Investigation

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Submission date: 13-Jan-2024 10:23PM (UTC-0800)
Submission ID: 2270629561
File name: paper_msceis_2021-2021.pdf (897.9K)
Word count: 2519
Character count: 14227

RESEARCH ARTICLE | OCTOBER 17 2023

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AIP Conf. Proc. 2734, 040008 (2023)
https://doi.org/10.1063/5.0157700

Investigation of The Independence of Pharmacy Students in Blended Learning

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Abstract. This study aimed to determine the level of independence of pharmacy students in participating blended learning of introductory chemistry (blended learning). A descriptive method with a qualitative approach was performed with instruments in the form of questionnaire. The subjects of this study were 75 students of introductory chemistry from the pharmacy study program. Each student was given a questionnaire containing thirteen questions contained a Likert scale with categories of strongly disagree, disagree, agree, and strongly agree. The questionnaire was tested using MINI STEP, then the results were analyzed using RASCH. The results of the questionnaire analysis showed that 80% of students were in the category of moderate level of independence and the remaining 20% had a high level of independence. Based on gender, both male and female students mostly have a moderate level of independence. Based on the data on the average value of the level of independence of students, as many as 52% of students have a level of independence below the average, and as many as 48% of students have a level of independence above the average. In conclusion, blended learning requires students' independence in learning, with blended learning also being able to motivate students to learn in this case basic chemistry concepts. For high-group students with self-study, this is an opportunity to learn more. As for students with low abilities, blended learning makes them study longer and can be repeated at any time until they understand.

Keywords: Basic Chemistry, Blended learning, Independence.

INTRODUCTION

Educational activities in pharmacy study programs in Indonesia are summarized in the national curriculum determined by the Indonesian Pharmacy Higher Education Association (APTFI). As demands at the local, national, and global levels are changing continuously, pharmacy graduates students must respond to those changes. Therefore, the curriculum must be determined based on competency and integration with the pharmacist profession. The competency standard for pharmacy education graduates in the pharmacy study program consists of two main principles, namely the ability to provide safe, effective, and stable drugs (pharmaceutical preparations), as well as the ability to provide pharmaceutical services that focus on the safety and efficacy of the drug usage [1]. To meet these requirements, lecturers are responsible to create high-quality, interesting, and accessible learning for students in order to achieve the competency standards.

Introductory chemistry is one of the basic courses which required a deep understanding from pharmacy students. Currently, there are still many basic chemistry concepts that are considered problematic by students, such as several previous studies on the concepts of redox and electrochemical matter [2, 3], particularly related to macroscopic, microscopic and symbolic aspects to chemical concepts [4, 5]. Students' understanding of chemistry concepts in multiple representations is fundamental [6].

The 2018 Program for International Student Assessment (PISA) survey published in March 2019 shows a picture of Indonesian education. The main focus of the PISA assessment is student literacy, where Indonesia's PISA score was ranked 74th out of 79, furthermore, concluded that student literacy is still lacking [7]. This is undoubtedly an

International Seminar on Mathematics, Science, and Computer Science Education (MSCEIS) 2021
AIP Conf. Proc. 2734, 040008-1–040008-7; https://doi.org/10.1063/5.0157700
Published by AIP Publishing. 978-0-7354-4696-0/$30.00

important problem for the education system and stakeholders. Furthermore, since the pandemic of COVID-19 has been spread throughout the world, including Indonesia, various sectors have been affected, including the education sector. Many adaptations and innovations have been developed in order to keep the education system to be able to adapt for these situations. One of the policies issued by the government was to conduct distance learning to minimize the spread of the COVID-19 virus [8]. Every new policy will have inevitable risks, where in online learning, the students are required to study independently, and it was difficult particularly for students in the first semester, because they have to adapt to the new systems and environments on campus [9].

