Jurnal Inovasi Pembelajaran Fisika
(INPAFI)

*Available online http://jurnal.unimed.ac.id/2012/index.php/inpafi*
*e-issn 2549-8258, p-issn 2337-4624*

# THE EFFECT OF INTEGRATED CHARACTER EDUCATION IN PROBLEM SOLVING STRATEGY TO STUDENTS RESPONSIBILITY AND PHYSICS PROBLEM SOLVING COMPETENCY

**Ridwan Abdullah Sani and Sartika Ramadhani Nasution**
Jurusan Fisika FMIPA Universitas Negeri Medan
*ridwanunimed@gmail.com*
Diterima: Juni 2017; Disetujui: Juli 2017; Dipublikasikan: Agustus 2017

***ABSTRACT***

*Encountered problem at school under research is student"s low ability in physics problem solving and low responsibility in completing assignment. The objectives of this research are to know:(1) the effect of character education implementation in improving students responsibility using problem solving strategy, (2) the effect of character education implementation in improving student's problem solving competency of physics problem. The research method was quasi experimental, using one experimental with the implementation of problem solving strategy with character education, and one control class with problem solving strategy without character education. Students responsibility data was obtained by direct observation using observation sheet and psychology test, and physics problem-solving competency was obtained using essay test. The data was analyzed using chi-square. These results indicate that implementation of character education give effect to the improvement of students responsibility and student's problem-solving competency of experimental class is also better than students of control class.*

***Key words:*** *character education, physics, problem solving strategy, responsibility*

**ABSTRAK**

Salah satu permasalahan dalam pembelajaran fisika di sekolah yang ditelilti adalah rendahnya kompetensi siswa dalam menyelesaikan masalah serta kurangnya tanggungjawab dalam memenuhi tugas pembelajaran. Tujuan dari penelitian ini adalah: (1) mengetahui pengaruh penerapan pendidikan karakter terhadap peningkatan tanggung jawab siswa dengan menggunakan strategi pemecahan masalah fisika, dan (2) mengetahui pengaruh penerapan pendidikan karakter dalam meningkatkan kompetensi siswa dalam pemecahan masalah fisika. Metode penelitian yang digunakan adalah quasi eksperimen, dimana diterapkan strategi problem solving dengan implementasi pendidikan karakter pada kelas eksperimen, dan strategi problem solving tanpa integrasi karakter pada kelas control. Data tanggung jawab siswa diperoleh melalui observasi menggunakan lembar observasi dan tes psikologi, sedangkan data kemampuan pemecahan masalah fisika diperoleh menggunakan tes essay. Data dianalisis menggunakan chi-kuadrat. Penelitian ini menunjukkan bahwa pelaksanaan pendidikan karakter memberikan pengaruh terhadap peningkatan tanggung jawab siswa, dan diketahui bahwa kemampuan siswa dalam pemecahan masalah fisika di kelas eksperimen lebih baik daripada siswa di kelas kontrol.

**Kata kunci:** *fisika, pendidikan karakter, strategi problem solving, tanggung jawab*

## INTRODUCTION

The national education objective states in UU No. 20 of 2003 about *Sistem Pendidikan Nasional (Sisdiknas),* is to develop skills and form the character and civilization of the nation's dignity. The character education must become educational institution responsibility to incorporate through school program and/or teaching and learning process. However, unsuccessful investment in education has resulted in less moral of learners who are not have character such as honesty, responsibility, discipline, etc. Many corrupt practices harm the State, which result from loss of honesty and responsibility. While in the classroom, students are cheated when doing test, also in completing tasks assigned by the teacher.

Many people think that loss of honesty and responsibility of student supposedly originated from education process at school. This condition occur because the learning process of moral education and character were limited to civic intellegence and less prepares students to address and deal with real life that most contributed to this situation. Based on the results of Afiya research (in Zubaedi, 2011:3), religious education includes moral teaching materials, tend to focus on the enrichment of knowledge (cognitive), whereas the formation of attitudes (affective), and habituation (psychomotor) are minimal. Furthermore, most of learning subject more focused on intellectual or cognitive development, while the soft skills aspect or non-academic as the main element of character education has not been considered and even ignored.

Due to less character society as a harvest of education, beginning in 2010 Ministry of National Education has sought an integrated character education innovation which must be impelemented into all learning subjects all levels of education. Implementation of character education in all subject matter is relevant with Anderson statement (2000:140): "Character education should not be taught as a separate curriculum, but must be entwined in all curriculums".

