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Development of Performance Technology Competency Training Model for Students of Chemical Education

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Abstract

The free learning-campus program (MB-KM) contained in SN-Dikti 2020, is very relevant to the demands of 21st century education in order to address the challenges of learning in the global era. The MB-KM program provides opportunities for students to master various fields of science, develop creativity, capacity and other competencies related to the needs of the world of work. The results of the needs analysis show that there are still four competencies that have not been maximally mastered by students, namely: school management competencies, analytical thinking, technological novelty and science behavior with an average of 51.75%, while the other three competencies: pedagogical competence, high school chemistry science, and DIGITAL LEARNING IT competence have been very good with an average of 80.20%. Against the background, this was conducted research on the Development of Rational-Creative Performance Technology Training Model for Chemistry Education Students. This research is educational development research (Borg & Gall: 2007). The characteristic of this training model is in the form of Merdeka Learning Teacher Mover for school education. The MODEL ID used to design this training model is adapting the modified ASSURE model, while the Rational-Creative Performance Technology Training Model was developed by Zurweni & Affan Malik (2020). The results showed that the Rational-Creative Performance Technology Training Model has four synths: Innovation Intervention Orientation, Rational Exploration, Rational Technology Training and Evaluation. Evaluation and validation results and trials state that the Rational-Creative Performance Technology Training Model falls into the category of good, with field trials have not been successfully implemented due to the covid-19 pandemic. It was concluded that this Rational-Creative Performance Technology Training Model is worth using and is a new breakthrough as an alternative to enrichment in the debriefing of students who follow the PLP Program to partner schools. It is recommended to use this training model at the level of the Study Program as well as at the student debriefing enrichment session before following the introduction of the school field.

Keywords: Chemical Education, ASSURE, Training Model, Performance Technology Competency

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INTRODUCTION

The world of Education is faced with the increasingly demanding challenge of creativity to innovate to improve the quality of education (Agbowuro, Saidu, & Jimwan, 2017; Pllana, 2019; Serdyukov, 2017; Shkabarina et al, 2020), which must refer to the demands of 21st Century learning in the Industrial 4.0 era and strengthened by the Policy of the Minister of Education and Culture with: Merdeka Belajar-Kampus Merdeka. One of

the most prominent characteristics in the Merdeka Campus Program in this millennial era is the increasingly attached to the world of science, so that the synergy among them becomes faster. In the context of the utilization of information and communication technology in the world of education, it has been proven that the melting of the "space and time" factor that has been the aspect that determines the speed and success of mastery of science for learners.

Industrial Revolution Era 4.0 situation where the change is very fast, revolutionized the pattern of the old order to create a new order that is different. This Era of Industry 4.0 initiated the birth of a new business model with more innovative and disruptive strategies (Cantu-Ortiz et al, 2020; Lee et al, 2018; Pereira & Romero, 2017). The scope of change is wide ranging from the world of business, banking, transportation, social society, to education. This era will require us to change or become extinct because we are unable to keep up with its development. The stage began at the end of the 18th century, marked by the transition in the Industrial Revolution 1.0, namely in the use of labor that previously used animal and human labor then replaced by the use of machines based on manufacturing, so that it reached the Industrial Era 4.0.

The characteristics of 21st Century learning that are very relevant to the Industrial Revolution 4.0 are Digital Generation or Digital Native with 4C Characteristics, namely: Critical thinking and problem solving (Critical Thinking and Problem Solving), Communication (Communication), Collaborative (Cooperation), Creativity & Innovation (Creativity & Innovation). Critical Thinking & Problem Solving (Trilling & Fadel, 2009), which requires competencies related to Performance Technology for each student who follows the learning process at a certain level of education, including at the higher education level. In connection with the Merdeka Belajar Kampus Merdeka Program in 2020 and the demands of 21st century learning with the 4C criteria, it takes the development and reconstruction of a curriculum that is able to change the learning approach that is centered on learners by independently developing themselves and developing soft skills in accordance with their respective capacities and interests. Skills with 4C characteristics must be owned by learners at all levels (Purnawirawan, Sudana, & Harlany, 2019; Zorina & Chirkova, 2019) of education including Higher Education, because 4C will make learners become intelligent in facing the challenges of the digital era in the 21st Century. Educators must strive for development and innovation so that the learning process they implement becomes more effective in meeting the demands of communication intelligence, critical thinking skills, collaboration and creativity supported by digital technology.

