



Standardized Achievement Testing, Aptitude Testing, and Attitude Testing: How Similar or Different are these Concepts in Educational Assessment?

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors conceptualized the idea for the paper. Author RMN wrote the introduction and searched for the documents. Both FQ and RMN handled the data sorting and synthesizes and wrote the results. Author FQ wrote the methodology and finalized the manuscript. Both authors read and approved the final manuscript.

Article Information

DOI:10.9734/AJESS/2021/v15i330383

Editor(s):

(1) Dr. Velan Kunjuraman, Universiti Malaysia Kelantan (UMK), Malaysia.

Reviewers:

(1) Abel C. Obosi, University of Ibadan, Nigeria.

(2) Yar Zar Chit, Sagaing University of Education, Myanmar.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/66155>

Review Article

Received 20 December 2020
Accepted 26 February 2021
Published 13 March 2021

ABSTRACT

Testing is an inevitable issue in educational and psychological measurement and assessment. Over the years, several tests and testing mechanisms have been developed to assess different latent traits of learners or examinees. Of these testing forms, standardized achievement, aptitude and attitude testing have taken the forefronts in education, psychology, and research. Whereas these concepts are distinct, they, however, play similar roles which have been misconceived by many, especially those without expertise in educational assessment and measurement. The aim of this paper is to compare standardized achievement testing, aptitude testing, and attitude testing, using a narrative literature review approach. The paper provides a synthesis of gathered information that delineates conditions necessary for the utilization of each testing approach.

Keywords: *Testing; standardized achievement test; aptitude test; attitude test.*

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1. INTRODUCTION

In the educational space, accountability is largely linked to the testing of examinees. Testing is important for almost all the individuals involved in the selection function of education. The learners always want to know how well they are doing and want to be certified at the end of the course/program. The teacher also wants to know not only how the learner is progressing, but also how successful they have been on their job [1]. There are also parents, educational authorities and countless others who have a keen interest in the learner's progress [2].

Throughout this process of testing, tests are extensively used to achieve the purpose of evaluating several aspects of teaching and learning. These tests are used to assess a person's ability, knowledge, interest, aptitude and attitude. Whereas some of these tests are standardized, others are not [3]. The difference between whether or not a test is standardized lies in the consistency of the questions, administration and scoring procedures as well as the interpretations provided [3,4]. When a standardized test is administered, it is done so according to certain rules and specifications so that the testing conditions are similar or the same for all test takers such that they are typically more reliable and valid than non-standardized measures [5].

There have been long-standing debates on the purposes and uses of test scores from psychological tests. Of these standardized tests, standardized achievement and aptitude tests seem to dominate the frontline of these debates [6-8]. Other tests like attitude tests have been involved since they are believed to influence the debate between standardized achievement test (SAT) and aptitude test [9-12]. In previous literature, the concepts of achievement, aptitude and attitude testing have been discussed independently [3,13,5,2]. The few papers that compared achievement test and aptitude test [6-8] only focused on differences and similarities between the two concepts and/or the instruments for measuring them. That is, the comparison made by these writers failed to incorporate the uses of these tests, the nature of items, administration procedures, among others. The focus of this review is to discuss standardized achievement testing, aptitude testing and attitude testing, and as well highlight how these concepts are related.

This review is relevant for some reasons. First, there are pieces of evidence to suggest that, to some extent, the terms standardized achievement testing, aptitude testing and attitude testing have been misunderstood and misused in education [14]; Salkind & Rasmussen [4]; Schneider [8]. This misconception is worse for educationists or scholars outside the field of educational assessment and measurement. This review provides a clear distinction between these concepts. Secondly, students who have now been introduced to these concepts may find this review useful in enhancing their understanding of the concepts. Furthermore, Instructors can also use this write-up as reference material for the courses they facilitate. This is essential since previous pieces of literature have not comprehensively dealt with the comparison among these concepts, as discussed in the earlier paragraph.

1.1 Standardized Achievement Test (SAT)

SAT is developed to measure the extent of learning which has occurred as a result of exposure to a relatively defined learning experience [15]. This test is normally standardized nationally, regionally, or locally and thus, the development, administration, scoring and interpretation of the results are consistently carried out among persons with a different socio-economic background [14]. This form of test is usually administered at the end of the course/program, and they are deliberately based on the content covered in the course/program [8].

