Improved Ability To Control Engineering Students Basic Skills Vocational

by M. Sukardjo
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IMPROVED ABILITY TO CONTROL ENGINEERING STUDENTS BASIC SKILLS VOCATIONAL

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Abstract

Objective of this research is to determine the relationships between mechanical aptitude and inductive thinking toward technician's profession and technique basic skill capability. The research concludes that there is positive relationships between: (1) mechanical aptitude and technique basic skill capability with a $r_{xy} = 0.279$ and $\hat{Y} = 11.935 + 0.258X$, (2) inductive thinking and technique basic skill capability a $r_{xy} = 0.289$ and $\hat{Y} = 11.401 + 0.348X$. Furthermore, there is a positive relationship between the two independent variables simultaneously and technique basic skill capability $r_{1,2} = 0.373$ and $\hat{Y} = 6.276 + 0.198X + 0.315X$.

The aim of this study was to determine: 1) the relationship between mechanical aptitude Vocational High School students with the capability of basic skills techniques, 2) the relationship between the ability to think inductively students with the ability of the basic skills of engineering 3) at the end of the study wanted to know the relationship between the mechanical aptitude of students, inductive thinking ability, together with the ability of basic technical skills.

The method used was a survey with simple and multiple correlation analysis, simple and multiple regression and partial correlation. This research was conducted at the Vocational High School V East Jakarta. This study population across grade 11 Department of Electronics Vocational School in East Jakarta Capital City 2013-2014 school year. The samples were taken randomly (simple random sampling), which is 75 students.

This study used three (3) instruments, namely: first, the instruments for measuring mechanical aptitude using standard instruments borrowed from the Graduate Program (PPS), State University of Jakarta, both instruments are basic skills the ability to think inductively techniques and instruments developed by the researchers. Inductive Thinking Instruments to form an inductive thinking tests.

Results of this study stated that the entire hypothesis is accepted. The results of the study hypothesis testing are as follows: First, the mechanical Talent has a positive and significant relationship with the knowledge of basic engineering skills. The higher the mechanical aptitude of students, then the higher the knowledge of basic skills and techniques vice versa. Secondly, inductive thinking ability has a positive and significant relationship with the knowledge of basic engineering skills. The higher the inductive thinking skills of students, then the higher the knowledge of basic engineering skills. Third, Mechanical and talent, ability to think inductively together have positive and significant correlation with the knowledge of basic engineering skills.

INTRODUCTION

In the information age of a worker is required to have high performance. It is necessary for Indonesian workers can compete with a workforce of mancangara. According Slameyo (1991: 1) to be able to compete internationally, required the excellence eminence either cooperatively or competitively. Manpower to be able to compete and compete well with other labor required superior human resources, one of which is a high quality human.

To be able to produce graduates who have the knowledge and vocational skills as demanded by the industry are many factors that to influence. Such factors include facilities and infrastructure in schools, internship opportunities in the industrial world, the curriculum, the support of a society of including parents as well
as the mental attitude of the students of SMK itself.

In the national education law, that the main purpose of vocational education is to prepare learners to be able to work in a particular field. (UU- No. 20 of 2003 on National Education System 2003: 43). Accordingly Schippers said the purpose of vocational education is to equip students to have competence in the field of vocational behavior of certain so concerned is able to work for the future and for the welfare of the nation. (Schippers, Patratama, 1994: 19).

Issues arising from the joint venture foreign direct investment (FDI) of Japan, workers in Indonesia generate annual turnover of only 20% of German workers. (Schippers, Patratama, 1994: 32) In addition raised the issue in various media performance of vocational school graduates are generally low. Vocational school graduates can not be removed immediately face a number of machines and production aids (Syafruddin, 1996: 66).

To improve the quality and the quality of vocational education is to improve the learning resources are adequate, good source to learn to practice and theory. Along with that it is necessary to study the theoretical literature and in-depth research about the factors that affect the quality and ability of a vocational school graduates, especially with regard to study mechanical aptitude, empirical experience that is reflected by inductive thinking, and the ability of the basic engineering skills. Based on the above background, the formulation of the problem in this study as follows: (1) Is there a relationship between the mechanical aptitude of students with the basic skills of technical capability? (2) Is there a relationship between the ability to think inductively students with the basic skills of technical capability? (3) Is there a relationship between mechanical aptitude and ability to think inductively, together with the ability skill basic techniques?

