

The Effect of Inquiry-Based Learning on Pharmacist Students

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Abstract. One of the influential factors in shaping professional health workers is the learning process during education. The professional attitude of pharmacy students can be modified with innovative learning methods. Inquiry-Based Learning (IBL) emphasizes students' involvement in systematically, critically, and logically gathering information so that they can formulate their findings. This study aims to determine the effect of IBL on pharmacist professional study program education students taking Pharmacy Communication and Health Promotion courses. This study employed quasi-experimental research with a group Pretest-Posttest Design. The study subjects were 40 students of the Pharmacist Professional Education Study Program. The students got learning interventions with IBL method. IBL stages consist of IBL orientation, problem formulation, hypothesis formulation, data collection, hypothesis testing, conclusion formulation, and learning evaluation. Assessment instrumentation included pretests, posttests, reports, and student satisfaction questionnaires. Pretest and posttest data were statistically analyzed with SPSS. The implementation of IBL resulted in an increase in mean scores from 59.82 on the pretest to 92.83 on the posttest. There is a statistically significant difference between these results (Asymp. Sig 0.000). The proportion of student reports rated as excellent 70%, good 20%, and sufficient 5%. Student satisfaction with the learning method reached an average of 93.94%. Inquiry-based learning increases the knowledge of Pharmacist Professional Education Study Program students in the Pharmacy Communication and Health Promotion courses.

Keywords: effect; inquiry-based learning; pharmacist students

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INTRODUCTION

Pharmacists are health workers who have completed an undergraduate pharmacy study program and pharmacist professional education. Pharmacists possess professional knowledge, skills, and attitudes related to medication management and clinical pharmacy

services (Izma et al., 2023; Lingga & Intannia, 2022). One of the influential factors in shaping professional health workers is the learning process during education (Kharb et al., 2013). A Bachelor of Pharmacy student is an individual who has successfully finished a minimum of 144 credits and four years

of pharmacy schooling. After graduating from the bachelor of pharmacy, students continue their pharmacist professional education. While lectures continue to occur, they are typically brief in duration. These short lectures should be packaged with innovative learning methods (Samarakoon et al., 2013). Learning methods emphasize independence, problem-solving, critical thinking, and initiative.

The professional attitude of pharmacy students can be modified with innovative learning methods. Learning methods influence pharmacy students' attitudes to be more concerned about their surroundings, more accountable, and responsible (Huang et al., 2022). Various learning methods can be applied to show the clinical abilities of prospective pharmacist students (Kodweis et al., 2020). Pharmacist professional education students are capable of doing something. However, their self-confidence still needs to improve, so they require various learning methods to increase self-confidence (Barry et al., 2007). Lecturers must possess an innate comprehension of the students to apply learning methods according to student needs (Hyytinen et al., 2021; Kongkaew et al., 2019).

Inquiry-based learning (IBL) emphasizes students' involvement in systematically, critically, and logically gathering information so that they can formulate their findings. By way of learning objectives, students concentrate on locating and discovering new innovative things (Acar & Tuncdogan, 2019). IBL stages consist of orientation, formulating problems and hypotheses, collecting data, testing hypotheses, and formulating conclusions (Furtak et al., 2012). The process will improve students' ability to learn independently, effectively, and efficiently (Aditomo et al., 2013; Handoyono & Arifin, 2016). IBL provides direct experience to students. Students will receive problem-

solving training applicable to the professional world in order to develop their knowledge, skills, and mentality. This learning method can significantly improve students' scores (Brown, 2010; Ezeala et al., 2013; Gunardi, 2020). The IBL method can also improve critical thinking skills in thematic learning (Susilowati, 2020). The IBL method also enhances metacognitive skills in terms of abilities that include control, awareness, and knowledge of cognitive processes (Tarwiyani et al., 2019). Can Inquiry-Based Learning be applied to pharmacist professional study program education students who take Pharmaceutical Communication and Health Promotion courses?. The implementation of IBL in professional education for pharmacists has not yet become widespread. This study aims to determine the impact of Inquiry-Based Learning on pharmacist professional study program education students taking pharmacy communication and health promotion.

