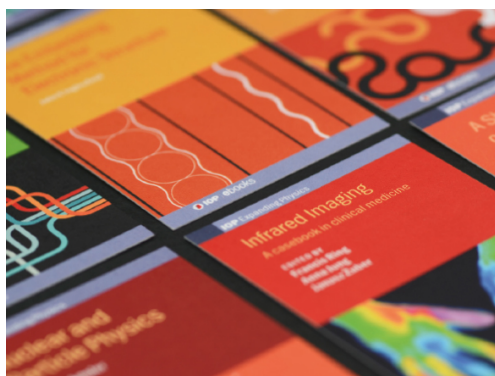


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# Multiple intelligences in welding practice lectures

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**Abstract.** This study aims to determine the multiple intelligences possessed by students, the level of multiple intelligences of students and to measure the relationship between multiple intelligences with the learning outcomes of welding practice lectures in the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. The method used is a survey. The research was carried out in the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. The research was conducted from April to July 2020 during the COVID-19 pandemic and was conducted online. The research subjects were students of the 2018 Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. The independent variable is the student's multiple intelligences and the dependent variable is the learning result of welding practice lectures. The result of this research shows that the highest multiple intelligences is interpersonal intelligence (78.91%) and the lowest multiple intelligences is naturalist intelligence (63.48%). Other multiple intelligences include verbal-linguistic intelligence (72.01%), logic-mathematics (72.59%), visual-spatial (71.29%), kinesthetic (72.02%), musical (68.36%), intrapersonal (73.93%) and existential (65.43%). The highest multiple intelligences that became dominant from the students of the S1 Mechanical Engineering Study Program, Faculty of Engineering, Yogyakarta State University, were interpersonal intelligence with 20 students (25.97%), intrapersonal with 17 students (22.08%), visual-spatial with 8 students (10.39%), logic-mathematics with 7 students (9.09%), musical with 7 students (9.09%), verbal-linguistics with 6 students (7.79%), kinesthetic with 5 students (6.49%), existential with 5 students (6.49%) and naturalists with 2 students (2.60%). The value (Sig.) Is  $0.028 < 0.05$  and the  $t_{count}$  value is  $2.246 > 1.99897$ , it can be concluded that there is a contribution of multiple intelligences of students of the S1 Mechanical Engineering Study Program, Faculty of Engineering, Yogyakarta State University (X) to the learning outcomes of welding practice in the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (Y).

## 1. Introduction

The era of the industrial revolution 4.0 is an era where technological advances penetrate all aspects. Technology is the basis for everything related to the life of the Indonesian people, be it in the fields of economy, politics, culture, art, and even education. This development requires many supporting factors, one of which is through strengthening human resources which can be developed in various ways, such as training, workshops, and education.

Education is a conscious and planned effort in the realization of an atmosphere of learning and an active learning process so that the development of spiritual self-potential is religious, self-control, personality, intelligence, morals, and the competencies that are needed by him, society, nation and state Education also stimulates an increase in a person's hard and soft skills. Hard skills are manifested in the form of student competencies in the process of skills according to expertise, while soft skills are manifested in the form of skills and proficiency in self-management to be more developed and competent [10].



The implementation of the realization of education by supporting the concept according to the goals of education is the learning process through the role of parents as the main educators in informal education, the role of educators as educators informal education, and the community as educators in non-formal education.

One of the formal education in the context of higher education that teaches educational concepts is Yogyakarta State University with one of the education graduate printing study programs which are closely related to the concept of the 4.0 era, namely the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. Students are taught how the concept of education is, steps in processing teaching and learning activities, and applying educational knowledge to make it more developed according to today's needs.

The learning process carried out by individuals aims at the concept of self-change and competency development which is the result of the implementation of the learning process that has been passed, even though in the end each change in self and the competencies that students have will vary from one individual to another. This is related to the factors that influence, one of which is multiple intelligences. Intelligence is the soul's ability to face and overcome new difficulties consciously, by thinking quickly and accurately [4]. Intelligence becomes one of the boosters in mental, mental, or intellectual abilities and becomes part of the cognitive process at a higher level. Intelligence is believed to be an important element that determines the learning success of students. The higher a person's intellectual ability, the greater the chance for achievement, conversely, if the lower one's intellectual ability is, the less likely it is to gain achievement [6]. However, the intelligence of each student has intelligence that has different values, some have high, medium, and low intelligence.

