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LEARNING OUTCOMES OF A COMPUTER BASED TEST FOR COMPUTATIONAL THINKING BASED ON LOCAL WISDOM

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ABSTRACT
Computational Thinking (CT) is an important ability in solving complex problems in the era of industrial revolution 4.0. This research aims to determine student learning outcomes in local wisdom-based computational thinking diagnostic tests in information technology research learning using CBT. This type of research is quantitative research with a descriptive approach. The sample for this research was 108 undergraduate students in Computer Science and Bachelor of Information Technology, Bumigora University. Construct validity estimation using EFA and instrument reliability using Cronbach Alpha. Data collection techniques and instruments use a two tier diagnostic test with CBT. The data analysis technique uses the average test. The results of this study show that the average student score on the local wisdom-based CT diagnostic test using CBT is in the high category. Thus, student learning outcomes in CT ability are high.

Keywords:
CBT, CT, Learning Outcomes

INTRODUCTION

Computational Thinking (CT) capabilities are becoming essential in the era of industrial revolution 4.0 to understand and solve complex problems in a rapidly changing technological landscape (Ansori, 2020). These capabilities are needed to design and implement new technologies, optimize processes, and make sense of the big data generated by the fourth industrial revolution. CT is defined as a way of understanding and solving complex problems using computer science techniques and concepts such as decomposition, pattern recognition, abstraction and algorithms (Marifah et al., 2022). CT is one of the main digital literacy contents in the world of education which enables students to have the ability to solve problems systematically as computers work (Rozandy & Koten, 2021). In fact, the development of CT is not always related to computers, but has turned into a way of thinking that is inserted into learning to equip students to have the ability to think logically in solving problems (Supatmiwati et al., 2021) .

Therefore, CT ability is a high-level thinking ability that requires a test form with HOTS criteria so that it can accommodate this ability. One alternative form of test that can be used to measure CT capabilities is a diagnostic test. Diagnostic tests are tests carried out to determine the types of difficulties faced by students in a course, especially in information technology research courses, so that appropriate solutions can be provided according to the problems experienced (Iriyadi et al., 2022; Suseno & Susongko, 2021). The problem faced by students when learning information technology research is difficulty in applying information technology knowledge to solve problems that exist in society.

Thus, an alternative solution that can be provided to solve this problem is to apply local wisdom-based learning. This is because the application of local wisdom-based learning is also considered to be able to improve students' cognitive abilities (Khaerani et al., 2020; Mayasari et al., 2020) . Later, the development of a CT diagnostic test containing questions to identify students' knowledge regarding the application of information technology research in daily life is adapted to local culture (Jufrida et al., 2021) . In this regard, the development of CT diagnostic tests can also help create solutions to local wisdom problems by including local knowledge and values in the problem solving process (Mutoharoh, 2020) so that it is hoped that results can be obtained that are more accurate and relevant to local conditions and culture (Jamilah et al., 2022; Fariyani et al., 2022) .

One effort to utilize technology in test development is to develop a Computer Based Test (CBT) based diagnostic test. CBT is a computer-based assessment system designed to assist teaching staff in evaluating assessments, administering tests, and increasing the effectiveness and efficiency of administration (Nasir et al., 2023) . CBT-based diagnostic tests have advantages compared to Paper Based Test (PBT)-based diagnostic tests which are still widely adopted in Indonesia, where PBT takes a long time to correct if carried out by just one person (Annisak et al., 2017) . This is because the test is carried out using computer-based CBT so there is no need to duplicate test questions such as PBT (Istiyono et al., 2018). Apart from that, testing using CBT has high accuracy in measuring students' ability levels because the tests taken by each student are random (Suwarya, 2021) .

The problem in the research is the application of CBT in diagnostic tests to improve CT skills based on local wisdom, especially in information technology research learning that has not been researched. Based on analysis of research conducted by several previous researchers, the study focused on developing CT tests in Mathematics, Science and Informatics learning (Kurniawati et al., 2019) Susilowati et al., 2021; Sartika et al., 2023 ; Setiarini et al., 2023; Sprott et al. 2023) in K-12 where instrument development is still based on PBT. Thus, referring to several previous studies, the novelty of this research is producing an assessment product in the form of a CT diagnostic test based on local wisdom in Information Technology Research learning using CBT media. Based on these conditions, the aim of this research is to determine student learning outcomes in local wisdom-based CT diagnostic tests: a study on information technology research learning using CBT.