Salkind and Rasmussen [4] identified some common features of SAT, which include: (a) examinees who are required to respond to the test are clearly described, (b) the content of the test is well defined, (c) items that constitute the test are carefully crafted and validated, (d) the tasks are developed to maximize the information that will be validly interpreted and utilized by its recipients, (e) the test administration and scoring conditions are uniform. In cases where there are multiple test forms, equating, scaling and linking approaches are used, (f) standards are designed validly through procedures that are generally known and recognized as valid and thus, interpreting the scores are done in a consistent manner bearing in mind the purpose of the test. SAT may be multi-battery measures that yield scores on a variety of different content areas, single-battery measures which are focused on a specific content area, or diagnostic measures (i.e., measures which are used to identify the

strengths and weaknesses of examinees). Multi-battery achievement measures are common in state assessment programs. In the US, some of the more popular ones include the Iowa Tests of Basic Skills, the Cognitive Test of Basic Skills, and the Stanford Achievement Tests. In addition to producing scores in a variety of content areas (e.g., reading, mathematics, social studies), most have multiple levels which facilitate students' academic growth from elementary school to high school [16]. Other forms of standardized tests include the Wechsler Individual Achievement Test–Third Edition.

In Ghana, for example, the Basic Education Certificate Examination (BECE) is a case in point of SAT organised for grade 9 pupils after completing 9 years of basic education. The test is designed to assess how much mastery pupils have attained over the years after going through numerous series of instruction in diverse subjects. This examination comes in different subject areas such as English, Mathematics, Integrated Science, among others. Another popular SAT in Ghana is the West Africa Senior School Certificate Examination (WASSCE) organised by the West African Examination Council (WAEC). The test is administered to grade 12 students in second cycle schools in West African countries, with Ghana inclusive, to assess their accomplishment after going through a series of instruction for 3 to 4 years. WASSCE comes in diverse forms depending on the program read by the candidate. This suggests that a student who reads Science program would be assessed in some papers unique to them. Nevertheless, all candidates write some common papers in the areas of Core Mathematics, Integrated Science, English Language and Social Studies.

1.2 Aptitude Test

An aptitude test is a form of test which seeks to assess an individual's characteristics regarding their potential to develop a culturally valued ability, given the right circumstances [8]. Aptitude potential, which is a latent trait within a person, is impossible to be observed directly. This trait can only be inferred by measuring observable characteristics that either are typically associated with examinee ability or are predictive of the future development of the ability. Most of the time, aptitude is assessed by measuring abilities that are considered to be necessary precursors of achievement. For example, children who understand speech have a greater aptitude for

reading comprehension than do children who do not understand speech. Such precursors may themselves be a form of achievement. It is important to emphasize that aptitudes are existing conditions (i.e., present at the time they are measured) and thus, there is nothing inherent in the concept of aptitudes that says whether they are acquired or inherited or signify some combination of environmental and heredity influences [7].

Aptitude test assesses intellectual abilities that are, in most cases, not specifically taught in school [17]. Aptitude tests are intended to measure an individual's potential to achieve; actually, they measure present skills or abilities. An aptitude test looks at "how well you would do". It has a strong predictive element to it. Aptitude test has the purpose of finding examinees' potentials for future performance on a specific task. Test assessing aptitude reflects only past learning. They do not directly assess innate ability or capacity. Further, because it is difficult to obtain a sample of performance from the future, such tests cannot directly assess future ability.

According to Nitko [5], the aptitude test is only one indicant of aptitude. An aptitude for X is the present state of a person that indicates the person's expected future performance in X if the conditions of the past and present continue. Other indicants of aptitude could include scores on achievement tests, data on prior performance in activities similar to those for which one would wish to predict success, and information derived from procedures for assessing personality, interest, attitude, physical prowess, psychological state, etc [5].

There are two general forms of aptitude test: job-specific tests and multi-aptitude batteries [4]. According to Salkind and Rasmussen [4], job-specific aptitude tests are usually developed to determine which applicants are best suitable for a particular job or specific role of a particular occupation. The multi-aptitude batteries, on the other hand, are commonly used in educational settings, and large-scale employment testing situations to make decisions of selection, placement, or classification [14].

