Promoting students self determination theory skill in merills first principle of instruction

H Wilujeng¹, Y S Kusumah ², and D Darhim ²

¹ Institut Agama Islam Negeri Ponorogo, Jl. Pramuka 156 Ponorogo 63471, Indonesia
² Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung, Indonesia

Email: hestuwilujeng@gmail.com

Abstract. The self determination theory is the ability that allows an individual to choose and have several choices to determine an action. The problems experienced by the students related to SDT are the decreasing motivation of students to develop themselves, students are unable to be responsible and not sensitive to the feelings of others. The purpose of this study was to examine the differences in SDT achievement of MPK student self determination theory (high, medium and low). This research method was quasi experiment with Post-test Only Control Design. Subjects in the study were 124 students. The learning process was carried out through Merrill's First Principles of Instruction and ordinary learning. The results shows that the average achievement of high, medium and low MPK on the self determination skill theory of students who received MFPI learning are better than those who received regular learning. In SDT indicator, autonomy and students relatedness who have high MPK are superior in comparison to medium and low MPK. The low MPK category is better on competence indicators compared to high MPK and medium MPK. MFPI learning should be an alternative learning for teachers in mathematics because in addition to improving student cognitive abilities.

1. Introduction

Self-determination is a combination of skills, knowledge, and beliefs that allow a person to be involved in directing goals, self-regulation and autonomous behavior that are free from other people interference. The ability to understand the strengths and limitations of oneself is important in SDT. Students who are able to act based on SDT skills (autonomy, competence and relatedness) will have the ability to be able to control life and become successful people [1]. As an example in learning process, students are said to understand the limitations on themselves when they are able to understand the part of the material delivered by teacher who is poorly understood. Then students begin to ask friends or teachers to discuss the material in order to understand the material (relatedness). The discussion process will increase knowledge and make students have the competence in the mathematics material. To achieve good autonomy, competence and relatedness, a learning approach to support these skills is needed.

Students who are taught with a more restricted approach will not only lose initiative but also make the learning process less effective, especially when the learning requires conceptual and creative processes [2]. This would result in the low student learning outcomes. In addition, students are accustomed to being assisted by teachers in solving problems, so their independence becomes low. They always think that the completion process taught by the teacher in school is the only solution, so they are limited by the way teachers think, they are not free to express their ideas. This has affected the skills to determine optimal freedom in achieving SDT.
One solution to overcome the problem of students' self determination is through an effective, meaningful and more free learning for them to express ideas in solving a problem. The learning mentioned here is MFPI learning. MFPI is a teaching whose basic principle is to facilitate students in solving real problems, activate existing knowledge as a basis for new knowledge, gain new knowledge, apply knowledge, integrate knowledge according to their world and everyday life. The principles in MFPI learning include five important principles in education that make learning more meaningful and students become more active in the learning process [3]. The five principles of learning stages are as follows: 1) the demonstration principles: learning occurs when students observe and demonstrate; 2) the application principles: this stage aims to make students apply new knowledge; 3) the problem-centered principle: this stage aims to enable students to apply strategies in solving mathematical problems; 4) the activation principle: this stage aims at students connecting the initial ability or experience to the knowledge to be learned; 5) the integration principle: this stage aims to enable students to integrate their knowledge into everyday problems. Those five principle of MFPI affect the students’ self determination skill.

2. Method
Based on the focus of the problem in the introduction, it was used quantitative approach with postest only control design. The subjects in this study were the 8th grade students of State Junior High Schools in Tangerang City, Indonesia. These students were chosen because they have already had the ability to answer the questions based on their own capacities. The experimental class consisted of 64 students, 15 students in the high MPK category, 41 students in the medium MPK category and 8 students in the low MPK categories. the control class consisted of 60 students, 10 students in the high MPK category, 41 students in the medium MPK category and 9 students in the low MPK category.

The validity and reability of the SDT instruments in this study have been validated by experts.

2.1. Test of Mathematical Prior Knowledge (MPK)
The MPK test is used to measure students’ initial abilities before being treated using MFPI learning and regular learning. MPK tests consist of mathematical material test related to the material used by researchers in this study. Table 1 show the grouping categories of high MPK, medium MPK and low MPK are as follows,

| Grouping | Category |
|----------|----------|
| n > 83.31 | High     |
| 58.23 ≤ n ≤ 83.31 | Medium |
| n < 58.23 | Low      |

2.2. Self Determination (SDT) scale
Student’ self determination abilities are measured using Likert scale. The statement in SDT consists of 21 statements with measured aspects, namely 1. autonomy (recognition of the feeling of acting of their own accord, the choice for their own experience, the opportunity for the direction with promoted); 2. Competence (fighting power, feedback, awards); 3. Relatedness (the development of self confidence, fulfilling relationships with others). The validity of the SDT instrument shows that the SDT statement is valid with the reliability coefficient of 0.771, indicating that the SDT questionnaire statement has a constancy in the high category.

