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PAPER

# Implementation of the Junior Mobile Programmer Professional Competency Certification Assessment Model

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**ABSTRACT**

This study is based on the gap in human resources in the proportion of Indonesian workers lower compared to other ASEAN countries, including human resources in the IT sector. Another problem is that the assessment process and results in the junior mobile programmer scheme run by the Digital Technology Professional Certification Institute (LSP) have not been maximally tested; the assessment activities carried out have not fully implemented a technology-based system in a centralized and systematic manner, causing problems in the remote assessment process. Lack of involvement of professional associations, academics, and industry in designing tested and reliable assessment models. The specific aim of this study is to implement an effective junior mobile programmer professional competency certification assessment model. This study method is an experiment by implementing a professional competency certification assessment model for junior mobile programmers. The test subjects are participants in the results of the Ministry of Communication and Information's Digital Talent Scholarship (DTS) Vocational School Graduate Academy (VSGA) training program, totaling 40 sessions, consisting of 20 sessions for the experimental class and 20 sessions for the control class. Data collection instruments include questionnaires, documentation, interview guides, observations, and competency tests. The study results prove that after being implemented, the professional competency certification assessment model for junior mobile programmers has proven to be effective.

**KEYWORDS**

assessment, competency certification, junior programmer

## 1 INTRODUCTION

The Indonesian government is making efforts to build an Indonesia with people who are superior, cultured, and experts in science and technology. In line with Indonesia's Vision 2045 and RPJMN 2020–2024, for quality human resources, a

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rapidly growing economy with good development, a clean, strong, and democratic country. However, the problem that occurs according to [1] is that the proportion of workers with education graduates in Indonesia is lower compared to other ASEAN countries, with only around 40.60 percent. Both the government and society are less capable and are still low in exploring technology [2–3].

Transformation has had an influence on economic development in Indonesia. This has the impact of increasing the need for IT experts in the field of programming. The problem is that the number of skilled and reliable programmer human resources in Indonesia is still very small and unable to meet the demands of the digital industry. So, there is a very large gap, and this has created a crisis in programmers and made our country import experts from abroad. To produce reliable human resources, it is necessary to carry out competency certification testing. Through the competency testing process, it must rely on Indonesian national work competency standards. According to [4], the certification process carried out by the Professional Certification Institute is preceded by an assessment process. Assessment is a process of assessing someone that focuses on the competencies they have towards fulfilling the requirements and standards set. Aspects of competency that will be assessed through cognitive skills as well as affective skills according to the criteria [5–9].

Another thing that emerged during the assessment process and results in the Junior Mobile Programmer scheme run by LSP Digital Technology was the lack of involvement of Professional, Academic, and Industrial Associations in designing the assessment model. Apart from that, the use of digitalization systems in the assessment process is also not fully optimal in online remote assessments. The assessment model applied has not been tested, so it does not guarantee that certification alumni will get jobs or become digital entrepreneurs. Based on these problems, it is necessary to develop an assessment model for IT competency certification in the field of vocational school graduates [10–12].

Specific research specifications for the IT competency certification assessment model, which will certify vocational alumni through the Ministry of Communication and Information's Vocational School Graduate Academy (VSGA) program to become Digital Talent Preneurs(Digital Talent Entrepreneurs), who will implement a digital-based assessment system and involve professional, academic and industrial associations so that it can form the professional behavior of a junior mobile programmer who is reliable, ready to work, and ready to be an entrepreneur. The purpose of this paper implement the junior mobile programmer professional competency certification assessment model to increase the relevance and quality of professional competencies and certification. The urgency of the study is to provide solutions to problems in the field of competency certification. There are still very few human resources whose competency certification is available; besides that, it is still difficult for LPS institutions to carry out assessments, and this study is still relatively new in Indonesia, so it is important to make improvements immediately.