The development of character values of students can be done through the science subjects according to Sumaji et al, as cited by Sofyan Sauri (in Zubaedi, 2011:292), because science contains a lot of value of life. Many important values of life can be learned from science, and teacher could used science teaching as a tool for shaping students' character. In this case, students can be invited to examine and learn the values that are useful in the society. There are relation of character implementation and student achievement, as shows by Benninga research that schools with higher total character education implementation tended to have higher academic scores on academic measures (Benninga, et. al, 2003:19).

Learning science, especially physics subjects is one of the less desirable to students. This condition results in low achievement in mastering physics concepts and problem solving competency. The condition was also exist at SMP Muhammadiyah 1 Medan which was under research. This research was conducted at junior high school because the students are in the age to adolescence and critical period of moral development.

Komalasari (2012: 246) research shows that living values-based contextual learning at university (e.g. problem based learning) is an alternative of character education integration model in learning process could be used to develop the students' characters including responsibility. Problem based learning may be difficult to implement at junior high school, but problem solving is suitable. Ifamuyiwa and Ajilogba (2012:122) research shows that problem solving instructional strategy is more effective in enhancing students' achievement and retention rather than the conventional teaching method.

Problem solving strategy is a form of learning strategies based on understanding constructivism. Problem solving is a very important part in learning physics (Heller, Keith, and Anderson, 1991:627). Problem solving can help students to process information that already exists in the minds of students and help students to construct knowledge. Problem

solving strategies is appropriate for integrating the character of learning because, according to Zubaedi (2011:240) that there are some skills that are necessary for someone to practice the values that are shared so that constructive and moral behavior in society. One of these skills are the skills to resolve conflicts. Berkowitz and Bier (in Sani, 2011:3), argued that practicing problem solving is necessary in forming the character of empathy, social skills, conflict resolution, life skills, etc. Problem solving is a strategy of teaching where students are given problems, then asked to solve. The purpose of problem-solving strategy is to encourage the students how to think systematically and logically in solving a problem. Student competency as well as their character will grow if they learn collaborately and interactive which emphasizes communications in order to solve given problems. One of the advantages of solving problems is help the students to develop new knowledge and responsible in learning process (Sanjaya, 2009:220).

Problem solving approach is student centered learning, so discussions with other friends of the newly learned concepts is needed to make them understand how to solve challenged problem. Gok and Silay (2010:7) research shows that problem solving strategies was more effective in cooperative learning than conventional teaching. Problem solving with discussion method provides the opportunity for students to take more responsibility for the success of the group and the results of solving problems that have been discussed. Pala (2011:30-31) suggest to use collaborative work in learning which could develop student's appreciation of others, perspective taking, and ability to work toward common goals.

Several problem arises in teaching and learning physics, related to student achievement and their character at SMP 1 Muhammadiyah Medan. The role of affective in solving problem is state by Aldous (2007:184): "… encouraging them not to give up because a solution is not immediately apparent". Researcher believed that student with higher responsibility in learning could achieved better results. The question is: Is implementation of character education using problem solving strategy could improve student responsibility and problem solving competency?

### Research objectives

The objectives of this research are:

1. To study the effect of character education implementation using Problem Solving strategy in improving of students responsibility Junior High School.
2. To study the effect of character education implementation using Problem Solving strategy at Junior High School student competency in physics problem solving.
3. To study correlation between students responsibility and problem solving competency in problem solving learning strategy by implementation of character education.

## RESEARCH METHOD

The research was conducted at SMP Muhammadiyah 1 Medan in April-May, second semester of academic year 2011/2012. The sample in this research is two classes of Class VIII, one as an experimental class with implementation of character education using Problem Solving strategy and one class is a control class that was treat using Problem Solving strategy without character education implementation.

### Research Design

The type of research that used is a quasi experiment. The research involved two classes, namely experimental and control class, where the classes are treated differently. Observation sheet and psychological test was used to see the increasing of student responsibility, and essay test related to problem solving was used to determine student's competency in physics problem solving.

