Vocational Aptitude Test

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Abstract. Test for measuring vocational aptitude has been formulated and validated. There are three main constructs involved in vocational aptitude test, which are individual characteristics, activities that are likely to be selected, and professions that tend to be idolized. Individual characteristics indicate the individuals talents, whereas the activity that tends to be chosen leads to student interest in the activity, and the intended profession gives clues about the capability of themselves to pursue the profession. Content validity test with Lawse technique yields content validity ratio (CVR) for all items are in the range 0.82-0.94 and content validity index (CVI) = 0.88. The construct validity test yields comparative fit index (CFI) = 0.918 and chi square coefficient ($\chi 2$) = 5.85 with significance (p) = 0.002. These findings indicate that the test is valid either by content or construct. Furthermore, the reliability test with Alpha Cronbach found the alpha coefficient (α) = 0.82. Finally, it can be concluded that vocational aptitude test can be utilized for early identification of student vocational aptitude. The hope, the test can help students to choose the appropriate vocational school, in order to obtain the better learning outcomes. Keywords: vocational aptitude test, individual characteristics, activities, professions

1 Introduction

Vocational Schools are being encouraged to produce graduates ready to work in various sectors. When viewed from the angle of a graduate, then all parties hope that the resulting school graduates have an optimum competence in their respective fields. On the other hand, when viewed from resources, all parties hope that the resources owned can be used effectively and efficiently to support the learning process. This means that prospective students who entered a vocational school have the capacity to learn and choose the program that suits their aptitude each. Scientific aptitude is a major determiner of science learning [1]. By taking analogy in science, prospective students of vocational schools need to know their respective aptitude in order to choose the right program. Parents are also very important to know the aptitude of their son or daughter in order to give the consideration of correct program will be selected. Experience in the field shows that not many prospective students considering vocational aptitude in selecting a program. Prospective students choose programs that crossed his mind or simply following the advice of friends or other parties without consideration. When this is the case then the prospective students are likely

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to have problems in their learning process. Even if the aptitude is not the only determinants of success of learning in vocational schools, aptitude still is the dominant factor. Motivation, creativity, and curiosity students will increase further when they choose program in accordance with his aptitude.

The aptitude is innate ability to learn specific areas quickly and easily [1, 2]. In this context does not mean successful people on a field solely because of his aptitude, because in reality all successful people always make the effort. It's just for people who are his works in accordance with his aptitude, work done would be nice, so that their work does not feel as forced work. Scarred scientists will always be interested in finding the problems need to be solved accordingly. Scarred musicians will enjoy in learning music. Meanwhile, scarred computer engineers will be working on computer repair in the laboratory with a zealous and feeling happy. Individual aptitude refers to how fast or how easy that individual can learn in the future [3, 4, 5]. Aptitude is measured with a test of aptitude. The Aptitude tests is more specific and more limited compared to the intelligence test [6]. Intelligence tests concentrate on abstract functions, include the use of verbal symbols or numeric, therefore more specific interests, relating to the ability of a more concrete or practical are forgotten. The gap is resolved by a test of aptitude. Single aptitude tests only measure a single domain capabilities, such as the mechanical aptitude test, aptitude test music, or a test of numerical aptitude. Multiple aptitude tests generate a score for some area of different capabilities, such as the Scholastics Aptitude Test (SAT), Differential Aptitude Test (DAT), and Multiple Intelligences Test-based on Howard Gardner Theory.

The importance of vocational school selection and counseling service spurred the development of aptitude test to measure mechanical aptitude, administration aptitude, musical aptitude, as well as aptitude in other fields. Even for the selection of employees in a particular field still requires an aptitude test more specifically, such as tests of auditory, observation, and agility. For instance, the selection of employees for the industry or the selection of members of the military requires aptitude of observation, hearing, and agility. Map of the program and aptitude pattern of each individual has given a strong impetus to the development of the aptitude test. Similarly, the map between job vacancies with the aptitude pattern of each individual has provided a powerful impetus to the development of the aptitude test. Individuals who have mechanical aptitude are directed to proceed to the field of mechanical vocational school. Individuals who have musical talent is advised to study in the field of music. Similarly, individuals who have a strong clerical talent placed on matters that much to do with the field of administration. The aptitude in this study is restricted to the vocational aptitude expected to help prospective students choose the program in vocational school.

Vocational aptitude tests developed into a multiple aptitude tests will be classifying vocational aptitude into four fields, namely engineering, administration, information, and health. Theoritical study identified three dimensions of vocational aptitude, i.e. individual characteristics, activities that are likely to follow, and the profession that tends to idolized. Individual characteristics indicates the basic potential belonging to that individual. Activities that are likely to follow activity that tends to be chosen leads to student interest in the activity, and the intended profession gives clues about the capability of themselves to pursue the profession. The classification of aptitude in this research are determined based on multiple intelligence theory from Gardner and cognitive style theory from Witkin.