To overcome these problems, some educators developed blended learning, which combines various learning methods and teaching strategies and utilizes recent technology. This model can be effectively applied by adjusting the conditions that have to be agreed upon by all parties. Blended learning can be conducted in both online and offline; where offline learning utilizes the environment close to students, such as the school environment, home, or other places [10]. Learning with the blended learning model provides opportunities for students to independently repeat the learning material and practice questions in both independent and groups, therefore, students will have more opportunities to improve their understanding. In addition, the blended learning model simplifies and speeds up the communication process without time limits between teachers and students [11].

In this study, we observed the student independence in online and offline learning or blended learning, especially in introductory chemistry subject, as a basis for understanding other concepts in the following semester. The data obtained can be used as a reference in conducting more proper, efficient, and effective online and offline learning with blended learning. In addition, to encourage the blended learning model to be applied in other subjects in order to meet the graduate competency standards.

METHODS

This study uses a descriptive method with a qualitative approach. The parameter is the level of independence of students in following basic chemistry lectures, measured by using a questionnaire. The subjects of this study were 75 students of basic chemistry from the pharmacy study program. The instrument used in the form of a questionnaire that was tested for validation first using Rasch using ministep software. Each student was given a questionnaire containing thirteen questions on a Likert scale with categories of strongly disagree, disagree, agree, and strongly agree. The research data were processed by correlation analysis using Rasch, the software used was ministep.

RESULT AND DISCUSSION

Before conducting the research, the instrument validation stage was carried out with a validation test using the Rasch method using a ministep device. After building the instrument with strongly agree, agree, disagree, and strongly disagree categories, thirteen questionnaires were successfully obtained. To measure the reliability of the instrument, MINI STEP was utilized. Figure 1 showed that the questionnaire instrument was categorized as a reliable instrument, with a reliability result of 0.92 and a separation value of 3.45. After the instrument reliability test, the questionnaire was distributed to 75 students.

PERSON	75 INPUT	75 MEASURED		INFIT		OUTFIT	
	TOTAL	COUNT	MEASURE	REALSE	IMNSQ	ZSTD	OMNSQ	ZSTD
MEAN	35.2	13.0	.66	.64	.97	-.2	.98	-.2
P.SD	3.9	.0	1.35	.11	.65	1.5	.69	1.6
REAL RMSE	.65	TRUE SD	1.19	SEPARATION	1.82	PERSON RELIABILITY		.77
ITEM	13 INPUT	13 MEASURED		INFIT		OUTFIT	
	TOTAL	COUNT	MEASURE	REALSE	IMNSQ	ZSTD	OMNSQ	ZSTD
MEAN	203.0	75.0	.00	.25	.98	-.1	.98	.0
P.SD	15.8	.0	.89	.01	.13	.8	.16	.9
REAL RMSE	.25	TRUE SD	.85	SEPARATION	3.45	ITEM RELIABILITY		.92

FIGURE 1. Questionnaire Reliability Test

The results of student responses were then analyzed by using SPSS. Figure 2 showed Pearson's reliability using

the Rasch method using a ministep device. Test results where the average value of the measurement obtained was 0.66. Additionally, it was observed that respondents had varied answers, and twere consistent in answering the questionnaire.

Rating Scale Instrument Quality Criteria					
Criterion	**Poor**	**Fair**	**Good**	**Very Good**	**Excellent**
Targeting	**>2 errors**	**1-2 errors**	**<1 error**	**<.5 error**	**<.25 error**
Item Model Fit Mean-Square Range Extremes	**<.33->3.0**	**.34-2.9**	**.5-2.0**	**.71-1.4**	**.77-1.3**
Person and Item Measurement Reliability	**<67**	**67-80**	**81-90**	**91-94**	**>94**
Person and Item Strata Separated	**2 or less**	**2-3**	**3-4**	**4-5**	**>5**
Ceiling effect: % maximum extreme scores	**<5%**	**2-55**	**1-2%**	**0.5-1%**	**<0.5%**
Floor effect: % maximum extreme scores	**<5%**	**2-55**	**1-2%**	**0.5-1%**	**<0.5%**
Varianve in data explained by measures	**>50%**	**50-60%**	**60-70%**	**70-80%**	**>80%**
Unexplained variance in contrasts 1-5 of PCA of residuals	**>15%**	**10-15%**	**5-10%**	**3-5%**	**<3%**