**Table 1.** Two group pretest-posttest design

| Class | Pre-test | Teatment | Post-test |
|---|---|---|---|
| Experiment Class | $T_1$ and $P_1$ | PS with IC | $T_2$ and $P_2$ |
| Control Class | $T_1$ and $P_1$ | PS without IC | $T_2$ and $P_2$ |

Description:

$T_1$ = Initial psychological test before treatment.
$T_2$ = Final psychological test after treatment.
$P_1$ = Initial problem solving test before treatment
$P_2$ = Final problem solving test after treatment
IC = Integration of character education
PS = Problem Solving

The collected data consist of the improvement of students responsibility and problem solving competency. The procedure of obtaining the data are:

1. Measurement of initial student responsibility using validated psychological test before treatment. Interview the teacher about student's responsibility, and observed student in classroom for triangulation.
2. Measurement of initial student competency using 5 item essay test about light and optical instruments before treatment.
3. Conducting teaching and learning of Integrating Character Education using Problem Solving strategy with Discussion Method in the experimental class (X) and teaching using Problem Solving strategy with Discussion Method in the control class (Y). Teacher and collaborator were observed student behavior using prepared observation sheet related to responsibility.
4. Measurement of the final responsibility using the psychological test

Measurement of student problem solving competency about light and optical instruments using test after treatment.

**Table 2.** Description of Final Score for Student Responsibility Test

| No | Range | Score |
|---|---|---|
| 1 | 77 – 100 | High |
| 2 | 53 – 76 | Medium |
| 3 | 30 – 52 | Low |

In this research, data observation is more valuable and compared to another data for triangulation of student character data.

Assessment criteria of character follows the guide of *Panduan Pendidikan Karakter di SMP*.

$$\text{Final score} = \frac{\text{score}}{\text{maximum score}} \text{ x } 100$$

Teacher observation score for each students was interpreted according to table 3.

**Table 3.** Teacher Observation Score

| Category | Score |
|---|---|
| High Responsibility | 3 |
| Medium Responsibility | 2 |
| Low Responsibility | 1 |

Maximum Score = 12
Minimum Score = 9

Student competecy was measured using test which is divided by pre-test and post-test. The formula that used to categorized students score is:

$$\text{P} = \frac{\text{total score of students}}{\text{ideal maximum score}} \text{ x } 100$$

**Table 4.** Category of Problem Solving Competency

| Category | Percentage |
|---|---|
| High | 75 – 100 |
| Medium | 55 – 74 |
| Low | 54 or less |

Improvement of student responsibility and problem solving competency is calculated using gain after treatment and before treatment. Score of gain is determined from subtraction of post-tests by pre-test score for problem solving competency, i.e.:

$$G = S_f - S_i$$

Description:
$G$ = Gain,
$S_f$ = posttest score,
$Si$ = pretest score

Normalized gain (<g>) is the ratio of actual gain score (gain of student achieved) with maximum gain score, the highest score that achieved. Criteria of normalized gain is according to (Hake, 1998:6) on table below.

**Table 5.** Criteria of normalized gain

| Criteria | Normalized gain |
|---|---|
| High | (<g>) > 0.7 |
| Medium | 0.7 > (<g>) > 0.3 |
| Low | (<g>) < 0.3 |

## Data Analyzing Technique

Student responsibility data in this research is categorical, so chi-square was used to analyze the data and testing the hypothesis. Table for calculating chi-square, are table 6, table 7, and table 8.

**Table 6.** Frequency Distribution Students Responsibility and Problem Solving Competency After Treatment

| Student Responsibility | Problem Solving Competency | | |
|---|---|---|---|
| | Low | Medium | High |
| Low | A | B | C |
| Medium | D | E | F |
| High | G | H | I |

**Table 7.** Improvement of Students Responsibility

| Teaching and Learning Process | Students Responsibility | | |
|---|---|---|---|
| | Not improve | Improve | Significantly Improve |
| With character integration | CN | CI | CS |
| Without character integration | WN | WI | WS |

**Table 8.** Improvement of Student Problem Solving Competency

| Teaching and Learning Process | Problem Solving Competency | | |
|---|---|---|---|
| | Not improve | Improve | Significantly Improve |
| Problem Solving with character integration | PCN | PCI | PCS |
| Problem Solving without character integration | PWN | PWI | PWS |

## Research Hypothesis

The formulation of research hypothesis in this study are:

a. First Hypothesis
   $H_a$: There is effects of character education implementation using Problem Solving Strategy for improvement student responsibility.
   $H_o$: No effect of character education implementation using Problem Solving Strategy for improvement student responsibility.
b. Second Hypothesis
   $H_a$: There is effects of character education implementation using Problem Solving Strategy for improvement of problem solving competency.
   $H_o$: No effect of character education implementation using Problem Solving Strategy for improvement of problem solving competency.
c. Third Hypothesis
   $H_a$: There is any correlation between students responsibility and problem solving competency in problem solving learning strategy by implementing of character education.
   $H_o$: No correlation between students responsibility and problem solving competency in problem solving learning strategy by implementing of character education.