1.3 Attitude Test

An attitude test is used to quantify the characteristics of persons which describes their positive and negative feelings toward particular

objects, situations, institutions, persons, or ideas [9,10,5]. When discussing attitudes and using the results of attitude test, it is important to note that: (a) student learns attitudes and once learned they direct or guide the students' actions, (b) one cannot observe a student's attitude directly, you must infer them from the student's actions or responses to attitude statements, (c) the difficulty in constructing attitude test has serious validity and reliability implications, (d) students can fake their responses [11]. Attitude test should drive at knowing the intensity and the direction of the person's attitude to the behaviour measured [12]. That is, two students may hold the same positive attitude (direction) towards the learning of mathematics, but they may differ greatly regarding the strength of feeling (intensity) they attach to the learning of mathematics. Students' attitude will also differ in affective saliency or emotionality. Two students may have the same positive attitude, but one may become much more emotional than the other regarding it.

Generally, attitude can be measured directly or indirectly [10]. The direct measures include multiple-item forms and single-item type. The multiple-item procedure requires designing a series of opinion statements that signify a varying degree of negativity or positivity toward the attitude object. The examinees are required to provide their responses usually on a rating scale and computations are done in line with the principles of the scale used. The results are then interpreted. The single-item form is similar to the multiple-item type only that the single-item utilizes a single item to estimate attitude of a person [7].

The indirect means of attitude measurement procedure starts with the development of a large volume of objective knowledge items about the target issue. The aim is to design items that in principle have an objective response but to which examinee are unlikely to identify the answers. The idea is that when persons are faced with questions for which they do not have the answer, they tend to make deductions in an attitude consistent manner [4].

2. METHODOLOGY

2.1 Research Approach

This paper uses a literature review approach. Specifically, a narrative literature review was conducted. In the narrative approach to literature review, there is a critical, objective and

comprehensive analysis of prevailing knowledge on an issue such that critiques of vital issues are discussed [18]. This approach to literature review has been widely used and accepted by many scholars [19-22]. This review adhered to the suggestions of Green, Johnson, and Adams [23] regarding synthesizing retrieved information from computer search databases.

2.2 Information Search Procedure

As a starting point, pieces of information were retrieved from several databases after the central issue of investigation was identified. The databases used include Google Scholar, BASE, ProQuest, Web of Science, Scopus, and general google search. The search was conducted using the following keywords: "standardized achievement testing", "aptitude testing", "attitude testing", "standardized achievement and aptitude testing", "standardized achievement and attitude testing", "aptitude and attitude testing". General Google search and Google Scholar were used as the primary route to identify several secondary sources of information, after which the citations/references were further used to retrieve the information from the primary source.

2.3 Data Analysis and Synthesis

The entire search process led to the retrieval of 33 documents which were evaluated to examine their relevance and relatedness to the issue under investigation. These documents included journal articles, books, commentaries, editorial reviews, and book chapters. After this phase of evaluation, 16 documents were discarded from the final synthesis. Details of the remaining documents are provided in Table 1. The synthesizes were conducted using the documents which were deemed relevant. The data were analyzed using a qualitative approach [24] where pieces of information were organized into specific themes [25]. Also, an approach developed by Glaser [26] was used by continuously comparing retrieved data for narrative review.

3. RESULTS

This section discusses the similarities and difference between standardized achievement testing, aptitude testing and attitude testing. The discourse is done according to 5 major themes which were identified during the data synthesizing process: (a) planning and crafting the test, (b) uses of the test results, (c) test

proctoring conditions, (d) why (not) use the test, (e) validity and reliability issues. It must be made clear that achievement, aptitude and attitude tests are tied to a particular subject. This is to say that the SAT can be for mathematics, typing ability, reading ability. Similarly, aptitude can be tied to algebra, statistics program, banking, etc. Likewise, attitude towards mathematics, public speaking, learning of research, among others, are exemplary of how attitude is tied to a specific subject.

3.1 Planning and Crafting the Test

3.1.1 Purpose

Whereas the purpose of SAT is primarily to assess the current status of mastery on a particular task, say numeracy [1], aptitude test has the purpose of predicting future performance based on the individual's performance on a current task. An attitude test has the aim of ascertaining an individual's disposition or feeling towards particular objects, situations, institutions, persons, or ideas [11]. Typical SAT can be illustrated by a licensing examination (as in obtaining a driver's license), a typing test (as in hiring a secretary), a French test (as in selecting an interpreter) and a competency test. What can the individual learn- how much and how fast can he or she learn- when put through a particular course of study, educational program, industrial apprenticeship, or other systematic learning experience? If a test's function is to record present or past accomplishment, what is measured may be called achievement. If there is the need to make inferences concerning future learning, what is measured is thought of as aptitude. If it the wish of the tester to assess the feelings of persons towards a specific object, task, or idea, then there is an attempt to measure attitude.