The theory of multiple intelligences states that there are eight bits of intelligence as follows: (1) Linguistic-verbal intelligence (language intelligence); (2) logical intelligence (intelligence to process numbers); (3) visual-spatial intelligence (sensitivity to see images and space accurately); (4) Physical-kinesthetic intelligence (a person's ability to control his body); (5) Musical intelligence-rhythmic (intelligence related to music); (6) Interpersonal intelligence (ability to influence, convince, and encourage others); (7) Intrapersonal intelligence (the ability to understand one's feelings, knowledge of one's strengths and weaknesses); (8) Naturalistic intelligence (one's sensitivity to nature, plants, animals, etc.) [2].

Based on this, intelligence has an important role in determining the results of the learning that students have gone through. This needs to be developed so that the objectives of the teaching and learning process can be realized, assisted by information about the intelligence profile and a preliminary study to determine the level of the intelligence profile of students so that the objectives of this study can be achieved such as a) multiple intelligences owned by students, b) levels student multiple intelligences and c) measure the relationship between multiple intelligences with the learning outcomes of welding practice lectures.

## 2. Method

The method used is a survey with a quantitative approach to measure the level of relevance of student multiple intelligences with learning outcomes in welding practice lectures in the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. the survey is used to collect data at certain points/sections that aim to describe the situation or identify standards between subjects being compared. Surveys can also be used to determine the relationship between variables [8]. This research was conducted in the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University from April to July 2020 during the COVID-19 pandemic so it was carried out online. The population was students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University, and the sample being students of the 2018 Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University.

The independent variable is a variable that affects, and in research, it is multiple intelligence. The dependent variable is the variable that is affected and in this study the learning outcomes of welding

practice [8]. The data collection methods used in this study were questionnaires and documentation. Validity is a measure that shows the levels of validity or validity of an instrument [1]. This research uses logical validity and empirical validity. Logical validity includes the validity of content and constructs. Content validity is used to test the coverage of the instrument items to the object to be measured [3]. The construct validity ensures that the results obtained from the instrument in question are compatible with the theory developed [7]. The logical validity that has been done for the research instrument is by expert judgment from 2 lecturers in the field of Psychology, namely from 1) Rahmatika Kurnia Romadhani, S.Psi., M.Psi. Psychologist, Department of Psychology, Expertise in Clinical Psychology and Positive Psychology, Faculty of Education, Yogyakarta State University and 2) Dian Purbo Utomo, S.Pd., M. Pd., Kons., Department of Guidance and Counseling, Expertise in Counseling Guidance, Psychology Education, Assessment., Faculty of Education, Semarang State University. Empirical validity is done by testing the instrument directly on the respondent. The results of the t-test were analyzed using a product-moment correlation using the SPSS 19 for windows computer program, with the results summarized in table 1. There are 57 valid items and 10 invalid items.

**Table 1.** Validity test results

Valid Items	1,2,3,4,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,26,28,29,30,31,32,34,35,37,38,39,40,41,42
Invalid Item	43,44,45,47,48,49,51,52,54,55,56,57,60,61,62,63,64,65,66,67 5,25,27,33,36,46,50,53,58,59

Reliability shows that an instrument can be trusted to be used as a data collection tool [1]. The reliability is calculated using the help of the SPSS 19 for windows computer program, the criteria used in this test are if ( $\alpha = 5\%$ ). The results are summarized in tables 2 and 3.

**Table 2.** Case processing summary results

		N	%
Cases	Valid	64	100.0
	Excluded <sup>a</sup>	0	.0
	Total	64	100.0

a. Listwise deletion based on all variables in the procedure.

**Table 3.** Results of the reliability statistics

Cronbach's Alpha	N of Items
.924	67

The questionnaire's reliability coefficient was 0.924 with a very high level of reliability. This value  $r_{count} > r_{table}$  ( $0.924 > 0.244$ ), thus it can be concluded that the multiple intelligences research questionnaire of the students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University is reliable and can be trusted for research.

The research analysis used simple linear regression analysis with the multiple intelligences of students as the independent variable (X) and the learning outcomes of welding practice lectures as the dependent variable (Y). In the process of simple linear regression analysis, researchers used the help of the SPSS 19 for windows program. This normality test uses the main data, namely the multiple intelligences possessed by students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. Test for normality using the help of the SPSS 19 for windows computer program which results are summarized in Table 4.

**Table 4.** One-sample Kolmogorov-Smirnov test

		Unstandardized Residual
N		64
Normal Parameters <sup>b</sup>	Mean	.0000000
	Std. Deviation	5.93848717
Most Extreme Differences	Absolute	.119
	Positive	.106
	Negative	-.119
Kolmogorov-Smirnov Z		.956
Asymp. Sig. (2-tailed)		.321

a. Test distribution is Normal.

b. Calculated from data.