For hypothesis test, this research use chi-square with the following formula:

$$\chi^2 = \sum_{i=j}^{B}\sum_{j=1}^{K}(O_{ij} - E_{ij})^2 / E_{ij}$$

Testing criteria are: reject $H_o$ if $\chi^{2}_{(1-\alpha)} > \{(B-1)(K-1)\}$ in significant level = $\alpha$ and degrees of freedom (dk) for distribution chi-square = (B-1) (K-1).

## RESULT AND DISCUSSION

### Student Responsibility of Experimental Class

Problem solving competency test and psychological test were given to 37 students of experiment class and 43 students of control class. Based on data obtained from students responsibility test, it is found that class with treatment of integrating character education using problem solving strategies got an average of the initial responsibility test score greater than the average of final test. The average initial test score is 75.55, while the average of the final test score is 73.55. The average normalized gain of -0.08 is low category based on Hake category (1998:65). However, based on the observation sheet, student's shows significant improvement of responsibility in the class with the integration of character education. The distribution of responsibility test scores obtained by students in the experiment class is shown in table 9.

**Table 9.** Students Responsibility Score of Experiment Class (test result)

| Test | $X_{min}$ | $X_{max}$ | $X_{average}$ | <g> | Category |
|---|---|---|---|---|---|
| Initial | 62 | 85 | 75.55 | - 0.08 | Low |
| Final | 51 | 89 | 73.55 | | |

The average increase of student responsibility test of the experimental class is not significant. This condition is affected by some student with decreased score which have effect the average score. Observation results is different with the observation result done by researcher in experiment class. Observation results of student responsibility with treatment of integrated character education using Problem Solving strategy is shows in table 10. Based on observations, the researchers seek to determine the gain <g> increase responsibility of students who integrated the characters in the experimental class. From this results we concluded that psychological tes related to student responsibility could not be used as a valid instruments for measuring character. Observation data is match with student behavior as compared to data from another teacher.

**Table 10.** Students Responsibility Score of Experiment Class (observed)

| Observation | $X_{min}$ | $X_{max}$ | $X_{average}$ | <g> | Category |
|---|---|---|---|---|---|
| Before | 33.33 | 88.89 | 81.17 | 0.33 | Medium |
| In research | 77.78 | 100.00 | 87.04 | | |

Based on the table, there is an increase in student responsibility derived from observations. This can be explained from the average yield obtained at baseline and the end of study of 81.17 and 87.04, respectively. The normalized gain obtained from the integrated character education class is increasing student responsibility score of 0.33. Based on the criteria of average normalized gain (<g>) defined by Hake (1998:65), the implementation of Character Education could improve students responsibility to medium category. This result is compared to another observation data, i.e: data of student submission of several assignment, table 11.

**Table 11.** Observation Result of Experiment Class

| Observation | Item | | |
|---|---|---|---|
| | I | II | III |
| Before research | 2.61 | 2.81 | 1.89 |
| Research | Submission of assignment I | | |
| | 3.00 | 2.22 | 2.28 |
| | Submission of assignment II | | |
| | 3.00 | 2.47 | 2.69 |

Description:
I = Turn assignment on time
II = Do assignment completely
III = Writing assignment well

Recorded observation of assignment completing and submission was conducted by

the researcher in order to compared with observation sheet data. From the observation results, it is shows some increasing in discipline (item I) and responsibility in doing the assignment (item III), despite item II was decline in the provision of first assignment. This condition is due to the difficulty in doing the assignment, while the assignment before treatment is easier. However, item II is increase of the next task although the assignment is more difficult. It can be seen from the average value of observations that have been observed, before conducting the study, the item I (collect assignment on time) there are students who are late to collect the assignment with the average yield of 2.61. However, in the lessons with integrated character education, the responsibility is improve significantly, where all students are on time in collecting the assignment with an average yield of 3.00 (maximum score) for the first and second assignment. At the previous attempt, item II (do assignment completly) there a decline from baseline. However, at the second attempt, item II is increase from 2.22 to 2.47. The decline of item II is also due to changes in classroom condition which is taught by different teachers (researcher). However, when researcher advice the students to complete the task with character building techniques, students realize that they have a responsibility to do the tasks completely. Furthermore, based on observations in item III, the average yield continues to increase from prior to research until finish the research that is of 1.89 before the study until 2.28 in the provision of the first task and 2.69 on the second assignment submission.