3.1.2 Development procedure and content coverage

For any test to be developed, it is important to first know the purpose of the test and what is to be measured.

Whereas the purpose of SAT is to assess the current performance of individuals on a task or subject, aptitude test examines future performances of persons on a specific task and attitude test aims at assessing the feelings of persons towards something. With this in mind, SAT usually covers some specific contents which

are exposed to the testees before taking the test. This is normally is not the case when developing aptitude or attitude tests; in these tests, the examinee is not required to be exposed to some content or materials before it can be administered. This suggests that the test developer is required to develop test items in the framework of what has been taught and cannot craft items beyond what has been taught. This does not necessarily happen in developing aptitude test – the test constructor usually draws on content related to experience and reasoning beyond classroom knowledge [27]. Thus, the experiential pool upon which the test constructor draws on when formulating test items is normally broader for aptitude test than when developing achievement and attitude tests. This experiential pool is defined with considerable clarity and precision in constructing, let us say, SAT on solid geometry, or medieval history, or motor vehicle operation.

For attitude test, the content with which the test constructor draws items is also relatively large focusing on the numerous behavioural traits which demonstrate a person's feeling towards the object [11]. The development of an attitude test has little to do with the materials exposed to learners as in the case of achievement. Both aptitude test and SAT can be best characterized as tests of developed ability (maximum performance). As such, the items for aptitude and SAT would require factual statements for examinees to show their competency or skills in doing something. In the same vein, the response should be such that you either get the item correct or wrong where correct means that you have such skill and vice versa. An aptitude test for university admission for a Master of Philosophy (Statistics) program would require the test developer to craft items to reflect whether the examinee has an aptitude for further studies in Statistics. In this sense, it is either the examinee has the aptitude or do not have. In the case of achievement, a mathematics test developed by say WAEC would be developed such that a score from the test would mean you have either or not attain proficiency in mathematics.

The development of attitude test items seems to deviate from how aptitude test and SAT are developed. Attitude test purely measures typical performance and demands typical responses, unlike aptitude test and SAT. Because attitude is a feeling or disposition towards an object, subject

Table 1. Summary of the documents used for the review

No.	Author(s)	Year	Title	Document type
1.	Banaji &Heiphetz	2010	Attitudes	Book chapter
2.	Cohen &Swerdlik	2018	Psychological testing and assessment: An introduction to tests and measurement (9 th ed.)	Book
3.	Nitko	2004	Educational assessment of students	Book
4.	Nitko& Brookhart	2014	Educational assessment of students (6 th ed.)	Book
5.	Schneider	2013	Principles of assessment of aptitude and achievement	Book chapter
6.	McClelland	2001	Measurement issues and validity tests for using attitude indicators in contingent valuation research	Working paper
7.	Salkind & Rasmussen.	2007	Encyclopedia of measurement and statistics (Vol. 1)	Book
8.	Anne	1984	Aptitude and achievement tests: The Curious Case of the Indestructible Strawperson	Book chapter
9.	Downing &Haladyna	2006	Handbook of test development	Book
10.	Fabrigar, Krosnick, & MacDougall	2005	Attitude measurement: Techniques for measuring the unobservable	Book chapter
11.	Miller Linn, & Gronlund	2009	Measurement and assessment in teaching. (10th ed.)	Book
12.	Borghans, Golsteyn, Heckman, & Humphries	2016	What grades and achievement tests measure	Discussion paper
13.	Haddock & Maio	2008	Attitudes: Content, structure and functions	Book chapter
14.	Carroll	1974	The aptitude-achievement distinction: The case of foreign language aptitude and proficiency	Book chapter
15.	Levine	1958	Aptitude versus achievement tests as predictors of achievement	Journal article
16.	Seashore, Wesman, Doppelt, Ricks, & Wallace,		Attitude, intelligence, and achievement	Editorial Review
17.	Mehrens, & Lehmann	1987	Using standardized tests in education (4 th ed.)	Book

or idea, items are constructed to measure this trait (positive or negative feeling). The items are constructed to reflect the likes or dislikes for certain behaviours and thus, statements or items are not factual. For an attitude test, there is no right or wrong respond as in the case of aptitude test and SAT. The options to attitude test items normally take the form of Likert scale or Likert scale-type or rating scales [28].