## 2 METHOD

The study method uses experimental methods to implement the junior mobile programmer professional competency certification assessment model. The test subjects for this study involved participants from the training program DTS, VSGA Kemkominfo, totaling 40 sessions, consisting of 20 sessions for the experimental class and 20 sessions for the control class. The instrument uses observation and interview guides to obtain data about competency certification. As well as providing

tests in the form of competency tests in the form of written, practical, and oral tests. Data analysis techniques use inferential analysis and descriptive analysis.

# 3 RESULT AND DISCUSSION

## 3.1 Result

**Effectiveness test.** The effectiveness test in this study was carried out to assess the level of effectiveness of the development of the professional competency certification model for the junior mobile programmer scheme, which was applied to 30 research respondents. Effectiveness analysis was carried out by comparing the pre- and post-test scores. The following is a description of the pre- and post-test data.

*Written test.* The written test is a test in the form of an exam that aims to determine and measure the intellectual capacity or thinking function of the individual. After data processing is carried out, results are obtained as shown in Table 1 below.

**Table 1.** Recapitulation of pre- and post-test results

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Pre_Eks | 30 | 50 | 77 | 66,47 | 6,942 |
| Pos_Eks | 30 | 80 | 100 | 87,83 | 5,820 |
| Pre_Kon | 30 | 50 | 80 | 66,97 | 7,559 |
| Pos_Kon | 30 | 60 | 90 | 76,93 | 6,938 |
| Valid N (listwise) | 30 | | | | |

Based on Table 1 above, it can be explained that when the pretest was carried out, respondents had an average ability score of 66.47. Then, after learning was given, there was an increase of 87.83. For more details, the distribution of pre-test data through interval classes can be found in Table 2.

**Table 2.** Recapitulation of experimental class pre-test results

**Pre_Eks**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 50 | 1 | 3,3 | 3,3 | 3,3 |
| | 60 | 10 | 33,3 | 33,3 | 36,7 |
| | 65 | 6 | 20,0 | 20,0 | 56,7 |
| | 70 | 4 | 13,3 | 13,3 | 70,0 |
| | 74 | 3 | 10,0 | 10,0 | 80,0 |
| | 75 | 5 | 16,7 | 16,7 | 96,7 |
| | 77 | 1 | 3,3 | 3,3 | 100,0 |
| | Total | 30 | 100,0 | 100,0 | |

More clearly, the data frequency distribution in the experimental pretest class can be visualized in the bar diagram of the experimental class pretest results in the image below.

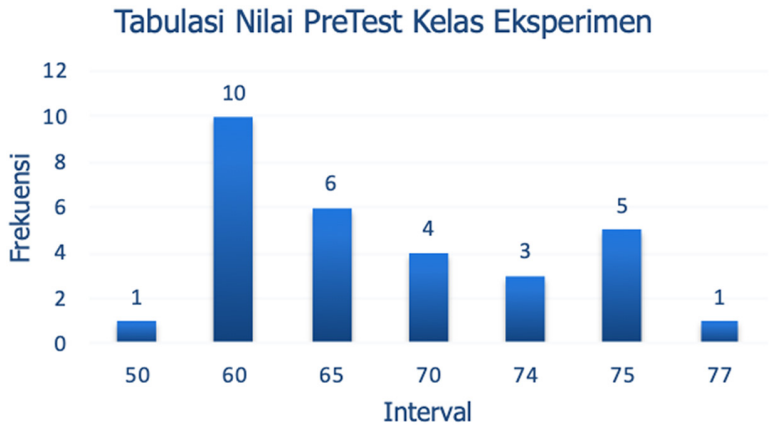


**Fig. 1.** Graph of pre-test data through the control class

Furthermore, the frequency distribution in the post-test in the experimental class after being given teaching material is briefly shown in the picture below.

