sukardi (2008), the CIPP model is designed to complement the basic decision-making in the system evaluation with a change-oriented analysis with three basic assumptions: (1) to state the questions that ask for answers and specific information to be achieved; (2) to require the relevant data to support the identification of the achievement of each component, (3) to provide information on which the results of its existence are needed by decision makers to improve the education program.

The CIPP model in its implementation has four focuses: context, input, process, and product. Context analysis is a requirement analysis to be able to formulate goals to be achieved such as courses that support the profile of graduates, and NQFI level 8; input analysis provides information on inputs such as lecturers, curriculum, facilities and infrastructures, and number of students; process analysis provides information on the compatibility of learning implementation with process characteristics according to NSHE, whereas product analysis is intended to evaluate the results shown and accommodate information to be assured under the conditions how objectives can be achieved such as GPA, study period, waiting period, and graduate performance.

Materials and Methods

1. Type of Research

The type of this research is qualitative with evaluation method. Evaluation research essentially aims to evaluate a program by comparing data obtained with a certain standard.

2. Research Procedures

- a. Conducting documentation study to analyze the current curriculum structure as well as the profile of graduates,
- b. Collecting data related to CIPP incompatibility
- c. Analyzing the context, input, process, and product for curriculum reformulation in accordance with applicable standards which are capable of producing qualified graduates.

d. Conducting Focus Group Discussion (FGD) involving alumni, students, stakeholders (principal, head of university, and Lecturer of Mathematics Education Ganesha University of Education). The focus in this FGD is to deeply explore the incompatibility of the curriculum structure, including both positive and negative sides in the planning, implementation, assessment and in the mentoring process.

3. Data sources, types of data, data collection methods, and research instruments

Data sources, types of data, data collection methods, and research instruments used are presented in Table 1.

Table 1. Data sources, types of data, data collection methods, and research instruments

Data Source	Type of Data	Data Collection Method	Research Instrument
Document	Old curriculum structure, the profile of graduates, Number of students, lecturer's condition.	Document study	Document record form
Alumni	<ol style="list-style-type: none"> 1. Context incompatibility (courses with a profile of graduates; profile of graduates with NQFI) 2. Input incompatibility (micro-level curriculum, facilities, and infrastructures) 3. Process incompatibility 4. Product incompatibility (Graduate tracking) 	Questionnaire	Questionnaire
Students	<ol style="list-style-type: none"> 1. Context incompatibility (courses with a profile of graduates) 2. Input incompatibility (micro-level curriculum and facilities and infrastructures) 3. Process incompatibility 	Questionnaire	Questionnaire
Stakeholder (Principal and Head of University where alumni duties)	<ol style="list-style-type: none"> 1. Context incompatibility (courses with a profile of graduates; a profile of graduates with NQFI) 2. Product incompatibility (Alumni performance) 	Questionnaire	Questionnaire

All questionnaires are developed by researchers with reference to the aspect or indicator of the variables. Questionnaires on context incompatibility refer to the profile of graduates and courses charged according to the guidelines set out in Postgraduate program

study reference book of Ganesha University of Education and the formulation level 8 of NQFI in accordance with Presidential Regulation No. 8/2012. Questionnaires on input incompatibility are observed from the aspect of lecturers, micro-level curriculum, facilities and infrastructures, and a number of students. Questionnaires on process incompatibility are developed with reference to the characteristics of the learning process according to NSHE, while questionnaires on product incompatibility are mainly related to graduate competence with reference to pedagogic, professional, personality, and social competence. Prior to use, the questionnaires are validated by three relevant experts.

The subject of research is determined according to need by using a purposive technique. For example, head of the university selected as respondents are universities with alumni lecturer staff of the Mathematics Education Master Program Ganesha University of Education. To obtain more in-depth data related to the curriculum compatibility or incompatibility, FGD is conducted by involving all data sources such as alumni, students, principals, head of university, undergraduate and master program lecturers. The number of respondents is 33 people consisting of 11 alumni, 6 students, 4 principals, 2 heads of university, 1 Head of Youth and Sports Office, 6 master program lecturers, and 3 undergraduate program lecturers.

