“Building the Nation Character through Humanistic Mathematics Education”

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Yogyakarta, July 21-23 2011

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Faculty of Mathematics and Natural Science
Yogyakarta State University
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Preface

Assalamu’alaikum Warahmatullaahi Wabarakuath.

First of all, we would like to say alhamdulillah, thank to Alloh SWT, the most gracious and the most merciful, therefore the proceeding of The Fourth National Conference on Mathematics Education can be finished successfully. The conference was held on 21 – 23 July, 2011 for the cooperation of Universitas Negeri Yogyakarta (Yogyakarta State University) and and Indonesian Mathematical Society (IndoMS). It is an honor for us to be entrusted by IndoMS and UNY to organize The Fourth National Conference on Mathematics Education. The theme of the conference was "Building the nation character through humanistic mathematics education" and the aims were to be a forum for researchers, lecturers, teachers, students, and people who were care in mathematics education to share positive, constructive and creative ideas in relation to the development of the nation character through humanistic mathematics education.

We are very happy and proud, because we have seven invited speakers in their expertise, three invited speakers are from abroad (Prof. Christa Kaune, Germany; Prof. Isoda Masami, Japan; and Prof. Dr. Noor Azlan bin Ahmad Zanzali, Malaysia) and four invited speakers are from Indonesia (Dr. Ary Ginanjar Agustian, Prof. Jozua Sabandar, Ph.D., Prof. Dr. Sutarto Hadi, and Dr. Marsigit). We also very happy since we have numerous participants who are come from all parts of Indonesia and also from Malaysia. Alhamdulillah, there were 83 papers related to mathematics education that have been presented on parallel session of this conference.

We are very grateful to all reviewers who have been dedicated to review the articles of the proceedings. The reviewers are: Prof. Yaya S. Kusuma, M.Sc., Ph.D. (UPI Bandung), Prof. Jozua Sabandar, M.A., Ph.D. (UPI Bandung), Turmudi, M.Sc., Ph.D. (UPI Bandung), Prof. Sutarto Hadi, M.Sc., Ph.D. (UNLAM), Prof. Dr. Ahmad Fauzan (UNP), Dr. Rahmah Johar (UNSYIAH Aceh), Dr. Abdurrahman As’ari, M.A. (UM), Dr. Cholis Sa’dijah (UM Malang), Dr. Yansen Marpaung (USD Yogyakarta), Sukirman, M.Pd. (UNY), Dr. Marsigit, M.A. (UNY), Dr. Hartono (UNY), Dr. Djamilah B.W., M.Si (UNY), Dr. Sugiman (UNY), Dr. Ali Mahmudi (UNY), Dr. Agus Maman Abadi (UNY), Dr. Jailani (UNY), Dr. Dhoriva Urwatul Wutsqo (UNY)and Dr. Heri Retnawati (UNY).

The proceeding contains as many as 84 articles. The author of the article came from several institutions, namely: UNY, UTM Malaysia, UPI, UNJ, UNNES, UM, Unsyiah Kuala, PPs UNY, Sekolah Pascasarjana UPI, PPs UNJ, S2 Pengajaran Matematika ITB, UNIMED, UNHALU, UNSRI, UNRAM, Universitas Negeri Gorontalo, UNILA, UNS, Univeritas Tadulako, UIN Syarif Hidayatullah Jakarta; STAIN Tulungagung, UII, UNISBA Bandung, USD Yogyakarta, Universitas Muhammadiyah Purworejo, STIKOM Surabaya, Universitas Muhammadiyah Bengkulu, Universitas PGRI Adi Buana Surabaya, UKSW Salatiga, Universitas PGRI Palembang, Universitas Widyadarma Klaten, STKIP Siliwangi Bandung, Universitas Veteran Bangun Nusantara Sukoharjo, STKIP Sebelas April Sumedang, SMA N 4 Tasik Malaya, Universitas Siliwangi Tasikmalaya, Universitas pelita Harapan Tangerang, SMA Lentera Harapan Lampung, UNIROW Tuban and IKIP PGRI Semarang.

We hope that the proceeding be useful, not only for the authors, but also can enrich the creative and innovative ideas that can support the advancement of mathematics education, especially in Indonesia.

Yogyakarta, May 2012
Chairman of the Committee
Dr. Ali Mahmudi
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The Implementation Of Multiple Intelligences Based Learning To Improve Students’ Learning Activities, Response, And Learning Outcome In Mathematics

Kadir & Eny Wulandari

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Abstract

The fundamental basic theory of this study comes from Howard Gardner, who introduced a theory of human intelligence known as the Multiple Intelligences Theory. This theory concludes that there are eight types of intelligence which belongs to each person. The purpose of this study was to find out the implementation of multiple intelligences based learning to improve students’ learning activities, response, and learning outcome in mathematics. This research was conducted in SMP PGRI 1 Ciputat in academic Year 2009/2010. This research used Classroom Action Research, which consists of four stages research procedures were planning, action, observation, and reflection. The instruments of collecting data were using observation sheet activities, daily student journals, interview, and test. The result of the research revealed that the implementation of Multiple Intelligences based learning can enhance mathematics learning activities, giving a positive response towards mathematics and to improve student learning outcomes.

