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The Development of Students' Aptitude Test in Online and Multimedia Based Interests Group Selection

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Abstract. Each individual has different aptitudes and personalities. Schools have a very important rules to map students' interests according to students' talents and interests. This is very important because proper placement of interest can support students' academic ability. This study aims to create a standard measurement that can be used for mapping and tracking students' talent in high school becomes easier and measurable. There are 5 aspects related to aptitudes in this research such as visual reasoning test, numerical reasoning test, verbal analysis test, spatial recognition test and vocabulary test. The Rasch model was used to analyze the difficulty level of the item, and from the results of the study showed that the difficulty level of the item was in the normal distribution at the interval -3.57 to 4.5. By using the Google Form tool, students' aptitudes tests are developed and presented in varied form and can provide test result information automatically. The use of Google Form has several advantages, such as (1) the test does not have to be done simultaneously at the same time and place, (2) the item can be made more interesting because it can use images and audio visual facilities and (3) there is no need to duplicate the test paper since it is computer-based tests to minimize test administration

1. Introduction

Every human being was born as a unique person; he or she has different aptitudes and personalities. Initially, aptitude refers to intelligence. According to Bingham "Aptitude is a condition or set of characteristics regarded as symptomatic of an individual"s ability to acquire with training some usually specified knowledge, skill or set of responses. Such as the ability to speak a language, to produce music. A talented person is said to be a qualified and highly capable individual [1]. Individual differences in subsequent learning can occur in both cognitive and non-cognitive domains [2], so talent or aptitude can refer to the quality of a person's characteristics that shows how well he or she can learn to solve a particular problem. One must have certain preconditions in order to master a skill, and this is what is called as talent.

At school, talent differences of students must be considered because it can determine the achivment of the students . The school aims to develop all the talents and abilities of students during the education process to reach the highest level . Choosing the right field of specialization can support the academic ability, but if the student is not right in choosing the specialization then the students will tend to be lazy to learn and can have difficulty in the teaching and learning process.

In order to improve the human resource quality and the nation's competitiveness, altogether with the development of knowledge, technology and art, the Indonesian government implements a new curriculum for the educational process in the elementary school, the junior high school, and the senior

high school and the new curriculum is called Curriculum 2013. This curriculum has been being implemented in Indonesia since July 2013. The 2013 curriculum provides opportunities for learners to develop their abilities, talents and interests more broadly and openly according to the principle of individual differences. Specialization offered at the equivalent high school level education is conducted in an effort to direct students according to their academic aptitudes or talents and interests [3]. Talent as a person's potential or special ability can be developed through intensive training and education processes. [4] states that talent or aptitude assessment can be used to predict success or determine the appropriate level of education.

The test as one of the instruments to know the ability of the students has evolved the way and the process of its implementation. A test is said to be good if it can make it easier for tthe testee to complete the test execution process with satisfactory results[5]. Prior to the existence of computer-based tests, usually the test is done in writing using paper (paper based test), but along with the development of information technology, written tests began to be replaced with computer-based tests (CBT). CBT overcomes the limitations of written tests. With CBT the problem distribution process can be done safer because it no longer requires printing. Computer and internet devices can distribute the problem with the desired format, so that the test can be done anywhere and anytime which is unlimited. Distribution of questions can also be adjusted to the participants' ability, so that the measurement error is smaller than the measurement error when using the written test. In other words the utilization of computer technology for test and evaluation purposes can improve the effectiveness and efficiency in the implementation of the tests[6] .

In the implementation of the test, students also need a comfortable condition and free from anxiety. Computers as a communication medium can create conditions like these, where computer-based tests can avoid face-to-face between testers and students, so students feel unattended, students can think straightly without thinking the supervisor is always lurking. In addition, computer-based tests can help students because students can have revised answers, got corrections quickly, can rework the tests and can find out the remaining time[7] and many students also prefer for web-based tests rather than written tests[8]. One easily accessible sotfware, free usage, simple operation, and good enough to be developed as a talent or aptitude test tool for knowing student's talent is Google Form. This app is one component of Google Docs service that is perfect for students, teachers, lecturers and other professionals who enjoy online forms and surveys.

