

CE-10

## **THE DEVELOPMENT OF INORGANIC CHEMISTRY LEARNING MODEL BASED ON PORTFOLIO ASSESSMENT**

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### **Abstract**

This study is a research and development that aims to produce the Inorganic Chemistry in learning model based on portfolio assessment. The research and development model was used is the Gall et al. ( 2003 ) model which consists of four stages: a preliminary study , the model design phase, design development and testing models phase. The subjects were 46 students of the third semester of Chemical Education who enroll a course of Inorganic Chemistry II in 2013/2014. Pilot phase model using a pre-experimental design. Implementation of the portfolio in the lecture through five stages, namely : planning assessment portfolio, portfolio collect, select and reflect on selected products, improve and evaluate products, utilizing the results of the assessment portfolio. The results showed that the Inorganic Chemistry Learning model based on portfolio assessment of generated include in the valid and practical criteria. The effectiveness of the model is 73.6 %.

**Key words:** Learning Model, Inorganic Chemistry, Portfolio Assessment.

### **INTRODUCTION**

The implications of changes in the curriculum is alteration paradigm in the education assessment system, i.e. assessment system that emphasizes on learning outcomes (assessment of learning) becomes holistic assessment that includes planning, processes, and outcomes of learning (assessment for learning). The assessments typically use traditional assessment (e.g., true- false, multiple choices, fill in, short answer, and essay) turns into the implementation of various types of authentic assessment. That is, the assessment conducted by educators for learning should be corresponding to the real world situation. This assessment is intended to educators and learners be able to monitor the process, progress, and improvement of student learning outcomes. it is consist of the principles implementation of the assessment proposed by the National Education Standards Agency (BSNP) that educational assessment is the series process of activities to analyze and interpret the data about process and learning outcomes of students who carried out a systematically and continuously, so that the results of these assessments can be a significance information in decision-making (BSNP, 2009).

One of the assessment systems appropriate in this objective is portfolio assessment. Portfolio assessment is an assessment system that uses a collection of student work that demonstrates achievement or improvement obtained by the students from learning process (Stiggins, 1994). Therefore, the assessment should give an idea of the learning process, the assessment of learning is not only carried out at the end of learning but also executed during the learning process. In other words, assessment is an integral part of the learning process.

Portfolio assessment included in the authentic assessment. This assessment can be used to determine the level of achievement and competence development of learners based on

collection of work from period of time (Arifin, 2011). Therefore, the works or tasks that are documented by the students are all aimed to the achievement of competencies or standards that have been targeted in the study.

In order to the implementation of an integrated assessment of learning, then this assessment system can be a basis in the development of learning model. Inorganic Chemistry learning with assessment-based on learning model that allows students to collect a portfolio of tasks associated with materials Inorganic Chemicals more a description of the concept of reading and monotonous. It supports students to improve their competence through the completion of the portfolio tasks.

A Key element of the development model is to improve the competence of student learning by working on the tasks and feedback. Feedback in portfolio assessment requires the students to reflect on and self-assessment. These elements are the basis for developing learning models of Inorganic Chemistry. Assessment reform Group (ARG) revealed that the success of role assessment in improving learning is determined by five key factors, namely: 1) the availability of effective feedback to students; 2) the active involvement of students in learning; 3) teaching adjustment to adjust the assessment results; 4) recognition of the influence of assessment on motivation and self-esteem of students; and 5) the students need to be able to judge themselves and know how to fix it (ARG, 1999).

Accompanying the principle that portfolio assessment is an integral part of learning process, the characteristics of learning model was developed based on the characteristics of learning model proposed by Arends (1997), which has: 1) learning objectives to be achieved; 2) The theoretical rationale 3) teaching behaviors necessary for these models can be implemented successfully; and 4) the learning environment necessary for learning objectives can be achieved.