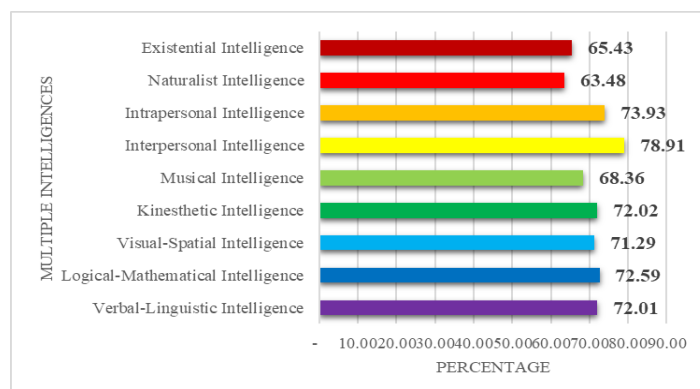
Based on the SPSS output on table 4, the Asymp value is obtained. Sig. (2-tailed) is 0.321. This value is greater than 0.05 ( $0.321 > 0.05$ ) so that by the basis for decision making in the Kolmogorov-Smirnov normality test, it can be concluded that the data is normally distributed, thus that the assumptions or requirements for normality in the regression model have been met. This linearity test uses the help of the SPSS 19 for windows computer program. The results are summarized in Table 5. Deviation from Linearity Sig. is .054 and the value is  $0.054 > 0.05$ , so there is a significant linear relationship between the independent variable and the dependent variable.

**Table 5.** ANOVA results

			Sum of Squares	df	Mean Square	F	Sig.
SMAW Welding Practices* Multiple Intelligences	Between Groups	(Combined) Linearity Deviation from Linearity	1874.454 180.700 1693.754	40 1 39	46.861 180.700 43.430	2.041 7.872 1.892	.036 .010 .054
Within Groups			527.981	23	22.956		
Total			2402.435	63			

### 3. Result and Discussion

The results of filling out the online multiple intelligences questionnaire filled in by the students are then carried out the recap, analysis, and calculations with assistance using SPSS 19 for windows. the mean percentage diagram as depicted in figure 1.

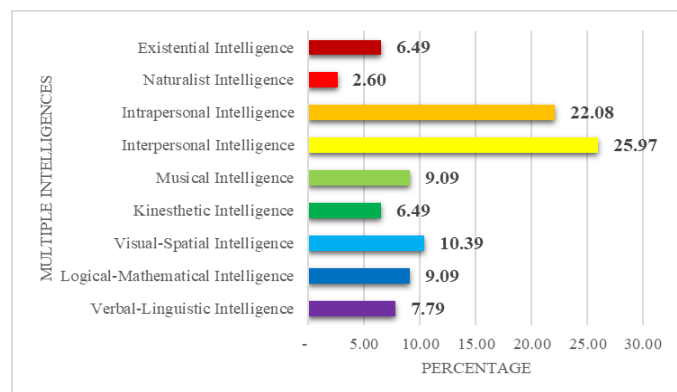
**Figure 1.** Diagram of the mean percentage of the multiple intelligences questionnaire

The diagram above illustrates the average multiple intelligences possessed by students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University. The highest multiple intelligences is interpersonal intelligence with 78.91% and the lowest multiple intelligences is naturalist intelligence at 63.48%. Other multiple intelligences such as verbal-linguistic intelligence 72.01%, logic-mathematics 72.59%, visual-spatial 71.29%, kinesthetic

72.02%, musical 68.36%, intrapersonal 73.93% and existential 65.43%. These results are then analyzed regarding which multiple intelligences are dominant and get the highest value from each respondent. The results are summarized in Table 6. The results are then made in the form of a diagram as depicted in figure 2. It is showed that the interpersonal intelligence of 20 students (25.97%), 17 students (22.08%) intrapersonal, 8 students visual-spatial (10, 39%), logic-mathematics 7 students (9.09%), musical 7 students (9.09%), verbal-linguistic 6 students (7.79%), kinesthetic 5 students (6.49%), existential 5 students (6.49%) and naturalists 2 students (2.60%).