THEORETICAL STUDY

Basic Skills Capability Engineering.

The term "capability" refers to the capability of learning and is the result of one's learning (Gagne, 1985: 48-49). Gagne, Briggs, and Wager (1992: 107) said that ability is organizing learning outcomes and experiences, where learning and experience can be seen (real) on the appearance of someone who is affected by the quality of the influence of the wider structure. So the result of learning is the accumulation of all that is experienced, learned by someone who gained through experience in the field and in the classroom. Besides the capability is defined as the general capacity of a person who is connected with the appearance of motor skills. (Magil, 1990: 13).

Of the five types of learning capabilities expressed Gagne one motor skills. (Gagne, 1985: 47). In the motor skills of learners perform in a number of follow-motor movements are organized. Motor movement itself refers to the acquisition of skills that require body movements. (Oxendine, 1968: 12) Definition of basic skills are the skills that people need in order to succeed in life. (Kohl, 1984: 107). Of the six basic skills students need to learn is the ability to understand science and technology, and can use tools. (Kohl, 1984: 110).

Motor skill is an ability that is contained in a person in performing movements with smooth muscle in the right time, such as swimming. Gagne, said that if an organized motor skills, it will form a unity of action that is smooth, regular and timely. (Gagne, 1985: 62). Furthermore it is said there are three main meanings in learning skills, namely: (1) action, (2) accuracy, and (3) timing. (Gagne, 1985: 198). The third characteristic is generally contained in learning motor skills.

To learn motor skills necessary in accordance with the phasing levels. There are seven levels of classification psychomotor domain, namely: (1) Perception (Interpreting), (2) Set (Preparing), (3) Guided Response (Learning), (4) Mechanism (Habituating), (5) complex overt response (performing), (6) adaptation (modifying), and (7) origination (creating). (Thorndyke, 1972: 27).

Results of the analysis of the needs in the field for the field of electronics requires the mastery of knowledge and skills of basic electronic circuits and electronic equipment. (Tranggangon, 1998: 1). Results of research on the basic need for unskilled workers was needed aspects of basic knowledge and skills as well as techniques have much to learn about safety. Kaleth, 1999, said they also want to know how to use measuring equipment and basic tests measure knowledge in technology and job skills.
All requirements needed in the field, especially for electronics technician on the mastery of knowledge and skills of basic electronic circuits and electronic equipment on the subjects taught basic skills in engineering Vocational High School in clumps electro mechanical subjects. According to Butler a person's ability to learn a very influential among them is the knowledge or skill that is mastered previously associated with a special material that has been studied. (Butler, 1979: 16).

Mechanical Talent

Talent is the inherent ability or "inherent" in a person (Semiawan, 1996: 5). Khatena (1992: 5) says giftedness is defined as a natural ability or aptitude; talent. Besides talent, or "aptitude" is defined as an innate ability which is the potential (potential ability) that still need to be developed or trained. (Semiawan and Munandar, 1987: 1). Children who are gifted in a certain field does not necessarily have a high IQ.

Gifted and talent give evidence on the ability of high performance in children in areas such as intellectual, creative, artistic, or leadership capacity of specific academic skills (Clark, 1983: 5). On the other hand Munandar say that talent and ability is one of the factors that determine one's achievement, where achievement is determined among other things by the intelligence (Munandar, 1992: 17.) Magill believed that the intelligence is the ability to learn and understand, often linked with the skill of someone on a new treatment or a material that is not known. (Magill, 1993: 1)