The objective of development Inorganic Chemistry-based on learning model portfolio assessment is to improve students' competencies as defined in the course syllabus of Inorganic Chemistry. Rational development of theoretical models based on the principle of portfolios assessment for learning (Rate, 2008; Barret, 2005). Assessment for learning is designed to improve student learning (Black, 2004; Black et al., 2004). In applying the learning portfolio, the student task was selected to illustrate the lesson. The portfolio serves as a formative assessment are used to improve student learning (Barrett, 2006). Assessment for learning is implemented to provide feedback as a means of improving student learning. Critical comments provided by lecturer as feedback to the student portfolio assignments that encourage them to reflect on themselves to improve their learning.

This learning model is also developed from the constructivist learning theory that come from the idea of Piaget and Vigotsky. Piaget's view of constructivism and Vigostky can contiguous in Piaget's constructivism learning process that emphasizes the internal activities of the individual objects encountered and the experience of the person. While the grouping of students in the learning process refers to Vigotsky constructivism process that emphasizes social interaction in the process of knowledge construction for the social environment (Rusman, 2010).

Teaching behavior that is expected to occur in Inorganic Chemistry-based learning model portfolio assessment, namely the syntax: portfolio assessment plan, gather a portfolio, selecting a portfolio of evidence, feedback and reflection portfolio, and utilization of portfolio assessment. A support system feasibility study model is the presence of the RPP, textbooks, and sheet portfolio assessment.

## **METHODOLOGY**

This study is research and development that uses models Gall et al. (2003) to Develop and validate products. Stages of the study consists of four main stages, namely: 1) a preliminary study that includes activities and studies Empirical studies of literature, requirements analysis, concept analysis; 2) planning and designing the product; 3) the development and initial product

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testing; and 4) implementation and validation of the product. Flowchart of the implementation of the study is shown in Figure 1.