FIGURE 2. Rating Scale Instrument Quality Criteria

Figure 2 showed the rating scale of instrument quality criteria. The questionnaire instrument was categorized as consistent, but based on the separation value in figure 2, the value was 1.82, showed that the separation value was categorized as relatively low, and it can be concluded that the instrument was less sensitive to measure students' abilities in the very high and deficient groups. However, based on this phenomenon, the questionnaire revealed essential information. Based on the data obtained, it was found that there were students who had low abilities but had a very good response to blended learning, the level of independence in participating in basic chemistry learning was the same as students who had high abilities. This fact proves that blended learning can increase student independence, especially in learning basic chemistry.

Figure 3 shows the results of item analysis of student answers to the questionnaire. The data shows wh 16 questionnaire statements are easy to approve or difficult to approve by students. From this analysis, it will be seen the level of independence of students in participating in blended learning basic chemistry. Based on figure 3 data, the instrument developed still measures other things besides independence so that further research is needed on blended learning, because there are other factors besides independence that affect the blended learning process found in this study.

```
INPUT: 75 PERSON  13 ITEM  REPORTED: 75 PERSON  13 ITEM  4 CATS MINISTEP 5.1.0.0
-------------------------------------------------------------------------------

     Table of STANDARDIZED RESIDUAL variance in Eigenvalue units = ITEM information units
                                        Eigenvalue   Observed   Expected
Total raw variance in observations     =      20.8990 100.0%         100.0%
  Raw variance explained by measures   =       7.8990  37.8%          37.0%
    Raw variance explained by persons  =       4.2163  20.2%          19.7%
    Raw Variance explained by items    =       3.6827  17.6%          17.2%
  Raw unexplained variance (total)     =      13.0000  62.2% 100.0%   63.0%
    Unexplned variance in 1st contrast =       2.0303   9.7%  15.6%
    Unexplned variance in 2nd contrast =       1.8015   8.6%  13.9%
    Unexplned variance in 3rd contrast =       1.4636   7.0%  11.3%
```

FIGURE 3. Standardized Residual Variance

To determine which question items are still difficult for students to answer, an item analysis is carried out and the results are shown in figure 5. Figure 5 shows the student's independence response in participating in blended learning

basic chemistry. Students who have low and high abilities have the same interest in learning using blended learning. The blended learning process carried out by low-level students gives them the opportunity to study independently for longer and there is an opportunity to repeat learning whenever they need it. For students in the high group, blended learning is able to increase their level of independence because they are given a great opportunity to find more learning resources.

