# An Examination of Binanga High School Students' Literacy Capabilities

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This study aims to analyze the literacy skills of high school students in Binanga. The research method used is descriptive research method with quantitative and qualitative approaches. The population in this study were high school students in class XI IPA in the odd semester of the 2021/2022 academic year in Barumun Tengah sub-district. A sample of 120 students was taken from 2 schools, namely class XI IPA SMAN 1 Barumun Tengah and class XI IPA MAN 2 Padang Lawas. The sampling technique used the cluster random sampling method. Data collection techniques with tests, questionnaires and the learning process. The results showed: 1) students' reading literacy skills were 52.02% very low category, 2) scientific literacy skills were 49.00% very low categories, 3) mathematical literacy skills were 50.26% very low categories.
**Keywords:** *Reading Literacy, Science Literacy, Mathematical Literacy*

## 1. Introduction

21st century education demands that the education system must be in accordance with the times (Arohman, M. et al., 2016). Education in this century aims to encourage students to have skills that support them to be responsive to changes along with the times (Sutrisna, N., 2021).

One of the important abilities students have today is literacy skills. *Literacy skills* are important abilities that must be mastered by students apply it in the era of disruption as the main skill to face the peak of the wave digital in the 21st century. In order to be able to maintain its existence in the concept of 21st century life, students are required to master 16 basic literacy skills that must be applied in everyday life, competence which consists of techniques to solve problems from various complex challenges, and concepts of how to deal with changes that absolutely keep happening (Harahap, DGS, et al., 2022). Science education has an important role in preparing children to enter the world of life (Rusdi, A., et al., 2017).

The literacy skills referred to in this case are reading literacy skills, scientific literacy and mathematical literacy. The Organization for Economic Co-operation and Development or OECD (2014) defines scientific literacy as individual scientific knowledge and the ability to use that knowledge to identify problems, acquire new knowledge, explain scientific phenomena, and draw conclusions based on evidence related to science issues. Based on PISA (Program for International Student Assessment)

scientific literacy is the ability to use scientific knowledge, identify questions, and draw conclusions based on scientific evidence in order to understand and make decisions regarding nature and its changes due to human activities (Sutrisna, 2021). The literacy skills needed now are scientific literacy (Triwibowo, S. et al., 2021). Scientific literacy is currently receiving attention in the academic field, because mastering scientific literacy skills is very important for everyone to solve problems (Nurhasanah, et al, 2020).

Furthermore, reading literacy is one of the lessons that not only hones the ability to understand written messages, but also trains students' thinking skills because this skill processes and sharpens information from the reading that is being read and connects reading with previous information that has been obtained (Sumbi, D. , et al, 2020).

Mathematical literacy is a person's ability to formulate, use, and interpret mathematics in various contexts of everyday life problems efficient. The intended mathematics includes all concepts, procedures, facts, and mathematical tools both in terms of calculation, numbers and space. Mathematical literacy is as important as skills in reading and writing. This ability enables individuals to be able to engage in mathematical literacy, which can estimate and interpret information, solve problems, provide reasons, in numerical, graphic, and geometric situations and communicate using mathematics (Sumbi, D., et al, 2020).

Based on the PISA assessment, it was explained that Indonesia's scientific literacy ability in 2006 was ranked 50th out of 57 countries. Literacy year 2009 Indonesian science students are ranked 60th out of 65 countries. Literacy year 2012 Indonesian science students are at level 64 of 65 countries then 66 of 72 in 2015 (OECD, 2017) . Based on this data, information is obtained that Indonesian students have low scientific literacy skills (Ayu P, N., 2018). Furthermore, data from PISA (2012) in the Assessment Framework, stated that scientific and mathematical literacy of Indonesian children, students aged 15 years was ranked 38th out of 40 participating countries. For mathematical literacy is ranked 50th out of 57 countries, and scientific literacy is ranked 50th out of 57 countries. While data from the Progress in International Reading Literacy Study (PIRLS) in the field of reading in grade IV elementary school children around the world is under the coordination of The International Association for the Evaluation of Educational Achievement (IEA) which is attended by 45 countries or states, both coming from developed countries as well as from developing countries, the results show that Indonesian students are ranked 41st in terms of reading and writing interest research objects (Warsihna, Jaka., 2016).