Micro Teaching Courses are Compulsory Courses in the Chemistry Education Study Program of FKIP Jambi University, but at the beginning of 2020 this is based on the policy of the leadership, then the Course is renamed to Micro Learning which is the same content or content as the Micro Teaching Course. This Micro Learning course is a description of the provision of Students to follow the Introduction to School Field (PLP), whose estuary is that students are able to have the competence to implement the sciences obtained during the lecture, especially for activities to carry out classroom learning and recognize students more and know the school environment. This PLP has a very limited time, only about 3 months, so it is necessary to develop the Training Model as an additional provision outside of Micro Learning Courses in the form of Training Programs for enrichment for students, in this case students of Chemical Education Study Program located in semesters IV and VI in the model of developing competence based on Performance Technology. This training can be incorporated into the Co-Curricular Program or the Curricular Esktra.

The results of the needs analysis show that one of the conditions that require this performance technology competency training model is developed, is due to the limitations of Micro Learning Course Credits and is associated with Performance Technology-based

Competencies that chemical education students must have before they do PLP activities and eventually later to provide if after graduating from the bachelor's degree, will work in the field of schooling.

Abaci (2015) states that performance technology is also referred to as an improvement is needed by everyone who will carry out a job to obtain optimal results. Performance technology has been observed in the field of medical and medical professions. Professional work, offering interventions that consistently increase human competence and productivity are better if followed by direct practice. A person's performance is the valued result of the work of that person working in a system or organization. Therefore, Human Performance Technology is the principles and applications related to the increased impact of any and all factors that affect the outcome of its performance. It emphasizes that we must see and recognize performance in the context of a system, the interdependence of various factors that affect performance. This indicates that it is necessary to look at a person while determining the factors that impact his or her performance results. This study defines that human performance emphasizes more on the results achieved and not on the activities it does (Tosti, 2006). The research discusses kenerja technology, but has not been tested, but states that performance technology is very important for the success of someone who carries out his professional duties to be more maximal and optimal.

Based on the background description, development research was conducted by designing a Performance Technology Training Model for Students of Chemical Education Study Program, especially students of Chemical Education FKIP Jambi University, so that one of the components of Merdeka Belajar-Kampus Merdeka can be fulfilled, which can also meet the educational challenges of the Industrial Revolution 4.0 and Society 5.0.

METHODS

This research was conducted at the Chemical Education Study Program S1 FKIP Jambi University. Research Schedule from May 2020 to October 2020. The method used in this research is a method of development research in the field of education, (Educational Research and Development) with a system approach, where each stage of development is equally important, carried out systematically, planned, measured and follows the criteria and procedures required in the design model used. According to Borg & Gall, (2007) development research in the field of education is research that produces a particular product in accordance with the developed. The use of development research in the field of education is research that is systematically designed so that it can be utilized to improve the quality of education and learning in all levels of education.

The Design Model used to develop the Performance Technology Competency Training Model is a ASSURE Design Model that is modified into a training model to adapt to the needs of this research. Conduct systematic studies of design, development and validation processes, aiming to establish an empirical basis for creating instructional and non-instructional products and bringing up new models and/or equipment, which influence and define their development. These opinions and views actually state that development research (R &D) is a research method that seeks to discover or develop a particular program that is new or innovative in order to facilitate and improve the quality of student performance today and for the future, in this case especially in the field of education and learning, the procedure must be in accordance with existing development research standards.