Key Words: Multiple intelligences based learning, learning activities, response, learning outcome

I. INTRODUCTION

1. Background

Mathematics as one of the main lessons on the educational unit plays a very important development of students potential and character, because mathematics is a method of logical thinking, critical, creative, order, art, and language that not only help the development of science and technology, but also for the formation of perseverance, personality and character. Through education, it plays an important role for the preparation of human resources and can develop their potential either intellectual, physical, emotional, mental, social, moral or ethics. In this case then, the math becomes one of the main subjects that must be learned by every student at every level of education. Mathematics is formed as a result of human work-related ideas, processes, reasoning, and art. Moreover, mathematics has the values to develop the children’s intelligent.

Gardner (1983), introduced a theory of human intelligence known as the Multiple Intelligences Theory. This theory concludes that there are eight types of intelligence which belongs to each person. such (1) linguistic intelligence, (2) logical-
mathematical intelligence, (3) visual-spatial intelligence, (4) bodily-kinesthetic intelligence, (5) musical intelligence, (6) Interpersonal intelligence, (7) intrapersonal intelligence, (8) naturalist intelligence. Gardner believes not on "what smart as you?" But "How do you smarter?" This requires the teacher to not only question the extent to which their students how to develop intelligent but intelligence potential learners.

According to Peter (1989) a person learns 10% of what he read, 20% of what he heard, 30% of what he saw, 50% of what he saw and heard, 70% of what he says, and 90% of what he said and did. Furthermore, Dierich (Rohani, 2004: 9) classified learning activities as follows 1) Visual activities, 2) Orally activities, 3) Listening activities, 4) Writing activities, 5) Drawing, 6) Motor activities, 7 Mental activities, and 8) Emotional activities,

This means that in learning activities in class most students acquire knowledge on what he said and did. The flow of constructivism the view that to learn mathematics, the important thing is how to establish the sense in children. Activities undertaken during the learning of students can make them understand what is learned, how to learn and what it is benefits in everyday life. Teachers are required to be able to selectively choose various models, approaches, strategies, and methods that can be implemented and in accordance with the objectives, materials, or materials, and evaluation in accordance with the potential intelligence of children. Thus, teachers should understand the differences in intelligence that each individual, so with characteristic precision of a way to teach children are able to facilitate various kinds of intelligence that has implications for increasing students' learning activities of students in math. In this context, researchers conducted a study on school-based learning by applying multiple intelligences to enhance the activity, response, and mathematics student learning outcomes.

2. Restrictions and research problem

To clarify and give proper direction in the formulation of the problem in this study, the researchers provides restrictions in accordance Multiple Inteligences based learning which is the learning by emphasizing the eight types of intelligences based on Gardner's theory. While learning the observed activity is the 6 types of learning activities are: visual activities (attention to the teacher's explanations or friend), oral
activities (explaining, asking, and asking the opinion), drawing activities (drawing), motor Activities (make model or experiment), mental activities (recall and solve problems), and emotional activities (interest / enthusiasm and feelings of pleasure).

Based on the restrictions above, the researchers formulate the problems as follows:

a. Is the application of multiple intelligences-based learning can enhance the activity of learning mathematics?
b. How do students respond to multiple intelligences-based learning?
c. Is the application of multiple intelligences-based learning can improve students' mathematics learning outcomes?

3. The objectives of the research

Based on the formulation of the problems, the study aims to:

a. Studying mathematics learning activities based on learning multiple intelligences.
b. Analyzing student responses to learning based on multiple intelligences.
c. Reviewing the results of students' mathematics learning is based on the application of multiple intelligences-based learning.

4. Benefits of the Research

The benefits of the research are provided as follows:

a. For teachers, the results of the research into theoretical and practical foundation in improving the professionalism of teachers to determine alternative mathematical learning model that can accommodate the characteristics of learners, especially the potential of a compound owned students’ intelligent.
b. For students, multiple intelligences-based learning model is a model of home study to enhance mathematical activities (doing math), positive attitudes towards mathematics and mathematics learning outcomes.
c. For schools, as a material for designing and evaluating the effectiveness of learning mathematical model of process quality and learning of mathematics by considering the potential of diverse learners intelligence.
d. For advanced researchers, the results of this study can provide inspiration to develop a range of learning designs that can shape our values and strong character-based intelligence that has the potential of learners.
II. METHODOLOGY OF THE RESEARCH

1. Design Research

This research used Classroom Action Research (CAR). The main purpose of the study of this class action is to improve and enhance the practice of mathematics learning. This study begins with a preliminary observation (pre-study). Based on the mapping and discovery of the problem root of pre-compiled research activities in the cycles I, covering the four stages, namely: Planning, Acting, Observing and Reflecting. In more detail the research design is drawn as follows (Arikunto, 2006: 16).

![Chart 1: Design of Classroom Action Research](image)

2. The subject of the Research

The subjects of this study were all students in grade VIII-6 junior PGRI 1 Ciputat in academic year 2009/2010 (February-May), and VIII-6 teacher as a collaborator and observer. The role of researchers in this study were as perpetrators of the research while mathematics teachers as collaborators and observers where as a collaborator is working with researchers in making the design of learning, reflection and determine actions at the next cycle. As an observer is to give an assessment of the application of multiple intelligences-based learning and observing students'
mathematics learning activities.