3.1.3 Dependence on formal instruction

Ordinarily, aptitude and attitude tests do not rely strictly on formal instruction, unlike SAT. Let us take a specific item. A student is taught to multiply (xy) by (z) . If he demonstrates that he can perform this operation correctly, then, this item is accepted as an achievement measure. If without specific formal instruction, he is asked to multiply $(a+b)$ by $(a-1)$, and again answers correctly. What will the mathematics teacher say it is? Is it aptitude? Certainly, the ability to perceive the analogy between the taught and untaught algebraic problems is indicative of future learning ability in algebra. Both aptitude and attitude tests can be conducted before or after instruction. For instance, a lecturer can examine students' attitude towards Intermediate Statistics, before exposing them to contents on the Advanced Statistics course. In the same way, Students attitude towards Advanced Statistics can be evaluated after students have been exposed to the contents of the Advanced Statistics course.

3.2 Uses of the Test Results

3.2.1 Selection, classification and placement

SAT, aptitude test and attitude test can all be used for selection, classification and placement decision in educational and work settings although under different circumstances [14,4]. Taking SAT, for example, results can be used to select students for a scholarship package; classify students into those who higher achievers, middle achievers and lower achievers; place students identified with specific strength and weakness at a particular class where they can benefit from instruction. Based on aptitude test results, Francis, for example, can be selected for a job interview or employment or even given admissions into a postgraduate program. An aptitude test can also be used to classify job applicant into those who have the tendencies to be vocal and those who do not have such tendencies and to further place them

appropriately in the departments which they can function very well in the future. Similarly, an individual's attitude towards the learning of mathematics can qualify such person to be selected for an advance mathematics program. In the research field, an attitude test is also used to classify (into having a positive attitude or negative attitude) and may assign such persons into experimental groups for treatment [11].

3.2.2 Certification

SAT can be used to certify persons who have been administered the test. Certificates indicate the level of accomplishment (current or prior) of the holder on a particular task. Since achievement tests can assess an individual's previous or current status on a subject, say Mathematics or English Language, it is appropriate for certification. Taking WASSCE or university examinations, for example, pupils/students are certified based on their performance on the various tests taken. Ordinarily, aptitude and attitude tests cannot be used or not appropriate for certification because the constructs measured by these tests are very capricious. Again, the purpose of certification goes contrarily to the purposes of the aptitude test (i.e. predicting future performance) and attitude test (i.e. quantifying an individual's disposition).

3.2.3 Instructional uses

Although SAT, aptitude test and attitude test are sometimes used for instructional decisions, they differ in the way and manner in which they inform instructional delivery. SAT data can help gauge the quality of instruction in a particular class, school, school district, or state. SAT is sometimes used to screen for difficulties, and in such instances may precede the administration of more specific tests designed to identify areas that may require remediation (i.e. achievement test acting as a diagnostic test in this case) [4]. For achievement tests administered for formative purposes, the outcome of the test can be used to modify instructional delivery. This is done after the course content have been exposed to the students.

In the case of aptitude and attitude tests, results can be used to inform instruction. In most instances, but not in all cases, these tests are administered without any form of instruction given to the examinees. Notwithstanding this, the data from every aptitude test in the school setting

can inform instruction. Aptitude test scores can help teachers form realistic expectations of students. Having an idea about the ability level of students in a given class can help a teacher identify which students are not learning as much as could be predicted based on ability scores. Thus, if learners aptitude test scores are very low than the expected, then, curriculum, learning objectives, effective teaching methods, or student characteristics might be investigated [29,30]. In a typical statistics class, students' attitude towards mathematics can be surveyed before the start of the class or even after the class. In whichever way, meaningful information is provided to the teacher.

Achievement, aptitude and attitude tests all serve as predictors of aptitude (i.e. how learners will respond to some form of instruction in the future). Whereas attitude and aptitude tests can be administered before or after instruction, achievement test can only be administered after a period of instruction. In fact, the attitude test can also be conducted after instruction to find out the learners' disposition towards the materials presented to them. Aptitude test can be administered after instruction to understand examinees potentiality and readiness for further instruction on the same or similar content taught. In some cases too, achievements in a previous course can inform the instructor on what form of instruction may be appropriate for such learners on a similar course.