This problem is in line with research (Fuadi, H, et al., 2020) which states that the factors that cause students' low scientific literacy include the selection of textbooks, misconceptions, non-contextual learning, and students' reading abilities. Furthermore, in another study by (Wiguna, A, et al., 2022) found that 1) low interest in reading, the findings show that the existence of School Literacy Movement (GLS) activities is a solution to increase interest in reading, 2) poor reading culture , 3) Low reading comprehension skills, 4) low awareness of reading from various parties, 5) technological

limitations. According to (Fortuna, RA & Yanti F., 2021) there are three ways to increase student information literacy, including: 1) conducting online learning effectively to increase student interest in learning and foster student curiosity, 2) teachers provide learning resources that are a lot as reading material in learning and increasing students' insights, and 3) parents and teachers must work together in monitoring, facilitating, and motivating students to develop their learning patterns, so that learning takes place effectively and can increase students' information literacy.

Recognizing the importance of literacy for the community, the Government through the Ministry of Education and Culture is trying to increase reading and writing literacy for the community, especially students (Warsihna & Jaka, 2016). One of the factors that influence students' scientific literacy skills is reading ability (Rusdi, A., et al, 2017). This reading skill is seen as one of the main pillars of language skills so it must be taught. This is because the ability or skill to read can make a significant contribution to language learners in accelerating mastery of language as a skill (Wulandari, T & Haryadi., 2020).

To support the government's program to improve literacy in students, it is deemed necessary to analyze the literacy skills of high school students in order to find out the description of the literacy abilities of high school students to be able to find solutions to existing problems.

## 2. Research methods

The research method used by the author is descriptive with a qualitative and quantitative approach according to the problem being studied by the author, namely to obtain an overview of the extent to which the literacy skills of high school students in Binanga are.

Data collection techniques in this study were by giving tests, questionnaires, and observing the learning process. The data collected comes from samples that aim to get an overview of certain aspects or characteristics of the population where the sample comes from.

The population in this study were high school/MA students in class XI IPA in the odd semester of the 2021/2022 academic year. The sampling technique used the cluster random sampling method.

The author took data from 2 schools of SMA Negeri 1 Barumun Tengah and MAN 2 Padang Lawas with a total sample of 120 students.

Furthermore, the data obtained from the field were then analyzed. The final results of all test instruments in the form of overall percentages and for each indicator. The final score is categorized based on the level of literacy which consists of very high, high, medium, low and very low. Correct answers are given a score of 1 (one) and wrong or unanswered answers are given a score of 0 (zero). The value of students' literacy skills in both reading, numeracy and science is calculated by calculating the percentage between the correct score and the maximum total score (Purwanto, 2008).

The percentage of scores obtained by students is grouped into very high, high, medium, low and very low criteria as in the following table.

**Table 1** Criteria for assessing students' *scientific literacy abilities*

| No | Category | intervals |
|----|----------|-----------|
| 1 | Very high | 86-100 |
| 2 | Tall | 76-86 |
| 3 | Currently | 60-75 |
| 4 | Low | 55-59 |
| 5 | Very low | $\leq 54$ |

## 3. Results and Discussion

### *Reading Literacy Ability*

The instrument used to measure students' reading literacy skills was using a questionnaire, in this case the researcher gave 25 test questions and a questionnaire from the PIRLS Framework. This test is used to determine reading ability in the process of understanding and reading goals of students. The following are indicators for measuring students' reading literacy skills:

**Table 2** Indicators of Students' Reading Literacy Ability

| No | Aspect | Question Number |
|----|--------|-----------------|
| 1 | The number and variety of reading books in the school | 2, 4, 6, 9, 10 |
| 2 | The frequency of borrowing books in the school library | 1, 3, 7, 13 |
| 3 | The number of activities in schools related to reading literacy | 5, 8,11, 16 |
| 4 | There is a reading community at school | 12, 14, 15, 17 |
| 5 | Aspects of understanding (accessing and retrieving information from texts, integrating and interpreting reading content, reflecting on and evaluating texts, and connecting text content with the reader's experience). | 19, 20, 21, 22, 23 |
| 6 | Results of student work on reading literacy | 18, 24, 25 |

The following are the results obtained from the field regarding the reading literacy skills of students at high school in Binanga.