4. Data Analysis Technique

Data on the profile of graduates, context, input, process, and product or curriculum discrepancy are analyzed descriptively. Compatibility, in this case, uses a 70% passing grade, so the conversion guide is set as follows.

If the average $\geq 85\%$ then categorized as very appropriate

If $70\% \leq \text{average} < 85\%$ then categorized as appropriate

If $55\% \leq \text{average} < 70\%$ then categorized as inappropriate

If the average $< 55\%$ then categorized as very inappropriate

Results and Discussion

a. Context Analysis

(1). Response to Courses with Profile of graduates

The incompatibility of the courses with the profile of graduates as the researcher is demonstrated by the students' assessment, whereas according to the assessment of the superior and the alumni are considered appropriate. These results are also indicated by the assessment of each statement. In general, according to superiors, alumni, and students, between the courses and profile of graduates as educators, are appropriate. In general,

according to alumni and students, there is compatibility between courses provided with a professional personal profile, even specifically according to the superior.

Table 2. Response to Courses with Profile of graduates

No.	Statement	Assessment	Average (%)	Category
1	Profile of Researchers	Superior	88.67	Very appropriate
		Alumni	77.82	Appropriate
		Student	64.00	Inappropriate
2	Profile of Educators	Superior	83.89	Appropriate
		Alumni	79.70	Appropriate
		Student	73.33	Appropriate
3	Profile of Professional Personnel	Superior	88.00	Very appropriate
		Alumni	80.00	Appropriate
		Student	64.67	Appropriate

(2). Response to Profile of Graduates with NQFI

Response to Profile of Graduates and NQFI is presented in Table 3.

Table 3. Response to Profile of Graduates with NQFI

Statement	Assessment	Average (%)	Category
Profile of Graduates with NQFI	Superior	87.71	Very appropriate
	Alumni	81.70	Appropriate

In general, the assessment of the relationship between the profile of graduates with NQFI by the categorized superiors is very appropriate, while by the alumni is categorized as appropriate.

b. Input Analysis

(1). Lecturers of Mathematics Education Master Program

All lecturers of Mathematics Education Master Program are qualified doctoral with a specialization of mathematics education and mathematics that is highly in accordance with the field of science.

(2). Curriculum and facilities and infrastructures

Table 4. Response to Curriculum and facilities and infrastructures

No.	Statement	Assessment	Average (%)	Category
1	Curriculum	Alumni	85.09	Appropriate
		Student	81.33	Appropriate
2	Facilities and infrastructures	Alumni	76.36	Appropriate
		Student	74.17	Appropriate

In general, both alumni and student curriculum developed in the classroom learning are categorized as appropriate. In general, both according to alumni and student facilities and infrastructures are categorized as appropriate.

(3). Students

Table 5. Number of Students

Academic Year	Number of Singaraja Students	Number of Denpasar Students 1	Number of Denpasar Students 2	Total
2014/2015	8	34	29	70
2015/2016	11	16	17	44
2016/2017	3	23	21	57

It appears that in the last 3 years the number of students has fluctuated, and the number of students studying in Singaraja is relatively fewer than those in Denpasar.

c. Process Analysis

Table 6. Process Assessment

No.	Statement	Assessment	Average (%)	Category
1	Process	Alumni	78.18	Appropriate
		Student	51.11	Very inappropriate

In general, the process according to the average student is 51.11% and the category is very inappropriate, whereas according to the learning process alumni, the average of 78.18% is categorized as appropriate.

d. Product Analysis

(1). Alumni GPA, Study Period, and Waiting Period

Based on the results of alumni tracking for the last three years in the average gain GPA = 3.65, the average study period = 25.82 months, and waiting period = 0.7 months.

(2) Graduate Performance

Table 7. Graduate Competence

No.	Competence	Total Score	Average (%)	Category
1	Pedagogic Competence	239	88.52	Very Good
2	Professional Competence	210	87.50	Very Good
3	Personality	152	84.44	Good
4	Social	129	86.00	Very Good
	Total	730	87.00	Very Good

In general, the graduate competency is very good, and specifically, the pedagogic and professional competencies are very good, while the personality and social competencies are categorized as good.