3.2.4 Prediction of future performance

Aptitude test is typically used to make predictions. This test has been used to measure readiness to: enter a particular preschool program, enter elementary school and assess the probability of completing a college-level work or graduate-level work. Thus, the test is used to predict whether individuals have the prerequisite skills, knowledge, attitudes, motivations, and other behavioural traits that will enable the learner to profit maximally from school instruction. Equally, an attitude test can also be used for prediction. At this point, a person's feeling or disposition towards an object or situation can predict their future behaviour or disposition towards a similar object or situation. For instance, a student who shows a negative attitude towards the learning of Intermediate Statistics is likely to show a similar attitude towards the learning of Advanced Statistics, all things being equal.

SAT may also be used for predictive purposes. For example, an individual who performs well on a first-semester foreign-language test might be considered a good candidate for the second term's language course. The operative assumption here is that an individual who was able to master certain basic skills should be able to master more advanced skills. Typically, when measures of SAT are used to make predictions, the measures tend to draw on narrower and more formal learning experiences than do aptitude tests. For example, a measure of achievement in a course entitled Basic Statistics might be used as a predictor of achievement for a course entitled Advanced Statistics. Aptitude tests tend to draw on a broader fund of information and abilities and may be used to predict a wider variety of variables. On a whole, SAT, aptitude test and attitude test are indicators of aptitude although they might have their weaknesses [5].

3.2.5 Administrative and guidance and counselling

Results from SAT are used for administrative decisions like promotion and awarding scholarships to students. Because achievement testing is an indirect approach to teacher evaluation, school administrators can use results of such test to assess how well teachers are doing (quality of instruction) [7]. In other cases, learners with special deficiencies or weaknesses can be identified and helped to overcome them through additional instruction and guidance and counselling. This is because an achievement test can easily diagnose what the problems may be and, in some instances, what is accounting for such problems so that interventions can be provided.

Similarly, aptitude tests are also used to group students, identify students with special needs, select students for special programs, and aid in counselling and vocational guidance [30]. These applications are problematic when (a) decisions are based solely based on ability measures, and (b) ability measures are treated as fixed and innate rather than as learned behaviours which are affected by environment, motivation, and a host of other factors. The results of an aptitude test can be used by school administrators, for example, to offer admissions to persons and place them at a particular grade level. In the same way, test results from aptitude tests can be used to identify learners who may have limited aptitude for a particular program or course or

career they may want to pursue. Such persons can be identified so that guidance and counselling services are offered to them.

Again, attitude tests are also useful for administrative and guidance and counselling decisions. The attitude of learners towards the English Language, for instance, can provide meaningful information for administrators. As such, if students are found to have a negative attitude towards the learning of the English Language, major decisions can be taken based on this. Perhaps, one thing will be to monitor the way the subject is taught in the school. Through attitude test, learners with a negative attitude towards, say Advanced Statistics, can be identified and helped either through counselling or additional special instruction given to them.

3.3 Test Proctoring Conditions

3.3.1 Administration environment

SAT and aptitude test are administered in a strict and controlled environment. Examinees are not allowed to talk to colleagues, they put all their materials away and are supervised to the extent that all their activities are monitored by invigilators. This does not happen with the administration of attitude test. The testing environment is rather loose and testees are not closely monitored. It is very easy for some interaction among the examinees to go on during the administration. Because of this, it is easy to administer an attitude test through electronic means for them to respond to the items in their private time. Scarcely do test administrators administer achievement and aptitude test through some electronic. Even in situations where achievement and aptitude are administered electronically, structures are put in place to ensure that responses come from the expected examinee and that there is the absence of examination malpractices.

3.3.2 Prior information about the test

Prior to administration of an achievement test, examinees are given prior and detailed notice before the test is administered. The notice is such that the test content area, item format, date, time and time involved in administration are specified and communicated to the examinees before taking the tests. For aptitude and attitude tests administration, although prior notice is given to the examinees regarding the date and time, this notice does not usually include the test content and even the nature of items to be taken.

3.3.3 Testing duration

Generally, the time duration for the administration of SAT and aptitude test is much lengthier than the time duration for the administration of attitude test. This is because achievement and aptitude tests are tests for developed abilities or competencies as such much time might be needed for examinees to respond to the items. These test types usually take several minutes to hours. Comparatively, the administration period for attitude test rarely goes beyond an hour or even 30 minutes. It is important to state that this contrast might change depending on some factors such as the content of the test, subject area and test length.