METHOD

The Pharmacist Professional Education Study Program (PSPPA) at Lambung Mangkurat University (ULM) is one of the Professional Study Programs for one year or two semesters. Prospective students at PSPPA have completed the Pharmacy Study Program, an academic program that spans an estimated duration of four years. The participant in this study were students enrolled in the Pharmaceutical Communication and Health Promotion course, which accounted for 1 credit or 50 minutes of face-to-face learning. This study focused only on material discussing Health Promotion with a total of 4 meetings.

This study employed quasi-experimental research with a group Pretest-Posttest Design. Research data were obtained prospectively. Pretest and Posttest Groups compared students' abilities before and after implementing learning with Inquiry-Based Learning.

The participants involved in this study were 40 students of the Pharmacist Professional Education Study Program at Lambung Mangkurat University. These students enrol a one-year education to get the title of Pharmacist (apt). All of these students have graduated with a Bachelor of Pharmacy degree.

IBL was implemented as the learning method in the Pharmaceutical Communication and Health Promotion course. Students were provided with verbal and written explanations of IBL activities at the outset of the learning plan, which included four meetings dedicated to health promotion discussions. IBL was applied to four materials with the themes of Need and Target Assessment, Program Planning Development, Program Implementation, and Program Evaluation. The learning stages of the IBL method include:

- a. IBL orientation is an introduction to IBL, an explanation of IBL stages, and a pretest for students.
- b. The formulation of the problem is to determine the formulation of the problem to be raised. The formulation of the problem in applying IBL is how to take steps in implementing health promotion activities in the community.
- c. The formulation of a hypothesis is a temporary conjecture that has been collectively formulated and requires empirical validation using data collected in the field. The hypothesis formulation is the step of implementing health promotion activities, including Need and Target Assessment, Program Planning Development, Program Implementation, and Program Evaluation.
- d. Data collection is the process of students understanding the learning materials provided by lecturers and conducting literature studies to answer problem formulations. The

learning materials provided by lecturers are PowerPoint materials and video recording explanations. Concurrently, each student is tasked with locating one scientific publication on community service that has been published in a community service journal as part of the literature review.

- e. Hypothesis testing is a process by students to synthesize all information obtained from data collection and present it in the form of a simple report. At this stage, students review scientific publications by identifying the stages of health promotion carried out in community service based on the previous steps.
- f. The formulation of conclusions is the process of drawing conclusions to answer the problem formulation.
- g. Learning evaluation is conducted through post-test, report assessment, learning satisfaction evaluation, and exam assessment.

The assessment instruments at the pretest and post-test stages are multiple-choice questions (MCQs). The MCQs consist of 15 questions according to the learning objectives representing four materials: Need and Target Assessment, Program Planning Development, Program Implementation, and Program Evaluation. The validity of the queries was assessed prior to their implementation as evaluation questions. Pretests and Posttests were conducted online in class using the Integrated Lambung Mangkurat University Information System.

The report assessment is conducted through an assessment of the publication articles acquired and the content of the report. The report's content must include four components of the health promotion stages: Need and Target Assessment, Program Planning Development, Program Implementation,

and Program Evaluation. The report describes the activities contained in the publication article for each stage of health promotion. Lecturers administer an assessment using a Likert scale for each stage of health promotion with scores of Very Good (5), Good (4), Fair (3), Poor (2), and Very Poor (1).

Learning satisfaction evaluation is assessed using a standard questionnaire in the Integrated Lambung Mangkurat University Information System (SIMARI). The questionnaire consists of 15 questions, which include lecturer attendance, suitability of materials, learning materials, supporting references, ease of material, lecturer's introduction, novelty, practice questions, discussions, suitability of questions, transparency of grades, e-learning utilization, lecturer activeness, and availability of teaching materials. The assessment uses a Likert scale with values of Strongly Agree (5), Agree (4), Moderately Agree (3), Disagree (2), and Strongly Disagree (1).