Profile of Mathematics Education Master Program Graduates consists of profiles as researchers, educators, and professionals. To realize this profile, some courses are proclaimed. Ideally, the courses that are charged to the master students in Mathematics Education are oriented towards the profile of graduates.

In the context of National Qualification Framework of Indonesia (NQFI), the curriculum developed in the master program must comply with the NQFI level 8. The results of this research indicate that in general the incompatibility of the courses given with the profile of graduates lies in the profile of the researcher. This incompatibility is only based on student assessment. While other profiles are appropriate, so are assessments made by superiors (users) and alumni. Incompatibility of the courses with the profile of the researcher is primarily concerned with student assessments relating to: (1) ability to apply science in solving problems, (2) ability in conducting research and development activities, and (3) ability to communicate research and development results. This result actually reinforces the incompatibility of the courses that support the profile of the researcher, namely in the curriculum structure, only the philosophy of science is included and the methodology course should be very appropriate with the profile of the researcher. The credit weight of methodology study is only 3 credits, so this is definitely not sufficient to produce graduates with competence as a researcher.

The incompatibility of the courses with the profile of the educator is generally not the case. However, in particular, there is an incompatibility on the aspect of (1) ability to improve the effectiveness of scientific knowledge teaching by operationalizing the scientific epistemology in the teaching-learning process that enables learners to master scientific procedures in obtaining, processing, and compiling scientific knowledge, and (2) ability to guide learners who are writing research reports or scientific activities. This incompatibility is according to the students, whereas according to the user (superior) and the given course alumni is very appropriate with the profile of the educator. This profile of the educator is formed through the Scientific and Skill Courses (SSC) which includes: (1) the Foundation / Problematic Education, and (2) the Foundation of Studying and Learning.

The incompatibility of the courses with the profile of the professional personnel in general according to the users, alumni, and students does not happen or in other words is already appropriate. However, according to the students, there is incompatibility in the aspect of (1) ability to apply the knowledge that becomes the field of expertise as a reference in solving various problems developing in the society; (2) ability to indicate a balance between technical ability and managerial skill in professional performance, and (3) ability to indicate professional ethics in professional performance incompatibility, even in the aspect of point (2) it is stated very inappropriate. The profile of these experts is formed through the Working Expertise Course (WEC) and the Working Behavior Course (WBC) in accordance with the respective study program. It is planned that more than 10 courses support the formation of the profile of professional personnel, i.e. real analysis, linear algebra and its application, application of Analysis, discrete mathematics, number theory, mathematics learning methodology, mathematics learning evaluation, mathematics learning seminar, the foundation of learning. This result is highly appropriate with the fact that there is neither explicit nor integrated course related to managerial skills.

In relation to the incompatibility, profile of graduates with NQFI is not assessed either by the superior or the alumni. Profile of mathematics education master program graduates in accordance with level 8 of NQFI is: (1) able to develop knowledge, technology, and / or art in the field of science or professional practice through research, to produce innovative and tested work, (2) able to solve the problems of science and technology in the field of science through inter or multidisciplinary approach, and (3) able to manage research and development that benefit the society and science, and able to gain national and international recognition.

Input incompatibility related to human resources, specifically lecturers, does not occur, because 7 lecturers in Mathematics Education Master Program are qualified doctoral. In terms of NSHE, qualified lecturer in the master program is a doctoral and the minimum number is 6. Even, 5 of 7 lecturers are professors. In relation to the micro-level curriculum, which is used in classroom learning, all lecturers have made a Semester Program Plan (SPP) in accordance with the courses they have. SPP is delivered at the beginning of the meeting, and in the implementation of learning in accordance with the SPP has been developed. According to alumni and students, there is generally no incompatibility of curriculum development conducted by lecturers. However, specifically according to the students on the aspects of the use of several methods in the lecture is not appropriate, because according to them the lecturers in the lectures use only expository methods or presentations. Related to facilities and infrastructures in general, according to alumni and students there is no incompatibility. What is expected in accordance with the NSHE is fulfilled, only specifically according to the alumni and students incompatibility occurs, which is an inconvenience? The number of master program students in the last 3 years is 70, 44 and 57 respectively distributed in 3 classes. Of the total number of students in the class who on average about 20 students are still in the ideal category, but of the total number associated with the guidance of the thesis, it is quite a lot because on average each lecturer will guide 15-20 students.