3. Research Procedures

a. Draft action (Planning)

This stage contains the determination of the design of multiple intelligences-based learning and the types of learning activities which will be observed, making the learning plan, set benchmarks, determine collaborators as partners in the learning process in class, and make the observation sheet, field notes, interview sheets and test questions for final cycles.

b. Implementation (Acting)

This stage is the implementation or application of the contents of the draft have been made, namely multiple intelligences-based learning.

c. Conducting Observations (Observing)

In this stage the researchers make observations on the implementation of multiple intelligences-based learning process along with collaborators (class teacher). This observation is intended to explore, and document all the indicators that occurred during the research process.

d. Doing Reflection (Reflecting)

This stage is to evaluate the activity, analysis, reflections on the implementation of multiple intelligences-based learning process that has been done. The results obtained from the observations collected and analyzed together researchers and observers, to learn whether the activities have been implemented already achieved goals (benchmarks) are expected or still needs improvement. This stage is implemented to improve the activities of the previous cycle, which will be applied in subsequent cycles.

4. Research Instruments

The instruments used to collect data in this study consisted of two types of test instruments and non-test instruments.

a. Test Instruments

Test instruments used were formative tests conducted at the end of each cycle. This test aims to analyze the yield increase student learning and completeness of all
material that has been given as the implications of the action.

b. Non Test Instruments

1) Observation of individual activity sheets were used to determine students' mathematics learning activities. Observation sheet is also used to analyze and reflect on each cycle to improve learning in the next cycle.

2) Sheet observation group activities was used to determine the development activities of each group of students studying mathematics.

3) Interview sheet
Researchers interviewed teachers and students to learn directly the condition of students as well as an overview of the implementation of learning and the problems encountered in the classroom.

d. Daily student journals
Daily Journal of the student is made to study the response of students in the learning process based on multiple intelligences at each meeting.

5. Data Analysis Techniques

Data analysis was performed on all data has been collected, namely in the form of interviews, the results of questionnaires, observations, test results and record students' observer's comments on the observation sheet. All data were analyzed using descriptive analysis. Before performing data analysis, researchers re-examine the completeness of data from various sources. Data analysis begins by presenting the overall data obtained from various sources, read the data, then held a recapitulation of the data and compare it with benchmarks (criteria) and concluded the findings obtained.

III. RESULTS AND DISCUSSION

1. Research Results

a. The activities of Learning Math

Description of data related to the activity of research findings, responses and learning outcomes after the implementation of the mathematics learning based on multiple intelligences-based learning cycle I and cycle II is presented as follows.

<p>| Tabel 1. Recapitulation Percentage of Student Activity Cycle I and II |</p>
<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Indicators</th>
<th>cycle I</th>
<th>cycle II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual activities</td>
<td>Pay attention to the teacher/other students’ material explaining</td>
<td>(56%)</td>
<td>(75%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of visual activities</td>
<td>56%</td>
<td>75%</td>
</tr>
<tr>
<td>2</td>
<td>Oral activities</td>
<td>Giving continuation when group discussion time is taking place</td>
<td>(56%)</td>
<td>(70%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asking question</td>
<td>(52%)</td>
<td>(70%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To react the teacher/student reason when the discussion is taking place</td>
<td>(68%)</td>
<td>(75%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of oral activities</td>
<td>58.67%</td>
<td>71.67%</td>
</tr>
<tr>
<td>3</td>
<td>Drawing activities</td>
<td>Drawing</td>
<td>(72%)</td>
<td>(80%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of drawing activities</td>
<td>72%</td>
<td>80%</td>
</tr>
<tr>
<td>4</td>
<td>Motor activities</td>
<td>Making a model/doing experiment</td>
<td>(68%)</td>
<td>(75%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of motor activities</td>
<td>68%</td>
<td>75%</td>
</tr>
<tr>
<td>5</td>
<td>Mental activities</td>
<td>To remember the previous material</td>
<td>(64%)</td>
<td>(80%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doing the tests</td>
<td>(68%)</td>
<td>(80%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of mental activities</td>
<td>66%</td>
<td>80%</td>
</tr>
<tr>
<td>6</td>
<td>Emotional activities</td>
<td>interest/students' enthusiasm during learning process</td>
<td>(68%)</td>
<td>(90%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>enjoy in learning</td>
<td>(72%)</td>
<td>(90%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of emotional activities</td>
<td>70%</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The average of total activities</td>
<td>65.11%</td>
<td>79.45%</td>
</tr>
</tbody>
</table>
The Comparing of students learning activities percentage may show in the diagram cycle I and II, as below:

![Student Activity Diagram](image)

**Figure 1. Student Activity Diagram**

Based on the analysis in table and chart above shows that the average percentage of the learning activities of students increased by 14.34%, i.e. 65.11% in cycle I to 79.45% in cycle II. The average percentage of activity in cycle II has reached of indicators (benchmarks) that have been established, namely by 75%.