The data analysis conducted includes the following:

- a. The data analyzed was a comparison of test scores before (pretest) and after (posttest) the implementation of IBL. The scores were analyzed using the Wilcoxon test on the SPSS (Statistical Package for the Social Sciences) application.
- b. The data from the report assessment and learning satisfaction evaluation was analyzed simply by quantification of the appraisal with the Likert scale.

RESULT AND DISCUSSION

Pharmaceutical Communication and Health Promotion (Code JBI104) is one of the courses in the Pharmacist Professional Education Study Program (PSPPA) FMIPA Lambung Mangkurat University which has a weight of 1 credit theory. The Pharmacist

Professional Education Study Program is one of the Professional Education Programs that produces pharmacists with the title "apt" which is taken for 2 (two) semesters (Sukrasno, 2008). Students who have successfully completed the Pharmacy Study Program are eligible to enrol in the Pharmacist Professional Education Study Program. There are sixteen meetings in the Pharmacy Communication and Health Promotion course, which consists of the Midterm and Final Semester Exams. Four (four) meetings in the course are devoted to health promotion in particular.

Inquiry-based learning (IBL) was implemented to the Pharmaceutical Communication and Health Promotion course with a specific focus on four health promotion materials. Forty students attended the Pharmaceutical Communication and Health Promotion lecture with the Inquiry-Based Learning method with student characteristics presented in Table 1.

Table 1 Characteristics of research subjects

No	Characteristics	Total	Percentage
1	Gender		
	Female	29	72.5%
	Male	11	27.5%
	Total	40	100%
2	Age		
	21 Years	2	7.5%
	22 Years	22	32.5%
	23 Years	13	55.0%
	24 Years	3	5.0%
	Total	40	100%
3	College Origin		
	ULM	36	90%
	Non-ULM	4	10%
	Total	40	100%
4	GPA of Bachelor of Pharmacy		
	3,00 - 3,25	1	2.5%
	3,26 - 3,50	7	17.5%
	3,51 - 3,75	18	45%
	3,76 - 4,00	14	35%
	Total	40	100%
5	Origin of Province		
	South Kalimantan	30	75%

No	Characteristics	Total	Percentage
	Central Kalimantan	2	5%
	East Kalimantan	5	12.5%
	Riau Islands	1	2.5%
	West Java	1	2.5%
	Central Java	1	2.5%
	Total	40	100%
6	Religion		
	Buddhism	1	2.5%
	Hindu	1	2.5%
	Islam	35	87.5%
	Protestant	3	7.5%
	Christianity		
	Total	40	100%

PSPPA FMIPA ULM students totaled 40 people for each batch. The students participated in this study were in accordance with the number of PSPPA FMIPA ULM students. The majority of students involved in this study are female (72.5%). This is in line with data from several studies on PSPPA students in other universities, which show the number of female students reaching 84.1% (Hidayati et al., 2016). This is in accordance with the number of female pharmacists, which reaches 83.33% (Ardiningtyas et al., 2017). Women are more dominant in undergoing the Pharmacist Professional Education Program. In the age category, it shows that the maximum age is 22 years (32.5%), while the age range involved in this study is 21-24 years. This aligns with previous research that has reported PSPPA students to be between the ages of 20 and 26 (Hidayati et al., 2016).

The majority of the students who participated in this research were Strata-1 Pharmacy FMIPA ULM alums, comprising 90% of the sample. The Cumulative Grade Point Average (GPA) of the majority of research subjects in Strata-1 Pharmacy is 3.51 - 3.75 (45%). Pharmacy students generally have a GPA above 3.00, as in other research which states that the GPA of pharmacy

students is dominated by a GPA above 3.00 (Herawati et al., 2022). Seventy-five percent of the pupils who participated in the study were from South Kalimantan, whereas eighty-seven percent were of the Islamic religion. Variations in student characteristics are evident, as indicated by the data pertaining to such attributes.