ASSURE's Instructional Design Model is a classroom-oriented instructional development model, and gives educators the opportunity to design systematic learning by integrating multimedia technology as a learning tool to create effective and efficient

learning. Learning is designed for different learners' learning styles, by requiring students to interact with the learning environment actively. The ASSURE model has advantages and disadvantages in its stages. The advantage of the ASSURE model is that it has simple stages developed for learning or training that use media and technology in creating the desired learning processes and activities. The ASSURE learning design model is better used on micro-scale learning that takes place in the classroom and on training programs. This ASSURE model also prioritizes the involvement of learners, conducting evaluations and revisions. The steps of the ASSURE model are as follows: Analyze learners; State objectives; Select methods, media and materials; Utilize media and materials; Require learners participants; Evaluate and revise.

This research instrument consists of: Observation Sheet, Questionnaire, FGD Format and Validation Sheet for Experts as well as student evaluation sheet. The observation sheet consists of three groups, namely: Condition of PLP Partner School, Quality and Accreditation of Partner School and IT Facility and internet network of FKIP Partner School of Jambi University. While the questionnaire is used for Needs Analysis, the results are used as the basis for the development of this performance technology competency training model.

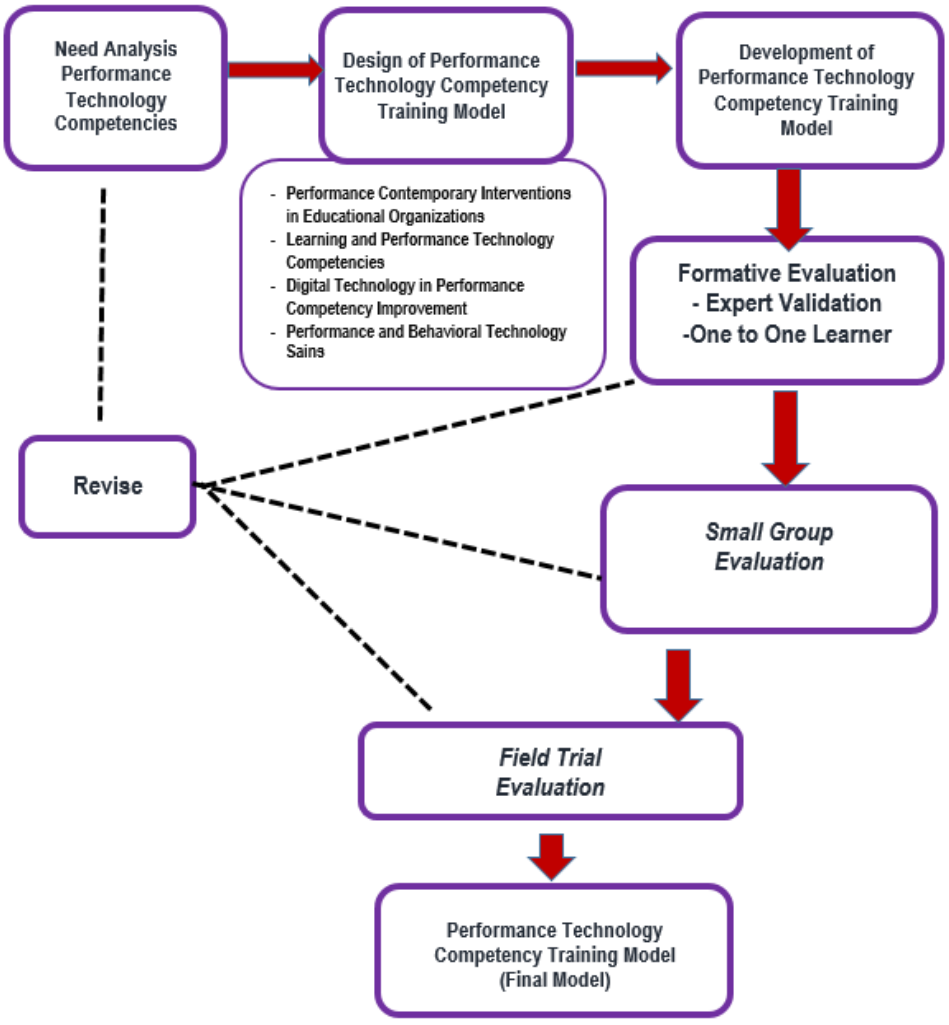

Figure 1. Procedural Design Research Development Model of Performance Technology Competency Training for Education Students

The data obtained from all stages of development research is analyzed using inferential descriptive statistics and subsequently for the effectiveness test of the Performance Technology Competency Training Model developed in pairs with SPSS and MS Excel software.