**Table 3.** Recapitulation of experimental class post-test results

| Pos_Eks | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 80 | 4 | 13,3 | 13,3 | 13,3 |
| | 81 | 2 | 6,7 | 6,7 | 20,0 |
| | 83 | 1 | 3,3 | 3,3 | 23,3 |
| | 84 | 2 | 6,7 | 6,7 | 30,0 |
| | 85 | 5 | 16,7 | 16,7 | 46,7 |
| | 87 | 1 | 3,3 | 3,3 | 50,0 |
| | 89 | 2 | 6,7 | 6,7 | 56,7 |
| | 90 | 6 | 20,0 | 20,0 | 76,7 |
| | 92 | 1 | 3,3 | 3,3 | 80,0 |
| | 95 | 4 | 13,3 | 13,3 | 93,3 |
| | 100 | 2 | 6,7 | 6,7 | 100,0 |
| | Total | 30 | 100,0 | 100,0 | |

More clearly, the data frequency distribution in the experimental post-test class can be visualized in the bar diagram of the experimental class post-test results in Figure 2.

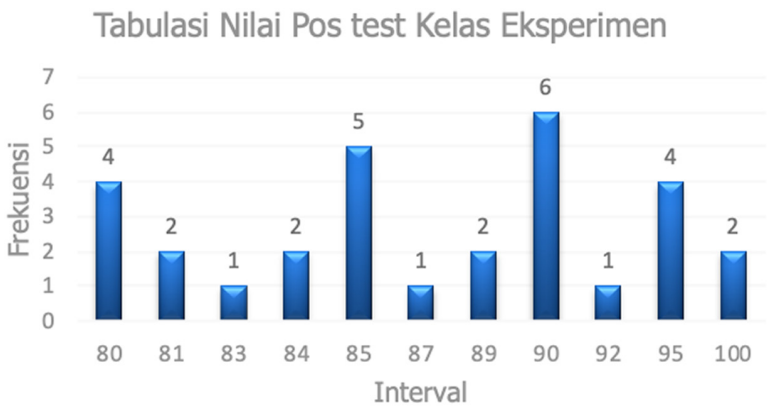


**Fig. 2.** Posttest data graph through the experimental class

Based on the Table 3 above, it can be explained that when the pretest was carried out, respondents had an average ability score of 66.97. Then, after being given training, there was an increase of 76.93. For more clarity, the distribution of pre-test data through interval classes can be stated in Table 4.

**Table 4.** Recapitulation of control class pre-test results

**Pre_Kon**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 50 | 1 | 3,3 | 3,3 | 3,3 |
| | 55 | 1 | 3,3 | 3,3 | 6,7 |
| | 56 | 1 | 3,3 | 3,3 | 10,0 |
| | 59 | 2 | 6,7 | 6,7 | 16,7 |
| | 60 | 4 | 13,3 | 13,3 | 30,0 |
| | 63 | 1 | 3,3 | 3,3 | 33,3 |
| | 64 | 1 | 3,3 | 3,3 | 36,7 |
| | 65 | 3 | 10,0 | 10,0 | 46,7 |
| | 68 | 1 | 3,3 | 3,3 | 50,0 |
| | 70 | 5 | 16,7 | 16,7 | 66,7 |
| | 71 | 1 | 3,3 | 3,3 | 70,0 |
| | 73 | 1 | 3,3 | 3,3 | 73,3 |
| | 74 | 2 | 6,7 | 6,7 | 80,0 |
| | 75 | 4 | 13,3 | 13,3 | 93,3 |
| | 78 | 1 | 3,3 | 3,3 | 96,7 |
| | 80 | 1 | 3,3 | 3,3 | 100,0 |
| | Total | 30 | 100,0 | 100,0 | |

More clearly, the data frequency distribution in the experimental pre-test class can be visualized in the bar diagram of the experimental class pre-test results in Figure 3.