Students who have previously studied using the IBL method undergo a pretest. The pretest was administered through the E-Learning Integrated Information System of Lambung Mangkurat University (SIMARI). The pretest consisted of 15 questions in Multiple Choice Question (MCQ) format. After implementing the the IBL learning method, students were asked to complete a the post-test. The questions were the same as the pretest questions. The pretest and post-test results are presented in Table 2.

Tabel 2 Student pretest and posttest scores (N=40)

No	Characteristics	Total	Percentage
1	Pretest Score	59.82	23.31
2	Post-test Score	93.83	8.59

Table 2 shows that the average value of the student pretest is 59.82, with a standard deviation value of 23.31. The pretest value illustrates students' starting point before receiving material with the IBL method. The pretest provides a quantitative description of student knowledge (Adri, 2020). The average value is 59.82. When expressed in letter format, the average score achieved by the student is less than C. The standard deviation of the pretest value is 23.31, indicating a standard deviation or spread of values that is a very large variation. A large standard deviation indicates that student scores are not homogeneous (Febriani et al., 2015). The students are then instructed for four meetings using the IBL method, which consists of the following stages: orientation, determination of problem formulation,

determination of hypothesis formulation, data collection, hypothesis testing, and conclusion formulation. In the IBL method, it is necessary to assist students in comprehending the learning model designed. Students who receive effective guidance will be capable of completing the IBL stages, attaining high scores, and mastering the material (Lazonder & Harmsen, 2016).

Students are required to read the material that has been prepared and listen to video recordings of learning from lecturers. The students engage in independent learning, with the lecturer's role being limited to overseeing the activities performed by the students. Audiovisual media possesses a multitude of benefits, such as enhanced appeal, incorporation of visual and aural components, and ease of repetition (Setiyawan, 2020). Moreover, beyond the confines of the classroom, students are required to locate community service articles published in nationally accredited journals. For each student, a unique article must be utilized. Students collect data from the article, including Need and Target Assessment data, Program Planning Development, Program Implementation, and Program Evaluation. The collected data is consistent with the predetermined formulation of problems and hypotheses. The data acquired by the students is subsequently presented in the form of a straightforward report that includes the derivation of conclusions.

Tabel 3 Statistical test result

	Mean Rank	Asymp sig.
Score post-test pretest	20.29	0.000

The analysis outcomes as determined by the Wilcoxon Test comparison test indicated a mean rank of 20.29 and 36 positive ranks. This finding suggests that 36 students increased their scores between the pretest and posttest. Student performance increased by an

average of 20.29. The significance value, or Asymp.Sig (2-tailed), is displayed as 0.000. Evidently, a substantial disparity exists between the pretest and posttest scores, indicating that the implementation of the learning method was successful (Sindiani et al., 2023). These results align with other studies that state that learning outcomes using inquiry-based learning (IBL) are better than those of the control class (Jiwanjaya et al., 2020). Other researchers' application of IBL in new medication development courses in Germany shows that IBL is one method that can be used as an approach in pharmaceutical education (Meijerman et al., 2013). This indicates that using the inquiry-based learning (IBL) learning method affects students.

Student reports from the review of community service articles are assessed. The report grades are categorized with a rating scale of very good, good, fair, poor, and very poor. The results of the student report assessment are presented in Table 4.

Tabel 4 Student report assessment (N=40)

No	Characteristics	Total	Percentage
1	Very good	28	70%
2	Good	10	25%
3	Fair	2	5%
4	Poor	0	0%
5	Very Poor	0	0%
	Total	40	100%

Students compiled the report as a component of the data collection process they employed to solve problems. Making reports is generally part of implementing IBL to improve students' writing skills (Azizah & Parmin, 2012). Students acquire data by consulting community service publication articles that specifically address the health sector. Each student must submit a minimum of one article from a nationally accredited community service journal (Sinta 1–6). Students determine the stages of health promotion, namely

Need and Target Assessment, Program Planning Development, Program Implementation, and Program Evaluation contained in the article. Students are additionally requested to draw conclusions in the report concerning the hypothesis that was formulated prior to the implementation of IBL. The publication article and the student report are subsequently gathered and evaluated by the lecturer. The evaluation results for the report indicate a scale of 70% very good, 25% good, and 2% sufficient. These results indicate that most students can comprehend the phases of health promotion by analyzing articles from community service publications.

