

Influence of Educational Level and Gender on Students' Verbal Ability

Rita Eka Izzaty^(*) and Farida Agus Setiawati

Dep. of Psychology, Faculty of Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia

(*)✉ (e-mail) rita_ekaizzaty@uny.ac.id, farida_as@uny.ac.id

Abstract

This study aims to assess whether there is a difference in verbal ability by the educational level and gender of students. The educational level consists of Junior High School (JHS), Senior High School (SHS) and Vocational High School (VHS), as well as Higher Education Institution (HEI); while the gender factor of students consists of male and female. The data were collected using a verbal reasoning subtest that is part of the Differential Aptitude Test instrument. In total, as many as 1,008 students in the Special Region of Yogyakarta (DIY), with an age range of 12-19 years, were recruited as subjects. Data were analyzed using variance analysis technique and independent t-test analysis. The results of the analysis indicate that there is a difference in verbal ability based on students' educational attainment and gender. The average verbal ability score from lowest to highest is achieved by JHS, SHS/VHS, and HEI respectively. Meanwhile, it was concluded that there was a difference in students' verbal ability score based on gender, wherein the mean verbal ability subtest score of female students was higher than male students.

Keywords: gender, educational level, verbal ability

Introduction

Aptitude is an individual's specific characteristics of potency or ability honed through knowledge and skill training and cannot be measured directly using regular tests (Salkind & Rashmussen, 2007; Kubiszyn & Borich, 2003; Berk, 2000; Aiken, 1985). Special tests used to measure individual aptitude are called aptitude tests (Ballado, Morales, & Ortiz, 2014; Macklem, 1989; Wesman, 1956). One of the most widely used aptitude tests in education is the Differential Aptitude Test (DAT). DAT which was constructed by George K. Bennet, Harold G. Seashore, & Alexander G. Wesman in 1947 is comprised of seven subtests, often called as multiple talent series. The multiple talent series includes verbal reasoning (VR), numerical abilities (na), abstract reasoning (s) and language usage (spelling and sentences) (Mankar & Chavan, 2013, Gregory, 2011, 2000; Wang, 1993; Bennett, Seashore, & Wesman, 1948).

Because aptitude is considered as an individual difference (Nazimuddin, 2015, Zafar & Meenakshi, 2012; Ehrman, Leaver, & Oxford, 2003), nobody can be deemed as talentless, merely distinguish by the presence or absence of interest to develop their talent. Aptitude is the innate potential possessed by humans (Mankar & Chavan, 2013; Howe, Davidson, & Sloboda, 1998; Anastasi, 1984) meanwhile interest is a positive feeling created by a keen interest in something (Harackiewicz & Hulleman, 2010; Ainley, Hidi, & Berndorff, 2002; Bergin, 1999). Various studies have shown that aptitude can affect a person's interest (Jonah & Igbojinwaekwu, 2015; Tellier & Brackin, 2013; Digumarti, 1994). However, individuals are frequently unaware of their talent in a given field or merely expresses certain interest in something without knowing whether they have the talent for it. Therefore, it is important to harmonize interests with aptitude. In measuring aptitude, other factors that may affect the individual's aptitude score in addition to interest, are namely physical factors, emotion, changes in motivation, attitude, and environment (Digumarti, 1994; Macklem, 1989).

In its use, DAT instrument can be presented as a whole (one series) or separated (one subtest) (Mankar & Chavan, 2013; Macklem, 1989; Ernst: 1951). One of the most commonly used subtests in measuring aptitude is the verbal subtest. The popular use of verbal subtest is similar to that of

numerical subtest. The combination of both subtests is better known as a scholastic test (Oyetunde, 2007, Allalaouf, 1996, Martin & O'Rourke, 1984), frequently used to measure capabilities that developed overtime as well as those required for academic success (Curabay, 2016; Stickler, 2007). In addition to functioning as a component of a scholastic test, verbal subtest also contribute to predicting individual success. Various studies conducted by Gambari & Kutigi (2014), Corengia, et.al. (2013), Vaughn, et.al. (2011), Abiodun & Folaranmi (2007), Toomela, Kikas, & Mottus (2006), Fakeye (2006) proved that verbal subtest, a component of DAT and SAT (Scholastic Aptitude Test), also acts as a predictor of student achievement. A meta-analysis report conducted by Young (2001), described that since 1959, the predictive ability of the verbal subtest is popular enough to be included as one of the components to be measured in the ACT (American College Testing) and SAT.