2. Method
The development of online aptitude test instruments uses research and development (R & D) method developed by [9]. The general process in the research can be tested systematically, evaluated and perfected to reach certain quality criteria. The respondents consisted of 105 senior high school students from new schools selected by random sampling. The types of tests used in this study are multiple choice and short answers which are presented in the form of writing, drawing, and video. The talent selection instrument model is justified through expert judgment, and uni-dimensionality testing using factor analysis exploratory. The SPSS 20 application was used to look at the Eigen value of the intercellular covariance matrix (KMO) and EFA, whereas item response theory using one logistic parameter (Rasch model) of R program to analyze the difficulty levels of the items.

3. Result and Discussion

3.1. Development of multimedia based test tools
The online talent test using the google form media is actually similar to most tests. The thing that sets it apart is the facilities that can be accessed online so that it is not limited by space and time. Data collection is also easier to analyze. In the aptitude test tool, Google Form is made into two parts, namely the respondent's information section and the item point. Respondent information using short answer fields such as name, gender, class, school name and email. The symbol located on the right side of the question can be used to add a question item. One of the advantages of google form is to create a problem with

various types. In this study, the problem item was developed using multiple choice type and short answer, question presented in the form of pictures, story and video.

3.2. Development of talent instruments

Respect The development of this talent test instrument consists of 35 items that are divided into 5 sub subjects namely visual reasoning test is 5 items, numerical reasoning tests consisting of 10 items, verbal analysis test consists of 5 items, spatial recognition test consists of 10 item and vocabulary test consisting of 5 items. Talent test instruments consist of several subtests presented in some form of problem. Some subtests represent the variables to be measured, namely (1) Visual reasoning test is one of the closest tests in measuring natural intelligence or innate intelligence that can be when we were born, (2) Numerical reasoning test measures the potential of mathematics by understanding the relationship (3) The Verbal Analysis Test measures the skills of word analysis by investigating, weighing instructions and making sensible conclusions from the given facts, (4) Spatial recognition tests measure the ability to detect, the potential of self-understanding of abstract problems as well as those often associated with art and design. (5) Vocabulary Test. This test measures intelligence in choosing and expressing themselves through the use of words, remembering words, concepts and expressions of information and ideas.

The method of collecting student data about visual reasoning tests is to use multiple choice. The type of item is presented in a series of shapes or drawings. The task of the student is to choose one of the forms or drawings on the choice of answers given, where one of them will be the next form or picture that is marked with a symbol "question mark" on the problem. For numerical reasoning tests, the type of item is presented in the form of numbers arranged in several ways. The numbers are arranged along the lines, there is a relationship with the numbers above or below the row of numbers with each other. A number can be lost and replaced by a space or line (-) placed on the spot.

Furthermore for the verbal tests presented in multiple-choice form, students are asked to describe the reasonable conclusions of the information already given. Students will be given a series of stories that contain enough facts and information. In addition to a series of stories, on this verbal test there are items given in the form of video views. The fourth type of test is a spatial recognition test presented in the form of a True (B) or False (S) option. This test will find out how students can view and rotate a spatial object form. Students will be confronted in a form of reference image to answer each item. The choice of image form will not be similar if any part or proportion is changed.. The last test is the vocabulary test presented in the form of multiple choices. Students will be given a word and are asked to look for one of the available options whose meanings are closest to a word on each question number.

3.3. Rasch analysis result

Based on the analysis of sample adequacy shows the value of Khi-squared on Bartlet test of 1028.308 with degrees of freedom 595 and p-value less than 0.01. These results indicate that the sample size of 105 used in this research is sufficient and the variables can be further analyzed[10] [11].

Furthermore, from the result of factor analysis by using SAS / IML, it can be obtained that student response data on talent test contains 13 Eigen values greater than 1, so it can be said that the talent test contains 13 factors. Of these 13 factors, there are 67.805% variances that can be explained. Furthermore, the significance of these factors was tested using the chi square test.
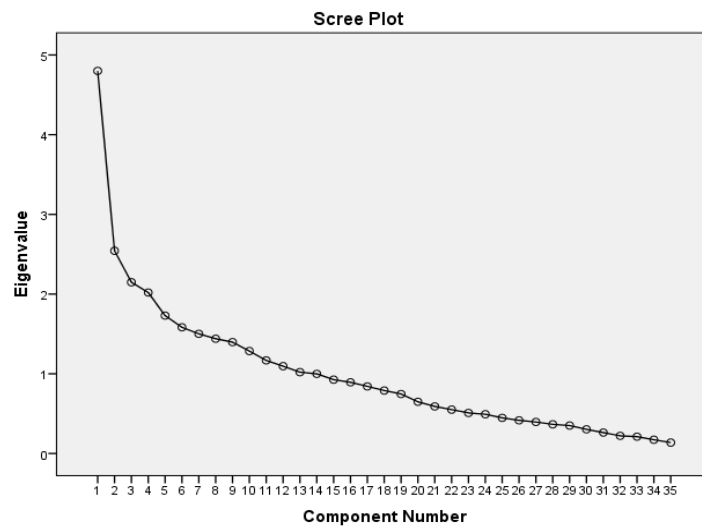
Figure 1. Results of Scree Plot of Explanatory Factor Analysis