The application of multiple intelligences-based learning can enhance students' activities because of this learning principle is to give students an opportunity to channel eight basic potential it has. Distribution potential is facilitated by the teacher to implement the learning through activities that accommodate the development potential of these students. The study's findings reveal that the average percentage increase student learning activity, from 65.11% in cycle I to be 79.45% in cycle II, is the impact or implications of the application of multiple intelligences-based learning. This gains supported Peter’s learning activities determining Peningkatan ini mendukung aktivitas belajar yang dikemukakan oleh Peter (1989) that a person learns 10% of what he read, 20% of what he heard, 30% of what he saw, 50% of what he saw and heard, 70% of what he says, and 90% of what he said and did.

### b. Response Against Student Learning

The average percentage of positive responses to students' multiple intelligences-based learning increased, from 64.55% in cycle I to 88.96% in cycle II. While the average percentage of negative responses of students declined from 15.61% in cycle I to...
11.04% in cycles II and no longer respond to students who are neutral on the cycle II. Visually the improving positive response and a decrease in negative responses to learning presented in the following figure.

![Figure 2. Student Response Diagram](image)

This finding is similar to the findings of the study Wifqi (2009) who reported that the application of multiple intelligences-based learning (multiple intelligences) can foster the spirit and liveliness of students in learning mathematics because it provides a fun new learning atmosphere for students to pay attention to all potential students have basic. Other findings from this study reveals there has been an increase in positive responses and decrease in negative responses to the multiple intelligences-based mathematics learning. This was seen in cycle I and cycle II, the percentage of positive responses of students increased, from 64.55% to 88.96%, while the percentage of negative responses of students was reduced from 15.61% to 11.04%. Thus the application of multiple intelligences-based learning can improve non-cognitive aspects of students towards learning mathematics.

3. Mathematics Learning Outcomes

The results of studying mathematics after learning multiple intelligences in cycle I and cycle II, presented in the following table.

<table>
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<th>Statistic</th>
<th>cycle I</th>
<th>cycle II</th>
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Based on the table above, shows increasing average mathematics learning outcomes are quite large from cycle I to cycle II. Improved results of learning mathematics has been defined success criteria, which reached an average value of 70 and no students who scored below 65.

These findings could inspire efforts to enhance positive attitudes and build self confidence on students towards learning mathematics. According to Spangler (1998) who stated that mathematics may be manifested classroom activities to ask, answer questions, solve problems, and with a new approach mathematical tasks. Along with the increased activity of learning and students positive response to the application of multiple intelligences-based learning model were the findings also revealed that students' mathematics learning outcomes also increased, amounting to 68.3 to 77.5 in cycle I to cycle II. This indicates that the increasing of students' activity and responses in mathematics learning has implications for the improvement of mathematics learning outcomes. Thus the application of multiple intelligences-based learning model can enhance the activity, response, and mathematics student learning outcomes.

**IV. CONCLUSION AND SUGGESTIONS**
1. Conclusion

Based on the data description and discussion, the researchers can conclude that as follows:

a. The application of multiple intelligences-based learning can enhance the activity of learning mathematics. Aspects of activities that can be enhanced through multiple intelligences-based learning activities that consider the teacher's explanations/friends, give explanations, ask questions, respond to questions of teachers and friends, drawing, model making/experimenting, reviewing the material, solve problems, enthusiastic and happy during the learning process. Some creative ideas or skills that students develop during learning, namely the ability of students to imagine a visual image, students' ability in making the rhythm of the song, and students' ability to frame up the space.

b. Student responses to the application of multiple intelligences-based learning in learning mathematics is very good, an increase positive responses and decrease in negative responses towards learning mathematics from cycle I to cycle II.

c. Multiple intelligences-based learning may Increasing students' mathematics learning outcomes. The results obtained studying mathematics students have exceeded ideal exhaustiveness criteria. This can be seen from the average math student learning results in cycle I of 68.3 and 77.5

2. Suggestions

a. The math teachers should involve the students in learning math by using learning model to facilitate the students’ intelligence. So, the multiple intelligence-based learning models can be used as the main purpose either cognitive aspect, affective, or psychomotor for perfectionist further.

b. From this research result, the students are able to use the math tasks in learning by using multiple intelligences-based learning in improving their math intelligence and appreciate the way how to create the math’s tasks as a model of autonomous learning.

c. The affectivity in applying multiple intelligences-based learning to the whole of learning math result needs the teachers’ creativity, so the teachers must on math training of multiple intelligences level.
REFERENCES


A Pedagogical Value From Mathematical Mistakes

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Abstract

A real correct and mistake basically have the same point. Mistake done by student during doing mathematics problem can have the positive values and worth to develop the new mathematics concept. In mathematics teaching, process to understand a concept sometimes will be easier if besides gave a lead real correct and also accompanied by the counter of example from looking the aspect of mathematics mistake good for student and to learn in developing values pedagogic such thinking critical, logical, analytical in exploring to born the new mathematics. We often dismiss a mistake as something to be avoided and at best to be corrected as soon as possible. Many types of algebraic mistakes and purely arithmetic ones and discusses how they can be channeled into positive, useful learning, and growing experience. Mathematical Mistake can be used as a springboard for developing new mathematics and can be use to turn negative experiences into positive ones.

