

Development of Computer-Based Adaptive Tests for Assessment of Scholastic Talent Ability of Prospective Senior High School Students

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ABSTRACT

Determining the specialization of majors for prospective high school students is still a problem for schools or local governments using several components of grouping criteria. The current specialization grouping by the local government for state schools uses the requirements for report cards, scores from local government standardized assessment tests, and student choices. Another grouping criterion for private schools uses academic test scores, the results of specialization questionnaire responses by students with parental approval. In addition, the requirements for using psychological tests using the pencil and paper method and computer-based. The phenomenon is that some students in public and private schools cannot adjust their abilities to their chosen specialization, so they decide to change majors. In addition, the development of aptitude tests is more for assessing the ability of prospective students to determine majors. The following phenomenon is related to test testing using both forms of the test with the principle of working on the items that require each test taker to complete all the things. Therefore, to answer some of these problems, this study developed a scholastic aptitude test (SAT) with adaptive computer-based testing (CAT) integrated with cluster analysis for determining major grouping based on assessing the talent abilities of prospective high school students. SAT consists of verbal, numerical, spatial, and logical skills with an adaptive test design of distributing questions based on the items' difficulty level and students' abilities. Testing with a scoring system can be done immediately, measuring student abilities more efficiently and accurately, as well as improving exam security. This research aims to produce valid, parallel, and reliable aptitude test instruments. In addition, to produce CAT program products integrated with cluster analysis for grouping the determination of prospective high school students' majors using a scholastic aptitude assessment. The product development stage involves selecting and analyzing existing needs; prototyping; formalization; implementation; evaluation; and repairs and improvements. The first stage, problem revision, sets and examines the markets of the existing system. The constructing design of the scholastic aptitude test instrument consists of verbal and numerical abilities obtained based on a literature review during the creation of the CAT program. The second stage, formalism revision, is designing the test instrument's design and the algorithm's design by creating a CAT program work systematics based on the first stage. The third stage, evolutionary revision, is the validation of the test instrument empirically using confirmatory factor analysis. Then for the product implementation stage with a CAT-based assessment on a limited scale trial on a large scale. The results from research implementation activities in 2022 consist of literature study activities with a meta-analysis approach. Meta-analysis was carried out on research studies with the same hypothetical characteristics related to the effect of numerical aptitude on learning outcomes and mathematical abilities of junior high school students in Indonesia. The results of the study show that numerical aptitude has a significant effect on mathematics learning outcomes. The meta-analysis results are used as supporting data on the background of the dissertation proposal problems. The results of this research are in the form of a manuscript entitled a meta-analysis of numerical aptitude's effect on learning outcomes and mathematical abilities as an additional research output for 2022. The manuscript's status was submitted to a reputable international journal on October 2, 2022, and the review process (in review) on November 6, 2022. Then, the initial trial activity on the development of the scholastic aptitude ability instrument with a response of 300 grade 9 junior high school students. The results of the initial trial of the instrument were validated empirically using a confirmatory factor analysis (CFA) approach with the status of a manuscript entitled The instrument development to measure the verbal ability of prospective high school students. The mandatory output manuscript was accepted in a reputable international journal on May 8, 2022, and the process of preparing for publication (proofreading) on November 24, 2022. The results of this study indicate that the constructed model for measuring the verbal ability test instrument is compatible with the trial data. Thus, the completed model for assessing verbal abilities is appropriate for measuring prospective high school students' synonyms, antonyms, and analogy abilities.

Kata Kunci: *Confirmatory factor analysis, Meta-analysis, Computerized adaptive testing, Scholastic aptitude test, Computer-based test*