**Table 3** Students' Reading Literacy Ability

| No | Category | The number of students | Percentage |
|----|----------|------------------------|------------|
| 1 | Very high | 12 | 10% |
| 2 | Tall | 13 | 10.83% |
| 3 | Currently | 14 | 11.67% |
| 4 | Low | 63 | 52.5% |
| 5 | Very low | 18 | 15% |
| | Amount | 120 | 100% |

**Table 4** Percentage of Scores per Indicator of Students' Reading Literacy Skills

| No | Aspect | Percentage |
|----|--------|------------|
| 1 | The number and variety of reading books in the school | 70.5% |
| 2 | The frequency of borrowing books in the school library | 60.4% |
| 3 | The number of activities in schools related to reading literacy | 44.38% |
| 4 | There is a reading community at school | 42.71% |

| | | |
|---|---|---|
| 5 | Aspects of understanding (accessing and retrieving information from texts, integrating and interpreting reading content, reflecting on and evaluating texts, and connecting text content with the reader's experience). | 46.33% |
| 6 | Results of student work on reading literacy | 47.78% |
| | **Average Percentage** | 52.02% **(Low)** |

Based on the data above, information can be obtained that there are several categories of students' reading literacy abilities according to the percentage of correct scores for each indicator. On the indicators of the number and variety of reading books in schools and the frequency of borrowing books in the library each obtained a score percentage of 70.5% and 60.6%, including the moderate category. As for the other indicators, they are included in the very low category with a score percentage of ≤ 54%. However, in general, the average percentage for reading literacy skills of high school students is in the low category.

This result is in line with research conducted by (Yanti, R, et al., 2020) which stated that out of 31 students (27.67%) who had reading habits in the very high category, 35 students (31.25%) had reading habits in the very high category. in the high category, 31 students (27.67%) had reading habits in the low category, and 15 students (13.39%) had reading habits in the very low category. From this data, information was obtained that reading habits were in the low and very low categories, which reached 46 students (41.06 % ).

***Students' Science Literacy Ability***

*Scientific* literacy ability is measured by providing 15 multiple choice questions with 3 indicators taken in PISA (2018), the indicators are presented in the following table:

**Table 5** Indicators of Student *Science Literacy*

| No | Aspect | Number |
|---|---|---|
| 1 | Explain phenomena scientifically | 1, 2, 5, 10, 13 |
| 2 | Evaluating and designing scientific investigations | 3, 4, 6, 8, 11 |
| 3 | Interpret data and evidence scientifically | 7, 9, 12, 14, 15 |

The following are the results obtained from the field regarding the *scientific literacy abilities* of HIGH SCHOOL students in Binanga.

**Table 6** Students ' *Science* Literacy Ability

| No | Category | The number of students | Percentage |
|---|---|---|---|
| 1 | Very high | 7 | 5.83% |
| 2 | Tall | 13 | 11.22% |
| 3 | Currently | 16 | 13.22% |
| 4 | Low | 25 | 20.72% |
| 5 | Very low | 59 | 49.00% |
| | **Amount** | **120** | 100% |

**Table 7** Percentage of Scores per Indicator of Students ' *Science* Literacy Skills

| No | Aspect | Percentage |
|---|---|---|
| 1 | Explain phenomena scientifically | 51.00% |
| 2 | Evaluating and designing scientific investigations | 48.33% |
| 3 | Interpret data and evidence scientifically | 47.67% |
| | **Average Percentage** | 49% |

From the data above, it can be explained that students' scientific literacy skills according to the percentage of correct scores for each indicator are still in the very low category. Indicators explain scientific phenomena (51.00%), evaluate and design scientific investigations (48.33%), interpret data and evidence scientifically (47.67%). The average percentage score of the three indicators is 49%, this figure is below ≤ 54 in the very low category.

The results of this study are in line with research conducted by (Sutrisna, 2021) which states that the average scientific literacy score of Class X high school students in the city of Sungaipuh is 31.58, which is in the low category. Furthermore, research (Angraini, G., 2014) states that the scientific literacy ability of class X students in Solok city is still in the very poor category with a percentage of 27.94 % (very low ≤ 54%), the causative factors include subject matter that has never been studied, students not used to working on questions that use discourse, and learning processes that do not support students in developing scientific literacy skills.

