



# Analysis of Science Problem Solving Ability with the Flipped Classroom Model Assisted with Flipbooks in View of Student Learning Independence

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## Abstrak

Tujuan dari penelitian ini mendeskripsikan kemampuan pemecahan masalah ditinjau dari kemandirian belajar pada model pembelajaran Flipped Classroom dengan E-Modul Flipbook pada materi zat aditif pada makanan. Penelitian ini menggunakan jenis penelitian *mixed methods research design* dengan desain eksplanatori. Teknik sampling yang digunakan adalah *purposive sampling* dan subjek penelitian ini adalah seluruh siswa kelas VIII A yang berjumlah 32 siswa. Teknik pengumpulan data menggunakan wawancara tidak terstruktur, angket, tes, dan dokumentasi. Teknik analisis data menggunakan analisis kuantitatif, yaitu uji t satu variabel, uji beda, uji N-Gain, dan uji regresi yang selanjutnya dianalisis menggunakan analisis kualitatif. Hasil penelitian menunjukkan bahwa: model pembelajaran flipped classroom berpengaruh terhadap hasil belajar siswa kelas VIII, terbukti tingkat ketuntasan klasikal yaitu 97%. Berdasarkan hasil uji *paired sample t test* Nilai Sig. (*2-tailed*) = 0,000 < 0,05, maka dapat disimpulkan bahwa model pembelajaran flipped classroom berpengaruh terhadap kemampuan siswa dalam memecahkan masalah. Selain itu melalui uji *N-Gain persen* model pembelajaran *flipped classroom* berpengaruh terhadap kemandirian siswa sebesar 40,7%.

**Kata Kunci:** Kemandirian Belajar, Kemampuan Pemecahan Masalah, Flipped Classroom, E-Modul Flipbook

## Abstract

The aim of this research is to describe problem solving abilities in terms of learning independence in the Flipped Classroom learning model with the Flipbook E-Module on food additives. This research uses a mixed methods research design with an explanatory design. The sampling technique used was purposive sampling and the subjects of this research were all 32 students in class VIII A. Data collection techniques used unstructured interviews, questionnaires, tests and documentation. The data analysis technique uses quantitative analysis, namely one variable t test, difference test, N-Gain test, and regression test which is then analyzed using qualitative analysis. The research results show that: the flipped classroom learning model has an effect on the learning outcomes of class VIII students, it is proven that the classical completion level is 97%. Based on the results of the paired sample t test, the Sig value. (*2-tailed*) = 0.000 < 0.05, it can be concluded that the flipped classroom learning model has an effect on students' ability to solve problems. Apart from that, through the N-Gain test, the percentage of the flipped classroom learning model has an effect on student independence by 40.7%.

**Keywords:** Independent Learning, Problem Solving Abilities, Flipped Classroom, Flipbook E-Module

## Introduction

Learning by utilizing ICT (information and communication technologies) as a medium is quite important, because when viewed from the material or teaching, both influence the results and interest of students in learning. Besides that, ICT can help teachers explain abstract science material, so that it is easy for students to understand.(Rahmawati, 2018). Utilization of ICT can be in the form of Flipbook media which is easy to access and use.

Problem solving abilities and independent learning in class VIII of SMP Negeri 2 Kajen, Kajen District, Pekalongan Regency, when the teacher was delivering material about "Additives in food", and carried out evaluations and observations of learning on these basic competencies, it turned out that 85% of students were not yet capable analyze, reason, communicate effectively, solve and interpret given problems. This certainly raises concerns and a solution needs to be found immediately. Therefore, researchers try to find a solution by implementing the Flipped Classroom learning model with Flipbook media. This model emphasizes the independence of each student and aims to form critical thinking competencies, problem-solving abilities and communication skills. By implementing the Flipped Classroom model, students have a main role in being active in learning and instilling an independent attitude and learning effectiveness in students.(Fariha, 2021)

To further improve problem solving and students' learning independence regarding the material "Food Additives", in implementing the Flipped Classroom learning model, it is necessary to be assisted with media that is appropriate to the material being taught. The media used is Flipbook media. Based on the results of previous research, it shows that students have a positive perception of the opportunity to use flipbooks for digital learning.(Roemintoyo & Budiarto, 2021). The results of this research can be used as a reference for educators in implementing flipbook-based digital learning media to simplify the learning process.