3.4 Why (not) Use the Test

3.4.1 Merits

Attitude and Aptitude tests take less time to administer than SAT. Although both aptitude test and SAT are tests of developed abilities, SAT usually, require more time to administer than aptitude tests. Aptitude tests are more efficient and are particularly useful when compared with achievement measures with regards to showing a difference between expected achievement and actual achievement.

SAT, aptitude test and attitude test scores are useful in educational, personal and vocational guidance. In vocational guidance, the educational requirements of some jobs require considerable general ability (aptitude test). Similarly, the measurement of differential abilities may facilitate self-understanding (achievement test) in vocational and personal guidance. Students can be made to understand their feelings and disposition towards subjects, objects, programs or ideas (attitude test). They can be helped to set realistic goals and to make decisions about the kinds of aptitude, feelings, abilities and strengths and weaknesses they possess [29,30].

SAT and Aptitude test results can be used to gain supplementary information for curricula planning and evaluation [31,32]. An idea of the current or potential future ability level of a school helps determine how much emphasis should be placed on college preparatory programs. Aptitude tests could be used to help identify students for early admission to kindergarten or acceleration at different grade levels. Aptitude

tests can be used along with other data when grouping students for some specific purposes.

3.4.2 Demerits

The development of aptitude test can be more time consuming and mind-cracking than the development of SAT. However, crafting attitude test items is less time consuming and less mind-cracking. The construction of achievement test, however, demands rigorous procedures than the attitude test. Also, criticism of aptitude test may relate to the fact that aptitude tests are used to parcel out the limited resources of society such as admission to select colleges and the tests are seen as closing doors to opportunity for success [8].

Due to the nature of attitude test items, there is a higher tendency of having a low response rate as compared to achievement and aptitude test. This is because of attitude test measures feelings of persons rather than ability and thus, there is no right or wrong answer. People may prefer not to respond to some of the items. It is also possible that individuals may not have an answer to some items. But for aptitude test or SAT, it is either you know or you do not know the subject content of interest and each examinee desires to attempt all the items expected of them.

Aptitude test scores are sometimes used to help teachers develop passive expectations regarding the developed abilities of students. This is because such a test focuses on the potentials of examinees to perform some future task. Similarly, some attitude tests are used to take such decisions, although opinions are highly unpredictable and largely influenced by several variables [9]. Aptitude test scores should never be interpreted as immutable, permanent or a total picture, which sometimes they are assumed to be.

3.5 Validity and Reliability Issues

Every test has an expected and relatively high level of validity based on its purpose. This is to say that every test is anticipated to be valid for the purpose to which it was crafted if best practices in item and test construction are observed. As was earlier indicated, SAT, aptitude test and attitude test can all serve the purpose of predicting future performance on a particular test. However, aptitude tests are more valid measures

of future performance than achievement and attitude tests [7]. This means that, compared with the other two tests, aptitude test gives a more accurate picture of an individual's future performance of a task [33,8]. This, to some extent, is not surprising since the aptitude test is developed to serve this main purpose. This notwithstanding, aptitude test results can lead to "under-achievement" (where an examinee with a relatively low score on SAT receive a high score on an aptitude test) and "over-achievement" (where an examinee with a relatively high score on SAT receive a low score on an aptitude test) [4]. This is usually a validity concern since the achievement of examinees is a precursor of aptitude.

Unlike the aptitude test, results from SAT and attitude test tend to lose their validity as time passes-by. Take, for example, a student who took SAT, aptitude test, and attitude test on Advanced Statistics on the same day 5 years ago, the individual is more likely to demonstrate behaviours based on the aptitude test scores (i.e. good aptitude or poor aptitude). This is because achievement in and attitude towards statistics over such a long time are unstable and unpredictable. That is, persons may forget some concepts since SAT makes use of procedural and heavy reliance on declarative knowledge. Similarly, a person's attitude towards a particular object is likely to change over time. This can also explain why aptitude test (i.e. highlights on the ability to apply information in novel ways) has much more consequential validity over time than SAT (i.e. usually stresses on mastery of content knowledge) and attitude test (focuses on behavioural traits regarding a person's disposition towards an object).

