Jurnal Ekonomi Pendidikan dan Kewirausahaan
Homepage : https://journal.unesa.ac.id/index.php/jepk
p-ISSN : 2303-324X; e-ISSN : 2579-387X

Vol. 14, No. 1, April 2026
Page 1-24

The Effect of Flipped Classroom Model and Learning Styles on Improving Students' Conceptual Understanding: An Experimental Study

Henky Muktiadji[1*], I Nyoman Sudana Degeng[1], Punaji Setyosari[1], Dedi Kuswandi[1], Arina Salsabilla Haq[2]

[1*] Doctoral Department of Learning Technology, Universitas Negeri Malang, Malang, Indonesia
[2]Louis-Leitz-Schule, Weiner Str. 51, 700469 Stuttgart Deutschland, Germany

Check for updates OPEN ACCESS

DOI: https://doi.org/10.26740/jepk.v14n1.p1-24

Sections Info

Article history:
Submitted: November 27, 2025
Final Revised: December 19, 2025
Accepted: December 19, 2025
Published: December 22, 2025

Keywords:
Flipped Learning
Learning Style
Conceptual Understanding
Higher Education
Student

ABSTRACT

Objective: *This research aims to explain the influence of the flipped classroom learning model along with learning styles on students' conceptual understanding.* ***Method:*** *This study uses a quasi-experimental method with a 2x2 factorial pretest-posttest non-equivalent control group design involving students from PGRI University Jombang at the undergraduate level.* ***Results:*** *The research results reflect that the flipped classroom has a better impact compared to conventional learning. The difference between verbal and visual learning styles is not significant to conceptual understanding. Overall, the use of flipped learning is effective for all types of learning styles in this study in improving conceptual understanding. In practice, the flipped classroom is highly recommended for application in concept comprehension learning with implementation on an LMS and effective discussion features.* ***Novelty:*** *The novelty of this research lies in the integrative flipped learning model combined with learning styles, which has not been extensively studied for enhancing conceptual understanding.*

INTRODUCTION

Understanding the concepts of a subject in lectures is important for students in the current era of educational dynamics (Doshi & Roy, 2016; Yonata & Azizah, 2024). Students are not at the stage of study solely to memorise material, but also to connect the concepts or theories learned with real-world phenomena to solve problems (Danim, 2024; Selvakumar et al., 2025). Student-centred policies in higher education are also important in the development of strong conceptual understanding among students (Bhardwaj et al., 2025; Dennis & Montagnino, 2025). Without this, demands in the form of global competencies such as analytical skills and problem solving will not be achieved. Conceptual understanding in SDGs regarding the quality of education (Awini et al., 2024; Fuentes-Penna et al., 2025; Greig & Priddle, 2019; Kioupi & Voulvoulis, 2019).

On the other hand, conceptual understanding has been integrated into the higher education curriculum in Indonesia, covering various fields of study. In Government Regulation (PP) No. 4 of 2014 concerning the Implementation of Higher Education and Management of Higher Education Institutions as well as Ministerial Regulation of the Ministry of Higher Education, Science, and Technology Number 39 of 2025 on Quality Assurance in Higher Education. It is reflected that the government encourages higher education of higher quality with curricula in all subjects across various levels with the cultivation of deep understanding of high standards (Prasetya et al., 2025; Rosalina Eka Permatasari et al., 2025). It is hoped that by strengthening students' conceptual understanding, they can make a real impact on society through meaningful learning.

One of the fields of study that emphasizes deep conceptual understanding is economic education (Milaszewicz & Zakrzewska, 2017; Moos van Wyk, 2015). The economic education program emphasizes a thorough understanding of economic concepts so that students, as prospective teachers, can master the material from introductory topics to practical applications in the field (Dahlan et al., 2014; Prakoso, Subroto, et al., 2025). This must be done not only for the sake of the students' competence in economics but also because they are future teachers who will need to teach the material they have learned to their students (Handayani et al., 2024). Understanding economic concepts does not happen by chance but through a structured and gradual learning process (Berti, 2016; Prakoso, Fitrayati, et al., 2025). The better the understanding of economic concepts, the more optimal the professional competence of students as future economics teachers (Chelnokova et al., 2022).

However, in practice, the expectation of a high level of conceptual understanding among economics education students has not yet occurred in all national universities, one of which is the economics education undergraduate program at PGRI University Jombang. Based on interviews and observations, it was found that there are still economic topics that students have not fully absorbed in terms of conceptual understanding, namely the topics of demand and supply elasticity. From the perspective of constructivist theory, the understanding of concepts should be built through students' active involvement in relating abstract concepts to real economic phenomena. In other words, it influences conceptual understanding.

One of the lecturers interviewed for the microeconomics course stated that the time allocated in the curriculum is considered insufficient compared to the complexity of the elasticity material that must be delivered. The results of student understanding tests before and after attending elasticity lectures show that the improvement in concept mastery is relatively low. The average ability of students to calculate elasticity values, interpret the calculation results, and analyse factors influencing elasticity does not show significant development.

The issue is urgent to address considering that mastery of the concept of elasticity is one of the professional competency achievements that economics education students must possess. Practically, the material also shows significant urgency to be mastered. Students who will later become economics teachers in schools must be able to comprehensively explain various economic phenomena that occur to achieve learning objectives in the classroom (Scott & Fox, 2023). Elasticity material becomes one of the main topics due to its high relevance (Siregar et al., 2023; Torriti, 2019) As an illustration, in Indonesia itself, fluctuations in the prices of rice, fuel, and online motorcycle taxi fares over the past five years indicate that understanding elasticity is very relevant to everyday life (Ruspayandi et al., 2022; Santoso et al., 2025; Shaffitri et al., 2024).