**Table 6.** Recap of the dominant multiple intelligences in each aspect

Aspects of Intelligence	Total	Percentage
Verbal-Linguistic Intelligence	6	7.79 %
Logical-Mathematical Intelligence	7	9.09 %
Visual-Spatial Intelligence	8	10.39 %
Kinesthetic Intelligence	5	6.49 %
Musical Intelligence	7	9.09 %
Interpersonal Intelligence	20	25.97 %
Intrapersonal Intelligence	17	22.08 %
Naturalist Intelligence	2	2.60 %
Existential Intelligence	5	6.49 %



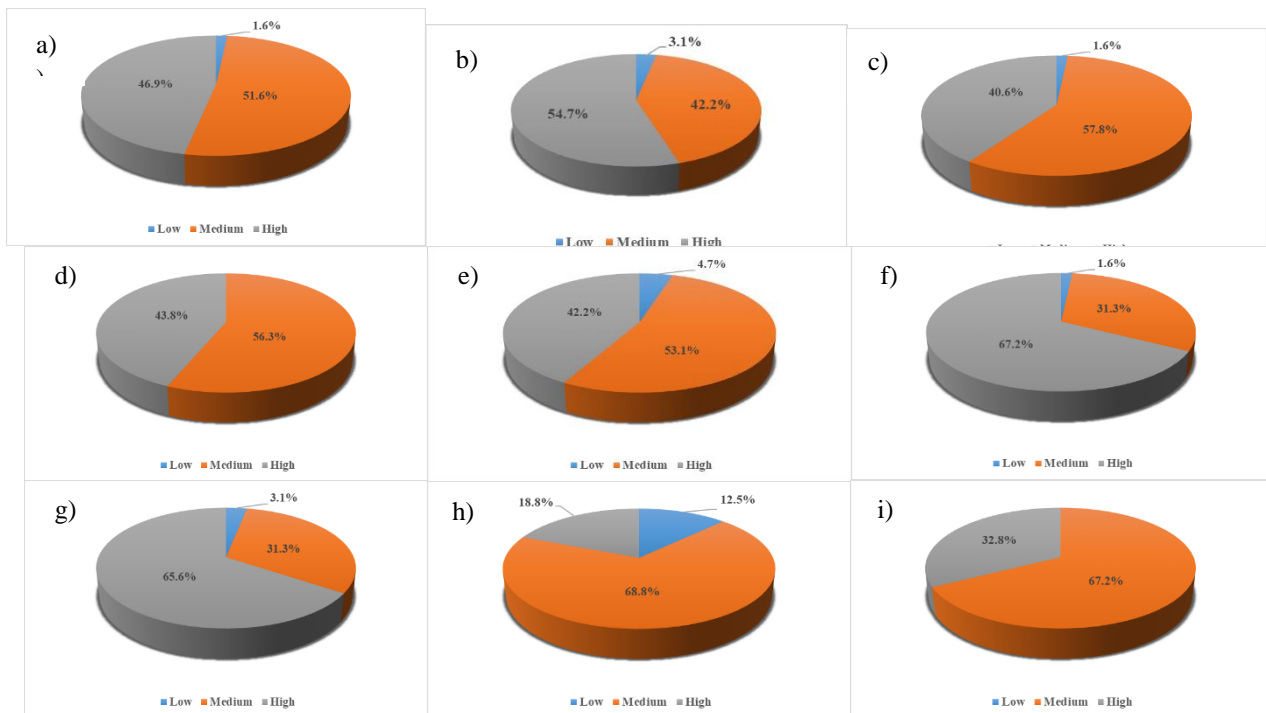
**Figure 2.** Diagram of potential multiple intelligences recap each aspect

Some students fill in and get the same results for each aspect so that these students have a dominant value for several points of intelligence. The results are summarized in Table 7.

**Table 7.** Results of entries with maximum values for the combination of several bits of intelligence

Aspects of Intelligence	Total
Interpersonal Intelligence & Intrapersonal Intelligence	3
Intrapersonal Intelligence & Existential Intelligence	3
Kinesthetic Intelligence & Intrapersonal Intelligence	1
Logical-Mathematical Intelligence & Visual-Spatial Intelligence	1
Musical Intelligence & Interpersonal Intelligence	1
Musical Intelligence & Intrapersonal Intelligence	1
Visual-Spatial Intelligence & Naturalist Intelligence	1
Visual-Spatial Intelligence, Intrapersonal Intelligence, and Existential Intelligence	1