RESULTS & DISCUSSION

This study provides results: 1) Preliminary Research Results compiled in the form of Needs Analysis; 2) Results of Draft Development of Educational Performance Technology Competency Training Model; 3) Validation of Design Experts in the Development of Educational and Learning Technology Models; 4) One to One Learner Trial Results and Small Group Trials.

The results of the needs analysis that has been carried out in this study include: Analysis of The Development of Science and Policy, Analysis of Needs in the field of schooling, and Analysis of Demands for Educational Quality Standards.

The results of preliminary research through this needs analysis are the results of observations to the school in this case high school and the results of the needs analysis obtained from students of the Elementary School Education Study Program who have passed the Practice of Field Schooling (PLP) FKIP Jambi University to several SMS in Jambi City.

Table 1. Observation Results at SMA Mitra PLP FKIP UNJA Jambi City

No.	Observed Aspects	Observation Results
1	High school conditions where PLP Students	All High School Conditions partners where PLP FKIP Jambi University is in good condition and has complete learning facilities
2	PLP Partner High School Accreditation Status	76.47% SMA Mitra PLP FKIP UNJA, accredited A
3	IT Conditions and Partner High School Internet Network	The average SMA Mitra PLP FKIP UNJA has a good IT System and a good internet network.

Based on the results of observations conducted on partner high schools where students participated in the PLP Program, showed that the average partner high school was all classified as a school with a good category, and met the requirements for student trials innovating.

