**SANITAS: JURNAL TEKNOLOGI DAN SENI KESEHATAN**
**ISSN : 1978-8843 (*PRINT*) / 2615-8647 (*ONLINE*)** **Vol. 14 No. 2 : 85 - 94**

# DEVELOPMENT OF A TRAINING MODEL FOR CT SCAN EQUIPMENT TO IMPROVE THE COMPETENCE OF RADIOGRAPHERS

**Adi Andhika[1*], Soeprijanto[1], Lipur Sugiyanta[1]**

[1] Jurusan Pendidikan Teknologi Kejuruan dan Vokasi, Universitas Negeri Jakarta, Jl. R. Mangun Muka Raya No.11, Rawamangun, Pulogadung, Jakarta Timur, Indonesia, 13220

*E-mail: adiandhika182@gmail.com

Submitted: November 11th 2023 ; Accepted: December 14th 2023

https://doi.org/10.36525/sanitas.2023.8

## ABSTRACT

Results of the author's survey in Radiology Mitra Keluarga Kelapa Gading Hospital, there is a discrepancy between the length of service of employees (Radiographers) and their career level competencies for each year, Radiographers have worked for quite a long time but their skills are still very lacking. Apart from that, the current training unorganized and undirected, giving the impression that it is just plain training. This research aims to carry out development, the development carried out is developing the current CT Scan equipment training into better training capable of increasing the competency of Radiographers at Mitra Keluarga Kelapa Gading Hospital. The development model carried out is using the Dick and Carey model, where the results of this process are a CT Scan training model product called the Kyazeka training model, with the title of the book "becoming an expert CT Scan Radiographer". The product feasibility test results from experts were 86.7% for material experts, 98.2% for education and training experts and 100% for curriculum development experts. The results of the effectiveness test were obtained 79%. The Kyazeka training model is recommended for use and effective in increasing the competency of Radiographers at Mitra Keluarga Kelapa Gading Hospital.

**Keywords:** *Radiographer, CT Scan, Dick and Carey, Radiology*

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## INTRODUCTION

Training is an activity carried out by associations, groups or organizations whose aim is to increase knowledge, skills and expertise, if the training is carried out well the results will have a positive impact on competence (1). According to (2) "the majority of medical personnel who work in health services have not received proper training, it can be seen that the health services provided are not in accordance with existing minimum standards.

Based on Suaedi's statement, the author tried to conduct a survey at Radiology Mitra Keluarga Kelapa Gading Hospital to ascertain whether this was true, based on a survey conducted by the author at Mitra Keluarga Kelapa Gading Hospital, based on data from the results of competency tests conducted annually on radiographer medical personnel. There is a mismatch between the Radiographer's work period and the competency of his career level, where Radiographers have worked for quite a long time but their skills are still very lacking. A radiographer is one of the medical personnel who has the duties and responsibilities of carrying out radiology service activities in hospitals, clinics and health centers (3). Radiology services are medical services whose activities use equipment that produces radiation and non-radiation (4). To ascertain more deeply whether the problems that occur at Radiology Mitra Keluarga Kelapa Gading Hospital are common problems that often occur in other hospitals, the author conducted a survey again at other hospitals in Jakarta, namely Mitra Keluarga Kemayoran Hospital, and Kalideres Mitra Keluarga Hospital. From the survey results, the results of the competency test were quite surprising, which of the three hospitals had the same problem, namely a mismatch between work period and career level. In this regard, it can be understood that the problem of a mismatch between work period and career level generally occurs also at home. other pain.

This problem is a serious concern for the author so that the author tries to find out why this happens, based on observations that the author has observed over several months, it is known that the training in radiology at the hospital is still carried out as is, not structured according to the rules for preparing training. For example, there is no training program plan, no training materials, no teaching materials, and no evaluation so that learning

achievements are not clear. So what Suaedi said in his research is true that medical personnel have not received proper training.