Gardner [7] sort aptitude into linguistic, logical-mathematical, musical, bodily kinesthetic, visual-spatial, interpersonal, and intrapersonal. The main indicator of linguistic talent was words and language. Activities that are able to do interpretation and explanation of ideas and information by using language, and understands relationship between communication and meaning. Professions that tends to be choosen include publict relation, presenter, media consultants. Main indicator of the logic aptitude involve number and logic.

Competence that tend to be owned are detecting patterns, perform mathematical calculations, scientific reasoning, and problems analyses. As an instance, strong numerical knowledge helped the students to achieve higher scores in programming [8]**.** The profession tends to be chosen include engineers, accountants, computer, bookmakers, analyser. Music, sounds, and rhythm is a music aptitude indicators. Activities that are likely to be able to do such as use of sound, understands relationship between sound and feeling. A profession that tends to be chosen are singer, composer, entertainers, party-planners.

Bodily-Kinesthetic aptitude main indicators there are in physical movement. Activities that are likely to be able to do is to involve the physical agility, dexterity, and balance. Pictures, shapes, images, plane trees, and space is the primary indicator of visual-spatial talent. Activities that are likely to be able to do is interpretation pictures and images, imagination and expression of space. A profession that tends to selected designers, architects, photographers, sculptors, engineers, beauty consultants. Communications and teamwork or cooperation is the main indicator of interpersonal talents. Activities that are able to be done includes the perception of pepople behavior, ability to relate to others. Professions that tends to be done include human relation, therapists, counsellors, politicians, doctors, healers. Self-reflection, self-discovery is the primary indicator of intrapersonal aptitude. Activities that are likely to be followed is self-awareness, the capability to understand oneself, one's relationship to others and the world. The work tends to be chosen is self-actualization.

Cognitive style is characteristic of the individual in feel, remember, think, solve problems, and make informed decisions [9]. Witkin et.al. [10] sorting out cognitive style into two polar inclination, i.e. the field independent and field dependent. Some individual characteristics of field independent cognitive style are: 1) has the ability to analyze to separate the object from the surrounding environment, so his perception is not affected when the environment changes; 2) had the ability to organize objects that have not been organized and reorganized the objects that already organized; 3) has the impersonal orientation, so that the less sensitive, cold, keep the distance with the other individual, and individualistic; 4) tend to define their own goals, and 6) tend to work concerned with intrinsic motivation [10, 13]. Job title tends to be favoured by field independent individual is work that prioritizes theory and analysis, as well as allowing to do independently, among others, include the fields of mathematics, natural sciences, medicine, or technology.

Some characteristics of field dependent individuals are: 1) tend to think global, looking at objects as a single unit with its surroundings, so that its perception is easily affected by changes in the environment; 2) tend to accept the existing structures due to lacking capability restructuring; 3) has a social orientation, so it looks more friendly, kind, thoughtful, considerate, and affectionate towards another individual; 4) tend to follow the existing goals, 5) tend to work with emphasis on external motivation [10, 13]. The profession tends to be selected is a profession that places emphasis on social skills, such as social workers, publict relations, extension officers, trademark, advertising, administration, or politics.

Many researches have been done related to cognitive style and it’s impact in individual activity, especially in learning. Hansen found that the selection of a major was influenced by cognitive styles [11]. Not differ so far Hansen, Salameh found that there were statistically significant differences in the field-independent cognitive style among academic specialization [12]. Research by Davis resulted that subjects with academic backgrounds in the physical sciences were more field independent [13]. In addition, engineering students tend to field independent. It proved by research of Zimmerman et.al. that found where three groups engineering students indicated a strong preference for the field-independent learning style [14]. In the area of computer programming, Mancy and Reid come to conclusion that in introductory programming courses, field dependency is an important

factor in determining success [15]. Futhermore, it is also found that cognitive style of language learners may affect the language performance of individuals [16]. In searching information, Santos Jr. et.al. found that analytic group tends to focus on documents with significantly more specific information than the wholist group [17]. In science process skills field independence were more successful than field dependent students [18].

Individual characteristics, activities that are likely to follow, as well as a profession that tends to favoured are used as dimensions of vocational aptitude. There are four vocational program identified, namely, techniques, administration, relationships, and health. Techiques includes computer and electrical engineering, automotive, and building. The program of administration includes, management, accounting, and cooperation. The program of relation includes tourism services, such front office or guide, production of food, and fashion. Health program covers health care services.

Program of production technique supported by logical-mathematical, visual-spatial, bodily-kinesthetic, and strong independent cognitive style. The field of administration supported by logical-mathematical, linguistic, interpersonal, relatively balanced field independent and field dependent cognitive style. The program of relation supported by linguistic, music, interpersonal, and strong filed dependent cognitive style. Health program supported by visual-spatial, interpersonal, bodily-kinestetic, and relatively balanced field independent and field dependent cognitive style.

2 Method

Vocational aptitude indicators that have been identified from the review of the theory developed into a test comprising 35 items each with five options. The test has been validated either by content or construct validity. The validity of the content tested qualitatively and quantitatively using Lawse technique. The construct validity is done by using factor analises. Finally the reliability of test is counted by using Alpha Cronbach reliability technique. Validated vocational aptitude test has been tried out its effectiveness by trying to apply it on the vocational school students with various program. The test results are analyzed descriptively.