Key Words: Mathematical Mistake, Pedagogical Values

I. INTRODUCTION

1. Background

We often glide through a lesson with satisfaction as long as our students are feeding back what we want them to learn. When they make a mistake we simply correct it and go ahead. It’s rarely do we capitalize on a mistake as an incident of high potential. When an obviously incorrect procedure yields a correct result, we may feel puzzled and curious to know how and why this could have happened. Trying to answer these questions can involve us not only problem solving but in problem-posing activities as well. Many teachers would automatically categorize a mistake as an evaluative experience for both the teacher and the student, but this not always a necessary avenue to follow. This experience can provide the opportunity for creativity even in mathematics basic level.

Mathematical Mistakes from the Classroom

Crouse and Sloyer (1978) reveal that, after several years of teaching a method course for college student preparing for secondary mathematics teaching, they found that these student teachers had great difficulty answering mathematical questions raised by their students. The majority of questions come from actual classroom experience.
Some examples of mathematical mistakes during instruction in class found by Crouse and Sloyer can be shown as follows.

1. You put the problem \( \frac{1}{5} + \frac{2}{3} \) on the board and ask one of your students to come to the board and demonstrate how to compute the answer. He writes the following: \( \frac{1}{5} + \frac{2}{3} = \frac{3}{8} \). You tell him that is wrong, but he gives the explanation, “if a baseball player is at bat 5 times on the first day and gets one hit, and in the second day he gets 2 hits out of 3 times at bat, then altogether he has 3 hits out of 8 times at bat. How do we reply?

2. A student hands in the following solution when asked to reduce \( \frac{16}{64} \) to lowest terms. \( \frac{16}{64} = \frac{1 \cdot 1}{1 \cdot 4} = \frac{1}{4} = \frac{1}{4} \). Is the student correct?

3. A student hands in the following work. \( \frac{x + 6}{2} = x + \frac{6}{2} = x + 3 \). When the student asks us why he can’t the 2 into 6, how would you answer him?

4. A ten grade student hands in the following work. \( \frac{y^2 - y}{x + y} = x - y \). The student wants to know why the method is wrong. How would you answer?

5. You ask the students to simplify \( \frac{x^2 - 9}{x - 3} \). One student does the following:

\[
\frac{x^2 - 9}{x - 3} = \frac{x^2 - 9}{x - 3} = \frac{x - 9}{x - 3} = \frac{x + (x + 3)}{x + 3} = x + 3
\]

Is the student correct? Will his method work all the time?

6. You ask the students to simplify \( \frac{1}{x} + \frac{1}{x} \). A student writes \( \frac{1}{x} + \frac{1}{x} = 2 \). What is the student’s problem?

7. A student says that \( 3a - 2a = 1 \). How would you help him?

8. A student is evaluating the expression \( \left( \frac{3^2 + 7^2}{\left( \frac{58}{10} \right)^2} \right) \).
and the student does the following: \[ \frac{3^2 + 7^2}{\frac{58}{10}} = \frac{100}{58} \]. Which is the correct answer? How would you help this student?

9. A student hands in the following work for the following problem.

Solve:
\[ x^2 - 14x + 24 = 3 \]
\[ (x - 12)(x - 2) = 3 \]
\[ (x - 12)(x - 2) = 3 \cdot 1 \]
\[ x - 12 = 3 \text{ or } x - 2 = 1 \]
\[ x = 15 , x = 3 \]
\[ x \in (3, 15) \]. Is the student correct?

10. A student hands in the following solution: \[(a + b)^2 = a^2 + b^2\] because, except for the operation being different, this problem is just like \[(a \cdot b)^2\], which is equal to \[a^2 \cdot b^2\]. Therefore, it follows that \[(a + b)^2 = a^2 + b^2\]. How would you help this student?

II. DISCUSSION AND ANALYSIS

The following is a possible treatment of a classical mathematical mistake. The student square \((a + b)\) to get \(a^2 + b^2\), leaving out the 2ab term.

1. The teacher may ask the student to substitute a numerical example; comparing that result with normal multiplication will hopefully confine the student that \((a + b)^2 \neq a^2 + b^2\).

2. The student may show correct method of squaring \((a + b)\), algebraically or geometrically, thus introducing the “middle term” as something demonstrated by proof. The first option uses falsifiability to persuade the student; the second provides “positive” proof.

This system is showing the student that his belief is wrong and then countering with the correct method make two basic assumptions:

(i) the student’s belief in his original ‘mistake’ was not strong;

(ii) the error was roughly speaking ‘random’; that is, the pupil did not base his conclusion on any mathematical or psychological idea previously explored by the teacher or the student.

There are cases where these assumption do hold, but is substituting numerical
examples enough to dispel a very strong belief that \((a + b)^2 = a^2 + b^2\), and more importantly, what mathematical or psychological reasons did the student have for arriving at his conclusion? The belief as symptom of what may be a serious disease or even more than one disease by substituting numerical examples, or by providing proof, the teacher has deal with the symptom only and left the disease to reach epidemic proportion.