This calculation is assisted by using SPSS 19 for windows. The results of the SPSS output are then made in the form of a diagram as depicted in figure 3. It is showed that a) Verbal-Linguistic, 1 student has the low category (1.6%), the medium category 33 students (51.6%) and the high category 30 students (46.9%), b) Logic-Mathematical, 2 students had the low category (3.1%), the medium category 27 students (42.2%) and the high category 35 students (54.7%), c) Visual-Spatial, 1 student has the low category (1.6%), the medium category 37 students (57.8%) and the high category 26 students (40.6%), d) Kinesthetic, 36 students (56.3%) owned the medium category and 28 students (43.8%) in the high category, e) Musical, 3 students have the low category (4.7%), the medium category 34 students (53.1%) and the high category 27 students (42.2%), f) Interpersonal, 1 student has the low category (1.6%), the medium category is 20 students (31.3%) and the high category is 43 students (67.2%), g) Intrapersonal, 2 students had the low category (3.1%), the medium category 20 students (31.3%) and the high category 42 students (65.6%), h) Naturalist, 8 students had the low category (12.5%), the medium, and i) Existential, 43 students (67.2%) owned the medium category and 21 students (32.8%) was in the high category.



**Figure 3.** a) Verbal-Linguistic, b) Logic-Mathematical, c) Visual-Spatial, d) Kinesthetic, e) Musical, f) Interpersonal, g) Intrapersonal, h) Naturalist, and i) Existential

### Regression Coefficient Test

Testing the regression coefficient hypothesis uses the help of the SPSS 19 for windows computer program. The results are summarized in tables 8 and 9. The simple linear regression equation is  $Y = 95,131 - 0,093X$ . This means that if there are no multiple intelligences (X), then the consistent value of learning outcomes in welding practice lectures (Y) is 95,131, while at every 1% addition of the level of multiple intelligences (X) will have an impact on increasing equal to 0.093 in the learning outcomes of welding practice lectures (Y).

**Table 8.** ANOVA<sup>b</sup> results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	180.700	1	180.700	5.043	.028 <sup>a</sup>
	Residual	2221.735	62	35.834		
	Total	2402.435	63			

a. Predictors: (Constant), Multiple Intelligences

b. Dependent Variable: SMAW Welding Practices

**Table 9.** Coefficients

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	95.131	6.812		13.964	.000
	Multiple Intelligences	-.093	.041	-.274	-2.246	.028

a. Dependent Variable: SMAW Welding Practices

The significance value (Sig.) Are 0.028 and less than 0.05, so it can be concluded that  $H_a$  is accepted by the regression effect of multiple intelligences possessed by students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (X) on the learning outcomes of welding practice of Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (Y). The  $t_{count}$  value is 2.246. At  $\alpha = 5\%$  and in the 2-sided test with 62 degrees of freedom (DK), the  $t_{table}$  value is 1.99897. So it can be concluded that the value is  $2.246 > 1.99897$  and indicates that there is a contribution of multiple intelligences owned by students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (X) to the learning outcomes of the students of the S1 Mechanical Engineering Study Program, Faculty of Engineering, Yogyakarta State University (Y).

**Table 10.** Model summary results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.274 <sup>a</sup>	.075	.060	5.986

a. Predictors: (Constant), Multiple Intelligences

The model summary results are summarized in Table 10. The value of R Square is 0.075, which means that the influence of multiple intelligences that students have (X) on the learning outcomes of welding practice students of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (Y) is 7.5% while 92.5% is influenced by other variables.

This result is by the strengthening of the theory which states that multiple intelligences are the bits of intelligence possessed by each individual and each individual has a different value of multiple intelligences [9]. Every intelligence that a person has, will cooperate with one another as well as 1) Linguistic intelligence is an intelligence related to language skills; 2) Mathematical-logical intelligence is intelligence related to the ability to count, reason, and think logically; 3) Naturalist intelligence is a combination of human nature which includes skills in recognizing, classifying flora and fauna and other natural objects, as well as having sensitivity to environmental conditions; 4) Kinesthetic intelligence is intelligence related to motor skills and balance; 5) Spatial intelligence is the ability to capture the spatial-visual world accurately; 6) Musical intelligence is the ability to develop, express and enjoy music and sound forms; 7) Interpersonal intelligence is the ability to understand and be sensitive to other people's feelings, intentions, motivations, dispositions, temperaments; 8) Intrapersonal intelligence is the ability



related to self-knowledge and the ability to act adaptively based on that self-knowledge; and 9) Existential Intelligence is intelligence that makes someone ask and answer about the nature of human existence in this world.