METHOD

This type of research is quantitative research with a descriptive approach. The sample for this research was 108 students from the Bachelor of Computer Science and Bachelor of Information Technology study programs, Bumigora University. The sampling technique uses purposive sampling. Data collection techniques and instruments use a two tier diagnostic test with CBT. Estimated construct validity using EFA is seen from the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value > 0.50 and Barlett's Test of Sphericity Sig value < 0.05, then the instrument item is declared feasible (Harwarni, 2019; Yamin, 2021). Meanwhile, to estimate reliability using Cronbach Alpha with reliability coefficient categories, namely 0.0-0.20 (very low),

0.20-0.40 (low), 0.40-0.60 (medium), 0.60-0.80 (high), and 0.80-1.00 (very high) (Istiyono, 2020). In this regard, the data analysis technique uses an average test with CT learning outcome assessment categories, namely 0 – 20 (very low), 21-40 (low), 41-60 (medium), 61-80 (high), and 80 -100 (very high).

RESULTS AND DISCUSSION

Construct Validity Results

The results of the calculation of construct validity using EFA are explained as follows.

1. Kaiser-Meyer-Olkin (KMO) and Barlett's Test

Table 1. KMO and Barlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,634
Bartlett's Test of Sphericity	Approx. Chi-Square	140.176
	df	45
	Sig.	,000

Looking at Table 1, the KMO value = 0.634> 0.5 and the Barlett's Test value = 0.000 <0.05, so that the instrument items are declared feasible and meet the requirements for factor analysis (Harwarni, 2019) .

2. Anti Image Matrices

Anti Image Matrices requirements as sample coverage in measuring the Measure of Sampling Adequacy (MSA) value> 0.5, so the requirements for factor analysis using EFA are met. The MSA value for each instrument item found on the diagonal of the matrix shows that all instrument items consisting of 10 test instrument items have an MSA value> 0.5 (Yamin, 2021) . So test instrument items are declared feasible.

Referring to the construct validity results above, it can be concluded that the CT diagnostic test instrument is declared suitable for use as a measuring tool. This finding is supported by research conducted by Sovey et al. (2022) and Junpho et al. (2022) who stated that the CT instrument has a construct validity index that is suitable for use as a research measuring tool.

Reliability Results

The results of the calculation of instrument reliability using the Cronbach Alpha formula are shown in Table 2.

Table 2. Cronbach Alpha

Cronbach's Alpha	N of Items
,628	10

Based on Table 2, the analyzed instrument items have a Cronbach Alpha value of 0.628 with a high reliability coefficient category (Istiyono, 2020) . Thus, the local wisdom-based diagnostic CT test items used in this study were declared reliable. This finding is supported by research conducted by Polat et al. (2021) and Gok & Karamete (2023) who stated that the CT instrument has a high reliability coefficient.

Test of Means

Table 3. Average Learning Outcomes

N	Mean
108	61.0463

Based on Table 3, it can be seen that the average student learning outcome in the local wisdom-based CT diagnostic test using CBT was 61. Therefore, students have an average learning outcome for local wisdom-based CT abilities in the high category. The findings of this research are also supported by research conducted by Kurniawati et al. (2019), Sartika et al. (2023) , and Sprott et al. (2023) which stated that students' learning outcomes in CT abilities were declared complete. Thus, it can be concluded that the student learning results in the local wisdom-based CT diagnostic test in information technology research learning using CBT stated that students had high CT abilities.

CONCLUSION

Based on the results and discussion, it can be concluded that construct validity with EFA states that the instrument items are suitable for use as research measuring tools. The results of the instrument's reliability with Cronbach Alpha stated that the instrument had a high reliability coefficient. Meanwhile, the average student learning outcomes in local wisdom-based CT diagnostic tests in technology research learning using CBT were stated to be high. Even though students' CT abilities are in the high category, it is important to apply learning methods that can optimize these CT abilities

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