Verbal subtest measures verbal ability. These verbal tests usually predict verbal knowledge and reasoning (Widhiarso & Haryanta, 2015). Kaufman Brief Intelligence Test-2 is an instrument that measures verbal knowledge (Kaufman & Kaufman, 2004). Verbal test can measure various domains such as vocabulary knowledge, which is done by testing users on synonyms, antonyms, analogies, substitutions, comprehension, as well as composing and completing sentences (Wang et al., 2016; Widhiarso & Haryanta, 2015; Lohman & Lakin, 2009). However, only part of these domains will be used to construct a verbal test. Selection of the domain depends on the characteristics of the theory, purpose of the assessment, and features of the participants subjected to the test developers (Widhiarso & Haryanta, 2015).

Verbal reasoning is one of the foundations of general intelligence (Barmola, 2013). In fact, according to Steinberg (2001), verbal reasoning and problem-solving skills are often referred to as intelligence, even though intelligence may be more appropriately used to describe a child's ability to learn and adapt to experiences in everyday life. This happens because, in western culture, a person is considered to have high intelligence if he/she is knowledgeable, able to solve verbal problems, and process information quickly (Lonnerin Steinberg, 2001). In essence, verbal reasoning is a necessary component in identifying relevant and irrelevant information, determining reasonable alternatives and deciding the best way to connect evidence in solving problems - allowing individuals to communicate effectively in society.

In everyday language, verbal reasoning is a prerequisite for developing four language skills: reading, writing, speaking, and listening; in which speech and writing activities are a demonstration of the verbal reasoning itself (Burton et al., 2009). Therefore, verbal reasoning has a major role in the understanding and expression of language (Gambari & Kutigi, 2014). This opinion is in line with Richard & Roger (1986) who stated that verbal reasoning is an ability related to language skills. Andrew, Cobb, & Giampietro (2005) added that verbal skills not only refers to the use of words orally or in writing but also includes the selection or arrangement of appropriate and coherent words so that the meaning can be conveyed well to another person. Ultimately, verbal reasoning can be defined as part of general cognitive abilities that require high-level thinking skills, referring to complex thinking tasks such as analysis, synthesis, and reading text evaluation (Mankar & Chavan, 2013; Sperber & Mercier, 2010; Burton et al., 2009). Thus, it can be concluded that verbal reasoning is one of four basic cognitive reasoning skills that encompasses almost all the learning tasks in formal education. Even mathematics, which is considered as a nonverbal skill, also requires verbal reasoning because it is taught through oral or written instruction (McCartney, 2009).

The development of verbal reasoning cannot be separated from cognitive development, particularly language development. This is based on the opinion of one of the leading figures of the cognitive theory developer, Piaget. Piaget's theory states that language is not a separate scientific feature, but instead one of many abilities derived from cognitive maturity (Heo et al., 2011; Hickman, 2001). The theory states that language development has begun since the age of two or entering the preoperational stage of development. (Ghazi & Ullah, 2016; Ghazi & Ullah, 2015; Joubish & Khurram, 2011). During the preoperational stage, the baby's brain volume increased to 80% - allowing the child to understand words and begin to compose simple sentences, although they have also started speaking in the form of babbles at approximately three months old (Sigelman & Rider, 2009). Verbal

reasoning ability will continue to develop as the children ages, reaching its peak performance during adolescence, and begins to decline at a very old age (Baltes, Lindenberger, & Staudinger, 2006; Balke-Aurel, 1982). Berglund (1965) adds that although verbal ability can decrease at the age of 13, in contrary to spatial abilities that increases at the same period, the development of verbal factors may continue until age 16. The findings are in accordance to Bayley (1968) who examined the development of verbal abilities of babies until the age of 36 years old. The study concluded that during the early years, an individual's verbal ability seemed very stable compared to when he/she entered adulthood.

As described in the previous paragraph, aptitude is a form of individual difference. Because verbal ability is a part of aptitude, it also differs from one student to another. This difference becomes stronger due to the influence of a person's length of education (last educational level) and social stratification (Cattell 1971, Carroll 1993). Balke-Aurell (1982) have investigated the effect of student's level of education towards their verbal skills. The study aimed to explore changes in specific aspects of ability, namely verbal reasoning and spatial or technical ability, based on educational and occupational factors. The results concluded that higher educational level predicted a stronger increase in verbal and spatial skills.

A similar study was conducted by Kaya (2013) who studied the relationship of intelligence in the context of poverty. The investigated variables were verbal and nonverbal ability of kindergarten and elementary school students. The results showed that students who experience poverty demonstrated a low level of intelligence. Also, there is a considerable gap of intelligence score between the kindergarten and elementary students. Meanwhile, the research conducted by Paez (2008) involved young (children and adolescent) immigrants from China, Haiti, and Dominica. Their verbal skills were measured using BVAT (Bilingual Verbal Ability Test). The results showed that verbal skill (finesse in English) was well below their age and education level, but their verbal skills improved when their first language was used. Based on the facts found, researchers interpret the need for considering the use of English language in assessing the verbal skills of immigrant students.