Interpersonal and intrapersonal intelligence is intelligence with the highest dominance. Interpersonal intelligence makes students understand and sensitive to the feelings, intentions, motivation, character, temperament of others, and this is related to a person's ability to establish relationships and communicate with various people. Students who have high interpersonal intelligence are easy to get along and make friends, quickly enter into groups, easily communicate, and gather friends. In the context of welding practice lectures, these students tend to prefer to learn to practice in collaboration with others, all difficulties are communicated and solutions to problems are found with friends by conducting group studies. These students also tend to be easy to help if other friends find it difficult to complete assignments or jobs.

Intrapersonal intelligence enables students to be adaptive based on self-knowledge, including the ability to reflect and balance themselves. These students have a high level of awareness of their ideas and have the ability to make personal decisions. In the context of welding practice lectures, these students tend to prefer to learn to practice independently both theory and practice with all the difficulties experienced will be more likely to be done and find solutions to problems by conducting independent studies either by reading modules, books, or asking a lecturer.

#### 4. Conclusion

Based on the results of the research and description above, it can be concluded that

- a. Multiple intelligences students of the S1 Mechanical Engineering Study Program, Faculty of Engineering, Yogyakarta State University have various values. The average result of the highest multiple intelligences is interpersonal intelligence (78.91%) and the lowest multiple intelligences is naturalist intelligence (63.48%). Other multiple intelligences include verbal-linguistic intelligence (72.01%), logic-mathematics (72.59%), visual-spatial (71.29%), kinesthetic (72.02%), musical (68.36%), intrapersonal (73.93%) and existential (65.43%). The percentage value shows the multiple intelligences of the Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University students in a good category in every aspect of intelligence.
- b. The level of multiple intelligences for Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University with the highest and dominant multiple intelligences is interpersonal intelligence with 20 students (25.97%), intrapersonal intelligence with 17 students (22.08%), visual-spatial intelligence with 8 students (10, 39%), logic-mathematics intelligence with 7 students (9.09%), musical intelligence with 7 students (9.09%), verbal-linguistic intelligence with 6 students (7.79%), kinesthetic intelligence with 5 students ( 6.49%), existential intelligence with 5 students (6.49%) and naturalists with 2 students (2.60%).
- c. The value (Sig.) Is  $0.028 < 0.05$  and the  $t_{count}$  value is  $2.246 > 1.99897$  so that it is concluded that  $H_a$  is accepted with the contribution of multiple intelligences students of Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (X) to the learning outcomes of the welding practice lectures for Undergraduate Program of Mechanical Engineering Education, Faculty of Engineering, Yogyakarta State University (Y) with R Square 0.075 that the effect of multiple intelligences on learning outcomes of welding practice lectures for students of the S1 Mechanical Engineering Study Program, Faculty of Engineering, Yogyakarta State University (Y) is 7.5% while 92.5% is influenced by other variables.

### Acknowledgments

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### Reference

- [1] Arikunto, Suharsimi 2010 *Prosedur Penelitian Suatu Pendekatan Praktik* Jakarta Rineka Cipta
- [2] Aryani, A.D., Sudjito, D.N., & Sudarmi, M. 2015 *Penerapan Model Pembelajaran Berdasarkan Teori Multiple Intellegence (MI) yang Dominan dalam Kelas Pada Materi Tekanan* Jurnal Radiasi 6 (1) 1-10
- [3] Awar, Saifuddin 2012 *Metode Penelitian* Yogyakarta Pustaka Pelajar
- [4] Baharuddin 2009 *Psikologi Pendidikan: Refleksi Teoritis terhadap Fenomena Jogjakarta* Ar-Ruzz Media
- [5] Cohen, L., Manion, L., & Morrison, K 2007 *Research Methods in Education (6th ed.)* London New York Routledge Falmer
- [6] Muhibbin Syah 1997 *Psikologi Pendidikan dengan Pendekatan Baru* Bandung Remaja Rosdakarya
- [7] Sekaran, Uma 2003 *Research Methods For Business: A Skill Building Aproach* New York-USA John Wiley and Sons, Inc
- [8] Sugiyono 2015 *Metode Penelitian Kombinasi (Mix Methods)* Bandung Alfabeta
- [9] Manurung, Nurhasanah 2013 *Pemanfaatan Multiple Intelligences dalam Proses Pembelajaran* Jurnal Keguruan Volume 1 No 1
- [10] Wibowo, Y.E & Syamwil, R. 2019 *Pengembangan Transferable Skills dalam Pembelajaran Produktif Sekolah Menengah Kejuruan di Era Industri 4.0* Jurnal Dinamika Vokasional Teknik Mesin Volume 4 Nomor 2 Oktober 2019