The next Eigen value is presented with the scree plot in Figure 1. Looking at the results of the Scree plot, it appears that the Eigen value starts to ramp up on the 6th factor. This suggests that there is a dominant factor in the talent test device, the other 5 factors also contributed substantially to the component variance. Based on figure 1, then there is only 1 threshold on 1 component, so it can be concluded that the talent test instrument measure 1 dimension test.

The analysis using a rasch model approach aims to scale measurements at equal intervals. Since the unprocessed score does not have an intrinsic nature, it can not be used to directly interpret the student's ability. Rasch modeling uses score data based on each student and scores data per item simultaneously. By using R program hence can be seen difficulty level hardest item exist on item 32 point with value 4,5 and 2nd point as the easiest item with value -3.57.
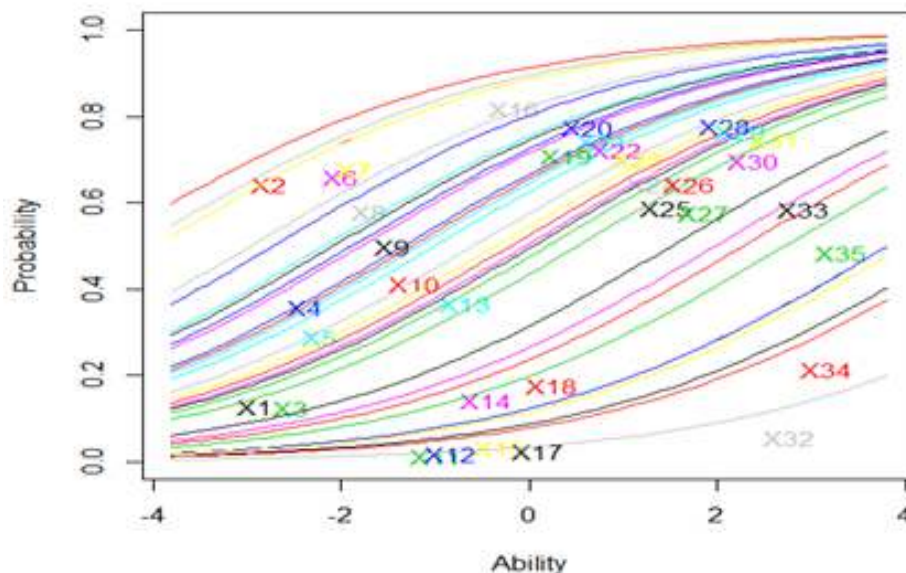

Figure 2. ICC Characteristic Curve

In the one logistic parameter model (IPL) or known as the Racsh model, all items have the same distinguishing power (same Dscrmn value). The item parameters on the Rasch model only have item difficulty levels.An item is said to be good if the level of difficulty (b) is between -2 to 2 [12].From the data above can be concluded every item has a normal difficulty level because it ranges between -3,57

up to 4,5. Because analyzed with 1PL then each item has discriminant index or the same difference that is 1.515. Figure 2 curve of ICC characteristic above shows that item 2 is the easiest item and the most difficult item is on item 32.

4. Conclusion

Based on the study of mix method of development of online talent test instrument, it can be concluded that online test tool using Google Form can facilitate the testee in taking aptitude test. Results generally show significant advantages over when tests are done conventionally using paper and pencil. Google Form that can be accessed via laptop and cellphone make this test tool has ease in its usage and execution of test can be done anytime with customized time. In addition, by using the Google Form can be made a variety of test items such as text, images or video. Test scores can be directly generated and analyzed so that it can be said the use of these talent test tools to be more effective and efficient.

From the results of the measurement can be concluded that the student's aptitude test instrument has a difficulty level of the problem item with a good enough interval that is generated ranging from -3.57 to 4.5. Item difficulty levels still have weaknesses in some items that are too difficult and too easy. The items that have a level of difficulty above +4, is an item that is too difficult they are in items 17, 32 and 34. While the item that is too easy is under -4 is number 2 and 16.

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