3 Results and Discussion

The developed of vocational aptitude test consisted of 35 items. The content validity of the test with qualitative approach done by seven experts to get 29 items worth using without revision and 6 items worth using with revision. After the revision, content validity is tested with quantitative approach by using Lawse technique to get content validity ratio (CVR) for all items are in the range 0.82-0.94 and content validity index (CVI) = 0.88. The results of content validity test show that the test developed feasible to be tested further. The vocational aptitude test then tested the validity of the construct. The tests were tested empirically by involving the vocational school students as respondents. The test results were analyzed by factor analysis. The first iteration yields the Kaiser-Meyer-Olkin coefficient (KMO) shown on the KMO and Bartlett's Test table of 0.512, with a significance of 0.08. Since the KMO is less than 0.5 and the significance of more than 0.05 means that the analysis can not be continueed. Therefore, item that has the smallest Measure of Sample Adequacy (MSA) coefficient in the Anti-image Matrices table is elemited. Furthermore factor analysis was repeated and resulted in KMO coefficient of 0.628 with a significance of 0.01. The KMO coefficient has exceeded 0.5 with significance less than 0.05, so factor analysis can be proceed further.

The MSA coefficient in the Anti-image Matrices Table for each variable indicates that there are two items having MSA coefficients less than 0.5. In order for further analysis to

be carried out, the MSA coefficients for each variable should be more than 0.5. Therefore, the two items must be eliminated, and re-analyzed. Factor analysis of 32 items is done because three items had been eliminated. After re-analysis, there was an increase of KMO's efficiency to 0.918 with a significance of 0.00. The MSA coefficients for each variable are all more than 0.5. Thus, the analysis can be continued.

Table Total Variance Explained shows there are seven factors that are formed. Varimax rotation results show that the first factor consists of five items, the second factor consists of three items, the third factor consists of five items, the fourth factor consists of four items, the fifth factor consists of five items, the sixth factor consists of six items, and the seventh factor consists of eight items. The first, second, fourth and fifth factors are indicators of individual characteristics. Meanwhile, the third sixth factors become an indicator of activities that tend to be followed. The seventh factor is a indicator of the preferred profession.

The above results show that the developed vocational aptitude test consists of three dimensions, namely individual characteristics, activities that tend to be selected, and the idolized profession. The dimensions of individual characteristics consist of three indicators, namely numerical ability, analytical skills, visual ability, and communication skills (language). The dimensions of activity that tend to follow consist of two indicators, namely formal activities and social activities. The dimensions of the idolized profession consist of only one indicator, the profession itself.

The constructs already found are tested by factor analysis. The test results obtained comparative fit index (CFI) = 0.918 and chi square coefficient ($\chi 2$) = 5.85 with significance (p) = 0.002. These findings indicate that the construct of the developed aptitude test is valid. Finally, reliability of test was counted by using Alpha Cronbach technique where Alpha coefficient (α) equal to 0.82. This means that vocational aptitude tests developed are reliable, so as to provide constant results.

Vocational aptitude test was also tried out on vocational school students' samples from various programs. The results show that the fit of the aptitude test result with the program chosen by the students is only 68%. Of the 32% of students whose aptitude did not match the chosen program, 78% were aware of the incompatibility, while the remaining 22% were unaware of the incompatibility. The results of the limited interview to 32% of students who aware a mismatch of aptitude test results with the selected program stated that 58% of them chose the program because of following friends or suggestions of others, including parents; 26% of them chose the program because it was easier to get a job; and the remaining about 16% did not say anything.

4 Conclusion

Vocational aptitude test has been tried to develop in order to give consideration to prospective vocational school students about their aptitude, so they can choose programs that match their aptitude. The vocational aptitude test developed consisted of 32 items representing three dimensions, namely individual characteristics, activities that tend to be selected, and idolized professions. The dimensions of individual characteristics consist of three indicators, namely numerical ability, analytical skills, visual ability, and communication skills (language). The dimensions of activity that tend to follow consist of two indicators, namely formal activities and social activities. The dimensions of the idolized profession consist of only one indicator, the profession itself.

The developed vocational aptitude test is sufficiently feasible to use, both content and construct. Content validity test with Lawse technique found content validity ratio (CVR) for all items are in the range 0.82-0.94 and content validity index (CVI) = 0.88. Factor analysis got comparative fit index (CFI) = 0.918 and chi square coefficient ($\chi 2$) = 5.85 with

significance (p) = 0.002. In addition, the test is also quite reliable. Test reliability analysis with Alpha Cronbach technique obtained Alpha coefficient (α) of 0.82.

Trial of the test at vocational student samples from several programs indicates that the fit of the test result with the program selected by the student is 68%. There are many arguments against it. Nevertheless, efforts to refine the already developed aptitude test need to be pursued, for example by the addition of indicators that are viewed more carefully giving clues to students' aptitude. It is hoped that the developed vocational aptitude test can really give consideration to the vocational school students' prospectives to choose the right program with the aptitude. Thus the learning process will take place more meaningfully and learning resources can be used more effectively and efficiently.

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