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The Use of Android Based Multi-representation Test to Profile 4C Skills Based on Experimental Activities Regarding to Gender and Learning Styles

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ABSTRACT

This study aims to see how well Android based multi-representation test to profile 4C skill based on experimental activities on heat transfer topic regarding gender and learning styles A descriptive research to profile the 4C skill students based on gender and learning style. We use fleming's VAK learning style questionnaire to identify student learning styles. The research subjects were 60 students of class XI MIPA at a public high school in Majalengka Regency, consisting of 20 male students and 40 female students. 33 students (7 boys and 26 girls) had an Auditory learning style, 17 students (8 boys and 9 girls) had a visual learning style and 10 students (5 boys and 5 girls) had a visual learning style. kinesthetic. Research data were analyzed using quantitative descriptive analysis techniques. The results showed that female students have higher 4C skills than male students in each student's learning style. This result is agreed with previous research. The visual learning style both female and male student have the higher 4C skill than other learning style and agreed with previous results. It can be understood since the application is dominant with visual content. We conclude that Android based multi-representation test has successfully measure 4C skills based on experiment activities. Teachers think that the application has complete features to measure 4C's students. It is practical tool to get student's 4C' profiles easily and quickly. Based on 4C's students profile have successfully gave feed back for teacher to improve their learning design such as inserting group experiment activity to solve problem. We conclude that Android based interactive test can be an alternative test for profiling Student's 21st century skill quickly, easily and practically.

Keywords: *4c profile, android based multi-representation test, gender and learning style*

INTRODUCTION

(Redhana, 2019) said anyone successfully face problems and Challenges if he has 21st century skills. Meanwhile, according to (Wagner, 2017), students need to master seven skills to be able to become productive citizens who contribute to solving problems in the 21st century, namely problem-solving skills and critical thinking, collaboration and leadership, adaptive skills and agility, initiative and entrepreneurship, effective oral and written communication skills, skills in accessing and analyzing information, as well as curiosity and imagination.

Laboratory activities by using physics concept exploration procedures, laboratory activities, as well as simulation or modelling really help students in analyzing the effects of natural phenomena and verifying existing theoretical models by designing and controlling the desired

conditions (Sani, 2012). Furthermore laboratory activities often conducted in group and present its result at the end. This makes 21ST century skills are trained a lot through experimental activities especially 4C's skill i.e. Creativity, Critical thinking, collaboration and Communication.

One component must involve in a quality learning process is evaluation (Zuhri & Rizaleni, 2016).According to (Lase, 2019) said it is important to train students with 21st century skills so that they have various life skills in the 21st century so that they can survive and be able to compete in various fields of life. According to (Widayat, 2018) are integrated in knowledge skills, skills and attitudes as well as mastery of ICT can be developed through: (1) Critical Thinking and Solving Skills Problems (Critical Thinking and problem solving Skills; (2) communication skills; (3) creativity and innovation Skills; and (4) collaboration Skills.

These four skills must be packaged in the learning process as mandated by the 2013 Curriculum. To ensure that the 4C skills have been trained through Physics learning and to what extent high school students have achieved the 4C skills after taking Physics lessons, it is necessary to identify them directly by presenting them to the 4C skills test. As stated by (Zubaidah, 2016). Whereas (Liesa-Orús et al., 2020) examined the relationship between learning models and learning styles on critical thinking skills, the results showed that learning styles significantly affect critical thinking.

Based on the description above, the aim of this research is to see how well android based multi-representation test be able to photograph the 4C skill based on experiment activities profiles of high school students based on gender and student learning styles to give feed back to teacher to Improve learning design to enhance the same skill.