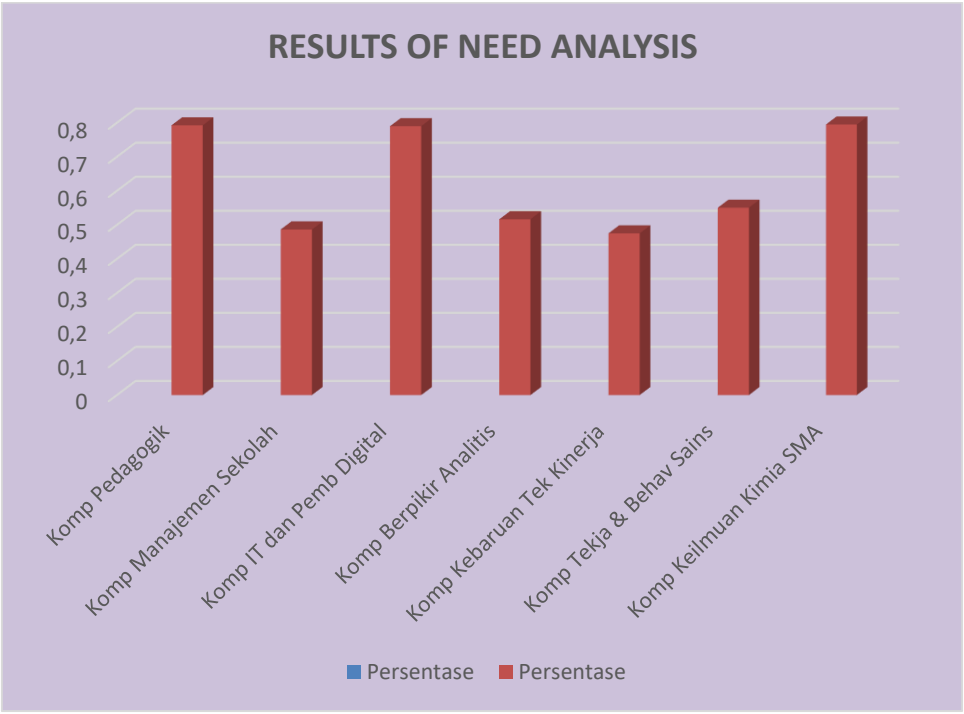

Figure 2. Results of The Needs Analysis of High School PLP Students

Based on the results of the analysis of the needs of students as respondents, information was obtained that the required complement was Performance Technology Competence in terms of School Management, Analytical Thinking Competence, Performance Technology Novelty Competence and Performance Behavior Science Technology Competence and Chemical Scientific Competence. The average data obtained from the needs analysis shows that there are still four competencies that have not been maximally mastered by students, namely: school management competencies, analytical thinking, technological novelty and science behavior with an average achievement of 51.75%, while three other competencies: pedagogical competence, high school chemistry science and digital learning IT competence have obtained excellent results with an average achievement of 80.20%. Furthermore, the design of the Performance Technology Competency Training Model for Education was tested against students of the S1 Chemical Education Study Program at FKIP Jambi University, with its peculiarities, namely, rational and creative.

Based on the results of the Needs analysis, the design of the Performance Technology Competency Training Model for Education was developed with the results of a draft in the form of a Training Model book document, the contents of which are as follows: Design of the Performance Technology Competency Training model for Education has four stages, namely: 1) Orientation-Intervention innovation Tekja; 2) Exploration of Tekja Competence, 3) Creativity Technology Training, 4) Evaluation of Tekja. This Performance Technology Competency Training Model for Education was developed by adapting the design stages of the instructional model (ID Model) ASSURE. Externally obtained from this research is a book that contains about the RC Performance Technology Competency Training model for Education.

Figure 3. RC Performance Technology Competency Training Model

The contents of the RC Performance Technology Competency Training Model Book are as follows:

I. EDUCATIONAL CHALLENGES OF THE 21ST CENTURY
II. MERDEKA PROGRAM OF MERDEKA LEARNING-MERDEKA CAMPUS
III. DEVELOPMENT OF PERFORMANCE TECHNOLOGY COMPETENCY TRAINING MODEL WITH ASSURE MODEL DESIGN
IV. RC PERFORMANCE TECHNOLOGY COMPETENCY TRAINING MODEL FOR EDUCATION
V. EXECUTIVE SUMMARY

This Draft Training Model is further processed for validation by education technology fund development experts. And also evaluated by two teachers who attended the field recognition program of high school as a Mitra school.

Table 2. Expert Team Validation Results

Expert Validation Results			Information
	Expert Validator 1	Expert Validator 1	
	Writing to be consistent especially with the appearance of the image	So that the developed Performance Technology training model is equipped with learning theory	Revisions have been made in accordance with expert advice
	Add an explanation with a sentence in the characteristic sub-chapter of the Training Model	Overall, the training model developed has been fulfilled as a performance technology training model.	
	It is also recommended that the theory of online learning competencies be added in the performance technology training model book.	Add an example documentation to an attachment	Revisions have been made in accordance with expert advice

The results of the Assessment of the Expert Team / Validator on the RC Performance Technology Competency Training Model developed are as follows.

Figure 4. Results of Valisasi Educational Technologists

The results of expert validation of the creative rational performance technolology training model for Chemical Education students developed, experienced several improvements, including about the relevant underlying learning theory that must be added. After improvements were made, the results of the evaluation or validation of the expert with an average of 81.57%. The results of this expert validation fall into the good category, which in the final part of the expert states that the training model developed is feasible to proceed to the trial stage to students. The trials carried out are one-on-one trials, (One to one learner), Small group evaluation trials, and large group trials (Field Trials).

The results of the one-on-one trial or evaluation were conducted on 3 (three) students of Chemical Education FKIP Jambi University who had never participated in the School Field Introduction Program with details: one student with low ability, one student with moderate ability, and one student with high ability.