From the problems that have been expressed above, the author wants to provide a solution by searching for and reviewing various kinds of literature from previous research to see if there is anything suitable to overcome the problems that the author is facing. Based on the results of the study, several studies were obtained which became inspiration for the author to conduct research, including : Basic PPR and CT Scan training to prepare Radiographer graduates(5), Education about detecting the risk of coronary heart disease through CT Calcium Score examination (6), How to detect lung cancer on a CT Scan of the Thorax (lungs) using the Fuzzy Logic method (7), How to detect Covid-19 quickly using deep learning architecture on a CT Scan tool (8)

Based on the results of a literature study conducted by the author, several studies related to CT scanning equipment were obtained, but none of the discussions discussed how to create an effective training model capable of increasing the competency of radiographers. According to (9), an effective training model is based on a curriculum, approach and strategy that is appropriate to the learning needs of students and the problems that occur around them. Therefore, in developing the training model that the author will compile, the author began collecting data related to Radiographers such as competency standards, Radiographer professional curriculum standards, graduate profiles and learning outcomes. Due to the discrepancy in the competency test results that occurred for Radiographers, namely competency in using CT Scan equipment, this research will be limited to CT Scan equipment only.

Computed Tomography Scanning or commonly called CT Scan is a diagnostic imaging technique that utilizes an X-ray radiation source which is processed using computerized technology to produce a detailed image of the human body (10). CT Scan is a diagnostic imaging tool whose working principle combines X-rays and a computer to obtain images of human body organs in the form of slices (11). CT scans can be performed using contrast or non-contrast (12).

## MATERIAL AND METHODS

This research was carried out at Mitra Keluarga Kelapa Gading Hospital. The implementation time from the start of the survey to the product trial was carried out from January 2023 to September 2023. The subjects of this research were Radiographers at Mitra Keluarga Kelapa Gading Hospital which totals 10 people and Radiographers from other hospitals.

1. Development Plan

The Dick and Carey development model adopted is the Dick and Carey development model which has been simplified from 10 stages to 5 stages (13) for the development of the CT Scan equipment training model at Mitra Keluarga Kelapa Gading Hospital, the development stages of which can be seen in Figure 1.

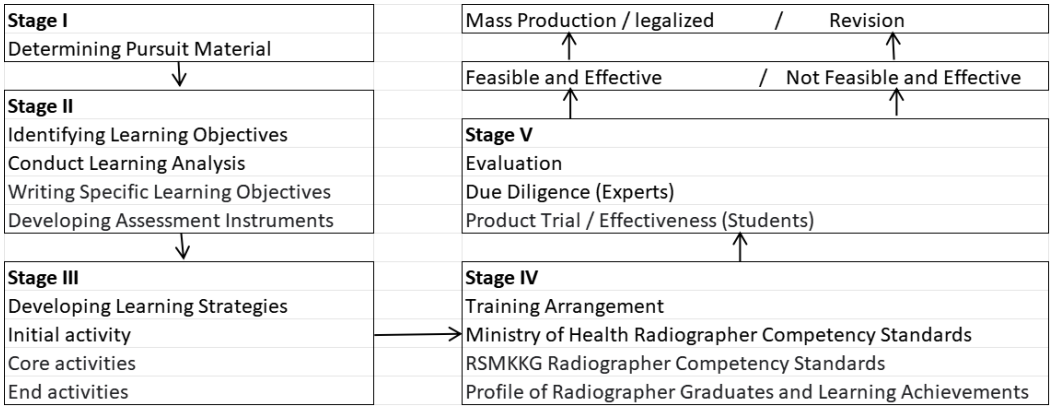



**Figure 1**. CT Scan Training Development Plan

2. Product Feasibility Test

This is done to find out whether the product developed is suitable for use. The instrument used for the feasibility test is a questionnaire in the form of a Likert scale which is distributed to field experts to provide an assessment of the product. Recommended field experts are material experts, education and training experts, and curriculum development experts. To obtain valid and reliable research results, valid and reliable research instruments or measuring tools are needed, this is an absolute requirement (14). From this statement, before being distributed to field experts to assess the product, the research instrument must first be tested for validation and reliability by each field expert.