METHODOLOGY

This research is a descriptive study. It is to determine differences of C's skills students based on gender and learning style (Etikan & Bala, 2017).. The selection of participants was done randomly. Random sampling is sampling that allows each element of the population to have the same opportunity to be a sample. The research was conducted from 3 to 15 October 2022 with 60 high school students as subjects in a school in Majalengka Regency class XI MIPA consisting of 40 female students and 20 male students. Furthermore, based on the collective results of the data from the two instruments, students are grouped based on the 4C skill test score, learning style and gender. Then the data is analyzed and described

Android based multi-representation test as 4C'S instrument based on experiment activities have developed 4C's Instrument based on experiment activities. In heat and heat conduction topic with ADDIE stage. The instrument have been validated by experts In this work we use 4C's instrument in heat transfer topic. It contains 16 multiple-choice test each 4 questions for creativity, Critical Thinking, Communication and collaboration based on experimental activities. Then they gather all features to measure 4C in technology-based test based on experiment activities that contain muti representation content both text and figurative language such as videos pictures, and diagrams.

The features of android application Simulation of android application Contain (1) The home section as seen in picture 1(a) (2) The heat transfer menu that make the user can choose either experiment video, virtual laboratory and access 21 st century skills test as shown in picture 1(b), the Experiment Activity Video is connected directly to You tube as shown in picture 1(c). While The virtual laboratory will directly connected to the wolfram web. For use this application properly, users are advised to use supported browsers such as Chrome, Safari, Firefox, and edge as shown in picture 1(d). Next is 4C's Test menu After experiencing virtual laboratory and watch the video, users can answer 21st century skills tests related to the data and experiment shown both from the video and experiment simulation as shown in picture 1(e). After answering all the

questions then user press the submit bottom as shown in picture 1(f). in Final Score Menu. While in K21 score menu, user can see each 4C;s score obtain ss shown in figure 1(g).