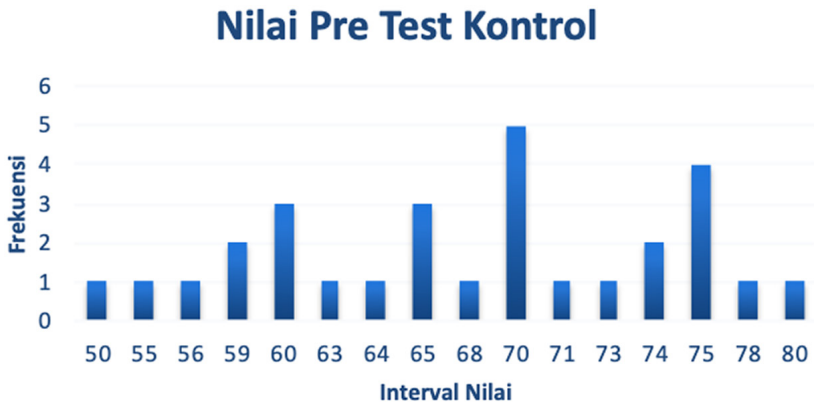


**Fig. 3.** Pre-test data graph through the control class

Furthermore, the frequency distribution in the posttest is briefly shown in the Table 5 below.

**Table 5.** Recapitulation of control class post-test results

| Pos_Eks | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 80 | 4 | 13,3 | 13,3 | 13,3 |
| | 81 | 2 | 6,7 | 6,7 | 20,0 |
| | 83 | 1 | 3,3 | 3,3 | 23,3 |
| | 84 | 2 | 6,7 | 6,7 | 30,0 |
| | 85 | 5 | 16,7 | 16,7 | 46,7 |
| | 87 | 1 | 3,3 | 3,3 | 50,0 |
| | 89 | 2 | 6,7 | 6,7 | 56,7 |
| | 90 | 6 | 20,0 | 20,0 | 76,7 |
| | 92 | 1 | 3,3 | 3,3 | 80,0 |
| | 95 | 4 | 13,3 | 13,3 | 93,3 |
| | 100 | 2 | 6,7 | 6,7 | 100,0 |
| | Total | 30 | 100,0 | 100,0 | |

More clearly, the data frequency distribution in the experimental posttest class can be visualized in the bar diagram of the experimental class posttest results in Figure 4.

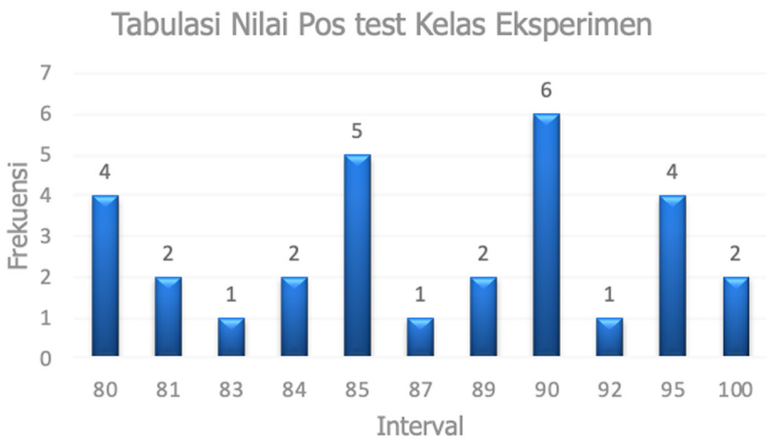


**Fig. 4.** Graph of posttest data through the control class

**Prerequisite test.** *Homogeneity* test statistics to see homogeneous data, and the *Kolmogorov-Smirnov* test to determine the normality of the data. Next, analyze the *paired sample t test* to find out whether there are changes between the experimental class and the control class. Data analysis calculations were carried out using the SPSS version 25 program.

***Homogeneity test.*** To determine the homogeneity of data for the two groups of data to be analyzed, a homogeneity test was carried out using the StatisticalLevene Test. The results of the homogeneity test of research data can be seen in Table 6.

**Table 6.** Homogeneity test

**Test of Homogeneity of Variance**

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Hasil Belajar Siswa | Based on Mean | ,731 | 3 | 116 | ,536 |
| | Based on Median | ,858 | 3 | 116 | ,465 |
| | Based on Median and with adjusted df | ,858 | 3 | 115,200 | ,465 |
| | Based on trimmed mean | ,771 | 3 | 116 | ,513 |

From Table 6, the results of homogeneity testing carried out in the experimental class and control class, can be seen, based on the sig value of 0.536, so it is greater than 0.05. This means that the value is declared homogeneous because it has a probability of significance, or sig > 0.05.