The following assignment was given to student in a method of teaching mathematics’ course by Professor S.I Brown at State University of NY. At buffalo.

(i) Justify each of the following classical mathematics mistake in as many ways as possible, given that you belief each correct.

A. \((a + b)^2 = a^2 + b^2\)
B. \(a/b + c/d = (a + c)/(b + d)\)
C. \(\emptyset = \{\emptyset\}\)

(ii) Re-examine the justifications in part one and discuss what you believe to be the reason (mathematical or psychological) behind the mistakes.

(iii) Make those mathematical mistakes a positive experience for the students.

Some of the following justifications are a direct result of the work done on this assignment.

**Part A.** \((a + b)^2 = a^2 + b^2\)

(i) The distributive law of squaring over addition.
(ii) Induction: \((a + b)^1 = (a^1 + b^1) \Rightarrow (a + b)^2 = a^2 + b^2\).
(iii) Consider the Pythagorean theorem, \(a^2 + b^2 = c^2\). If \(c = a + b\), then \(a^2 + b^2 = (a + b)^2\).
(iv) Say the following sentence fast. The sum of the squares equals the square of the sum. The attraction this has is that is *sounds* correct.
(v) Since \((ab)^2 = a^2b^2\) and since multiplication is just a quick form of addition, then…
(vi) How many times have we as teachers told our pupils, “Whatever we do to the left side of an equation we must also do to the right side?” Start with the following:

\[(a + b)(a - b) = a^2 - b^2.\]

Now, apply the principle above by changing the negative sign in the left side of the equation to a plus, and changing the negative sign on the right side to a plus. Then

\[(a + b)(a + b) = a^2 + b^2.\]

All six of these explanations have two things in common. One is that each has
used some principle learned previously and the other is each has the compelling notion that “in mathematics, the future must look like the past”. (Special acknowledgement for this observation goes to Prof. S. I. Brown.)

**Part B.** \((a/b) + (c/d) = (a + c)/(b + d)\)

(i) This looks like multiplication:

\[ (a/b)(c/d) = (ac)/(bd). \]

and since multiplication is really a fast way of doing addition…

(ii) The “baseball analogy” was first proposed by Dorothy Buerk (Brown & Walter, 1993) who assisted, along with others, in the teaching of the methods course. Anyone who follows baseball knows that if a batter has 3 hits out of 5 attempts on Monday and has 2 hits out of 3 attempts on Tuesday, his combined record is 5 hits out of 8 attempts. Therefore it follows that \((3/5) + (2/3) = 5/8\), or in general terms.

**Part C.** \(\emptyset = \{\emptyset\}\)

(i) The null set is nothing and the set of nothing is nothing, therefore \(0 = \{0\}\).

(ii) Notation argument: All other sets use brackets therefore we must use brackets in this case.

(iii) One student claimed that \(0 = \{0\} = \{\}\), but \(\{0\}\) is best because it leaves “no doubt” that we are talking about the empty set. Redundancy stresses the point.

Again, in examples B and C there is a strong needed to make the future looks like the past. The multiple reasons given for each mistake suggest that a simple correction by the teacher is insufficient. For example, if a student give induction as his reason that \((a + b)^2 = a^2 + b^2\). Justification (vi) offers yet another disease, the pupils’ tendency to generalize rules that are used rather loosely in the classroom. As you can see in this example the rule was applied rather than ingeniously.

Examples B and C offer rich ground for determining and perhaps beginning to diagnose mathematical diseases. Perhaps a list of questions will help us begin to re-examine what may be at the root of the mistakes by Mayerson (Brown & Walter, 1993: 153).

1. Where are these justifications in the notion of variable misunderstood?
2. The baseball analogy demands that we take a closer look at so-called everyday occurrences and attempt to see what they may imply mathematically.
3. How confusing is notation?

4. How much do we as teachers underestimate the ability of our students to derive new mathematical principles, e.g. the ‘no doubt’ principle?

5. Some of the justifications of 0 = {0} imply that there is a confusion between the meanings of ‘is an element of’ and ‘is a subset of’. How does this misconception relate to other misconceptions students have in beginning set theory?

Other Mathematics mistake by Borasi (Brown & Walter, 1993: 159) “Algebraic Explorations of the Error $\frac{1b}{b4} = \frac{1}{4}$”

Why does such an absurd simplification produce the correct result? Is this example the only case for which this kind of simplification work? We can attempt to answer both questions at one time, by starting the more general problem: For what values of the digits $a$, $b$, and $c$, is

$$\frac{10a + b}{10b + c} = \frac{a}{c}?$$

Or, equivalently, what are the integral solution between 1 and 9 of the following equation?

(1) $(10a + b)c - a(10b + c) = 0$

The values $(a, b, c) = (1, 6, 4)$ satisfy this equation, which explains why the result of the simplification turned out to be correct in the specific case presented. Do other solutions exist? How can we search for them? We do not have a straight-forward algorithm that can be applied to solve equations of this kind, but we can try several approaches.