3. Test Product Effectiveness

The product effectiveness test is used to measure the learning outcomes of students (Radiographers) as well as assess whether the training products created are effective or not. The method is by conducting an experiment, the experimental design that the researcher chose was pre-experimental with the type one group pretest-posttest. Pre-experimental one group pretest-posttest was carried out in just 1 experimental class where students (Radiographers) before being treated (training) were given a pretest first, after that they were given training and then after that they were given a posttest. For pre-test and post-test instruments, validation and reliability tests are carried out before being given to students To analyze research data, researchers used the SPSS program. SPSS stands for Statistical Package for The Social Sciences, originally created for the purposes of processing statistical data for the social sciences, but over time SPSS has developed so that it is not only used for processing statistical data but is also used to serve various types of uses, for example in processing production in factories, research, and others, SPSS, which was previously a Statistical Package for The Social Sciences, became a Statistical and Service Solution (15). The SPSS program that the researcher used was the original SPSS 29 trial version for 30 days which the researcher uploaded directly from the official website, namely IBM. Using the original SPSS program is one way of validating and reliable statistical measuring instruments, so that the calculation results from this research are not in doubt.

## RESULTS AND DISCUSSION

The results of the training model development that the researchers have carried out are in the form of a CT Scan tool training model product which the researchers named the "KyaZeKa" training model. The KyaZeKa training model wants to make Radiographers experts in using CT Scan equipment, so the book is entitled "Becoming an Expert CT Scan Radiographer". The Kyazeka training model is a non-level training model (only one program) which was created to meet the needs for achieving competency in Radiographers' skills in using CT Scan equipment, both regulatory, professional and Radiographer competencies in the hospitals where they work. The hope is that by following the Kyazeka

training model, learning and training activities can run well and be directed so that the goal to be achieved, namely increasing the competency of Radiographer skills, is appropriate and fulfilled. The following is a view of the front and back covers of the KyaZeka training model book in Figure 2.




**Figure 2**. Front and Back Cover of the Kyazeka Training Model Book

The Kyazeka training model book contains 196 pages including the front cover and back cover. The component results of the Kyazeka training model are RPP (training program plan), learning modules, teaching materials and training evaluation questions, which with the Kyazeka training model makes it easier for Radiology department heads, trainers, lecturers and hospital training to conduct CT training Scan well where they are.

1. Validation and Reliability Test Results of Research Instruments

**Table 1**. Material Expert Instrument Validation Test Results

| No | Research variable | r count | r critical | Decision |
|---|---|---|---|---|
| 1 | Question (X1) | 0,99 | ≥ 0,3 | Valid |
| 2 | Question (X2) | 0,99 | ≥ 0,3 | Valid |

**Table 2**. Validation Test Results of Education and Training Expert Instruments

| No | Research variable | r count | r critical | Decision |
|---|---|---|---|---|
| 1 | Question (X1) | 0.98 | ≥ 0,3 | Valid |
| 2 | Question (X2) | 0.86 | ≥ 0,3 | Valid |
| 3 | Question (X3) | 0.99 | ≥ 0,3 | Valid |
| 4 | Question (X4) | 0.90 | ≥ 0,3 | Valid |

| No | Research variable | r count | r critical | Decision |
|---|---|---|---|---|
| 5 | Question (X5) | 0.96 | ≥ 0,3 | Valid |
| 6 | Question (X6) | 0.90 | ≥ 0,3 | Valid |
| 7 | Question (X7) | 0.86 | ≥ 0,3 | Valid |

To test the validation of the basic decision making instrument, if the pearson product moment correlation for each factor is positive and the magnitude is 0.3 or more, then the factors have a strong relationship and it can be concluded that the instrument has good validity (14). Based on the results of the analysis using the SPSS program, it is known that the questions on the material expert and education and training expert instruments obtained a Pearson correlation value of more than 0.3, so that the material expert and education and training expert research instruments were valid.