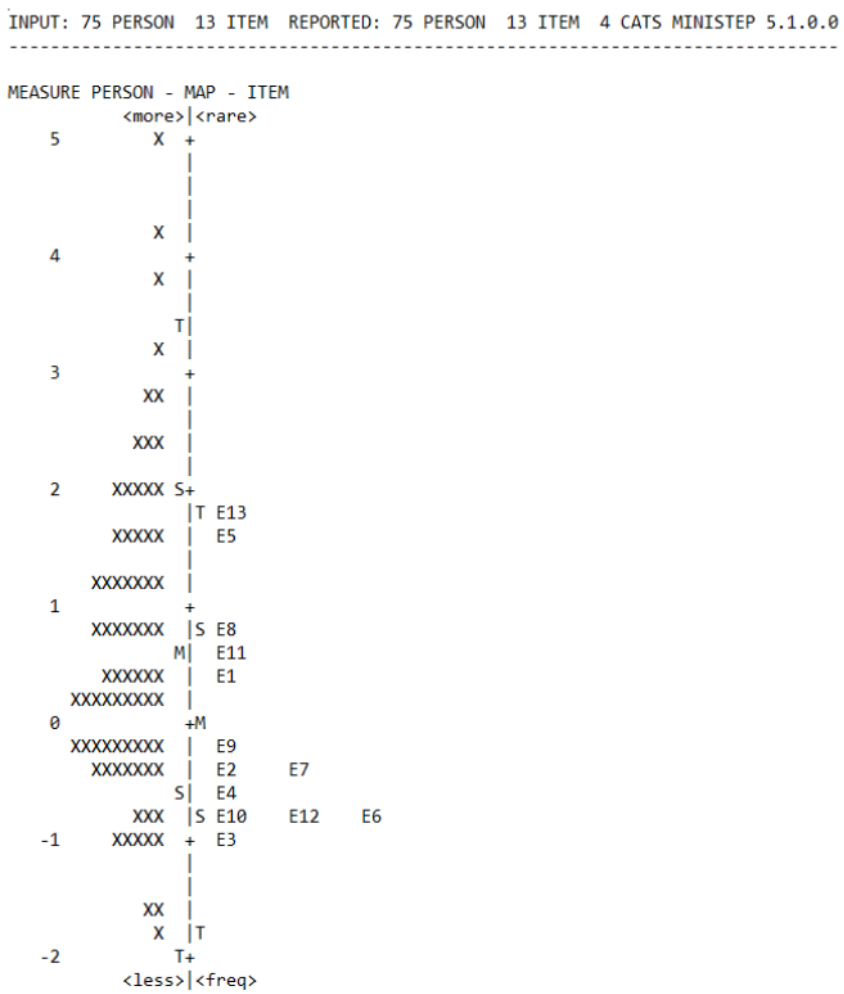

FIGURE 4. Analysis of Questions

INPUT: 75 PERSON 13 ITEM REPORTED: 75 PERSON 13 ITEM 4 CATS MINISTEP 5.1.0.0

SUMMARY OF CATEGORY STRUCTURE. Model="R"

CATEGORY LABEL	SCORE	OBSERVED COUNT	%	OBSVD AVRGE	SAMPLE EXPECT	INFIT MNSQ	OUTFIT MNSQ	ANDRICH THRESHOLD	CATEGORY MEASURE	
1	1	17	2	-1.67	-1.73	1.05	1.14	NONE	(-5.14)	1
2	2	310	32	-.50	-.46	.96	.93	-4.02	-2.19	2
3	3	590	61	1.12	1.08	.91	.93	-.36	2.01	3
4	4	58	6	2.96	3.15	1.15	1.08	4.38	(5.48)	4

FIGURE 5. Rating Scale

The rating scale works well because all the scale options are selected, and it can be seen in figure 5 that the measurable category improvement increases consistently and the items are not confused. Questionnaire items have measured well according to students' conceptual understanding, students who have high abilities will respond very well to blended learning activities.

The next stage is a correlation test, to determine the independence of students' independence towards blended learning which is carried out in basic chemistry learning. The data above is in figure 6, the higher the student's independence, the better in participating in the learning process with blended learning.