Process incompatibility in general according to the alumni does not occur, but occurs according to the students and is categorized as very inappropriate. The learning process conducted by lecturers compared with the standard process according to NSHE in 2015. This incompatibility is mainly on aspects of (1) the learning process encourages the formation of a comprehensive and broad mindset by internalizing the advantages and wisdom of local and national (holistic), (2) learning achievement is achieved through an integrated learning process to meet the achievement of graduate learning as a whole in a single program through interdisciplinary and multidisciplinary (integrated) approach, (3) learning achievement is achieved through the learning process that prioritizes the scientific approach so as to create an academic environment based on the value systems, norms, and rules of science as well as upholding the values of religion and nationality (scientific), (4) learning achievement is achieved through the process of learning suited to the demands of ability to solve problems in the realm of expertise (contextual), (5) learning achievement is achieved through a learning process that is suited to the scientific characteristics of the study program and is associated with real problems through a transdisciplinary (thematic) approach, (6) learning achievement is achieved successfully by emphasizing the internalization of the material well and correctly

in the optimum (effective) period. There is a difference in the principle of the assessment results by the alumni and students, because in general, the alumni follow the lecture according to the old standard, while the current student has been oriented to NSHE in 2015. Learning on the Mathematics Education Master Program has not adjusted yet to the demands of learning process characteristics in the NSHE.

Product incompatibility observed from GPA, study period, and waiting period does not occur. The average GPA is 3.65 and the average of the study period is 25.83 months, and the waiting period is 0.7 month which is generally very good and much above the standard. In general, the input of master program students is to have worked as a teacher or become a tutor. Observing the performance of graduates assessed by his superior (principal or head of the department) the graduates' competence is categorized as very well. This achievement cannot be separated from the service both academically and non-academically given to the students. This result is supported by the opinion of alumni who indicates satisfaction with the service and the usefulness of the competence gained during graduation. There are 45.45% of alumni who express satisfaction and 27.27% are very satisfied with the services provided in the Mathematics Education Master Program. There are 63,64% who are satisfied and 36,36% are very satisfied with the competence they get.

Conclusion

Based on the results of research and discussion that has been described above, it is concluded as follows.

- a. Context, Input, Process, and Product (CIPP) models can be used to analyze the incompatibility of curriculum that is conducted with existing standards or guidelines. Context incompatibility can be observed from the relevance of the courses given to the profile of graduates as well as the relevance to the NQFI demands. Input incompatibility can be observed from lecturers' condition, the micro-level curriculum, facilities and infrastructures, and the number of students. Process incompatibility can be studied based on learning process characteristics expected in NSHE, while product incompatibility can be studied from GPA, study period, waiting period, and graduate performance.
- b. In general, there is compatibility between:
 - (1). subjects provided with a profile of graduates as researchers, mainly concerned with aspects of applying science in solving problems, utilizing science for the

development of science, technology and art, and the ability to communicate research and development results.

(2). the learning process is conducted with characteristics of NSHE learning process, especially related to holistic, integrated, scientific, contextual, thematic, and effective characteristics.

c. In general, there is compatibility between:

(1). courses provided with profiles of educators and professionals.

(2). profile of graduates with level 8 of NQFI

(3). lecturer's condition, micro-level curriculum, facilities and infrastructures, number of students with existing standards.

(4). the quality of graduates from the aspect of GPA, study period, waiting period, and performance formed with expectations.

Since the curriculum is one of the most important means used to achieve the desired objectives, the curriculum assessment and development needs to be conducted in a planned, directed and programmed manner. The implementation of the curriculum needs to be supported by policymakers with high commitment to produce the expected results. Recognizing that the curriculum is just one of the most important factors in our education system, it is advisable for other researchers to examine other factors in depth so as to reveal in depth the issues and solutions that deserve to produce the expected graduates.

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