In addition to educational attainment and social stratification factors, other aspects such as gender, age, school, knowledge, ethnicity, nationality, test materials (new or familiar), environment, teaching methods (i.e. reasoning methods), also causes differences in students' verbal reasoning abilities (Merrill, et.al., 2016; Biedinger, 2011; Priess & Hyde, 2010; Burton, Henninger & Hafetz, 2005; Lohman & Lakin, 2009; Quaiser-Pohl & Lehmann, 2002; Balke-Aurell, 1982; Rock & Werts, 1980). Concerning gender issues, it is particularly difficult to answer questions on sex differences in students' cognitive abilities (William & Ceci, 2007). This is because various factors may affect the condition of the research, resulting in inconsistent conclusions (Priess & Hyde, 2010). Nevertheless, some studies show that female students seemed to be more capable of completing education with higher scores than males (Jacob, 2002). The study was further strengthened by Merrill et al. (2016), Deary, et.al. (2003), Caplan, et.al. (1997) and Hyde (1981) who concluded that female students tend to have higher verbal skills than males, while male students tend to have higher spatial and arithmetic abilities than females.

Based on the explanation that has been described, this study aims to enrich the results of previous research, particularly on assessing the presence or absence of differences in verbal ability regarding the educational level and gender of students. The educational level consists of Junior High School (JHS), Senior High School (SHS) and Vocational High School (VHS), as well as Higher Education Institution (HEI); while the gender factor of students consists of male and female.

Method

This research used a quantitative approach. The research recruited as many as 1,008 students in the Special Region of Yogyakarta (DIY), with an age range of 12-19 years as subjects. The age inclusion criteria were decided as such because the instrument was originally designed for adolescents seeking to discover their aptitude, particularly their verbal abilities. Because data analysis was done based on educational level and gender, detailed information on the distribution of research subjects are presented in Table 1.

Table 1. Distribution of Research Subjects

Category		Total (people)
Educational Level	JHS	103
	SHS/VHS	822
	HEI	83
Gender	Male	630
	Female	378

The data were collected using multistage random sampling technique. The sampling technique was chosen because more than one probability sampling technique was used, i.e., cluster sampling during the first and third stages while stratified sampling was done in the second stage. The first random sampling was conducted based on regency and municipality in the Special Region of Yogyakarta. The second random sampling was carried out on the basis of the schools identified during the first round of random sampling. Finally, the last random sampling was performed based on the class at the school selected at the previous sampling stage. The data was collected using verbal ability subtest, one component of the differential aptitude test, composed by Bennet, Harold G. Seashore, & Alexander G. Wesman in 1947. The instrument for measuring this verbal ability is in the form of multiple choice questions consisting of 50 items.

The variables measured in this study consist of independent and dependent variables. The educational level (JHS, SHS/VHS, and HEI) and gender (male and female) are independent variables. Meanwhile, the dependent variable is the verbal ability score of the students. Because the analysis is based on the level of education and gender of students, two data analysis techniques were performed, namely: variance analysis techniques (ANOVA) and t-test. ANOVA technique is used to discover the difference of verbal ability score based on student's educational level, while the latter seeks to determine the difference of verbal ability score based on student's gender through an independent t-test. The output of both the variance analysis and t-test will produce a significance score indicating whether there is a difference in students' verbal ability score based on their level of education and gender.

Results and Discussion

Table 2. presents descriptive statistics data of verbal ability consisting of mean, standard deviation (SD), minimum and maximum value based on gender. Table 3 shows that the range of verbal scores for male and female students is 6-40, and 7-43, respectively, with the mean verbal scores of female students being higher than the males.

Table 2. Descriptive Statistic of Verbal Ability based on Gender

Gender	Mean	SD	Minimum	Maximum
Male	24,0794	6,50401	6,00	40,00
Female	25,0053	7,21551	7,00	43,00

Table 3. presents the analysis result of verbal ability differences based on gender through ANOVA testing. The significance of the test results indicates that the value obtained is smaller than alpha (0.05) so the hypothesis tested in this study is not proven. Based on this, it can be concluded that there are differences in verbal ability based on students' educational level.

Table 3. ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13229,709	2	6614,854	200,185	0,000
Within Groups	33208,859	1005	33,044		
Total	46438,567	1007			

Because the ANOVA test result indicates a difference in verbal ability based on students' level of education, it is necessary to conduct further analysis in the form of Post hoc (Multiple Comparisons) test to see which level of education affect the students' verbal ability the most. Based on the Post hoc test presented in Table 4, all verbal ability differences viewed from the education level of the students have a significance score smaller than alpha (0,05). Thus, it can be concluded that the differences between the levels of education are statistically significant, with the largest mean difference between JHS-HEI. This indicates that, respectively, the lowest to highest average of verbal ability are from JHS, SHS/VHS, and HEI.