Furthermore, in another study by (Dwisetiarezi, D & Yanti F., 2021) argued that students were not yet capable of the science process, namely carrying out indicators of identifying scientific questions and using scientific evidence with a science process percentage value of 43.08%. Students are not yet capable of the attitude aspect, namely carrying out the indicators of scientific literacy in new ideas and knowledge being a point of the habit of scientific scholars with an attitude percentage value of 60.26%. Furthermore (Hasasiyah, SH, et al., 2020) stated that junior high school students' scientific literacy skills were low in the aspect of understanding and interpreting basic statistics, with scores obtained in the aspect of identifying valid scientific opinions (58%), understanding elements of research design on findings (24%), able to solve questions based on scientific phenomena (32%), understand and interpret basic statistics (21%) and students are able to make inferences, predictions, and draw conclusions based on data (39%).

Based on experience in the field, there are several factors that cause students' low scientific literacy, including: 1) they have never worked on scientific literacy questions previously related to research results; 2) students' habits prefer to memorize learning material rather than understand it so they don't understand its application in everyday life. Therefore, educators should have high scientific literacy skills and critical thinking skills. This is very important so that they can develop their students' scientific literacy skills (Hasiyah, SH, et al., 2020). The low ability of students' scientific literacy is influenced by several factors, namely low interest in reading, evaluation tools that have not yet led to the

development of scientific literacy, and the teacher's lack of knowledge about scientific literacy (Sutrisna, 2021).

In another opinion, several factors cause the low scientific literacy of students in Indonesia, including: students' low understanding of the nature of science; students have not been able to apply science concepts in everyday life, students are only able to understand science in theory; the low ability of students to read and interpret data in the form of images, diagrams, and tables; low ability to think critically, reason scientifically, think creatively, and solve problems (Utami, F., and Endang, S., 2022).

***Students' Mathematical Ability***

The research instrument used in measuring students' mathematical literacy in this study was a test consisting of 10 essay questions. The guidelines for assessing mathematical literacy abilities used by researchers were adapted from the aspects of NCTM's mathematical literacy skills (2000).

**Table 8** Mathematical Literacy Indicator Student

| No | Aspect | Maximum Score |
|---|---|---|
| 1 | Solve and formulate problem | 15 |
| 2 | Implement a concept or procedure mathematics | 15 |
| 3 | Explain the solution and interpret the conclusion | 20 |
| | **Amount** | **50** |

The following are the results obtained from the field regarding the mathematical literacy abilities of high school students in Binanga.

**Table 9** Students' Mathematical Literacy Ability

| No | Category | Number of Students | Percentage |
|---|---|---|---|
| 1 | Very high | | 4.17% |
| 2 | Tall | | 5% |
| 3 | Currently | | 24.17% |
| 4 | Low | | 54.17% |
| 5 | Very low | | 13.33% |
| | **Amount** | | **120** |

**Table 10** Percentage of Score Per Indicator
Students' Mathematical Literacy Skills

| No | Aspect | Percentage |
|---|---|---|
| 1 | Solve and formulate problem | 60.13% |
| 2 | Implement a concept or procedure mathematics | 55.28% |
| 3 | Explain the solution and interpret the conclusion | 45.25% |
| | **Average Percentage** | 50.26% |

Based on the data above, information can be obtained that there are several categories of students' mathematical literacy abilities according to the percentage of correct scores on each indicator. On the

indicators of solving and formulating problems, the percentage score of 60.13% is in the moderate category, applying mathematical concepts or procedures, the percentage score is 55.28%, it is in the low category, explaining the completion and interpreting conclusions, the percentage score is 45.25%, it is in the very low category. Meanwhile, the average percentage of students' mathematical literacy skills is 50.26%, which is included in the very low category.

This research is in line with the results of research (Rifai & Dhoriva, UW, 2017) suggesting that the mathematical literacy abilities of students of State Junior High schools in Bantul Regency for the process domain of formulating mathematical situations are included in the high category with a percentage of , for the process domain using concepts, facts, procedures, and Mathematical reasoning is included in the low category and in the process domain of interpreting, applying, and evaluating mathematical results, it is included in the very low category with an average percentage of 20.66%. Furthermore (Farida, NR ., et al, 2021) has researched the results show that students with high abilities are able to demonstrate good mathematical literacy skills, that is, students are able to fulfill the three aspects of the mathematical process, namely formulate, employ and interpret well. Moderately capable students are only able to fulfill two indicators in the aspect of the mathematical process, namely formula and employ. Students with low abilities cannot fulfill all the indicators in the aspects of the mathematical process, students with low abilities only fulfill one aspect of the mathematical process, namely the formula.