2.3. Techniques of data analysis
The data is processed from the results of student post-test on the student SDT achievement skills. The results were processed by descriptive and inferential statistical analysis, using t-test and Mann-Whitney test with 0.05 significance level.
3. Result and Discussion

The results of descriptive statistics on the students' self determination achievement skills based on the MPK category shown in Table 2.

**Table 2.** Descriptive Statistics on The Students' SDT Achievement Skills Based on The MPK Category

| MPK Group | Learning Approach | MFPI | Regular Learning |
|-----------|-------------------|------|------------------|
| High      | The number of the Students | 31   | 29               |
|           | Average            | 72.35| 68.89            |
|           | Stdev              | 6.62 | 5.65             |
| Medium    | The number of the Students | 30   | 26               |
|           | Average            | 72.86| 67.79            |
|           | Stdev              | 6.12 | 5.65             |
| Low       | The number of the Students | 13   | 16               |
|           | Average            | 73.94| 66.71            |
|           | Stdev              | 4.44 | 5.45             |
| Overall   | The number of the Students | 64   | 60               |
|           | Average            | 72.72| 68.02            |
|           | Stdev              | 5.95 | 8.32             |

The average achievement of self determination ability on students who got MFPI learning is better than students who got regular learning. The results of the students' SDT achievement based on the category of high, medium and low MPK must meet the difference test requirements between students who received MFPI learning and students who received regular learning. Tables 3, 4 and 5 show the results of the normality test, homogeneity test, t-test and Mann-Whitney test with 0.05 significance level.

**Table 3.** Data Normality Test for Student SDT Ability Achievement Based on MPK Category

| Category | Learning Approach | N  | SW          | Sig. (2-Tailed) | $H_0$ | Interpretation |
|----------|-------------------|----|-------------|----------------|-------|----------------|
| High     | MFPI              | 15 | 0.923       | 0.214          | Accepted | Normal         |
|          | Regular           | 10 | 0.947       | 0.635          | Accepted | Normal         |
| Medium   | MFPI              | 41 | 0.964       | 0.219          | Accepted | Normal         |
|          | Regular           | 41 | 0.969       | 0.316          | Accepted | Normal         |
| Low      | MFPI              | 8  | 0.902       | 0.299          | Accepted | Normal         |
|          | Regular           | 9  | 0.833       | 0.048          |Rejected  | Not Normal     |

High MPK and medium MPK, Sig value. data of student self determination achievement is more than 0.05 so the null hypothesis is accepted. The conclusion is that the data on the achievement of self determination capabilities for high MPK and medium MPK are being normally distributed. Sig value. Student achievement data of self determination ability for low MPK is less than 0.05 so the null hypothesis is rejected. In conclusion, the data of achieving self determination abilities for low MPK are not normally distributed.
Table 4. The Homogenity Test of Data for Students' SDT Skills Achievement Based on MPK Category

| Category | Learning Approach | N   | F  | Sig | H₀   | Interpretation     |
|----------|------------------|-----|----|-----|------|-------------------|
| High     | MFPI             | 15  | 0.698 | 0.412 | Accepted | Homogeneous       |
|          | Regular          | 10  |      |      |       |                   |
| Medium   | MFPI             | 41  | 0.9530 | 0.003 | Rejected | Not homogeneous  |
|          | Regular          | 41  |      |      |       |                   |

Sig data on student SDT skills achievement in the high MPK category is more than 0.05 so the null hypothesis is accepted. The conclusion for the students' SDT skills achievement in the high MPK category has homogeneous variance. Medium MPK category, Sig data of student SDT skills achievement is less than 0.05 so the null hypothesis is rejected. So, the achievement of SDT skills students in the MPK category has a homogeneous variance.