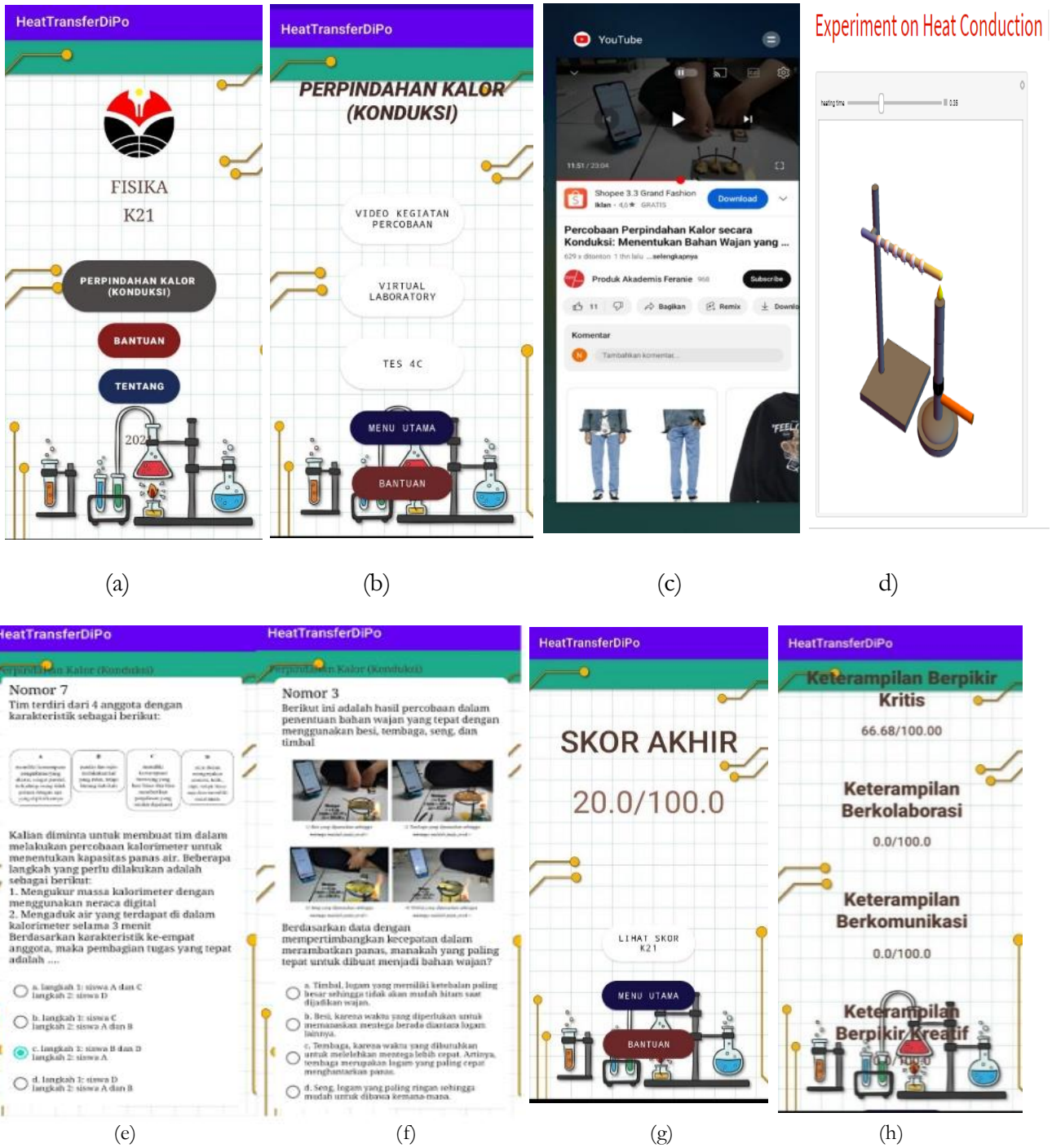

Figure 1. Features of Android Based Multi-representation Test

VAK (Visual Auditory and Kinesthetic) learning styles form a model of learning designed by Walter Burke Barbe and later developed by Neil Fleming. There are 11 questions that are given to explore which learning styles tend to be students, whether the learning style is auditory, visual or kinesthetic. The results of filling in the students showed different results according to the choice of statements that matched the characteristics of the students.

This research uses a descriptive method. The research was conducted from 3 to 15 October 2022 with 60 high school students as subjects in a school in Majalengka Regency class XI MIPA consisting of 40 female students and 20 male student.

RESULT AND DISCUSSION

Based on the results of VAK test, 60 high school students showed 33 students (7 boys and 26 girls) had an Auditory learning style, 17 students (8 boys and 9 girls) have a visual learning style and 10 students (5 boys and 5 girls) have a kinesthetic learning style. From the results of the study, it was obtained data on students' 4C skill scores based on gender and learning style as follows:

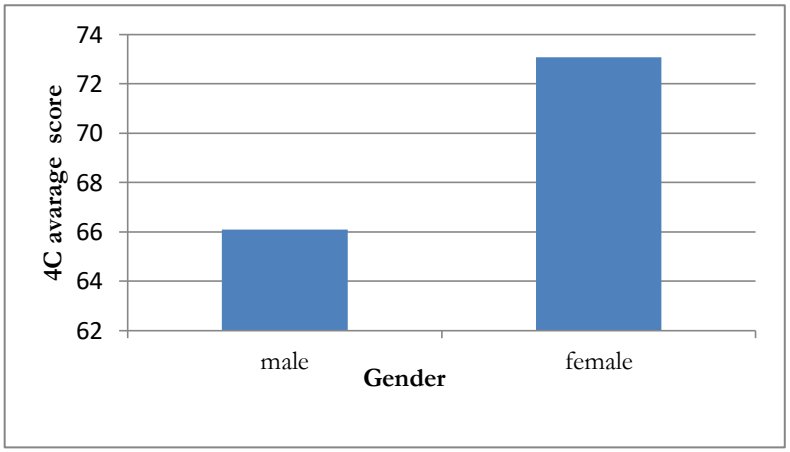

Figure 2. Chart of 4C Avarage Scores Based on Gender

It can be seen from figure 2 that the scores of female students are greater than those of male students. Based on the significance test of the two mean differences between the average scores of male and female students with a significant level of 95%, the following data were obtained: XL = 66.09, Xp = 73.07, SL = 16.61 and sp = 16.17 z α = 0.025 obtained z count (-0.3475) < Z table so the null hypothesis is rejected meaning that there is a significant difference between the scores of male students and the scores of female students. Both (Abraham, 2016) and (Himmah et al., 2017)has investigated creative thinking based on gender. Both result showed that the creative thinking skills of female students are higher than the creative thinking skills of male students. (Salahshoor & Rafiee, 2016; Wardani et al., 2018) also get the same result for criticall thinking. The results of the 4C score based on learning styles is shown in figure 3.