Subsequent research that supports this has been carried out by (Muzaki, A and Masjudin, 2019) stating that students can solve routine questions belonging to the high KAM category with a percentage of 19%, interpret problems and solve them with formulas, carry out procedures well, be able to handle situations complex and use their reasoning in solving problems, and students are able to work effectively and interpret different representations and then relate them to the real world (Level 4). Students belonging to the moderate KAM category (66%) can solve routine questions, interpret problems and solve them with formulas, and carry out procedures properly (Level 3). Students with low KAM category (15%) were only able to solve routine questions (level 1).

Based on the information in the table above, data on students' literacy abilities from the highest to the lowest is presented as follows.

**Table 11 Literacy Ability of high school Students**

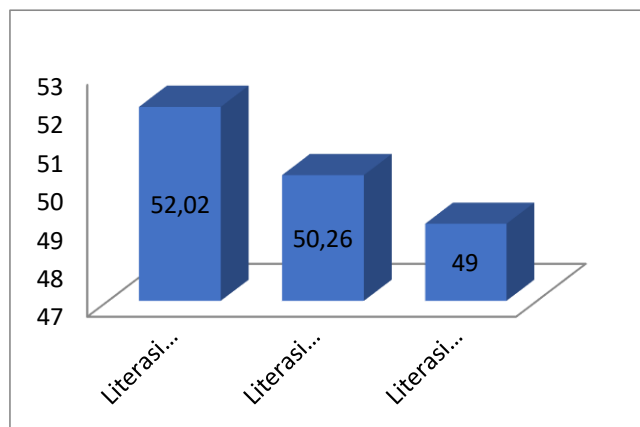| No | Literacy Type | Percentage |
|----|---------------|------------|
| 1 | Literacy Reading | 52.02% |
| 2 | Mathematical Literacy | 50.26% |
| 3 | Science Literacy | 49.00% |
| | **Average Percentage** | 50.43% |

**Figure 1** Percentage Graph Student Literacy Ability

From the graph above, information on students' literacy skills can be obtained from the highest to the lowest, namely reading literacy ability of 52.02%, mathematical literacy ability of 50.26% and the lowest is scientific literacy ability of 49.00%.

This situation shows the weakness of students' literacy skills, even though the government has actually launched a literacy program since the end of 2015 known as the National Literacy Movement (GLB), or now called the National Literacy Movement (GLN). Optimizing this program also requires the active participation of stakeholders at all levels and types of education that cover the entire school ecosystem (Mahfudh, MR & Ali Imron, 2020).

In addition, a learning approach that supports all literacy components also needs to be used to facilitate the program. Because the optimization of a program will not run well if it does not involve all components of the school. For this reason, the role of the school principal is becoming increasingly important because of his position as a policy maker as well as spearheading the progress of an educational institution (Mahfudh, MR & Ali Imron, 2020).

Research that supports this has been carried out by (Wulandari, T & Haryadi., 2020) showing that: (1) there is a positive and significant influence between the school literacy movement on reading interest as indicated by the t count > t table ($_{6.315} > _{1.980}$) ; (2) there is a positive and significant influence between the school literacy movement on reading skills as indicated by the t count $_{>}$ t $_{table}$ (6.3397>1.980); (3) the influence of the school literacy movement on reading interest is 25.6%; (4) the influence of the school literacy movement on reading skills is 26.1%. Students' scientific literacy abilities are dominantly influenced by reading habits so students should be trained and accustomed to working on questions that test and can improve scientific literacy skills (Yanti, R, et al., 2020)

## 4. Conclusion

Based on the description and description above, it can be concluded that the reading literacy skills of high school students are still relatively low, the scientific literacy skills of high school students are still relatively low and the math literacy skills of high school students are still relatively low. So it can

be concluded that the reading literacy, scientific literacy and mathematical literacy abilities of the two sample schools in the Binanga area are still in the low category.

**References**

Arohman, M. et al. 2016, *Scientific Literacy Ability of Students in Ecosystem Learning,* Proceedings of Biology Education Conference, Volume 13 No. 1: 90-92.