In the approach to the analysis of the factors stated there are two main factors that shape to construct-ability is a factor g (general) and the factor s (specific). (Khatena 1992: 5). The concept of factor analysis repaired by other experts, known as the usual factors (multiple factors). In the plural factor is said that intelligence operates on four levels, namely (1) try try (trial and error), (2) perceptual, (3) ideational and (4) conceptual. (Khatena 1992: 3). The main capabilities expressed in the usual factors consists of six capabilities: (1) Verbal comprehension (V) that is commonly measured verbal understanding through reading and understanding subtest per bendharaan said, (2) Number (N), which is measured through counting problems. (3) Spatial relations (S) measured through manipulation of the symbol of geometric. (4) Word Fluency (W) measured by the quick response words. (5) Memory (M) measured by the memory of the words that are interconnected. (6) Reasoning (R) is measured through a series of tests of various analogies or complete sentences or patterns. (Khatena 1992: 73)

In the theory of multiple intelligence dikatah that human intelligence has seven dimensions: (1) linguistics, which is sensitive to sound, rhythm, understand the meaning of words, and sensitive to distinguish the functions and language. (2) Music, which includes the ability to create and appreciate the sound of instruments and music. (3) mathematical logic, including the ability of logic, mathematics and scientific. (4) visual spatial, namely the ability to form a spatial model includes the ability to manipulate and operate according to the model. (5) physical kinesthetic, namely the ability to solve problems or problems with the model of partial limbs or whole limbs. (6) social interpersonal, namely the ability to sense and make a difference in various situations, stating the purpose, motivation and feelings of others. (7) intrapersonal the ability and the capacity to control the feelings correctly and effectively applied in their lives.

Of some aspects of intelligence such as that mentioned above, in accordance with the spatial aspects of mechanical ability. A measurement experts say is often used to measure special ability is to measure the ability of mechanics. (Aiken, 1997: 210).

According to Ernest Hilgard R workers mechanical, electrical and building must have a degree in mechanical reasoning above average. From one of the results of research Renuzzi et al, states that one of the important points that determine a person's giftedness is liable or binding themselves to the task. It is also stated by other experts who say that the ability of children who have high performance includes the capability demonstration or potential ability within the scope of 14 following may unggal or a combination of: (1) General intellectual ability; (2) Specific academic aptitude, (3) Creative or productive thinking, (4) Leadership ability, (5) Visual and performing arts and (6) Psychomotor ability. (Dorothy, 1987: 8).

Abramson, Title, Cohen says there are 10 kinds of talent that can be identified include: (1) Intelligence, (2) Verbal, (3) Numerically, (4) Spatial, (5)
perception, (6) clerical perception, (7) motor coordination, (8) Skills hand, (9) manual skills, (10) koordinasi eyes, hands and feet, (11) the color discrimination. (Abramson, Title, Cohen, 1979: 257)

Inductive Thinking Ability

Thinking is a process of change information from the existing data is done by the brain as a tool. (De Bono, 1971: 43) In addition, it is said to be thinking skills where the application of intelligence to act based on the experience for a purpose. (De Bono, 1990: 3). Thinking stated that focuses on three elements, namely (1) the application of skills, (2) intelligence, and (3) experience. In general thinking is the development of the ideas, concepts and so forth. (Syria-sumartani, 1989: 52).

Logic process draws conclusions from facts or premises given. (Leahy, Hariss, 1997: 229). Inductive reasoning is closely connected with the empirical, where understood empiricism meant that the facts are revealed through human experience is the source of truth. (Surisumartani, 1998: 45). Human experience that is the source of truth is a science for the man himself.

Inductive thinking is a way of thinking draw general conclusions from individual cases. (Surisumartani, 1998: 48). Other experts say that inductive reasoning illustrate the general conclusions from a data set. (Leahy, Hariss, 1997: 229). Work inductive reasoning is of a special observation leading to generalization and theory. In inductive reasoning, we start from the observation and measurement of specific, then start by detecting irregular patterns and properties, then the formulation of a tentative hypothesis that can be explored and eventually develop some general conclusions or theories. (William, 1999, 1). For more details can be seen in Figure 1. Inductive thinking can be described in three stages as deductive, namely: (1) the first stage to understand and appreciate the observations or state information, (2) a second stage to form a hypothesis that can describe the above information in conjunction with knowledge the common person, and (3) The third stage is to evaluate the validity of the conclusions that have been enriched. (Laird, Philip, 1993: 1)

Taken from Research Methods Knowledge Base. 2nd edition, 1999

Think of some component parts, one important component of thinking is thinking (reasoning). Thought is the conclusion of a description of the logic, facts or of the reasons given. Inductive reasoning includes an overview of general conclusions from the data. (Laird, Philip, 1993: 1).