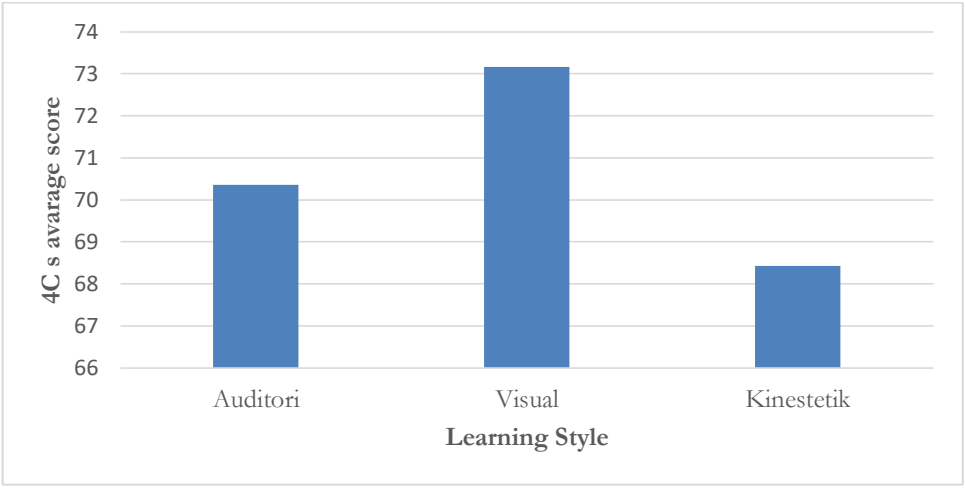

Figure 3. Chart of 4C Scores Based on Learning Styles

In figure 3 it can be seen that the highest scores were obtained by students in the group with the visual learning style. Each component of 4C average scores based on gender and learning style can be seen in figure 4. The result show agreement with previous researches. Köksal & Çöğmen (2018) have found that female students' are significantly different and higher than male students' communication and critical thinking skills. Vebrianto et al (2020) said that between male and female has the same relationship to strengthening the 21st Century skills but week correlation.

Madyani et al (2019) found in their research that the students have high percentage on flexibility for male students and on fluency for female student. The students have average percentage on both originality and fluency for male students and on elaboration for female students. The students have low percentage on elaboration for male students and on both originality and flexibility for female students. Saryanto et al (2021) shows that students master critical thinking indicators, i.e., in the determination of actions due to their accurate thinking for male students and in making conclusions due to their decent thinking process of seeing reality for female students.