Ayu P, N., 2018, The Relationship between Reading Habits and Scientific Literacy Ability of High school Students in East Jakarta, Bioma, Volume 7 No.2: 161-171.

Dwisetiarezi, D & Yanti F., 2021, *Analysis of Students' Science Literacy Ability in Integrated Science Learning in Elementary Schools,* Basicedu Journal, Volume 5 No.4 : 1958-1967.

Farida ,NR ., et al., 2021, *Analysis of the Mathematical Literacy Ability of Class X High school Students in Solving Problems Type of Pisa Content Change and Relationship* , Scholar's Journal: Journal of Mathematics Education, Volume 5 No.3: 2802-2815.

Fortuna, RA & Yanti F., 2021, *Efforts to Improve Scientific Literacy of Elementary School Students in Online Learning Due to Covid-19* , Basicedu Journal, Volume 5 No.4 : 2054 – 2061.

Fuadi, H , et al ., 2020, *Analysis of Factors Causing Low Students' Scientific Literacy Ability* , Educational Professional Scientific Journal, Volume 5 No.2: 108-116.

Harahap, DGS, et al., 2022, *Analysis of Elementary School Students' Literacy Ability,* Basicedu Journal Volume 6 No.2 : 2089 – 2098.

Hasasiyah , SH , et al., 2020, *Analysis of Science Literacy Ability of Middle School Students on Blood Circulation Materials,* Journal of Science Education Research, Volume 6 No.1: 5-9.

Mahfudh, MR & Ali Imron., 2020, *Principal's Strategy in Improving Students' Reading Literacy at SMA Negeri 1 Kota Kediri,* Indonesian Journal of Islamic Education Studies (IJIES), Volume 3 No.1 : 16-30.

Muzaki, A and Masjudin, 2019, *Analysis of Students' Mathematical Literacy Ability,* Mosharafa: Journal of Mathematics Education, Volume 8 No.3: 439-502.

Nurhasanah. , et al , 2020, *Development of Science Literacy Research in Physics Learning in Indonesia,* Education Science, Volume 12 No.1 : 38-46

OECD. 2009. *PISA 2009 Assessment Framework : Key Competencies in Reading, Mathematics, and Science* . Paris: OECD Publishing.

OECD. 2014. PISA 2012 Results in Focus. Program for International Student Assessment, 1–44. http://doi.org/10.1787/97892 64208070-en

OECD. 2017. *Program for International Student Assessment: Result From PISA 2015.* http://www.oecd.org/pisa/

Rifai & Dhoriva, UW, 2017, *Mathematical Literacy Ability of State Middle School Students in Bantul Regency,* Journal of Mathematics and Science Education, Volume 4 No.2 : 152-162

Sumbi, D., et al, 2020, *Analysis of Students' Mathematical Literacy Ability in Solving Mathematical Problems in the Form of Story Problems* , Journal of Mathematics and Science Education, Volume 8 No.1: 36-43.

Sutrisna, N ., 2021, *Analysis of Scientific Literacy Capability of High school Students in Sungai Full City* , Volume 1 No.12:

Rusdi, A., et al. , 2017, *The Relationship between Reading Ability and Attitudes Towards Science with Scientific Literacy in Class XI IPA MAN Students* , Proceedings of the National Seminar III on Biology and Learning, Hal: 314-325.

Utami, F., and Endang, S., 2022, *Scientific Literacy Ability of Students Using Problem Based Learning in Excretion System Material* , Journal of Educational Learning and Innovation, Volume 2 No.2 : 240-250

Wiguna, A, et al. , 2022 , *Problems of Reading Literacy in the Next Generation of the Nation in Facing the 21st Century,* Naturalistic: Journal of Research and Education and Learning Studies, Volume 7 No.1: 1478-1489.

Wulandari, T & Haryadi., 2020, *The Influence of the School Literacy Movement on Reading Interest and Reading Skills of SMAN 1 Purworejo Students,* Journal of Indonesian Language and Literature Education, Volume 9 No.2: 92-97.

Yanti, R, et al., 2020, *Analysis of Scientific Literacy Ability in View of Reading Habits, Learning Motivation and Learning Achievement* , INQUIRI: Journal of Science Education Vol. 9, No. 2 : 147-155.