SAT and aptitude test are more reliable than an attitude test. When the administration of these tests is conducted more than once on different occasions, scores from achievement and aptitude test are more likely to be consistent than scores from the attitude test. This is because of the volatility of people's feeling towards an object or situation over time. Thus, a person may have a positive attitude towards an object at one point but the same person will have a negative attitude towards the same object at another point. Again, the opinionated nature of the attitude scale (e.g., Likert scale and rating scale) lends itself to subjective experiences of individuals and this has implications for validity. That is, different

Table 2. Summary of findings data synthesizing

Thematic Areas	Major Themes	Sub-themes	Comparison
Theme 1	Planning and Crafting the Test	(1) Purpose	SAT measures the present state of what an examinee can do; Aptitude test predicts what one can do in the future based on their current performance on a task; Attitude test measures the current state individual's degree of like or dislike for a person, an object or a situation.
		(2) Development procedure and content coverage	SAT covers a more specific and narrow content area than aptitude and attitude tests. SAT and aptitude test go through a more rigorous validation procedure and their results are used to make summative decisions. Attitude test results are usually used for formative decisions.
		(3) Dependence on formal instruction	Whereas SAT mostly relies on formal (classroom) instruction, aptitude and attitude tests so not strictly depend on formal instruction.
Theme 2	Uses of the Test Results	(1) Selection, classification and placement	SAT, aptitude and attitude tests are all used for selection, classification and placement decisions under different situations.
		(2) Certification	Only SAT results can be used for certification.
		(3) Instructional uses	Information from SAT, aptitude and attitude tests are used to inform classroom instruction, but in different ways and conditions.
		(4) Prediction of future performance	Although results SAT, aptitude and attitude tests can provide some basis for predicting future performances of examinees, only inferences from aptitude test results can be relied on largely.
		(5) Administrative, and guidance and counselling	Information from SAT, aptitude and attitude tests can be used for administrative, and guidance and counselling decisions.
Theme 3	Test Proctoring Conditions	(1) Administrative environment	SAT and aptitude test are usually administered in a strictly controlled environment.
		(2) Prior information about the test	It is only SAT which will require examinees to have adequate knowledge about the content areas to be assessed. This is not the case for attitude and aptitude.
		(3) Testing duration	SAT and aptitude test demand more time in the administration than the administration of attitude test.
Theme 4	Why (Not) Use the Test	(1) Merits	Within the education arena, SAT, aptitude and attitude tests all have several advantages to school administrators, teachers and even parents can tap into.
		(2) Demerits	A key demerit of SAT and aptitude test is that they require a lot of time in developing, validating, administering, and scoring the items.
Theme 5	Validity and Reliability Issues**	--	All the tests have some level of validity based on their purpose. In terms of construct validity, for instance, SAT and aptitude test have a high level of validity.

***There is no sub-theme for this major theme*

individuals may have different rating values. For instance, a rating value of 5 for an item on an attitude scale with 7 points rating may be interpreted differently by different individuals. Also, the subjectivity of the response format for attitude scale may lead to respondents/examinees providing inaccurate ratings which may not reflect the actual trait measured. This may affect the validity of the responses.

4. CONCLUSIONS

SAT, aptitude test and attitude test all have some degree of relevance in the teaching and learning process. Most importantly, tests of developed abilities (i.e., achievement and aptitude tests) do not fall into sharply differentiated categories but rather along a continuum. Both aptitude test and SAT vary widely among themselves, and those near the centre of the continuum overlap to such a degree as to be nearly indistinguishable. Nevertheless, if the instruments that have traditionally been called aptitude tests and SAT are arranged in this continuum and strip them of unwarranted assumptions about their nature, some meaningful and useful differences can be discerned.

It must be noted that all tests assess the current status of something, whether their purpose is terminal assessment or prediction or assessing feelings of persons. Hence it is not surprising that some aptitude tests look very much like SAT and vice versa. And attitude tests can predict some level of aptitude. In fact, some writers [32] have argued for aptitude as a concept or construct, is defined as all the characteristics of an individual that predispose him or her to success or failure in new learning or the performance of some future activity. These characteristics can be seen in achievement and attitude as well.

It is worth noting that whether a test can be classified as achievement, aptitude or attitude, the purpose of such a test should be paramount [34]. This is not to say that test developed for purpose X cannot be used for purpose Y. But is this appropriate? It must be mentioned that SAT in 'Psychology', for example, can be used as an aptitude test for a Master's degree program in Psychology of Learning. Indirectly, the same course can serve as a clue to judge the attitude of individuals to a future course they may take. In this fast-growing and changing world, there is the possibility that a test developed to measure current or past competencies can be used for a different purpose other than the purpose for each

it was created. Caution should be taken in cases like this.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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