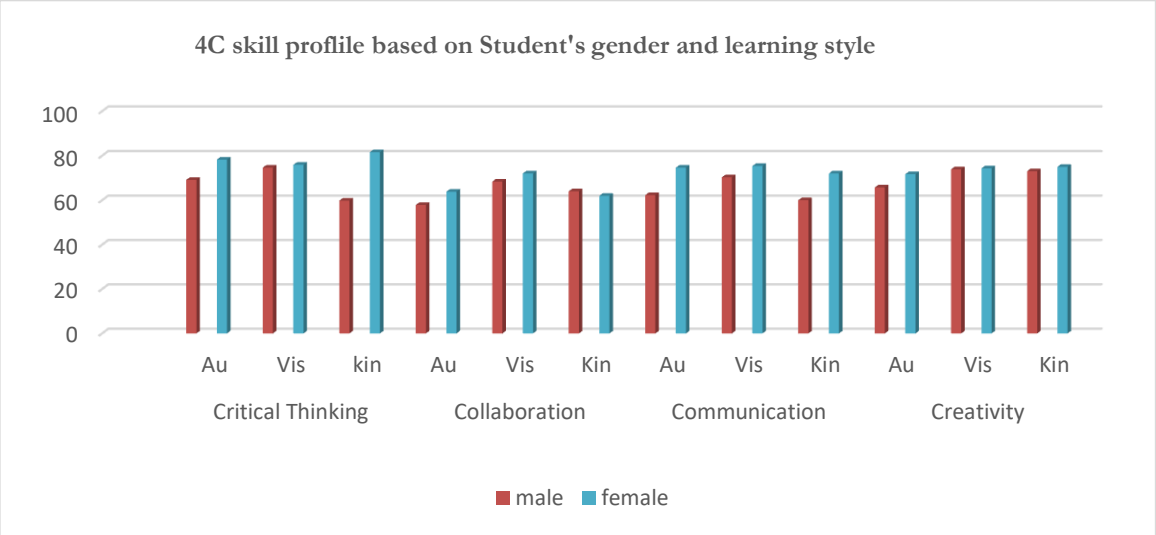

Figure 4. The 4C Average Scores Based on Gender and Learning Style

Since 4 questions to measure each 4C's skills. Based on image 5 we found that both male and female and each learning style have answered correctly average 2 of 4 questions 4C's skill. It may duo to students have less group experiment activities especially in heat transfer topic. Since the instrument is based on experiment activity, the student's achievement in 4C's is strongly depend on how often student often interact with experiment activities, involve with experiment group work and present and discuss their experiment. Having this result should be an input for teachers to design their next learning design to enhance their 4C skill based on experiment activities.

Mardhiyah et al (2021) said that 21st century learning should be oriented towards training student skills by directing the learning process and student centre learning. Some researchers have developed the 21st century learning apparatus trough experiment activities. Such as (Agmita et al., 2021) have developed problem-based worksheet to enhance 21st century skill that related to electricity experiment and Sutarno et al (2018) have developed model of higher order thinking virtual laboratory to enhance student's creative and critical thinking. Some Previous results show that learning style have no significant effect such as (Rogowsky et al., 2015) said no statistically significant relationship between learning style preference (auditory, visual word) and instructional method (audiobook, e-text) for either immediate or delayed comprehension tests.

Wilkinson et al (2014) has also the same result. Shamsuddin & Kaur (2020) have found from their result that students' learning styles and their perceptions towards blended learning has no significant difference. But Weng et al (2018) said that adopting multimedia-based teaching style promoes students' learning attitude. He also found that using multimedia-based teaching style has significant effects on students' learning attitude with different learning styles in teaching Taekwondo Aerobic which is agree with our result shown in figure 4. (Raiyn, 2016) has investigated the roleof visual learning on improving high order thinking skill.

The result show classroom that promotes the presentation of information in visual formats such as images, diagrams, flowcharts and interactive simulations have increased the students HOT's skill. This 2 results are strengthen our result which is those who has visual learning style have average 4C skill higher than other learning style using the android based multi-representation test.

CONCLUSION

Based on the results of this study, it can be concluded that the students' 4C skill scores based on gender and learning style are as follows, namely based on auditory learning styles, the average 4C score for male students is 63.89 and the average 4C score for female students is 72.09; Based on the visual learning style, the average 4C score for male students is 71.90 and the average 4C score for female students is 74.27; and based on the kinesthetic learning style, the average 4C score for male students is 64.20 and the average 4C score for female students is 72.65. Then from the significance test of the average 4C score at the 95% level of confidence, the result is Z count = -0.3475 > Z table - 1.96, so the null hypothesis is rejected, meaning that there is a significant difference between the average scores of male students and the average 4C score of female students. And this result is agreed with lots of previous results. The results of this study only photographed data in one school on one subject matter. It is suggested to other teachers/other researchers to develop the results of this research to be implemented in their respective schools using the same application or other applications. It is also suggested that the differences in student learning styles must be able to motivate teachers to be able to deliver subject based on different student learning styles.

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