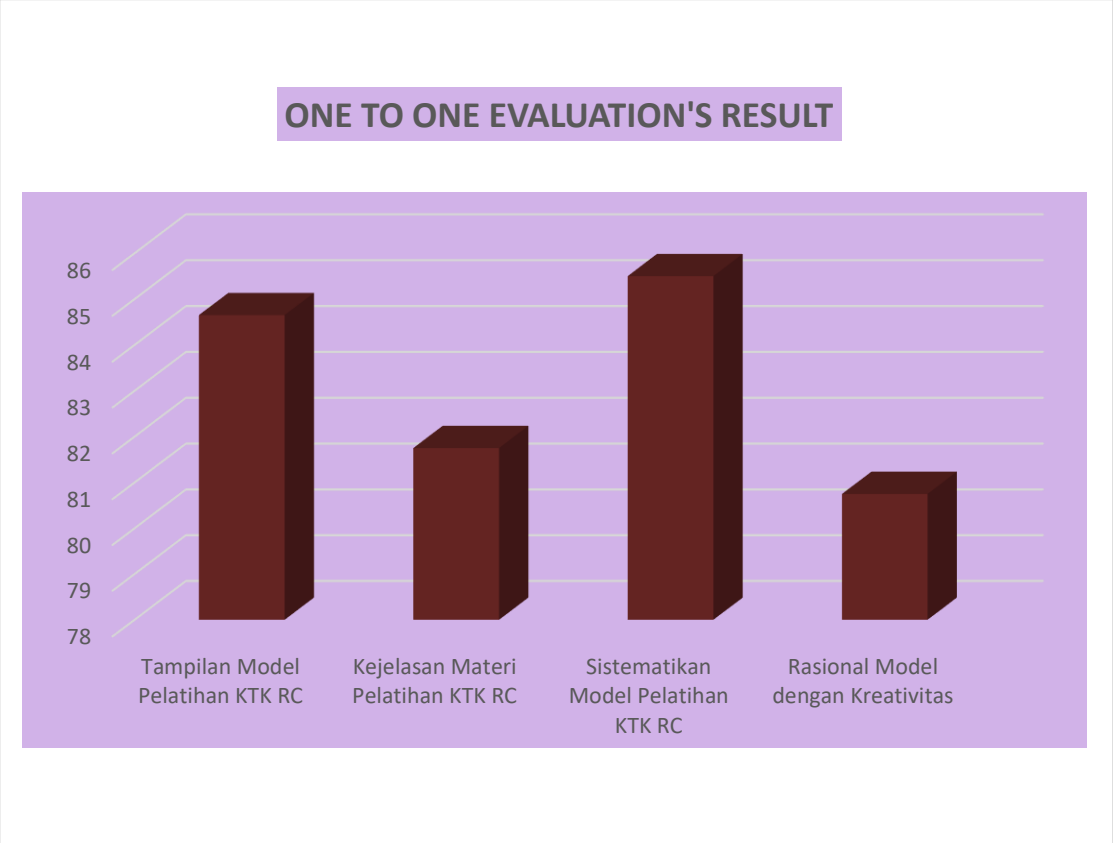

Figure 5. One to One Learner Trial Results

The results of one-on-one trials of chemistry education students gave an average result of 83.16%. The results of this trial fall into the good category, which means that the rational-creative performance technology training model can be used for all levels of student ability: medium high, and low. The trial can be continued to the small group evaluation stage. The small group evaluation was conducted on 8 (eight) students who had not participated in the School Field Introduction program in addition to three students who took the one to one learner trial. The results can be seen in the figure 6.