To be able to conclude a general truth of various data or case there can be shaped inductive generalizations, analogies inductive and causal. From the above it can be concluded that empirical thinking ability is reflected by inductive thinking is the ability of students in the general conclusions of the cases were found, including in this case on the ground that is often experienced in the field of engineering.

FRAMEWORK OF THINKING

Relationship Between Student Talent Mechanics (X1) Basic Skills Engineering Capabilities (Y)

Of the many factors that contribute to the success of a person is talent. The talents of someone very different between one person with another person. The difference is due to an inborn talent.

In the field of engineering ability of a person are also very different in both the acquisition of skills and knowledge. To be able to master the engineering field well, which should be controlled or be a prerequisite is the acquisition of skills that are basic. Abilities that are basic in vocational subjects reflected in electro mechanical. In electrical engineering subjects that must be mastered the basic skills related to the ability of the technique. The ability of basic skills is a technique that requires organizing ability of the entire physical movement that can not be separated from knowledge.
Therefore we need a better understanding of knowledge concerning the safety and knowledge of the equipment. A skilled person to do a job not just a habit, but it requires the ability of each individual to be able to adapt to changes. So here it is necessary that the dynamic response of a person. From the description of the basic engineering skills and talents as above, then someone who has a talent in the field of engineering, if given adequate education can develop their potential, then the ability of basic technical skills will be good also. This suggests a positive relationship between the mechanical aptitude vocational students with the basic skills of technical ability.

**Correlation Between Thinking Inductive Students (X2) Capabilities-Pilan Ketaram Basic Techniques (Y)**

The ability to think empirically that the conclusion of inductive thinking is a process thought to take general conclusions from particular th Making general conclusions from particular data that can be shaped inductive generalizations, analogies, and causation things. People think empirically, then rationalism will be strong, because it is derived from the experiences of individuals. All abilities are obtained either from the school as well as the experience gained from the outside as practical experience of the industry or the practice in other places will make a valuable provision for students to be able to infer the general from what ever experienced. It is therefore expected with empirical thinking ability that is reflected by inductive thinking ability of students will have the mastery of basic skills good technique.

From the description it can be said the higher the person's ability to think inductively, then the higher the ability of basic technical skills, and vice versa

**The Relationship Between The Mechanical And Inductive Thinking Ability, Together With The Ability Of Basic Technical Skills**

From the description framework as described above which states that if a person has a mechanical aptitude is high, then the ability to basic technical-skills will also be high. Thus suspected mechanical aptitude of the students is positively related to the ability of basic technical skills.

Similarly, the ability to think inductively students. The higher the person's ability to think inductively, then the higher the ability of basic technical skills. Therefore, it is suspected there is a positive correlation between the ability to think inductively with the basic skills of technical ability. So of the three above explanation, it can be concluded that with good talent, especially talent with regard to mechanical ability inborn then supported or supported by the ability to think inductively is good, then all of this together unexpected will generate skilled capability good basic technique.

**RESEARCH HYPOTHESIS**

Research hypotheses were proposed as follows:

1. There is a positive relationship between the mechanical aptitude X1 students with the basic skills of technical capability Y
2. There is a positive relationship between students ability to think inductively X2 with basic technical skills capability Y
3. There is a positive relationship between students of mechanical aptitude, the ability to think inductively, together with the ability of basic technical skills

**RESEARCH METHODOLOGY**

The method used was a survey with simple and multiple correlation analysis, simple and multiple regression and partial correlation. The aim of this study was to determine the relationship between mechanical aptitude students Vocational High School (VHS) with the capability of basic skills techniques. In addition, this study also wanted to know the relationship between the ability to think inductively students with the basic skills of technical ability. At the end of this study wanted to know the relationship between the student mechanical aptitude, the ability to think inductively together with the ability of basic technical skills.

This research was conducted at the Vocational High School in East
Jakarta. This study population across grade II Department of Electronics Vocational School in East Jakarta 2013-2014 school year. The samples were taken by simple random sampling of 75 students.