For example, we can try to rewrite equation (1) in different ways to see if anything may be revealed. For example:

(2) $10a(b - c) = c(b - a)$

(3) $10ab = c(9a + b)$

(4) $9ac = b(10a - c)$

Equation (2) may presents some advantages, as all $a$, $|b - c|$, $c$, and $|b - a|$ must be less than 10. We can then observe that since 5 divides the first side and 5 is a prime number, either $c = 5$ or $|b - a| = 5$. In the example, we had, in fact, $b - a = 6 - 1 = 5$. We can now see if $c = 5$ in some solutions. With this extra condition, equation (2) becomes
10a(b – 5) = 5(b – a) or

(5) \[ b = \frac{9a}{2a-1} \]

Computing from (5) the values of b corresponding to \(a = 1, 2, \ldots, 9\), we do find two new solutions besides trivial one:

\[
(a, b, c) = (1, 9, 5) \quad \Leftrightarrow \quad \frac{19}{95} = \frac{1}{5}
\]

\[
(a, b, c) = (2, 6, 5) \quad \Leftrightarrow \quad \frac{26}{65} = \frac{2}{5}
\]

We have found all the possible solutions with \(c = 5\). If other solutions exist, they must derive from \(|b - a| = 5\), that is, when either \(b = a + 5\) or \(a = b + 5\). At first sight checking this case may seem more complicated than checking \(c = 5\), but it is actually less so. For \(b = a + 5\), equation (2) becomes

10a(a + 5 – c) = 5c, or

(6) \[ c = \frac{2a^2 + 10a}{1 + 2a} \]

And this time we have only to check for \(a = 1, 2, 3, 4\) in (6), as it must be that \(b = a + 5 < 10\). We thus find two nontrivial solutions, one of which is our original one:

\[
(a, b, c) = (1, 6, 4) \quad \Leftrightarrow \quad \frac{16}{64} = \frac{1}{4}
\]

\[
(a, b, c) = (4, 8, 9) \quad \Leftrightarrow \quad \frac{49}{98} = \frac{4}{8}
\]

In the case of \(a = b + 5\), equation (2) becomes

10(b + 5)(b – c) = -5c, or

(7) \[ c = \frac{2b^2 + 10b}{9 + 2b} \]

Checking for \(b = 1, 2, 3, 4\) (again it must be that \(a = b + 5 < 10\)) in (7), we find no other solution. This situation may become a rich source of new problems once and we challenge the way that we have stated the problem previously (equation 1) or modify some of its elements. For example, we assumed that the numbers were written in the usual decimal notation. What if the base of numeration was not ten but another natural number \(k\)? The problem would then be to find the integral solutions between 1 and \((k – 1)\) of the equation: \(c(ka + b) – a(kb + c) = 0\).
It may be interesting to discuss the values of $k$ to which we can still apply the argument used in this paper.

In this article, we have also limited our consideration to two and one digit numbers. Can we come up with analogous “simplifications” using more digits? For example, what about $\frac{54}{27} = \frac{54}{27}$? Finding all “three-digit fractions” that can correctly be simplified in this way will now involve a lot more cases. Even if we use a computer, we will face the real challenge in writing an efficient program and eliminating a priori as many trivial solutions as possible (you can expect hundreds of solutions in this case!). What are other possible simplifications that can occur with “three-digit fractions”? What is the percentage of “correct” versus “wrong” result of each simplification? Does any pattern occur in the solutions?

This problem can provide concrete material and the stimulus for a discussion about the difference between necessary and sufficient conditions for solutions and about the values and limitations of heuristic procedures versus algorithms in solving equations. It can also provide further reflection on the use of computers in mathematics, in comparison to more “classical” mathematical activities.

There are many questions and strategies to be explored; these were just a few. We could do well to re-examine our pupils’ mistakes and initiate investigations that will no doubt lead to new pedagogical experiences for ourselves and positive learning experiences for both teachers and pupils.

**Pedagogical Values Expanding**

Mathematical mistake has the education values and can be used;

1. To develop new mathematics and to turn a negative experience (making an error) into a positive experience.
2. Instead of showing pupils that their mistake is wrong, ask them when it is right; that is, what questions can we ask to make the solution correct? Another example of this type of activity can be seen by exploring mistake B where the pupils add the numerators and the denominators instead of finding a common denominator. Consider the solution $(a + c) / (b + d)$. In addition to reviewing addition of fractions one can ask, when can we add the numerators and
denominators together in such a fashion? Pupils can now explore questions such as:

(i) How many ways are there to find a fraction between two other fractions on a number line?
(ii) Is \((a + c)/(b + d)\) always between \(a/b\) and \(c/d\)?
(iii) Can we talk about between’s in two or higher dimensions?

3. If the solution is correct, how does this affect the rest of mathematics? And similarly what changes have to be made in our system to accommodate our solution? For example, let us consider again the error, \((a + b)^2 = a^2 + b^2\). How can we change the system to accommodate this or similar expressions? One consequence is that when two different numbers are multiplied together their product is zero. This eliminates the \(2ab\) term in \((a + b)^2\). How does this change affect the rest of our system? What happens to \((a + b)^3\), \((a + b)^4\), etc.?

4. Are there other existing mathematical systems in which our solution holds? A classic example can be found in the field of geometry. There are many constructions that cannot be done by Euclidean methods and can be done by non-Euclidean methods.