Table 4. Multiple Comparisons

(I) School	(J) School	Mean Difference		Sig.	95% Confidence Interval	
		(I-J)	Std. Error		Lower Bound	Upper Bound
JHS	SHS/VHS	-8,23192	0,60084	0,000	-9,7048	-6,7590
	HEI	-16,92058	0,84790	0,000	-18,9991	-14,8420
SHS/VHS	JHS	8,23192	0,60084	0,000	6,7590	9,7048
	HEI	-8,68865	0,66205	0,000	-10,3116	-7,0657
HEI	JHS	16,92058	0,84790	0,000	14,8420	18,9991
	SHS/VHS	8,68865	0,66205	0,000	7,0657	10,3116

Table 5. provides the results of verbal ability differences test based on gender using an independent t-test. The significance of the test results indicates that the value obtained is smaller than alpha (0.05), so the hypothesis tested in this study is not proven. Based on this, it can be concluded that there is a difference in verbal ability based on the students' gender.

Table 5. Independent T-Test

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Verbal	-2,099	1006	0,036	-0,92593	0,44107	-1,79144	-0,06041

There are two important points to be discussed in this section, namely the analysis of verbal skills based on the level of education and gender of students. The descriptive analysis on the students' verbal ability score by their educational level shows that successively the order of educational attainment with the lowest to highest average is JHS, SHS/VHS, and HEI. Meanwhile, concerning gender, female students demonstrate a higher average verbal score compared to male students.

Statistical analysis result, both through ANOVA and independent t-test, provides a conclusion regarding the significant difference of the students' verbal ability score. Table 4 shows that the ANOVA significance analysis score is smaller than alpha (0.05). This indicates that there is a difference in students' verbal score based on their educational level. This difference is increasingly

visible by observing the mean difference presented in Table 5. It shows that the largest verbal ability score difference was between JHS-HEI (mean difference = -16.92058). This figure suggests that the verbal ability score of JHS student is approximately 16 points below the score of HEI students. Therefore, it can be concluded that the average verbal ability score from lowest to highest is achieved by JHS, SHS/VHS, and HEI respectively, with the score being in accordance to the descriptive statistic summarized in Table 2. Meanwhile, Table 5. also shows a significance t-test score that is smaller than alpha (0.05), indicating a difference in the students' verbal ability score based on gender. Thus, based on the analysis, this research proves that the level of education and gender affect the students' verbal ability.

Findings in this study that relates to differences in students' verbal skills, arising from variations in educational level, are consistent with studies done by Rich (2013), Paez (2008), and Balke-Aurell (1982). In this study, the average verbal ability score of JHS students was 16.3204 which increased by 8 points to 24,5523 (SHS) and another 8 points to 33,2410 (HEI). Each increase in score has been proven to be statistically significant. This indicates that the higher level of education that students have, the higher their verbal ability. In other words, students' verbal ability develops by their educational attainment.

The educational level can affect the development of verbal abilities by enriching their vocabulary (Sweeny & Mason, 2011; Mukoroli, 2011; Beck, McKeown, & Kucan, 2002). Students' vocabulary expands as a result of regularly exercising it through four language skills, namely reading, writing, speaking and listening (Cole & Feng, 2015; Asemota, 2015; Carranza, et.al., 2015; Kacani&Cyfeku, 2015; Alqahtani, 2015; Wasik& Cambridge, 2012; Burton, et al., 2009; Kavaliauskiene&Anusiene, 2009; Pikulski& Templeton, 2004; Fisher, 2001). The form of communication done by the students is adjusted to the learning environment or level of education currently experienced by the students. Contrary to primary school, JHS and SHS students, college students are able to perform independent learning, generally done through a series of group discussions followed by a presentation. Learning methods that rely on group discussions have proven to be very effective in developing students' verbal reasoning abilities (Cabel, et al., 2015; Taggart, 2005; Larson et al., 1984).

Meanwhile, it was concluded that there was a difference in students' verbal ability score based on gender, wherein the mean verbal ability subtest score of female students (25,0053) was higher than male students (24, 0794). The average verbal subtest score difference was not great numerically, but it was proven to be statistically significant. In other words, females are more dominant at verbal skills compared to males.

The dominance of females in the verbal field in this study is consistent with the results of previous research, i.e., Merrill et al. (2016); Burton, Henninger & Hafetz (2005); Kolb & Whishaw (2001); Mildner (2008); and Weiss et al. (2003). Also, studies have shown that females have better grammatical and verbal skills, starts speaking earlier, faster language development, better articulation and ability to use complex sentences, and richer vocabulary compared to males of their age (Warastuti, 2011; Wallentin, 2009; Markovic, 2007).

Conclusion

Based on the analysis and discussion, there are differences in verbal ability by the level of education and gender of students. Specifically for educational attainment variable, the development of verbal ability seems to grow by the degree of education undertaken by the students.

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