

The independence learning and learning outcomes of Mathematical analysis of students at civil engineering department, faculty of engineering, Universitas Negeri Padang

R Abdullah¹ and J Silalahi¹

¹Engineering Department, Faculty of Engineering, Universitas Negeri Padang

E-mail: rijalabdullah2019@gmail.com

Abstract. This research is motivated by the high percentage of students who get low scores in Mathematics Analysis Courses. The purpose of this study was to reveal the contribution of learning independence to the learning outcomes of Mathematical Analysis of Building Engineering Education Study Program students, Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang. This study was designed as a quantitative research. The population was 63 students of Building Engineering Education Study Program in 2015, the samples were taken by totally. Instruments in the form of questionnaires that have been tested for validity and reliability. The findings of the study showed that the contribution of learning independence to the learning outcomes of Mathematical Analysis of students of Building Engineering Education Study Program, Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang was 35.28%.

1. Introduction

Mathematical Analysis is one of the Expertise Field Courses, which is in the Building Engineering Education Study Program, Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang. This course serves as a support for mastering the subject matter structure and other subjects that require calculation. Lecture material is focused on the analysis and application of mathematical concepts in the field of Civil Engineering. The basic material includes operational counting, system of equations (algebra), geometry, trigonometry, series/sequences, functions and limit functions, derivatives (differentials) and their applications in the planning, implementation, and supervision of building engineering work [1].

In general, students assume that mathematics is a difficult course. The same problem was also found in the Building Engineering Education Study Program, Civil Engineering Department, Faculty of Engineering Universitas Negeri Padang, where the achievement of student grades in Mathematics Analysis subjects was not very satisfying. The learning outcomes of Mathematical Analysis for 2015 class students, for example, can be seen in Table 1 below.



Table 1. Learning outcomes of mathematical analysis class of 2015

Students	Grade	Amount	Percentage
Year Entry	$\geq C$	27	36%
2015	$< C$	48	64%
Total		75	

Source: Administration of Civil Engineering Department, FoE, UNP

For students, learning outcomes are a reflection of their success in learning in a subject (course). As for lecturers, student learning outcomes are an illustration of their success in teaching students. But often the achievement of student learning outcomes is not in line with expectations. Many things affect student success in learning, both from internal and external factors of the student. One of the important aspects of internal factors that influence learning outcomes is learning independence.

Independence of learning is an active and participatory way of learning for each individual student [2]. Students who have learning independence will be able to study even though the lecturer or friends are not present. Independence is formed gradually from oneself, parents, and educators (lecturers). Students who can learn independently will be able to understand the material given during the learning process well. Some indicators of students who have learning independence, among others: high self-confidence, being able to work alone, mastering skills, and learning skills, respecting time, and being responsible.

From the above, it can be concluded that learning independence can contribute to learning outcomes. In connection with this, a study was held which aimed to reveal the contribution of learning independence to the learning outcomes of Mathematical Analysis of students of the Civil Engineering Department, Faculty of Engineering, Padang State University.

2. Literature review

2.1 Affecting factors of learning outcomes

Learning is an effort made by someone to obtain a change in behavior, as a result of his experience when interacting with his environment [3]. Meanwhile [4] states that learning is a process activity and is a very fundamental element in managing every type and level of education. Learning is a process of the development of human life. By learning, humans make individual qualitative changes so that their behavior develops [5]. Based on the opinions above it can be concluded that learning is a change in behavior that is relatively permanent from a student as a result of his interaction in the learning process.

Learning outcomes are abilities possessed by students after he receives his learning experience [6]. Learning outcomes are abilities obtained by students after going through learning activities. Based on the opinions of several experts above, it can be concluded that learning outcomes are the abilities acquired by a student after experiencing learning activities.

There are two main factors that influence the achievement of learning outcomes, namely internal factors and external factors. Internal factors are factors that originate from within the students, which consist of health, intelligence and talent, interests and motivations, and ways of learning. The external factors are factors that originate from outside the students, consisting of family, school, and society [8] and [9].

Health, both physically and spiritually has a very big influence on students' learning abilities. Students who have excellent health are certain to be able to study well, and of course they will get high learning outcomes, and vice versa. Students with high intelligence and intelligence will be able to absorb learning material quickly, while students with low intelligence or not gifted will need more time to absorb learning material.

Students who have high interest (interest) towards something expertise delivered by the teacher will be motivated in learning. An important role of an educator is to develop students' interest in becoming an internal motivation for success. Internal motivation is the encouragement of students to take part in learning seriously, diligently, and not give up quickly when faced with problems in learning.