***Normality test.*** The normality test is carried out to determine whether the research data is normally distributed or not. Normal data is an absolute requirement before we carry out parametric statistical analysis (paired sample *t* test and independent sample *t* test). In parametric statistics, there are two types of normality tests that are often used, namely the Kolmogrov test and the Shapiro-Wilk test. The results obtained from data processing are presented in Table 7.

**Table 7.** Normality test

**Tests of Normality**

| | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | Kelas | Statistic | df | Sig. | Statistic | df | Sig. |
| Hasil Belajar Siswa | Pre Test Eksperimen | ,159 | 30 | ,052 | ,937 | 30 | ,076 |
| | Post Test Eksperimen | ,204 | 30 | ,003 | ,933 | 30 | ,060 |
| | Pre Test Kontrol | ,156 | 30 | ,061 | ,961 | 30 | ,330 |
| | Pos Test Kontrol | ,137 | 30 | ,154 | ,964 | 30 | ,397 |

a. Lilliefors Significance Correction

From Table 7, the normality test results show that the experimental class value in the pretest results was 0.076 and in the control class it was 0.330, more than 0.05. Based on these results, the data is normally distributed. Likewise, the post-test results for the experimental class were 0.060 and the control class were 0.397, more than 0.05, so they were also declared normal. Based on the output above, it is known that the significance value (sig.) for all data in both the Kolmogorov-Smirnov test and the Shapiro-Wilk test is > 0.05, so it can be concluded that the research data is normally distributed. Because the research data is normally distributed, researchers can use parametric statistics (test paired sample *t*-test) to analyze research data. Testing paired sample *t*-test to determine differences in learning outcomes between assesses taught using information systems media and assesses taught using conventional media, especially web programming schemes.

***Independent sample t test.*** Testing independent samples *t*-test to find out the difference in learning outcomes between assesses who were taught using the development of the professional competency certification model junior mobile programmer scheme and assesses who did not take a pre-certification test by the association.

The hypothesis testing is:

H 0: There is no difference in the learning outcomes of participants who were taught the competency test and certification training model with the learning outcomes of participants who were taught using conventional media.

H a: There is a difference in the learning outcomes of participants taught using the competency test and certification training model with the learning outcomes of participants taught using conventional media.

The results of the independent sample *t*-test on post-test data for the experimental and control classes can be seen in Table 8.

**Table 8.** Independent sample *t*-test results

| | | Levene's Test for Equality of Variances | | *t*-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | Q | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Test_Value | Equal variances assumed | 0.188 | 0.666 | 2.424 | 58 | .019 | 4.233 | 1.474 | 0.737 | 7.730 |
| | Equal variances not assumed | | | 2.264 | 57.844 | .019 | 4.233 | 1.474 | 0.737 | 7.730 |

Based on Table 8, the results of *the independent sample t-test* obtained show that *the Levene test's* $F_{count}$ is 0.188 with a probability of 0.666 > 0.05, so it has the same *variance. Then the* $_{calculated}$ t value for *equal variance assumed* is 2.424 with a significance probability of 0.019 (*two-tailed*) and in the $t_{table} = 1.697$. So $t_{count} > t_{table}$ or 2.424 > 1.697, therefore Ha is accepted and Ho is rejected.

It was concluded that there were differences in the learning outcomes of participants who were taught the competency test and certification training model with the learning outcomes of participants who were taught using conventional media.

A summary of the inferential statistical results is presented in Table 9.

**Table 9.** Summary of inferential statistics results

| Group | Normality Test | Homogeneity Test | *T-Test* |
|---|---|---|---|
| Experiment | Normal | Homogeneous | Reject $H_0$ |
| Control | Normal | | |

Based on Table 9, it can be concluded that in the experimental and control class groups the data showed homogeneous and normally distributed, so an independent sample *t*-test was carried out and it was obtained that there were differences in the learning outcomes of participants who were taught using competency tests and certification training with the learning outcomes of participants who were taught using conventional media.