Several examples of cases obtained by the researchers, is presented in order to reflect the process at experimental class, e.g.:

- One of the students who are late in collecting the assignment. When researchers conducted a study to integrate character education, especially for developing responsibility, the student is become responsible to collect the assigned task on time. This was also followed by several other students.
- Another occasion is the first submitted task, is done by cheating. Researcher give advice with care and the next meeting the student is able to be responsible by trying to do the tasks by himself and when learning or doing the homework.
- Student with good responsibility (highest score) promotes positive reinforcement to other students. The effect is, several students collect the assignment one day earlier than the appointed day by the researchers. This means that the student already has a high responsibility for submission the homework that have been assignt. Based on psychology, if teachers give rewards for good behavior then that behavior will tend to be repeated. It is intended that students are encouraged to take responsibility for its role as a student.

From the data and described case above we can analyzed that the implementation of character education in improving students' responsibility for the overall effect does not affect all of the students but for some individuals.

### Student Responsibility of Control Class

Based on data obtained from the results of the responsibility test and observation, the overall responsibility of students, class without integrating character education and problem solving strategies also not improved significantly. The average initial test score is 72.41 while the average of the final test score is 74.46. From these data, it can be said that in general the responsibility of students did not experience a significant increase although the final test score is greater than the initial test. The average normalized gain is only 0.07 which is low category based on Hake (1998:65). This result is also confirmed with the data obtained from observations of individual student by researchers. The distribution of scores obtained by students in the control class is presented in table 12. Researcher did not find any student with significant improvement of responsibility in the control class.

**Table 12.** Students Responsibility Score of Control Class (test)

| Test | $X_{min}$ | $X_{max}$ | $X_{average}$ | <g> | Category |
|---|---|---|---|---|---|
| Initial | 60 | 86 | 72.41 | 0.07 | Low |
| Final | 65 | 88 | 74.46 | | |

Based on observations data, the average students responsibility even decrease. The gain <g> of student responsibility without character education (the control class) is shows in table 13. The implementation of Problem Solving strategy without taking care of student behavior proved ineffective. Contradictive results of psychology test dan observation evident of student responsibility shows that responsibility could not measured using such test. This is inline with the previous result of experiment class.

**Table 13.** Students Responsibility Score Improvement of Control Class (observed)

| Test | $X_{min}$ | $X_{max}$ | $X_{average}$ | <g> | Category |
|---|---|---|---|---|---|
| Initial | 44.44 | 88.89 | 75.71 | -1.55 | Low |
| Final | 77.78 | 100.00 | 50.39 | | |

Observation result done by researcher in control class concluded in table below:

Table 14. Observation Result of Control Class

| Observation | Item | | |
|---|---|---|---|
| | I | II | III |
| Before research | 2.63 | 2.67 | 1.51 |
| Research | Submission of assignment I | | |
| | 1.00 | 1.00 | 1.00 |
| | Submission of assignment II | | |
| | 2.26 | 1.91 | 1.91 |

Another data of student responsibility in submission of assignment was recorded in table 14 for control class. The data shows that student responsibility was decrease in each item of observation. The observations data shows the discipline and responsibility of student in submit home work and task assigned. The data before research was obtained from the science teacher using the same criteria of research observation sheet In average, item score is 2.63, 2.67, and 1.51 for item I, item II, and item III respectively. At the first occasion, a lot of student did not submit the assignment on time, the score for item I inaverage is 1.00. Student is also not responsible to complete the assignment and writing neatly, as shows by low score of item II dan item III. However, due to serious teaching using problem solving strategy, the student attitude toward problem solving is improved. This condition result in slight increase of student responsibility in fulfilling the assignments. This improvement is related to increase score of item I, item II, and item III, which is 2.26, 1.91, and 1.91 respectively.