The success of increasing problem-solving abilities and learning independence is not only determined by the learning model and media applied in learning, but there are also other factors, namely students' learning

independence. This is supported by previous research which states that there is a significant influence of students' learning independence on mathematics learning outcomes, every time there is an increase in students' independent learning attitude it will be followed by an increase in learning achievement.(Hidayat & Sutirna, 2020),

Based on the description above, the researcher attempted to determine problem-solving abilities and learning independence in the Flipped Classroom learning model with Flipbook media, in class VIII students at SMP 2 Kajen, Kajen District, Pekalongan Regency, regarding the material "Additives in food" with the research title " Analysis of science problem solving abilities using the Flipped Classroom model assisted by the Fliipbook E-Module in terms of student learning independence.

## Method

Referring to the problem formulation and research objectives as well as the framework of my research, namely: The research design used is Mix Method Design (mixed research).*Mixed Methods* known as the third methodological movement was born after quantitative and qualitative research developed first (Creswell et al., 2011). Long before qualitative research was developed, quantitative research designs had been well developed. Qualitative research methods were then developed to answer many things that could not be resolved only with quantitative research, especially in the area of social/community sciences. As time goes by, it turns out that quantitative and qualitative research often cannot stand alone to answer a research problem. So, mixed methods began to develop around the 1980s when many researchers realized the need for breakthroughs to answer more complex problems.

In this research, there are two stages of research where the research begins with a preliminary study in order to find problems in the field by conducting studies on data, interviews with teachers, and studies in the literature. Quantitative research to obtain data on problem solving ability test results and student independence scale results. Meanwhile, qualitative research is used to obtain data on problem solving abilities in terms of student independence during the problem solving process. Quantitative data collection is followed

by qualitative data collection. In the second stage, intervention was carried out to students using the Flipped Classroom learning model with the help of the Flipp Book E-Module. The Flipped Classroom intervention was provided with the help of the Flipp Book E-Module during 4 meetings, where one meeting at the beginning was used to fill in the student independence scale. One last meeting for *post-test* problem solving abilities. Meanwhile, 2 meetings were held for implementing learning using the Flipped Classroom with the help of the Flipp Book E-Module. Grouping students based on the results of the independence scale was then continued with student independence interviews and discussions with the class teacher. The purpose of interviews with students and consultations with class teachers is to obtain research subjects that truly match the researchers' expectations and the research subjects chosen are students who have good problem-solving abilities. Based on the results of the independence scale, the results of interviews and consultations with the class teacher, two students were selected in the low independence category, two students in the medium independence category and two students in the high independence category. During the implementation of the learning, there were four meetings. a problem solving skills quiz was carried out at the end of the meeting. Whereas The interview was conducted after giving the quiz and *post-test* at the fourth meeting. The subjects interviewed were subjects who had been previously selected from each independence scale group. The results of the interviews in stage two are used to interpret students' problem solving abilities during the problem solving process. Data interpretation uses data triangulation so that the data can provide a clear picture and correct answers to research questions. Triangulation techniques are carried out through Technical triangulation is carried out through several different data collection techniques, namely problem solving ability tests, independence scale and problem solving ability interview as well student independence to find out a description of problem solving abilities based on student independence correctly.

## Results and Discussion

This research was conducted from 27 October 2023 to 10 November 2023 at SMPN 2

Kajen Class VIII E (experimental class) and Class VIII D (control class) Kajen District, Pekalongan Regency. The aim of carrying out this research is to: 1). Analyzing the effectiveness of using the Flipped Classroom learning model with Flipbook E-Module media in increasing problem solving and student learning independence. 2). To describe problem solving abilities in terms of learning independence in the Flipped Classroom learning model with the Flipbook E-Module. Regarding food additives.

The implementation of research in the experimental class, namely learning adapted to the RPP steps stated in implementing the Flipped Classroom learning model. using Flipbook. The research was carried out by starting with the distribution of learning independence questionnaires and a pretest on problem solving on food additives to 32 students to measure the students' level of independence and initial solving abilities. The next day the researcher carried out the learning treatment in 2 meetings.

In accordance with the Flipped Classroom Learning model, the day before class learning, via WA the class group researchers sent teaching materials and LKPD to be studied first so that students have preparation in receiving lessons tomorrow morning as well as distributing learning independence questionnaires to be filled out, so that later they finally know the students' initial level. the extent of student independence in their learning. The first material I shared was about additives in food. I packaged the material in a Flipbook and shared the link via WA group.

At the first class meeting in the morning according to the learning schedule, students are asked to do pretest questions on food additives and psychotropic addictive substances first. Next, students were asked to group up and have a discussion about additives in food, using the material in the flipbook as a guide, and to do a practicum about additives in food by looking at the composition on snack packaging. After they had done the practicum and then discussed it, then each group Present the results in front of the class, taking turns in each group.