Research instruments for measuring mechanical aptitude using standard instruments borrowed from the Graduate Program (PPS), State University of Jakarta. For other instruments created and developed by researcher. Inductive Thinking Instruments to form an inductive thinking tests.

Table 1.
Analysis of variance for the regression of Y on X1 with the equation:

\[ \hat{Y} = 11,395 + X_1 \]

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>Df</th>
<th>SJK</th>
<th>KT</th>
<th>F</th>
<th>FCritical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>75</td>
<td>21798</td>
<td>21798</td>
<td>(5%)</td>
<td>(1%)</td>
</tr>
<tr>
<td>Regresi (a)</td>
<td>1</td>
<td>20966.88</td>
<td>20966.88</td>
<td>6.45*</td>
<td>3.06</td>
</tr>
<tr>
<td>Regresi (b)</td>
<td>1</td>
<td>64.68</td>
<td>64.68</td>
<td>6.30*</td>
<td>0.89</td>
</tr>
<tr>
<td>Residual</td>
<td>72</td>
<td>766.44</td>
<td>10.50</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Tuna Coook</td>
<td>14</td>
<td>120.37</td>
<td>8.6</td>
<td>0.79*</td>
<td>1.88</td>
</tr>
<tr>
<td>Error</td>
<td>59</td>
<td>666.07</td>
<td>10.95</td>
<td>2.40</td>
<td>2.40</td>
</tr>
</tbody>
</table>

Description:
* = Significant regression in α = 0.05 (Fb = 6.45 > Ft = 3.06)
Regression is not significant in α = 0.01 (Fb = 6.30 < Ft = 6.95)
* = shaped linear regression (Fb = 0.79 < Ft = 1.87)
df = degrees of freedom
JK = Sum of squares
KT = Squares middle

RESEARCH RESULT
In this study tested three hypotheses. Testing the hypothesis as follo:
First, the relationship between talent Mechanical X1 with Basic Skills Knowledge Engineering Y obtained form the relationship between the two variables to the equation: \[ \hat{Y} = 11,935 + 0.258X1 \]. To determine the significance of
regression equation F test results can be seen in Table 1. From table 1 above in mind the price of the F counts F table prices (Fh = 6.45 > Ft = 3.37), it can be concluded that the coefficient of the regression of Y on X1 direction "significant". To test linearias as in Table 1 above were obtained Fh = 0.79 <Ft = 1.87 at the significance level of alpha " = 0.05, said linear regression. Thus the regression equation \[ \hat{Y} = 11,935 + 0.258X1 \] can be used to predict the dependent variable Y relationship with the independent variable X1. This means that each increase of one unit X1 will increase towards Y for konstanta 0.258 at 11.935.

Ry1 correlation coefficient = 0.27 and the significance test of correlation coefficients obtained price t = 2.11267. Because t = 2.11267> t table = 1.66 can be concluded that there is a positive relationship between knowledge of the basic skills of engineering with mechanical aptitude.

Determination coefficient of 0.078. This means that 7.8% of variation that occurs in the knowledge-skills learning outcomes can be explained by the basic techniques of mechanical aptitude.

The second relationship between X2 with Inductive Thinking Skills Knowledge Basic Techniques Y obtained form the relationship between the two variables to the equation Y = 11.401 + 0.348X2

Tabel 2.
Analisis varians untuk regresi Y atas X2 dengan persamaan:

\[ \hat{Y} = 11.401 + 0.348X2 \]
Description:

\( * \) = Significant regression in \( \alpha = 0.05 \) (\( F_b = 6.67 > F_t = 3.37 \))
Regression is not significant on \( \alpha = 0.01 \) (\( F_b = 6.67 < F_t = 6.695 \))
\( ns \) = shaped linear regression (\( F_b = 0.135 < F_t = 1.98 \))
\( df \) = degrees of freedom
\( JK \) = sum of squares
\( KT \) = Squares middle

From Table 2, it is known \( F_b = 6.67 > F_t = 3.37 \), it can be concluded that the coefficient of the regression of \( Y \) on \( X_2 \) direction significantly. To test the linearity such as Table 2 above the price obtained \( F_b = 0.135 < F_t = 1.98 \) at \( \alpha = 0.05 \), so it can be said to be the linear regression. Thus the regression equation \( \hat{Y} = 0.401 + 0.348X_2 \) can be used to predict the dependent variable \( Y \) with independent variable \( X_2 \).