Table 5. Test Differences in Student SDT Skills Achievement Based on MPK Category

| Category | Learning Approach | N   | t   | t'  | Z   | Sig (2-tailed) | H₀   | Interpretation     |
|----------|------------------|-----|-----|-----|-----|----------------|------|-------------------|
| High     | MFPI             | 15  | 1.491 |     |     | 0.150         | Accepted | There are no differences |
|          | Regular          | 10  |      |     |     |               |       |                   |
| Medium   | MFPI             | 41  | 2.690 |     |     | 0.009         | Rejected | There are differences |
|          | Regular          | 41  |      |     |     |               |       |                   |
| Low      | MFPI             | 8   | -1.011 |     |     | 0.312         | Accepted | There are no differences |

The Sig value of students' self determination skills achievement based on high MPK is more than 0.05, so the null hypothesis is accepted. In conclusion there is no difference in the students' self determination skills achievement who got MFPI learning and students who got regular learning in terms of high MPK categories. The Sig value of students’ self determination skills achievement based on medium MPK is less than 0.05, so the null hypothesis is rejected. The conclusion is there are differences in students' self determination skills achievement who got MFPI learning and those who got regular learning in terms of the medium MPK category. The Sig value of Students' self determination skills achievement in the low MPK category is more than 0.05 so the null hypothesis is accepted. The conclusion is that there is no difference in the students' self determination skills achievement in MFPI learning groups and regular learning in terms of high MPK categories.

Figure 1. Graph of Achievement for SDT Capabilities based on MPK

Based on statistical tests, it can be concluded that the students' self determination skills who received MFPI learning are better than the students who received regular learning based on the
medium MPK category. In the high MPK and low MPK categories, there are no differences in SDT skills between students who received MFPI learning and students who received regular learning. Although high MPK and low MPK showed no differences, the descriptive statistics shows that the average achievement of students' SDT skills who received MFPI learning is better than students who received normal learning. It can be concluded that MFPI learning has an influence on the SDT skills achievement but it is not significant.

MFPI learning stages are carried out through activation, demonstration, application and integration. The activation phase develops autonomy and competence, the teacher motivates students by giving previous material questions to determine students' readiness. The demonstration and application stages further develop relatedness, competence, grouping by the teachers and assistance for student discussions. The integration phase gives rise to all aspects of SDT skills because the teacher asks students about the concepts or knowledge that have been learned and relates problems to everyday life. The teacher motivates and provides feedback to students about the material that has been learned [4-5].

Figure 1 shows the autonomy of high MPK students is superior, while the competence possessed by the low MPK category is slightly higher than the high MPK students. Based on Miserandino's research [6] it would mean that even though the students have high abilities, they are not quite confident in their abilities so that they always withdraw during learning process. High MPK students who do withdrawal in a learning does not necessarily mean that they are not motivated in the learning process but because high MPK students tend to have fears when making a mistake in solving problems or they are too careful when they act. On the contrary to high MPK students, those who belong to low MPK category, based on Figure 1, have low competence but they possess superior autonomy, this is because low MPK students have high self-confidence in solving problems, they do not have fear when the solution is not accurate so they feel confident of having the ability. Relatedness between the three MPK categories has the same skills. Students already have good skills in discussing and empathizing. Based on the SDT questionnaire given to the subjects, the low MPK category believes that it has good competence even though in term of autonomy it is still poor. These results show that MFPI influences students' SDT skills.

4. Conclusion
The average SDT skills achievement of students who got MFPI learning is better than students who got regular learning. It can be concluded that MFPI learning has an influence on the achievement of self determination skills but it is not significant. The MFPI learning stages which was carried out namely through activation, demonstration, application and integration affected the students skills in achieving their self determination.

Acknowledgment
The researcher is deeply grateful to the principal of SMPN Kota Tangerang who has allowed her to carry out this research. In addition, the high appreciation is also addressed to all eighth grade students who have participated fully to succeed this research.

References
[1] Field S, Martin J, Miller R, Ward M and Wehmeyer M 1998 Self-Determination for Persons with Disabilities: A Position Statement of the Division on Career Development and Transition, The Council for Exceptional Children Career Development for Exceptional Individuals 21 113-128.
[2] Deci and Ryan 2000 Self Determination Theory and The Facilitation of Intrinsic Motivation Social Development and Well Being The American Psychological Association 55 68-78.
[3] Merrill, M.D. 2006. The Impacts and Challenges of Pedagogical Skills Improvement Program at Adama Science and Technology University. International Journal of Instruction 10 19-38.
[4] Wilujeng H 2018 Analysis of students’ self-determination in learning mathematics J. Phys. Conf. Ser. 948 012013.
[5] Wilujeng H, Kusumah Y S and Darhim D 2019 The students’ achievement of algebraic thinking ability using Merrill’s First Principles of Instruction. J. Phys. Conf. Ser. 1188 012039.
[6] Miserandino M 1996 Children Who Do Well in School: Individual Differences in Perceived Competence and Autonomy in Above-Average Children J. Educ. Phys. 88 203-214.