At the second meeting, the material studied was about psychotropic addictive substances. Learning begins with a review of meeting 1 material and practicing prerequisite questions as a form of checking initial learning knowledge. Students will receive question

stimulation from the teacher to ask and discuss addictive psychotropic substances and their effects on everyday life. After the second meeting was over, the researcher gave students problem solving questions as a posttest on food additives and completed a learning independence questionnaire. To find out more about student independence and students' science problem solving abilities, interviews were conducted with research subjects.

The research data conducted by the researchers consisted of students' independent learning and problem solving abilities of class VIII students on food additives in the control and experimental classes. Data on student learning independence was collected using a questionnaire with 8 questions. Meanwhile, data on students' problem solving abilities was collected using 4 questions. Based on test data taken by 32 students from the control class and experimental class, the problem solving pretest average was 54.44 and 54.81. Meanwhile, the problem solving posttest averages were 66.26 and 75.20. In the pretest, learning independence was 36.75 and 40.9, while in the posttest, learning independence was 57.4 and 76.3.

Table 1  
 Increasing Learning Completeness

Pair 1	Paired Differences		t	df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
	Mean	Std. Deviation				Lower	Upper
Pretest-Posttest	-27.218	14.239	2.517	-32.353	-22.085	-10.813	.000

Based on the results of the paired sample t test, the Sig value. (2-tailed) = 0.000 < 0.05, so there is a difference in the results of students' problem solving abilities during the pretest and posttest on the material on additives in class VIII food. So there is an increase in problem solving abilities after learning.

Table 2  
 Average Problem Solving Ability Score

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Hasil Kemampuan Pemecahan Masalah	32	83.47	11.418	2.197

Table 3  
 Average Equality Test

One-Sample Test						
Test Value = 75						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Hasil Kemampuan Pemecahan Masalah	2.696	31	.015	5.704	1.19	10.22

Based on calculations using the proportion test with a real level of 5%,  $t_{count} = 2.696$ , while  $t_{table} = 1.693$ , while SPSS calculations get a Sig value. (2-tailed) = 0.015 < 0.05. So  $H_0$  is rejected, meaning that the average problem solving ability of students in the science subject on additives in food for class VIII students who use the flipped classroom model with the help of flip books exceeds the KKM. This is reinforced based on the test data results of 31 students out of 32 students completing the test, meaning that the completion percentage of the experimental class is around 97% completing the KKM.

Table 4  
 Test the influence of student independence on problem solving abilities

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80,110	1	80,110	1,463	.000 <sup>a</sup>
	Residual	1207,859	30	40,262		
	Total	1287,969	31			

In the Anova output results, the value Sig = 0.00 < 0.05 is obtained, so  $H_0$  is rejected. So, it can be concluded that there is a significant influence between student independence on problem solving abilities in science lessons on food additives using the flipped classroom model.

Table 5  
 The relationship between student independence and problem solving abilities

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.218 <sup>a</sup>	.407	.016	6.345

a. Predictors: (Constant), Kemandirian

Based on the summary model output, it is known that the correlation/relationship value (R) is 0.218, which indicates a strong and positive relationship between the two. From this output, a coefficient of determination (R square) value

of 0.407 was obtained. Which means that the influence of the independence variable and the science problem solving ability variable regarding additives in students' food is 40.7% of students caused by other factors.

In line with the opinion expressed by Berrett, D, (2012), that the Flipped Classroom learning model has several advantages, including students having time to study lesson material at home before the teacher presents it in class so that students are more independent, students can study lesson material in good conditions. a comfortable atmosphere with the ability to receive material. So that the application of the flipped classroom learning model can provide children with the opportunity to study the material first. Student learning readiness can improve student learning outcomes, in this research the material is additives in food.

In line with research by (Aminuddin, 2022), learning using the flipped classroom is divided into two phases, namely (1) the class outclass phase by uploading materials before learning is carried out using LMS in the form of Culture Literacy Digital Wetland, then (2) the inclass phase with discussion and solve the problem. The research results show (1) the use of the flipped classroom has an influence on

students' learning outcomes in Biology material compared to the control class (2) Students' learning independence shows in the high category in the class that uses the flipped classroom when compared to the control class which is categorized as medium.

## Conclusion

Through the results of the research and discussion that have been explained, the researchers drew the following conclusions, namely that the flipped classroom learning model has an effect on the learning outcomes of class VIII students, it is proven that the classical completion level is 97%. Based on the results of the paired sample t test, the Sig value. (2-tailed) = 0.000 < 0.05, it can be concluded that the flipped classroom learning model has an effect on students' ability to solve problems. Apart from that, through the N-Gain test, the percent of the flipped classroom learning model has an effect on students' abilities by 40.7%. Thus, there are other variables that influence learning independence besides the learning model, such as motivation, attitudes, habits, and so on which were not examined in this research.

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