This equation implies that every one-unit increase in \( X_2 \), then will increase to \( Y \) by 0.348 units to a constant 11.401. The strength of the relationship is indicated by \( r_{y_2} \) correlation coefficient = 0.289 and significance test of correlation coefficient with the price obtained \( ujt \) th \( = 2.4711 > t = 1.66 \) can be concluded that there is a positive correlation between the knowledge of basic skills by thinking inductive techniques.

This equation implies that every one-unit increase in \( X_2 \), then will increase to \( Y \) by 0.348 units to a constant 11.401. The strength of the relationship is indicated by \( r_{y_2} \) correlation coefficient = 0.289 and significance test of correlation coefficient with the price obtained \( ujt \) th \( = 2.4711 > t = 1.66 \) can be concluded that there is a positive correlation between the knowledge of basic skills by thinking inductive techniques. The coefficient of determination between \( Y \) with \( X_2 \) is equal to 0.0835. This means that 8.35% of variation that occurs in basic skills learning outcomes technical knowledge can be explained by the ability to think inductively with the regression equation \( \hat{Y} = 11.401 + 0.348X_2 \).

The third relationship between talent Mechanical and Inductive thinking, the Basic Skills Knowledge Engineering obtained regression equation \( \hat{Y} = 8.276 + 0.198X_1 + 0.315X_2 \).

The calculation results in Table 3 show that the price of the \( F \) count obtained at 5.817, while \( F \) table with 2 degrees of freedom numerator and denominator degrees of freedom 72 at \( \alpha = 0.05 \) significance level of 2.74. From the calculation of the prices of \( F \) count \( F \) table prices (\( F_b = 5.817 > F_t = 2.74 \)), thus it can be concluded that the regression equation \( \hat{Y} = 8.276 + 0.198X_1 + 0.315X_2 \) can be used to predict the mechanical aptitude \( X_1 \), inductive thinking and \( X_2 \), with the knowledge of basic engineering skills \( Y \).

**Tabel 3**

<table>
<thead>
<tr>
<th>Sumber Variasi Regresi Linear jamak</th>
<th>( \hat{Y} = 8.276 + 0.198X_1 + 0.315X_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Regresi</th>
<th>Dk</th>
<th>JK</th>
<th>KT</th>
<th>( F_{hitam} )</th>
<th>( F_{table} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>7</td>
<td>115.62</td>
<td>5.81</td>
<td>7.4</td>
</tr>
<tr>
<td>residu</td>
<td>2</td>
<td>7</td>
<td>715.50</td>
<td>9.93</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>831.12</td>
<td>9.93</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Faculty of Engineering, Universitas Negeri Jakarta
  Denp. Surabaya Building, 2nd Floor UNJ
  Jakarta, October 27th 2015
Description:

** = Significant regression in $\alpha = 0.05$ ($F_9 = 5.817 > F_1 = 2.74$)

df = degrees of freedom
JK = sum of squares
KT = Squares middle

$\alpha =$ significance level

Results of calculation of plural correlation between the variables X1, X2, Y generates a plural Ry.12 correlation coefficient of 0.37. Significance test $F_9$ price correlation coefficient $= 5.817 > F_1 = 2.74$, then the correlation between Y with X1 and X2, together "means". It can be concluded there is a positive relationship between the mechanical talent and Thinking Inductive vocational students together with the Basic Skills Knowledge Engineering.

The coefficient of determination $= 0.139$, shows that 13.9% of variation that occurs in the knowledge of the basic skills of vocational students techniques can be predicted by Talent mechanical and Thinking Inductive with Basic Skills Knowledge Engineering jointly by the regression equation $Y = 8.276 + 0.198X1 + 0.315X2$. In other words a score of Talent Mechanical and Inductive Thinking together can predict the score of knowledge-Skills Basic Techniques by 13.9%, while the remaining 86.1% cannot be explained, and derived from other variables not accounted for in this study.