Family factors (as external factors), especially educational background and income level of parents, will greatly affect the success of a student in following learning.

A family with a level of education and income of good parents will be able to facilitate their children in learning. In addition, school and community factors also greatly influence the success of students in achieving success [9].

2.2. *Learning independence*

Independent learning does not mean learning alone [10] and being an independent person is one of the goals of National Education [11]. Independence is a state of being able to stand alone without relying on other people [12]. Students who learn independently will have an impact on the achievement of learning outcomes. The higher the level of independence of learning, the better the learning outcomes [13].

Independent learning is the ability and willingness of students to learn on their own initiative, with or without the help of others, both in terms of determining learning goals, learning methods, or evaluating learning outcomes [10]. Independent learning is an active and participatory way of learning to develop each individual who is not bound by the presence of a teacher, or lecturer, face-to-face meeting in class, or the presence of schoolmates [14]. Self-learning has many benefits for students' cognitive, affective, and psychomotor abilities [14]. Students who study independently have the freedom to learn without having to attend the learning provided by the teacher/educator in the class [10].

In independent learning needs to be accommodated various activities, including: (a) Competencies to be achieved, (b) processes that are set and searched for themselves, (c) learning inputs that are set and searched for themselves, run by students, with or without teacher guidance, (d) Self-evaluation activities (self-evaluation) carried out by the students themselves, (e) Reflection activities on the learning process that has been undertaken by students, (f) Past experience review or review of experiences that students already have, (g) Efforts to foster student learning motivation, and (h) active learning activities [15]. Independence is the desire (desire) to do something for yourself [16].

Based on several opinions above it was concluded that learning independence is an activity/learning activity carried out by students on their own desires and not dependent on others. Students who have learning independence will be able to establish learning competencies to be achieved, seek self-learning input, can conduct self-evaluations, and can reflect on the learning process. The main characteristic of an independent learning process is the opportunity given to students to participate in determining their goals, sources, and evaluation of learning [10]. Characteristics of learning independence include: (a) Able to think critically, creatively and innovatively, (b) Not easily affected by the opinions of others, (c) Not running away or avoiding problems, (d) Solving problems with deep thinking, (e) If you encounter a problem solved by yourself without asking for help from others, (f) Not feeling inferior if you have to be different from others, (g) Trying to work with diligence and discipline, and (h) Responsible for his own actions [17].

Meanwhile [18] shares the characteristics of independence in five types, namely: (a) Confidence, (b) Able to work alone, (c) Mastering skills and learning skills, (d) Respecting time, and (e) Responsible. From the description above, it can be concluded that students with learning independence are characterized by the ability to think critically, be responsible for their actions, not easily affected by others, work hard, and are not dependent on others.

2.3. Mathematical analysis course

Mathematics Analysis Course is a course that serves as a support for mastery of material structure and other subjects that require calculation. Lecture material is focused on the analysis and application of mathematical concepts in the Civil Engineering Field. Mathematical Analysis materials include: Operational Calculations, Equation Systems (Algebra), Geometry, Trigonometry, Series / Sequences, Functions and Limit Functions, Derivatives (differential) and their applications in planning, implementing, and monitoring building engineering work [18].

2.4. Relevant research

The following are the findings of several studies that are relevant to this study: (a) The motivation for learning and independence of learning contributes significantly to student learning outcomes [19], (b) Learning independence has a significant influence on economic learning outcomes [20], and (c) There is a significant relationship between learning independence and Mathematics learning outcomes of Parung-Bogor MTsN students [21].

2.5. Research framework

Based on theoretical studies and summaries of relevant research findings, it can be concluded that learning independence contributes to student learning outcomes. The framework of this research can be described in the following scheme (see Figure 1).

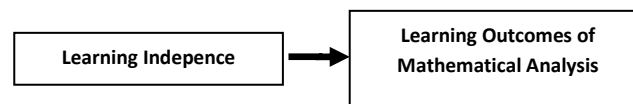


Figure 1. Research framework

3. Research method

3.1. Research design

This research is descriptive quantitative, which is used to express the contribution of learning independence to the learning outcomes of Mathematical Analysis of Civil Engineering Department students, Faculty of Engineering, Universitas Negeri Padang. The research was conducted at Civil Engineering Department, Faculty of Engineering, Padang. The study was conducted in June-July 2018. The population was 63 people, namely students of Building Engineering Education Study Program, Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang 2015 who were registered in the Semester January-June 2018 and had passed the Mathematics Analysis Course. Samples was taken by totally.