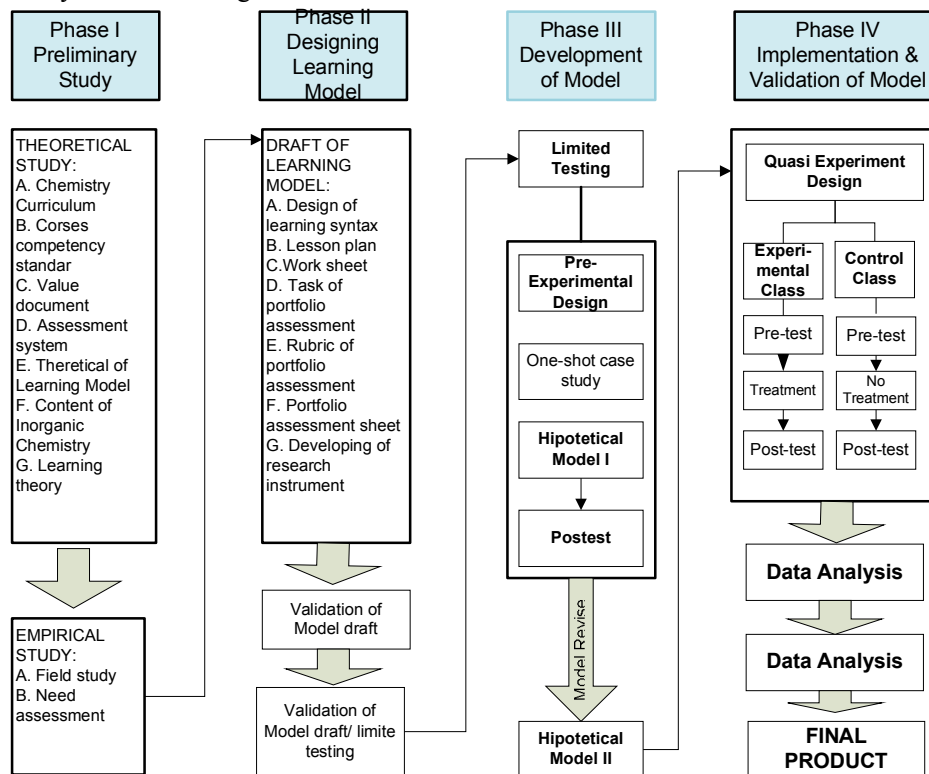


Figure 1 Flowchart of the Implementation Research

The devices and instruments model that have been developed validated by three experts. The device model has been validated was tested further limited by using a type pre-experimental design with a one-shot case study. The modelt was implemented in one class of Chemical Education, State University of Makassar that consists of 45 students in the first semester of 2013/2014. The instrument used to collect the data is in the form of achievement test multiple choices. The object of research is the subject of Inorganic Chemistry II and the subject matter metallic bond, ionic bond, Metallurgy, and Metals Alkali. The portfolio implementation process in the lecture through five stages, namely: planning a portfolio assessment, collecting the products that have been made, select and reflect on selected products, improve and evaluate products, utilizing the results of the assessment portfolio. The components of portfolio assessment in the course include the individual tasks and task groups on any subject matter. The tasks in the portfolio students are admitted feedback in the form of comments and returned on a weekly basis. Components portfolios in learning were assessed using a portfolio assessment rubric.

The outcomes learning data were processed using descriptive statistics. The criteria used to determine the value of the student achievement category are five-point scale based on categorization techniques standards set by the Ministry of National Education.

## RESULT AND DISCUSSION

In general, the implementation of this study consists of four phases. The first year of

research only carried out up to the stage three. In the first stage, a review of theoretical and empirical, such as: (1) analysis of curriculum, standards of competence and type of assessment is applied to the subject of Inorganic Chemistry; (2) analysis of the value of the course of Inorganic Chemistry; (3) Inorganic Chemical analysis of the material, as well as the theoretical studies (4) portfolio assessment; and (5) learning theory and learning models. The results of the analysis, the source of information used to design the instructional design models.

The second stage is the design stage and designs the learning model. At this stage, the design of learning tools that support the learning model of Inorganic Chemistry II based portfolio assessment and instruments associated with developing model. Learning device was developed through textbooks, portfolio assessment sheet and rubrics assessment, lesson plans, and research instruments such as achievement test and questionnaire responses of students to the learning model used. This initial design was then evaluated by a preliminary field validation sheet and testers using open-ended questions to provide feedback. Revisions were prepared based on their responses. Final revisions were made based on this feedback. The results of validation tools and instruments of learning models show that the devices and instruments are in the category of valid research. Table 1 presents the summary results of the assessment and research instruments.

Table 1 The Results of Validation Device Assessment and the Research Instrument

No.	Tools/Instrument	Average Research Result	Category
1.	Lesson Plan	3.04	valid
2.	Handbook	3.2	valid
3.	Portfolio assessment sheet	3.4	valid
4.	Achievement test	3.4	Valid
5.	LOKM	3.1	Valid
6.	LPAD	3.1	Valid
7.	LPAM	3.0	Valid
8.	ARM	3.4	Valid
9.	RDRPP	3.1	Valid
10.	RMBA	3.3	Valid
11.	RDAP	3.3	Valid
12.	RMAP	3.2	valid

Information:

RPP = lesson plan

LOKM : model implementing observation sheet

LPAD: lecturer activities observation sheet

LPAM: student activities observation sheet

ARM: student respond questionnaire

RDRPP: lecturer respond to the portfolio assessment rubric

RMBA: student respond to the handbook

RDAP: lecturer respond to the portfolio assessment

RMAP: student respond to the portfolio assessment

The third stage is the development stage. At this stage, the trial is limited to models that have been validated by using pre-experimental design with the type of one-shot case study. The subjects were students in one class that consist of 45 students who took a course of Inorganic Chemistry II. Subject matter that is the object of testing: Metal Bonding, Ionic Bonding, Metallurgy and Alkali Metals.

The implementation of trial in four sessions. Based on the analysis of data obtained by an average amounting 73.6 student results are included in the high category. Students gain a

minimum value of 40 and a maximum value of 92 is the ideal score of 100. The Distribution category of learning achievement by students at the time limited trials are presented in Figure 2. On the picture appears that around 64.44% of the students have learning achievement at the high category. A small part of achievement by student learning outcomes is at medium and low categories.