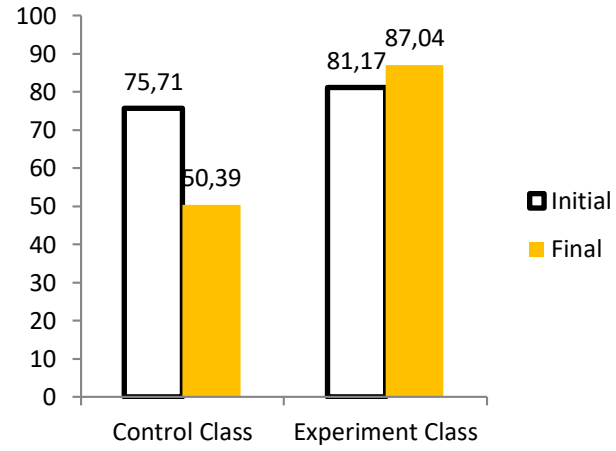


**Figure 1.** Average Students Responsibility based on Observation

Evident of student responsibility improvement with integration of character education in teaching and learning process is shows in figure 1, the initial score is 81.17 and final score is 87.04. While class without character education implementation shows decreasing score of responsibility based on observation, the initial score 75.71 and final score is 50.39. Normalized gain of students responsibility of teaching and learning without

character education is -1.55. This data could be explain from additional field notes, where the student found not interesting in learning sciences, especially physics. Without advice and encouragement in teaching and learning, there is no responsibility to achieve better results in learning. Even the student with good attitude could become less diligent in learning when researcher replacing their teacher in teaching science. Student at experimental class was treat differently using advice and encouragement as well as telling stories to motivate the student in learning. Several effort was tried to motivate the students remain diligent and not easily shaken to achieve success, even this is confronted by many difficulties. Without any sanction or punishment for who did not collect assignment, they repeat the bad attitude in next lesson. Therefore, the class which is treat by learning problem solving strategies without integrated character education behave lower attitude and their responsibility is even decreased from the previous state due to some reason that have been described previously.

## Problem Solving Competency of Experimental Class

The average improvement of students competency of experimental class is significant. The increased of problem solving competency test results before learning and after learning by integrating character education using problem solving strategies the initial and final test scores have been analyzed. The average post-test score is higher than the average score of pre-test, in general the students' problem solving competency in learning matter of Light and Optical Instruments have increased after the following teaching and learning with integration of character education using problem solving strategies. The calculation results show that the average pretest score is 8.55 while the average posttest score is 53.55, with normalized average gain of 0.5 which is in the medium category. The distribution of minimum, maximum, and average scores of the students in the experiment class is show in table 15.

**Table 15.** Problem Solving Competency Score of Experiment Class

| Test | $X_{min}$ | $X_{max}$ | $X_{average}$ | <g> | Category |
|---|---|---|---|---|---|
| Pre-test | 0 | 20 | 8.55 | 0.50 | Medium |
| Post-test | 34 | 82 | 53.55 | | |

The average improvement of problem solving competency that obtained in the experiment class and control class are presented in figure 2.

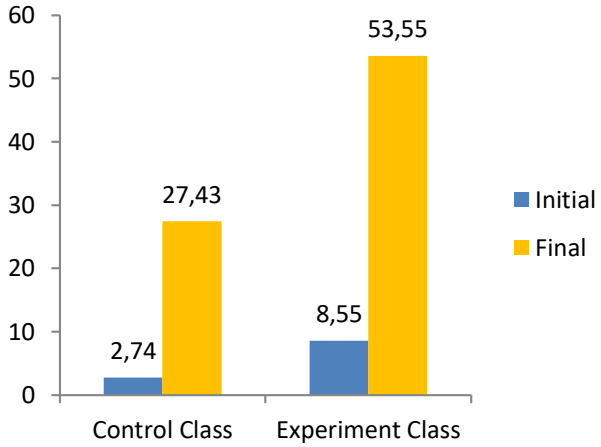


**Figure 2.** Improvement of Problem Solving Competency

Based on data obtained from the assessment score of student's problem solving competency for control class with teaching and learning problem solving strategies without integrating character education, it was found that the average pretest score is less than the average score of posttest. However, the gain is low as calculated from the average problem solving pretest score of 2.74 and the average posttest score of 27.43. The normalized gain of control clas is 0.25 which is categorized in the low category. The scores obtained by students in the control class is shows in table 16.

**Table 16.** Problem Solving Competency Score of Control Class

| Test | $X_{min}$ | $X_{max}$ | $X_{average}$ | <g> | Category |
|---|---|---|---|---|---|
| Pre-test | 0 | 16 | 2.74 | 0.25 | Low |
| Post-test | 7 | 51 | 27.43 | | |

## Hypothesis Testing

### 1. Student Responsibility

Hypothesis testing was carried out using chi-square statistics. The data of student responsibility improvement for two treatment is presented in table 17.