3.2. Research instruments

The research instrument is a questionnaire whose items are derived from the indicators of the results of theoretical studies, including: (a) Confidence, (b) Able to Work Alone, (c) Mastering Learning Skills and Skills, (d) Respecting Time, and (e) To be responsible

To measure the learning independence variable, a Likert scale is used with positive and negative statements namely Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD). Giving an answer score for each statement is 4, 3, 2, and 1 for positive statement, and for negative statement, the score is 1, 2, 3, and 4.

The instrument has gone through validity and reliability tests, both constructively and statistically (SPSS version 17.0) where the number of valid items is 33 items. Furthermore, the data obtained has met the requirements of statistical tests, namely normal and linear data. To be able to find the level of contribution of learning independence to the learning outcomes of Mathematical Analysis a correlation test was carried out and continued to calculate the value of determination.

4. Results

4.1. Data description

To find out the description of each variable's data, the average scores (median), median, mode, and standard deviation (Stanard Deviation) are presented. The results are presented in Table 3 below.

Table 3. Variable data frequency distribution research

	Learning Independence	Learning Outcomes of Mathematical Analysis
Valid	63	63
Missing	0	0
Mean	105.52	56.75
Median	105.00	54.00
Mode	104	54
Std. Deviation	3.519	7.683
Minimum	99	41
Maximum	117	81
Sum	6648	3575

The frequency distribution of learning independence variables can be seen in Table 4.

Many classes = $1 + (3.3 \times \log N) = 1 + (3.3 \times \log 63) = 6.937 = 7$

Interval class = $\text{Range} / (\text{Many Classes}) = 18/7 = 2.57 = 3$.

Table 4. Distribution of Frequency of Learning Independence

No.	Interval	Frequency	Percentage
1	99-101	5	7,95%
2	102-104	24	38,1%
3	105-107	22	34,92%
4	108-110	7	11,1%
5	111-113	2	3,17%
6	114-116	2	3,17%
7	117	1	1,58%
Total		63	100%

The highest frequency is in the interval class 102-104, which is 24 (38.1%), while the lowest frequency is 117, it is 1 (1.58%).

For Learning Results Mathematical Analysis obtained:

Many classes = $1 + (3.3 \times \log N) = 6.937 = 7$

Interval class = $\text{Range} / (\text{Many Classes}) = 40/7 = 5.714 = 6$

Frequency Distribution of Learning Outcomes Mathematical Analysis can be seen in Table 5.

Tabel 5. Distribution of Frequency Learning Outcomes Mathematical Analysis

No.	Interval	Frequency	Percentage
1	41-46	4	6,35%
2	47-52	9	14,29%
3	53-58	33	52,38%
4	59-64	10	15,87%
5	65-70	3	4,76%
6	71-76	2	3,17%
7	77-81	2	3,17%
Total		63	100%

The normality test using the Kolmogorov-Smirnov formula uses the SPSS version 17.0 program. If the significance value is ≥ 0.05 , then the data is normally distributed, if < 0.05 the data is abnormally distributed. The results of the normality test show data are normally distributed (see Table 6).

Tabel 6. Output of Normality Test

		Learning Independence	Learning Outcomes of Mathematical Analysis
N		63	63
Normal Parameters ^{a,b}	Mean	105.52	56.75
	Std. Deviation	3.519	7.683
Most Extreme Differences	Absolute	.147	.165
	Positive	.147	.165
	Negative	-.110	-.138
Kolmogorov-Smirnov Z		1.166	1.312
Asymp. Sig. (2-tailed)		.132	.064

a. Test distribution is Normal.

b. Calculated from data.

From the linearity test it can be concluded that the distribution of data is linear, where the linear deviation is $0.382 > 0.05$, see Table 7 below.

Tabel 7. Output Uji Linearitas

			Sum of Squares	df	Mean Square	F	Sig.
Learning Outcomes of Mathematical Analysis * Learning Independence	Between Groups	(Combined)	1875.522	15	125.035	3.293	.001
		Linearity	1290.562	1	1290.562	33.992	.000
		Deviation from Linearity	584.960	14	41.783	1.101	.382
	Within Groups		1784.414	47	37.966		
	Total		3659.937	62			

Next from the correlation test between variables X and Y, with the SPSS version 17.0 program it was found that there was a significant relationship between the two variables. This means that there is a relationship between learning independence and student learning outcomes in the Mathematics Analysis Course (see Table 8).

Table 8. Correlation Test Outputs

		Learning Independence	Learning Outcomes of Mathematical Analysis
Learning Independence	Pearson Correlation	1	.594**
	Sig. (2-tailed)		.000
	N	63	63
Learning Outcomes of Mathematical Analysis	Pearson Correlation	.594**	1
	Sig. (2-tailed)	.000	
	N	63	63

** . Correlation is significant at the 0.01 level (2-tailed).

Finally, using the formula for the coefficient of determination, KP is obtained by 35.28%. The meaning is that the contribution of learning independence to the learning outcomes of Mathematical Analysis of Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang students is 35.28%.