INPUT: 75 PERSON 13 ITEM REPORTED: 75 PERSON 13 ITEM 4 CATS MINISTEP 5.1.0.0

PERSON: REAL SEP.: 1.82 REL.: .77 ... ITEM: REAL SEP.: 3.45 REL.: .92

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM	
1	195	75	.48	.23	1.24	1.53	1.27	1.56	A .56	.53	61.3	66.4	E1	
5	174	75	1.60	.23	1.08	.51	1.25	1.42	B .52	.55	76.0	68.1	E5	
13	172	75	1.71	.23	1.13	.80	1.13	.80	C .65	.55	77.3	68.4	E13	
9	208	75	-.25	.24	1.07	.49	1.05	.34	D .38	.52	76.0	69.8	E9	
2	209	75	-.31	.24	1.03	.24	1.05	.35	E .49	.52	66.7	70.2	E2	
7	212	75	-.49	.25	1.01	.12	.93	-.34	F .51	.52	69.3	71.4	E7	
3	220	75	-1.00	.26	1.00	.05	.97	-.08	G .44	.51	76.0	74.6	E3	
12	217	75	-.80	.25	.98	-.04	.98	-.06	f .52	.51	70.7	73.5	E12	
8	190	75	.75	.23	.92	-.50	.97	-.10	e .54	.54	69.3	67.0	E8	
6	216	75	-.74	.25	.94	-.32	.84	-.80	d .44	.51	76.0	73.0	E6	
4	215	75	-.68	.25	.82	-1.05	.80	-1.04	c .45	.51	77.3	72.5	E4	
11	194	75	.54	.23	.79	-1.48	.79	-1.30	b .67	.53	74.7	66.6	E11	
10	217	75	-.80	.25	.77	-1.35	.74	-1.39	a .65	.51	78.7	73.5	E10	
MEAN	203.0	75.0	.00	.24	.98	-.1	.98	.0			73.0	70.4		
P.SD	15.8	.0	.89	.01	.13	.8	.16	.9			4.9	2.8		

FIGURE 6. Measure Correlation

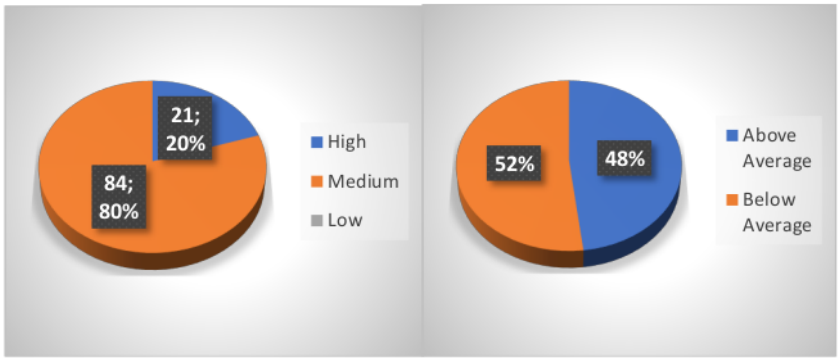

FIGURE 7. Student Independence Level

Based on the results, this study suggested that the blended learning model applied in essential chemistry learning requires students to study independently. The application of learning with the blended learning model occurs both in the classroom and outside the classroom. Blended learning requires more time than conventional learning [12]. Students have more opportunities to repeat learning the material and train themselves to do practice questions [13]. Learning with blended learning can encourage students to learn more actively (student-center), and lecturers are functioned to be more as facilitators to create a pleasant learning atmosphere.

Based on the questionnaire processing data, students tend to have a moderate level of independence, and this shows that the data was able reflect students' provision in blended learning model [14]. Students' ability to master technology also affects the readiness of students to take part in blended learning. The ability to modify online and offline learning contributes to independence in learning [15]. Blended learning is considered efficient in helping students acquire skills and knowledge at varying speeds, but because learning can be repeated independently, all students can achieve the same level of understanding even at different speeds [16]. Students with high independence in blended learning support the learning process. Students with high independence who can participate in blended learning will always compete to show the best results, whereas, students with low independence using blended learning to repeat learning to catch up. Independence is an individual's motivation in making decisions and accepting responsibility [17].

CONCLUSION

In blended learning, learning requires students' independence in learning, with blended learning also being able to motivate students to learn. For high-group students with self-study, this is an opportunity to learn more. As for students with low abilities, blended learning makes them study longer and can be repeated at any time until they understand. This information is in accordance with the data obtained showing that 80% of students are in the category of moderate level of independence and the remaining 20% have a high level of independence. Based on gender, both male and female students mostly have a moderate level of independence. Based on the data on the average value of the level of independence of students, as many as 52% of students have a level of independence below the average, and as many as 48% of students have a level of independence above the average.

ACKNOWLEDGMENTS

We would like to thank Ristekdikti for providing grants for this research and the basic chemistry lecturer, Dr. Yusnidar Yusuf, M.Si and Ibu Fitriani, M.Si Universitas Muhammadiyah Prof. Dr. HAMKA which allows its class to be used for research, and the Indonesian Education University which has provided facilities for licensing the research process.

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