Pursuant to finding and analyze to mathematical mistake, as we have been studied above, hence values which can be developed shall be as follows:

1. **Having knowledge.** Through new knowledge mathematical mistake in outside will give a new information too. Skills of gathering the information involve such ability such as: reading, counting/calculating, and doing observation in where the student learn to calculate non merely learning mechanistic to apply the number calculation but interpreting what information obtained from that calculation. Contextualization Mathematics become of vital importance for student to understand the meaning from what they have learned in their daily life as information.

2. **Using scientific skills and scientific thinking.** Think by scientific skills and scientific thinking are core from new knowledge invention, but the process of invention is not walking smoothly, but a lot of met the failure and mistake. Therefore mathematical mistake can becomes to access potential to find the new very amazing mathematics.
3. **Thinking strategically.** To follow up the mistake, we should try the investigation of important features from the mistake needs to think strategically. In this case, values which can be taken away from a mathematics mistake is try to make a mapping of the cognitive or metacognitive and apply it in problem solving of mathematical mistake.

4. **Long life learning skills.** Learn through mistake is one of principle from long life learning. With this view learn the mathematics will be wider because study do not only through example just real correct case but also can be developed from mathematics mistake. Mathematics mistake represent the starting points to learn to investigate further.

5. **Communication skill, Skill of research and exploration, and able to use technology to further developing their scientific.** Mathematics’ mistake done by a student need the explanation or communication. The Mistake possibility resulted from by a perception mistake to problem which is all student face. In this case, possible they see the other side at the opposite of mathematics problem which we have given to them. Try the understanding way of thinking; the students are given the opportunity to find the new mathematics which is unforeseen possible previously. This invention, sometimes require to be made more common, so that we require the technological skill like computer program application where use computer application will quicken the invention process with the more gratifying result.

6. **Critical, creative and independent thinking.** Resolving to mathematical mistake needs the ability to think critically, creative and independent thinking. Only one who own the opinion of like this which can see the positive values from mathematical mistake and also able to think that people can find something from the outside of the mistake. Therefore the way of thinking requires to be developed at school and then apply it in the form of problem base instruction.

7. **Decision making.** If knowledge has been processed to become a conclusion, hence people can take the decision pursuant to the conclusion. This fact indicates that the people oftentimes fear to take the decision for fear of facing the mistake which emerge. But, if mistake is the basic to make decision hence somebody will be getting self confidence in his/her life.
8. **Problem solving and Problem Posing.** Problem Solving is the heart of mathematics, basically there no mathematics without problem solving. In this case, mathematics’ mistake is potential source of problem to make somebody becomes the problem solver. Problem solving needs the creativity and wisdom such creativity to find the efficient and effective to find solving, while wisdom is needed because resolving have to always pay attention to the relevancy environmentally. Therefore early on student require learning to solve problem as according to level thinking of it (Brown & Walter, 2005).

### III. CONCLUSION AND SUGGESTIONS

1. **Conclusion**

Mathematical mistakes that either students or teachers faced are not cases to be avoided, but how we learn more from it to consider further then can perform a new mathematics. And to realize it, let’s consider some smart steps to change making an error to be a good experience in mathematics learning and teaching process. Based on analyzing that mathematical mistake, can be developed new mathematics and to turn a negative experience (making an error) back into a positive experience.

2. **Suggestions**

Some pedagogical values which can be developed is life skills value as following:

a. **Having knowledge.** Some steps can be used in gathering information from the outside of the life to get new information such reading, counting, and observation in where the student learn to calculate non merely learning mechanistic to apply the number calculation, but interpreting what information obtained from that calculation.

b. **Using scientific skills and scientific thinking.** Think by scientific skills and scientific thinking is core from new knowledge invention, but the process of invention is not walking smoothly, but a lot of met the failure and mistake. Therefore mathematical mistake may as access potential to find the new very amazing mathematics.

c. **Thinking strategically.** In this case, values which can be taken away from a mathematics mistake is try to make a mapping of the cognitive or metacognitive and apply it in problem solving of mathematical mistake.
d. **Long life learning skills.** Learn through mistake is one of the principle of long life learning. With this view learn mathematics will be wider because study does not only through example, but also can be developed from mathematics mistake. Mathematics mistake is a representation of starting points to learn and to investigate further more.

e. **Communication skill, Skill of research and exploration,** from the mathematics mistake, the students must be able to explore the case they faced, communicate it and looking it back is possible for them to see the other side at the opposite of mathematics problem which the teacher has given to them.

f. **Critical, creative and independent thinking.** Resolving to mathematical mistake need the ability to think critically, creative and independent thinking, and also able to think that people can find something from the outside of the mistake.

g. **Decision making.** The students can take the decision pursuant to the conclusion. This case indicates that the people are often feared to take decision in facing the mistake which is emerging. Further more, the mistake in making decision hence somebody in getting self confidence in his/her life.

h. **Problem solving and Problem Posing.** Everyone is potentially may becomes a problem solver. Therefore early on student require learning to solve problem is according to the level of thinking it. Problem solving needs more creativity to find the efficient and effective to find solving and always pay attention to the relevancy environmentally.

**REFERENCES**