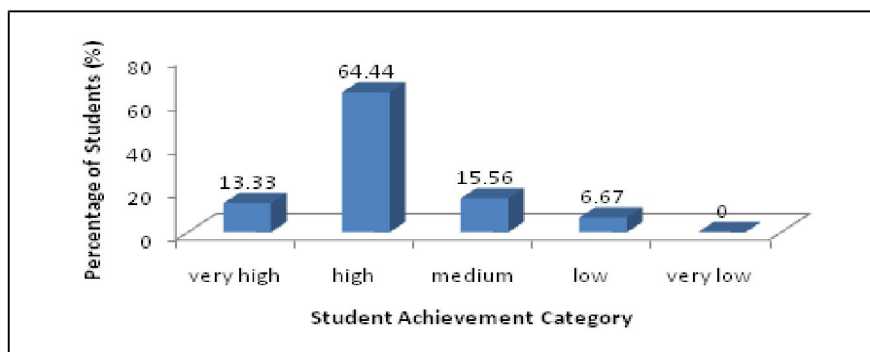


Figure 2 Distribution of Student Category by Learning Outcomes in the Course of Inorganic Chemistry II

Figure 3 presents the distribution of student achievement of learning outcomes in the material Metal Bonding, Ionic Bonding and Metallurgy and Alkali Metals. In the picture appears that the percentage achievement of student learning outcomes in all three materials is generally same, although the cognitive aspects of student achievement on the third matter have not been fully achieved. The success of the role assessment in improving learning is determined by five key factors. These five factors are: 1) the availability of effective feedback to students; 2) the active involvement of students in learning; 3) adjustment of teaching with assessment results; 4) recognition of the influence of assessment on motivation and self-esteem of students; and 5) the students needed to be able to judge themselves and know how to fix it (ARG, 1999).

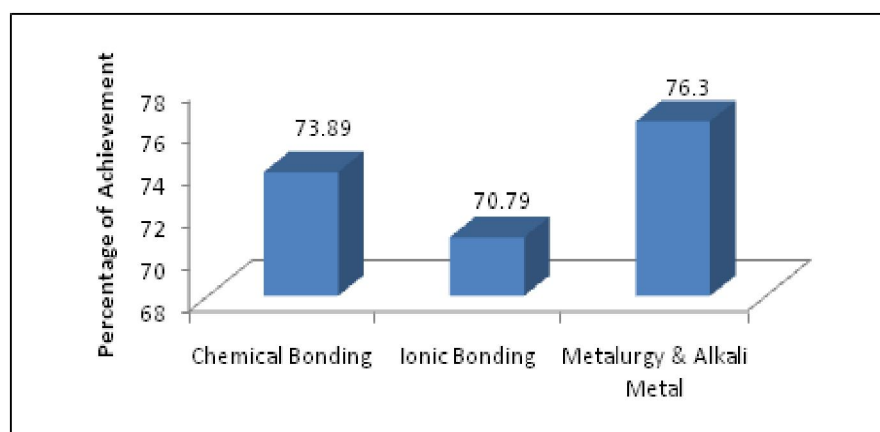


Figure 3 Distribution Percentage of Student Achievement on Different Topic

The concepts in materials Chemical Bonding and Metallic Bonding generally consist of abstract concepts and the concepts stated principles, it is relatively difficult to be understood by the students in lectures. The use of portfolio assessment in the lecture has effectiveness

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respectively 73.89 and 70.79. In the material metallic bonding, which is somewhat elusive concept among others on view in the molecular orbital theory explains bonding of metals and calculation of atomic number and mass of the unit cell.

Slightly different with subject matter Metallurgy and Metal group that consist of more alkali in abstract concepts with concrete examples and concepts expressed symbol. Through the implementation of portfolio assessment in the course enables students more easily grasp the concepts of the material. The feedback through comments for improvement admitted to the student portfolios enables them to evaluate themselves against the learning outcomes, thus spurring them to be able to repair their learning. Ramlawati (2012) states that through the feedback admitted by the lecturers allow the students to know their strengths and weaknesses, so that they can improve their learning process.

### CONCLUSION

Based on the result of the research that has been obtained, it can be concluded that the model-based on portfolio assessment of learning Inorganic Chemicals has met the criteria for a valid and practical. Effectiveness of the learning model that measured the percentage of achievement of learning outcomes obtained for 73.8%, and at the high category.

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