**Observation test (practice).** An observation test (practice) is obtained from the results obtained from practical tests on the junior mobile programmer scheme. The results assessment indicators are seen from several aspects, namely work preparation, work process, work results, work attitude, and time. The results obtained can be seen in the Table 10.

**Table 10.** Recap of assessment of learning results in practical tests

| Indicator | Experimental Class | Control Class |
|---|---|---|
| Work preparation | 84.44 | 72.00 |
| Work process | 90.00 | 70.96 |
| Work result | 89.90 | 70.49 |
| Work attitude | 91.33 | 77.00 |
| Time | 88.67 | 74.44 |

Based on Table 10, it shows that from the two assessment classes that implemented the competency test model program in the junior mobile programmer scheme, the results obtained in the experimental group had different average values. Figure 5 is a recap of the assessment of training results in the practical test.

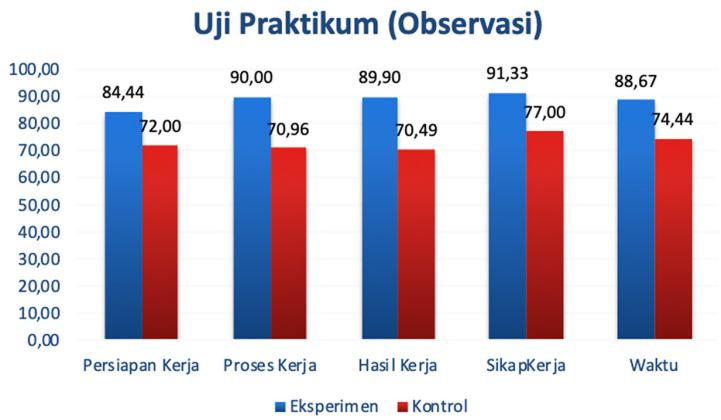


**Fig. 5.** Practical test assessment graph (observation)

## 3.2 Discussion

The aim of this study is to implement the Junior Mobile Programmer professional competency certification assessment model so that it can provide benefits in the field of education effectively, especially technology and vocational education, namely to increase the relevance and quality of competency and professional certification. The application of this model focuses on the pre-certification test carried out by the founding professional and industrial association of LSP P3 digital technology as preparation for the assessment before taking the competency certification exam by LSP. Participants who have received junior mobile programmer scheme training through the Ministry of Communication and Information's DTS VSGA program will be tested by association practitioners so that assesses have sufficient time and strategies to face the LSP certification exam. Before this model was developed, participants who had completed junior mobile programmer training through the Ministry of Communication and Information's DTS VSGA program only prepared independently to face the LSP exam. After the training is complete, there is a long period of time for participants to face the LSP exam, approximately one month. So, participants often forget the training material that has been provided, so that during the LSP certification exam many participants are under prepared and receive a recommendation of Not Competent. By implementing this model, participants will be more confident because of the time span before the certification exam. There is an increase in the quantity of competent assessors compared to assessors who do not use the model.

In the experimental class, the junior mobile programmer professional competency certification assessment model was used, while in the control class, conventional media was used. The study was carried out on test subjects involving participants from the training program *DTS, VSGA* Kemkominfo, totaling 40 sessions, consisting of 20 sessions for the experimental class and 20 sessions for the control class.

According to [13–15] assessment is a series of processes carried out with the aim of obtaining information used to design policies and decisions within the scope of policies, programs, measuring tools, institutions, and others. Positions and means of measuring success in learning. Meanwhile, an independent assessment model was proposed to measure competency [16–17]. According to [18–19] competency is the ability to do a job containing elements of skill, cognitive, and attitude. According to [20–21] the learning life cycle and competency framework are divided into five

phases, namely the content design phase, assessment design phase, content and assessment delivery, assessment feedback, and content review.