The search for community service articles according to the health sector is part of the student's efforts to find answers to the problem formulation. Students' ability to perceive these articles innovatively will increase

(Oderda et al., 2010). Some students are asked to present their findings, and others are asked to respond. Discussion and the exchange of information are anticipated, augmenting every student's collective knowledge. This will build students' self-confidence, communication skills, and an open attitude (Syafuruddin, 2017). If this is practiced during lectures, students will become accustomed to performing it when employed.

Students are requested to evaluate their overall satisfaction with the learning provided by the lecturers. An online questionnaire routinely accessible through the Integrated Lambung Mangkurat University Information System (SIMARI) was utilized for the review. The satisfaction questionnaire comprises standard statements in all courses offered by Lambung Mangkurat University. The evaluation of student satisfaction is detailed in Table 5.

Tabel 5 Student Satisfaction Assessment (N=40)

No	Statement	Likert Scale (%)
1	Lecturer attendance is always on schedule	96.47
2	Course material is in accordance with syllabus	94.12
3	Resources/lecture materials are available in the Reading Room	94.12
4	Lecturers provide supporting references	94.74
5	Course material is easy to understand	95.29
6	Lecturers master the course material	96.47
7	A lot of new material/something can be achieved	91.58
8	Lecturer provides exercises and discussion of the questions	92.73
9	Lecturers are very helpful in learning	91.58
10	Questions/quizzes/tests are in accordance with the lecture material	95.56
11	Questions/quizzes/tests are medium or not too difficult	91.76
12	Lecturers are transparent in giving final grades	92.63
13	Lecturers utilize e-learning media facilities	97.78
14	Lecturers actively conduct discussions and quizzes on e-learning	92.22
15	Lecturers share materials via e-learning	92.00
Average		93.94

The average score of 93.94 was obtained from the satisfaction questionnaire administered to the lecturer regarding the content delivered through the Inquiry-Based Learning (IBL) method. Examining the values assigned to each statement reveals that

they are all greater than 90. This indicates that students are very satisfied with the knowledge they have acquired. According to similar research, The IBL method has shown to increase student satisfaction with learning activities (Sonsun et al., 2023). "Lecturers utilize

e-learning media facilities" received the highest percentage of responses (97.78%) on the satisfaction survey. The utilization of e-learning is crucial for facilitating learning methods (Hartanto, 2016). Exams, PowerPoint presentations, video recordings of lecture explanations, report collection, pretests, and post-tests are all administered via e-learning at Lambung Mangkurat University (Utomo et al., 2022). This facilitates the engagement of students in lectures, including the implementation of Inquiry-Based Learning (IBL).

The "Lecturer mastery of course material" rating on the student satisfaction questionnaire is the second highest, at 96.47%. Lecturers must possess a comprehensive understanding of the subject matter, as evidenced by the provision of complete lecture materials (PowerPoint slides, video recordings of explanations, literature), clear and comprehensible presentation of the material, illustration of practical applications of the material about real-life scenarios, and active participation of students in all classroom discussions. The IBL method is one of the methods included in the Active Learning Strategies category widely used by universities in the United States (Stewart et al., 2011).

CONCLUSION

Inquiry-based learning increases the knowledge of pharmacist professional education study program students in Pharmaceutical Communication and Health Promotion. This is evident based on the increase in post-test scores, which significantly differ from the pretest scores (Asymp. Sig 0.000). The value of student reports is very good (70%) and good (20%). The level of student satisfaction reached 93.94%.

The results of this study indicate that Inquiry-Based Learning can be applied as one of the learning methods in

the pharmacy professional education program. This method can be used in applied courses to help students understand and achieve the learning objectives. The application may be completed in a single course or across multiple courses that cover similar topics.

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