**Table 17.** Improvement of Students Responsibility (Observation Result)

| Treatment | Students Responsibility | | | |
|---|---|---|---|---|
| | Not Improved | Improved | Significantly Improved | Total |
| Learning process by Integrating Character Education | 23 | 6 | 4 | 33 |
| Learning process without Integrating Character Education | 35 | 0 | 0 | 35 |
| Total | 58 | 6 | 4 | 68 |

**Table 18.** Result of First Hypothesis Testing

| Kind of Data | $\chi^2_{count}$ | $\chi^2_{table}$ | Conclusion |
|---|---|---|---|
| Gain of responsibility | 12.43 | 9.21 | $H_a$ received |

The calculation results using chi-square, shows that $\chi^2_{count}$ = 12.43 which is greater than $\chi^2_{table}$ = 9.21, for dk = 2, $\alpha$ = 0.01. Because value of $\chi^2_{count} > \chi^2_{table}$ so hypothesis null is rejected, or hypothesis alternative is accepted. So, there is effects of the implementation of character education using Problem Solving Strategy for improvement of student responsibility.

### 2. Problem Solving Competency

The results of student problem solving competency improvement for two treatment is presented in table 19.

**Table 19.** Improvement of Problem Solving Competency

| Treatment | Problem Soving Competency | | | |
|---|---|---|---|---|
| | Not Improved | Improved | Significantly Improved | Total |
| Problem Solving Strategy with Discussion Method process and Integrating Character Education | 2 | 29 | 2 | 33 |
| Problem Solving Strategy with Discussion Method without Integrating Character Education | 22 | 13 | 0 | 35 |
| Total | 24 | 42 | 2 | 68 |

**Table 20.** Result of Second Hypothesis Testing

| Kind of Data | $\chi^2_{count}$ | $\chi^2_{table}$ | Conclusion |
|---|---|---|---|
| Gain of Competency | 24.67 | 9.21 | $H_a$ received |

The calculation result using chi-square shows that $\chi^2_{count}$ = 24.67 is greater than $\chi^2_{table}$ = 9.21, for dk = 2, $\alpha$ = 0.01. According to this results, the hypothesis null is rejected or hypothesis alternative is accepted. So, there is effects of the implementation of character education using of Problem Solving Strategy for improvement of student's problem solving competency. Based on the data in table 19, we can state that the ability of student in physics problem solving for both classes have improved from the previous state. The improvement of

students achievement in learning with implementation of character education is better than students learning problem solving strategies without implementation of character education.

The correlation of students responsibility improvement and problem solving sompetency is also tested chi-square. The results of hypothesis testing is presented in table 21.

**Table 21.** Result of Third Hypothesis Testing

| Kind of Data | $\chi^2_{count}$ | $\chi^2_{table}$ | Conclusion |
|---|---|---|---|
| Corelation of responsibility and competency | 0.00 | 13.3 | $H_o$ received |

The calculation result using chi-square shows that $\chi^2_{count} = 0$ which is lower than $\chi^2_{table} = 13.3$, for dk = 4, $\alpha = 0.01$. Because the value of $\chi^2_{count}$ is smaller than $\chi^2_{table}$ so hypothesis alternative is rejected, or hypothesis null is accepted. So, there is no correlation between students responsibility improvement with problem solving competency. The second hypothesis shows evident of student improvement in problem solving with the implementation of character education, while the third hypothesis seem contrary. This condition is explained as follow: student with better improvement of responsibility was student with lower ability in learning physics, which in turn have no significant achievement in academic results. The improvement of students problem solving competency of experimental class is better in average because the student with good competency in physics achieved better results, while their responsibility is only slight increase. Teacher advice and motivation to for the student to be more responsible for a given task has brought positive influence which in turn affected the students to study more diligent.

## Discussion

Teaching and learning using problem solving strategy is better integrated with implementation of character education. Without paying attention to student attitude, the challenge in learning will not encourage them to learn seriously. Learning with problem solving strategy could improved student attitude in problem solving followed by better achievement. The student in this research have various ability in learning physics, which in turn affect the research results. Inexperienced student in problem solving, spend little time in formulate the strategy of solving the problem and quickly jump into quantitative expressions, this is relevant with Larkin research (1979:285-288). This kind of student apllied problem solving techniques using formula-seeking and solution pattern matching as formerly reported by Reif, et.al (1976:212-217) and Van Heulen (1991:891-897). Student with better experienced in problem solving take more time in planning to solve the problem before writing equation relevant to the problems. The process of teaching and learning could be carried out easier if the student is motivated and responsible to fulfill the task assigned.