Conclusion

From the results of the study hypothesis testing described above conclusion as follows:

First, the mechanical Talent has a positive and significant relationship with the knowledge of basic engineering skills. The higher the mechanical aptitude of students, then the higher the basic skills of technical knowledge and vice versa.

Secondly, inductive thinking ability has a positive and significant relationship with the knowledge of basic engineering skills. The higher the inductive thinking skills of students, then the higher the technical knowledge of basic skills.

Third, mechanical and talent, ability to think inductively together have positive and significant correlation with the knowledge of basic engineering skills.

IMPLICATIONS RESEARCH

Noting the conclusions of the research results as described above, it is to increase the knowledge of basic skills with the engineering students can improve mechanical aptitude and thinking inductively with the following steps:

Improving Talent Mechanics

Results of studies have provided a distribution of 7.78% of the increase in knowledge of basic engineering skills. Therefore, in order to improve a better result on the basis of technical skills knowledge, there are some efforts that need to be done include: (1) There should be an optimization capabilities of each individual in the schools. Optimization can be by taking into account each individual talents and optimize the talent. (2) talent someone, especially in this case the mechanical talent which is inborn can be optimally developed through experience and practice. Experience here can be created in the school situation, especially vocational schools by providing practical experience as much on students. The practical experience can be provided in industries or can also be assigned to the student, so that the assignment through these subjects students gain valuable experience. (3) The talent is inborn, therefore, the need for guidance on the younger generation, especially in schools to be able to pay attention to nutrition. With good nutrition, the brain will develop and grow well. (4) Because talent is innate abilities, the education system in schools should not be too restrain the child. Let the child in school activities that can support the talent, and the teacher only lived to provide direction and guidance. Likewise, in the home of the parents should not overly restrain the child, for the child to move and walk on the right track.

Efforts to Improve Thinking Inductive

From the research think inductively-ment has given sum 8.35% of the basic skills of technical knowledge. Therefore, in order to further enhance the technical knowledge of the basic skills of vocational students, the need for the following programs: (1) classroom learning system in both
theory and practice need to be created in such a way so as to train the student's cognitive. If cognitive students are trained regularly and continuously, will eventually become a habit, then by itself a way of thinking that students can quickly grasp science, and this in turn will be able to increase the knowledge of basic engineering skills. (2) It should provide sufficient experience which can train students how to think. The experience can be acquired in school, at home or also with peers. But of course it must be planned by the teacher in planning a coherent, logical, and continuous. (3) The next step needs to be done is an atmosphere of learning, especially learning atmosphere in schools. The learning environment both in laboratory and in the classroom needs to be created in such a way, so that the atmosphere of learning can be developed the ability to think inductively as optimally as possible. (4) Familiarize children discuss observe symptoms that occur both in the field or Mr engineering in other fields. Next will be asked to make a conclusion. The material can be discussed in the classroom or at home assignments. Therefore, teachers should really make careful planning to provide learning that can develop students' thinking inductively.

SUGGESTIONS

Discussion of the results of the research, conclusions and implications as described above, it is proposed the following suggestions: First, Vocational schools should particularly in new admissions to consider holding the aptitude test, in addition to the selection tests through pure NATIONAL EXAM value. Second. By knowing the talent of the students, the school through teachers can give lessons to optimize the ability of their students. Third. To train inductive thinking, in addition to be created in the classroom learning system that can train students' thinking skills, must be added the tool library or books related to the ability to think, especially books that can improve the ability to think empirically.

If the books are available given the opportunity for teachers to learn the books, so that future teachers can prepare lesson plans so as to be able to train to think inductively. Fourth. Because the key to success in the classroom is the teacher, then the Regional Office of the National Education Service (RONE) should provide the means to increase teachers' activities in creating a learning atmosphere that can create an inductive thinking ability of students. Means of these activities can be by way of a training workshop organized by RONE, seminars, research, and so on. Fifth. There should be further studies on the ability of the basic skills of vocational students techniques by observing the weaknesses that exist in the study.

References


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Improved Ability To Control Engineering Students Basic Skills Vocational

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