A person's competency is always developed and continues to follow competency standards that apply now and in the future [22–23]. In the field of human resource development, the professional certification process should be carried out at the Professional Certification Institute (LSP). To maintain its credibility and consistency, LSP must obtain the National Professional Certification Agency (BNSP).

Junior Mobile Programmer is a certification scheme designed based on the Indonesian National Work Competency Standards. Assessors who are given competent recommendations for this scheme are expected to be able to create and develop mobile-based software with the Android operating system in accordance with current industry needs. A person with the profession of Junior Mobile Programmer is a certified member of competency in the field of mobile programming and is given the task of carrying out junior or primary level mobile programming such as writing and creating software and operating systems. A profession is a field of work that has functions and duties that require a person to fulfill the competencies required by that profession. The institution that has the authority to issue competency certification is the National Certification Body (BNSP). So it is necessary to adapt an international examination system, one of which uses Cisco [26]. This can make it easier for competency test venues and competency test participants or assesses to carry out the competency test process without abandoning the assessment principles that have been established by BNSP [27].

Junior mobile programmer professional competency certification assessment model in order to improve the quantity and quality of DTS program graduates for the junior mobile programmer scheme: The assessment model applied so far is not well prepared to face the certification tests conducted by LSP Digital Technology, is still conventional in nature, and does not involve various parties in conducting the assessment. Location of the model concept variables adopting several relevant studies that previously existed.

Results of the written test: When the pre-test was carried out, respondents had an average ability score of 66.47. Then, after being given learning, there was an increase of 87.83. The *independent sample t-test* results obtained show that *the Levene test's* $F_{count}$ is 0.188 with a probability of 0.666 > 0.05, so it has the same *variance. Then the* $_{calculated}$ t value for *equal variance assumed* is 2.424 with a significance probability of 0.019 (*two-tailed*) and in the $t_{table} = 1.697$. So, $t_{count} > t_{table}$ or 2.424 > 1.697, therefore Ha is accepted and Ho is rejected. It was concluded that there were differences in the learning outcomes of participants who were taught the competency test and certification training model with the learning outcomes of participants who were taught using conventional media. The results of the observation test (practice) contain indicators for assessing results seen from several aspects, namely work preparation, work process, work results, work attitude, and time. The results obtained in the experimental class were superior to those in the control class.

Based on the findings, it shows that the implementation of the junior mobile programmer professional competency certification assessment model has proven to be effective. This study contains more concrete experiences regarding industry needs, professional competency certification assessments for junior mobile programmers, digital technology, online, and LPS. Achievement of quality certification assessments and increasing professional competence. Research was conducted [24] on developing interest-based competencies for careers in information technology. In the field of evaluation, [25] developed a technology-accepted model (TAM) model for designing e-assessments using web-based assessment features.

## 4 CONCLUSION

The findings show that after the junior mobile programmer professional competency certification assessment model was implemented, it was then measured, including cognitive, psychomotor, and affective aspects in participants in the experimental class and control class. The results proved that the experimental class was more effective than the control class. The results obtained in the experimental class used the junior mobile programmer professional competency certification assessment model, while in the control class using conventional media. In the experimental class for the written test results when the pre-test was carried out, respondents had an average ability score of 66.47; post training of the score stood read, 87.83. The results of the observation test (practice) contain indicators for assessing results seen from several aspects, namely work preparation, work process, work results, work attitude, and time. The results obtained in the experimental class were superior to those in the control class. It was concluded that there were differences in the learning outcomes of participants who were taught the competency test and certification training model with the learning outcomes of participants who were taught using conventional media. The implications of these findings for this certificate program are given specifically to participants who have criteria in accordance with the provisions and decisions of the Digital Talent Scholarship committee of the Ministry of Communication and Information. suggestions: For assessors, it is recommended to be able to implement model competency tests and certification. For assesses, it is recommended to be active in carrying out learning in a model manner through competency tests and certification. Apart from that, assesses can use this information system more widely; assesses can be actively involved in learning anywhere and at any time without space and time limitations.

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