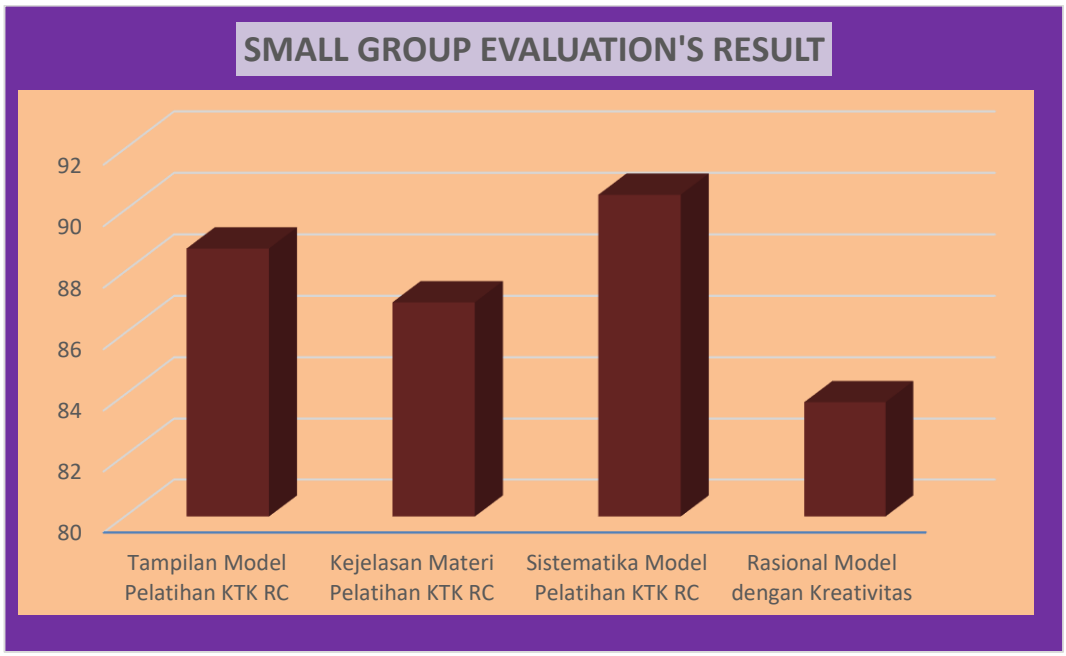

Figure 6. Small Group Trial Results

The results of this Small Group Trial gave an average result of 87.5% which means that the response given by students to the developed RC Performance Technology Training Model is excellent. So that the Trial can be continued in the Filed Trial or large group trials. However, because the world is in the midst of the Covid-19 Pandemic, researchers have difficulty implementing this training model in actual conditions in the school field. Students are still learning from home online and it is not possible to hold large group trials.

In general, the results of the development of this RC performance technology training model are in the good category, but there are still some that need to be developed again for the next research. Field Trial has not been successfully implemented, because the situation is still in the era of the Covid-19 pandemic, (LFH). The creative rational performance technology training model is a new breakthrough as an alternative to the enrichment of Chemical Education students who will follow the PLP and also as a provision of competence for prospective master education graduates. This model is very relevant to the Merdeka Belajar Program.

The output obtained from this research is that the innovation product of this development research result can contribute to the Chemistry Study Program, which will provide provisions to students of the Chemical Education Study Program in connection with the work that will be pursued later after graduation. In addition, the results of this study also contribute to supporting and complementing the materials and contents provided in the Micro Learning or Micro Teaching course.

This Training Model can also be implemented in other education study programs as enrichment provisions before participating in the School Field Program. Implementation of Rational-Creative Performance Technology Training Model for Students of Chemical Education Programs and other Study Programs can be done by varying the competencies in Performance Technology.

CONCLUSION

The Rational-Creative Performance Technology Training Model for Chemical Education Students has four syntaques: 1) Innovation Intervention Orientation; 2) Exploration of Rational Tekja Competencies; 3) Creativity Technology Exercises; 4) Evaluation. This development research resulted in the book document Rational-Creative Performance Technology Training Model for Education Mhs. This Rational-Creative Performance Technology Training Model is worth using for the debriefing of students who will participate in the school field introduction program. It is recommended to conduct further research with large group tests as well as it is advisable to conduct research on the use of this RC performance technology training model for other Educational Study Programs.

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