The teaching and learning strategy implemented in this research was refer to Reif, et.al (1976:212-217), consist of four major steps: 1) *Description,* which brief information of given and wanted information, draw a diagram of the situation if necessary; 2) *Planning*, which involved selection of basic relations relevant/suitable for solving the problem and outline of using the relations/formula; 3) *Implementation,* carry out the previous plan by doing all necessary procedure including calculations; and 4) *Checking,* which checks the validity of each preceding steps and the final answer. The critical step found difficult for the student of SMP Muhammadiyah 1 Medan is the planning step. This step need ability to frame the given problem, seeking relevant relation, and more understanding of physics concept. Another weaknesses of student in mathematics yield to difficulty of doing calculation and solving expression. The results analyzed of student's posttest of integrated character education, shows by percentage of student for each of the steps in solving the problem, i.e. 53% for identify and formulate the problem, 43% for physics description, 54% for a solution plan, and 48% for execute the plan. Student

difficulty in solving the assigned problem was overcome by cooperative learning using small groups in which students work together to solve problem and gain from each other, as applied previously by Johnson (1999: 2-11) in physics teaching. Cooperative teaching and learning enable the student to help, discuss and argue with each other; and fill any gaps in each other's understanding (Slavin, 1995).

Based on analyzed results of student assignment and post-test, it is known that student main weaknesses is description or relation of physics concept of the given problems. Based on the pattern of students' responses, it could be revealed that students ability to connect concepts in physics that have been studied with the given problem is the handicaped. Students were also less able to describe the physical concepts and quantities of a given physics problem. This weaknesses affected the student in planning strategy to solve the problem. The weaknesses of student in executing the plan was results of wrong description of known physical concept and quantities, so there is a mistakes in using the equations of physics. Furthermore, students are failed to find the most effective techniques to solve the problem. According to Dogru (2008: 15), one of the most important components to solve the problem is the technique used to reach the solution. This condition is also affected by student low competency in reasoning. Robbins (2011: 41) states that reasoning is an essential element of both problem solving and analytical thinking. This opinion is support by Lee and Laird (2012:8) research results that have established an important role for deduction in solving series problems.

Researchers have tried to assess the responsibility of students through a less precise instrument (questionaire), however it is proved that the results is not valid because student just choose better possible answer. Student answers are very vulnerable does not match with actual reality compared to more accurate assess through a direct observation. This results is relevant with Salta (2004:535-547) that the behavioral component pertains to the way in which people act toward the object and its assessment must be performed with directly observed behaviors.

This study shows that problem-solving competency with integration of character education, escpesially the responsibility character could improve student achievement physics problem solving, as well as improved their responsibility. The attitudes of student for experimental and control class in problem solving is improved for majority of student. Despite the improvement is not enough to overcome the difficulty in solving physics problems. This is relevant with Gok and Silay (2010: 16) research result that teaching of problem solving strategies was affecting the attitudes of the students toward problem solving. This research is also relevant with Berkowitz and Bier (2009: 38) report that character education have significant impact to problem solving skills of student.

Based on this research, we found that the implementation of character education could improved students' desire to transform themselves into better and more diligent in learning. It is important for the teacher to instill the values that want to be improved by himself, understands the nature of character education and is able to demonstrate good behavior in front of the students in learning as a good figure that deserves to be emulated. This research was done with many obstacles, especially because the students are less familiar with the learning problem solving strategy. The weaknesses of student in providing themself to learn concept to enrich their understanding about the nature of the given problem was arise because they usually passive in learning at school.

## CONCLUSION AND RECOMENDATION

### Conclusion

The implementation of character education give effect to the improvement of student responsibility, escpesially if teacher encourage and taking care of their affective to be responsible from the beginning of the lesson. Integration of character education could transform the student to be more diligent in

learning and have good responsibility to fuffill the assigned homework or task. Implementation of character education also affected the competency of students to solve problems. However, there is no correlation between the students responsibility improvement with problem solving competency.

## Recomendation

Based on the research results that have conducted, researcher gives the following recommendations:

a. For researchers who want to conduct further research to implement character education should be relied on direct observations to obtain accurate data. Psychology test is not appropriate for measuring responsibility.
b. For teacher who want to implement Problem Solving strategy, pay attention to students affective, and encourage them to be responsible in finishing every assigned problem.

## ACKNOWLEDGMENTS

Support for this work was provided by Directorate of Research and Community Services (DP2M) of DIKTI under the program of University Priority Research of Medan State University (UNIMED) in academic year of 2012.

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