**Table 3**. Reliability Test Results of Material Expert Instruments

| No | Research variable | r count | r critical | Decision |
|---|---|---|---|---|
| 1 | Question (X1) | 0,986 | ≥ 0,6 | Reliabel |
| 2 | Question (X2) | 0,986 | ≥ 0,6 | Reliabel |

**Table 4**. Reliability Test Results of Education and Training Expert Instruments

| No | Research variable | r count | r critical | Decision |
|---|---|---|---|---|
| 1 | Question (X1) | 0,99 | ≥ 0,6 | Reliabel |
| 2 | Question (X2) | 0,99 | ≥ 0,6 | Reliabel |
| 3 | Question (X3) | 0,99 | ≥ 0,6 | Reliabel |
| 4 | Question (X4) | 0,99 | ≥ 0,6 | Reliabel |
| 5 | Question (X5) | 0,99 | ≥ 0,6 | Reliabel |
| 6 | Question (X6) | 0,99 | ≥ 0,6 | Reliabel |
| 7 | Question (X7) | 0,99 | ≥ 0,6 | Reliabel |

For the split half reliability test from Spearman Brown for basic research instruments for decision making, the assessment is reliable, namely if the calculated r is greater than 0.6 then the instrument is reliable (14). Based on the results of the analysis, it is known using the SPSS program that questions on the material expert and education and training expert instruments obtained a Spearman Brown coefficient value of more than 0.6, so that the material expert and education and training expert research instruments are reliable.

The instrument for curriculum development experts is directly validated by lecturers who are experts in curriculum development so that it is valid and reliabel.

2. Product Feasibility Test

**Table 5**. Product Feasibility Test Results from All Field Experts

| No | Respondent | Score Percentage | Qualification |
|---|---|---|---|
| 1 | Materials Expert | 86.7% | Very Feasible |
| 2 | Education and Training Expert | 98.2 % | Very Feasible |
| 3 | Curriculum Development Expert | 100% | Very Feasible |

To assess the determination of the percentage formula analysis above, you can use the program evaluation criteria from Arikunto, the educational program evaluation criteria according to (16) which are as follows:

- Very feasible, if it reaches 81 – 100%
- Feasible, if it reaches 61 – 80%
- Quite decent, if it reaches 41 – 60%
- Not feasible, if it reaches 21 – 40%
- Not feasible, if it reaches <21%

3. Product Effectiveness Test

**Table 6**. Effectiveness Test Results

| No | Respondent | Number of participants | Effectiveness | Qualification |
|---|---|---|---|---|
| 1 | Mitra Keluarga Kelapa Gading Hospital | 10 People | 70% | Effective |
| 2 | Mitra Keluarga Kemayoran Hospital | 13 People | 85% | Very Effective |
| 3 | Combined two Hospitals | 23 People | 79% | Effective |

To assess the effectiveness of an educational method or program, you can use Ari Kunto's program evaluation criteria, the educational program evaluation criteria according to (16) are as follows:

- Very effective, if it reaches 81 – 100%
- Effective, if it reaches 61 – 80%
- Quite effective, if it reaches 41 – 60%

- Less effective, if it reaches 21 – 40%
- Not effective, if it reaches <21%

## CONCLUSIONS

To develop a training model to improve Radiographer competency, a curriculum reference, competency standards, graduate profile and learning outcomes of Radiographers are very necessary, whose function is to prepare subject matter, training subjects, RPP (training program plan), learning modules, teaching materials and evaluation training.

Based on the results of the analysis that has been carried out, the Kyazeka training model is very suitable for use in Radiology at Mitra Kelapa Gading Hospital and in other Hospital Radiology.

Based on the results of the analysis that has been carried out, the Kyazeka training model is effective in increasing the competency of Radiographers in using CT Scan equipment.

The suggestion is that using the Kyazeka training model is very effective if the number of training participants is 13 participants with a percentage level of 85%.

## ACKNOWLEDGEMENT

This research was conducted and supported by the Jakarta State University (UNJ), Faculty of Technology and Vocational Education.

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