5. Discussion

This study aims to reveal the contribution of learning independence to the learning outcomes of Mathematical Analysis students of the Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang. The results of data processing revealed that learning independence contributed 35.28% to the learning outcomes of Mathematical Analysis of students of the Civil Engineering Department, Faculty of Engineering, Padang State University.

The findings of this study prove that learning independence correlates and contributes to learning outcomes, as theoretically extracted from [13], [14], and [10], and is supported by relevant research findings by [19], [20], and [21].

6. Conclusion

Based on the results of data analysis it can be concluded that learning independence contributes 35.28% to the learning outcomes of Mathematical Analysis of Civil Engineering Department, Faculty of Engineering, Universitas Negeri Padang students.

Based on these conclusions, it was suggested: (a) Lecturers need to strive to create and encourage the growth of the attitude of independence of student learning by providing more challenging independent tasks, (b) Other lecturers need to develop this research with broader indicators so that they can be known more in-depth other factors that contribute to student learning outcomes.

7. References

- [1] Kurikulum Pendidikan Teknik Bangunan Jurusan Teknik Sipil FT UNP Tahun 2018.
- [2] Martinis Yamin. (2009). *Desain Pembelajaran Berbasis Tingkat Satuan Pendidikan*. Jakarta: Gaung Persada Press Jakarta.
- [3] Slameto. (2010). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Jakarta: Rineka Cipta.
- [4] Muhibbin Syah. (2013). *Psikologi Belajar*. Jakarta: PT Rajagrafindo Persada
- [5] Abu Ahmadi dan Widodo Supriyono. (2013). *Psikologi Belajar*. Jakarta: Rineka Cipta.
- [6] Nana Sudjana. (2009). *Penilaian Hasil Proses Belajar Mengajar*. Bandung: PT Remaja Rosdakarya.
- [7] Mulyono Abdulrahman. (2003). *Pendidikan Bagi Anak Berkesulitan Belajar*. Jakarta: Rineka Cipta.
- [8] Slameto. (2010). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Jakarta: Rineka Cipta.
- [9] Dalyono. (2009). *Psikologi Pendidikan*. Jakarta: Rineka Cipta.
- [10] Rusman. (2012). *Model-Model Pembelajaran Mengembangkan Profesionalisme Guru*. Jakarta: Rajawali Press

- [11] Undang-Undang Nomor 20 Tahun 2003. *Sistem Pendidikan Nasional*. Jakarta: Depdiknas.
- [12] Departemen Pendidikan dan Kebudayaan. (2008). *Kamus Besar Bahasa Indonesia*. Jakarta: Perum Balai Pustaka.
- [13] Hendra Surya. (2003). *Strategi Jitu Mencapai Kesuksesan Belajar*. Jakarta: Elex Media Komputindo.
- [14] Martinis Yamin. (2009). *Desain Pembelajaran Berbasis Tingkat Satuan Pendidikan*. Jakarta: Gaung Persada Press Jakarta.
- [15] Haris Mudjiman. (2008). *Belajar Mandiri*. Surakarta: UNS Press.
- [16] Zainun Mu'tadin. (2002). "Kemandirian Sebagai Kebutuhan Psikologi pada Remaja". <http://www.e-psikologi.com>.
- [17] Chabib Thoha. (2006). *Kapita Selekta Pendidikan*. Yogyakarta: Pustaka Pelajar.
- [18] Pedoman Akademik UNP tahun 2015/2016.
- [19] Carolus Adi Purwono. (2014). *Kontribusi Motivasi Belajar dan Kemandirian Belajar Terhadap Hasil Belajar Siswa Kelas X Jurusan Teknik Kendaraan Ringan SMK Negeri 1 Cangkringan Tahun Ajaran 2013/2014*.
- [20] Ika Sulistya Warnaningsih. (2014). "Pengaruh Kemandirian Belajar dan Motivasi Belajar Siswa terhadap Prestasi Belajar Ekonomi pada Siswa Kelas XI IPS SMA Negeri 1 Kartasura Tahun Ajaran 2013/2014". *Skripsi*. Universitas Negeri Yogyakarta.
- [21] Rosyidah. (2010). "Hubungan antara Kemandirian Belajar dengan Hasil Belajar Matematika pada Siswa MTsN Parung-Bogor". *Skripsi*. Universitas Islam Negeri Syarif Hidayatullah Jakarta.