Considering the various existing conditions, one approach that potentially can enhance understanding of subject concepts is the use of the flipped classroom learning model (Diningrat et al., 2023; Kinteki et al., 2019; Surjono & Mahmudi, 2023). The flipped classroom is an approach that emphasizes student autonomy and active participation, making students the protagonists of their own learning (Ajayi et al., 2017; Liu, 2021; Reinoso et al., 2021). In this model, students first study the material through videos, e-

books, or tutorials provided by the lecturer and can be accessed online or offline (Hanif et al., 2025; Kwon, 2021; Moreno & Martínez, 2022; Talbert & Bergmann, 2023). Face-to-face time in class is then used not for passive delivery of material, but for in-depth discussion, questions and answers, and collaborative problem-solving. Thus, the classroom becomes an active space for interaction between lecturers and students as well as among the students themselves.

In the context of learning economics, flipped framework is very relevant for material that is analytical in nature and requires a strong conceptual understanding (Long et al., 2017; Rahayu et al., 2022; Wong & Chu, 2014), such as demand and supply elasticity. Elasticity material not only requires students to memorise definitions or formulas, but also to understand the relationships between variables, read graphs, interpret price changes, and analyse consumer and producer responses in various market conditions (Agbokou, 2023; Newman, 2018). With learning time that better fits students' needs, and good discussion space during classroom learning, the potential for a strong understanding of elasticity concepts will be even greater.

Nevertheless, there are internal aspects that cannot be ignored, namely students' learning styles. Learning style is the learner's ability to absorb, organise, and process information. Learning style is an important part of a learner's characteristics (Pujianto et al., 2020), while the learner's characteristics themselves are a key element in learning conditions. There are various categories of learning styles, and one widely used model is that developed by Johnson, (2007), which classifies learning styles into four dimensions: (1) active–reflective, (2) sensing–intuitive, (3) visual–verbal, and (4) sequential–global. One of the most relevant is the visual–verbal dimension. This dimension is relevant to learning that employs the flipped classroom model, where the delivery of material can be done via video, graphics, text, or discussions, making it suitable for learners with visual or verbal preferences (Hasanudin & Fitrianingsih, 2019). In addition, the visual-verbal dimension has the highest connection. Pre-class material is delivered through digital media and offline classes are conducted in person, thereby promoting high visual-verbal activation.

Based on a review of previous literature, there is an influence of the Flipped Classroom and learning styles on concept understanding. Structurally, the flipped classroom has a clear separation between the concept acquisition phase and the concept elaboration phase for students' conceptual understanding, something that is not guaranteed in blended or hybrid learning. Research by Juniantari et al., (2019) found that the mathematical concept understanding of high school students who participated in learning with a flipped classroom approach was higher than those who followed conventional learning. Meanwhile, research by Atikah et al., (2022) found that the flipped classroom method successfully improved the mathematical concept understanding of students at STIT AL-Quraniyah Manna. Beside that, research by Pratama et al., (2024) stated that visual and auditory learning styles significantly affect understanding in the Algorithm and Programming course. Research by Nurlia et al., (2021) stated that there is a correlation between learning styles and the ability to understand mathematical concepts for vocational high schools.

The research gap identified is that there has been no study examining the influence of flipped learning and learning styles as moderators on the understanding of economic concepts at the university level, particularly in the economic education study program within a single model. This arose because previous research, such as that by Naldi & Susanti, (2018) and Sirait, (2018), had examined learning styles, but not in combination with flipped learning or rather in other learning models. Furthermore, no one has placed it within an integrated research model. In practical implications, no previous flipped classroom research has been found that examines an integrative learning model combining flipped classroom and learning styles in the specific context of economics education on the topic of elasticity. Therefore, this research aims to test differences in the understanding of economic concepts, namely demand and supply elasticity, based on the implementation of the flipped classroom. In addition, it also aims to examine differences in concept comprehension based on students' verbal and visual learning styles.

The novelty of this research lies in offering an integrative model combining flipped classroom practice experiments and learning styles as a comparison for understanding the concepts of demand and supply elasticity in economics for economics education students, which has not been done before, thus providing a new perspective on the effectiveness of modern learning strategies integrated with student learning characteristics. On the other hand, the integration of the new model offered has implications for the application of constructivist theory in economics learning by positioning the flipped classroom as an active knowledge space through interaction, reflection, and problem-solving tailored to individual learning styles with the relationship of economic material characteristics differing from other subjects.

The contribution of this research theoretically is to enrich the literature on economics learning pedagogy, particularly regarding factors and strategies that influence the depth of conceptual understanding in microeconomics courses. Practically, this research provides recommendations for a flipped classroom-based learning model that is adaptive to students' learning styles, thus serving as a reference for universities and lecturers in designing effective economics learning. As for the research question in this study are RQ1: Is there a significant difference in students' conceptual understanding between those taught using the flipped classroom model (X_1) and those taught using conventional online learning (X_2)? RQ2: To what extent does the flipped classroom framework or model influence students' conceptual meaning against to conventional online learning? RQ3: Does learning style (visual vs. verbal) significantly moderate the relationship between the flipped classroom and students' conceptual comprehension? RQ4: Does learning style (visual vs. verbal) significantly moderate the relationship between conventional online learning and students' conceptual understanding? RQ5: Which learning style (visual or verbal) demonstrates a stronger interaction effect with the flipped classroom in enhancing students' conceptual comprehension? The research model to be tested in paper is illustrated in Figure 1.

Vol. 14, No. 1, April 2026
Page 1-24

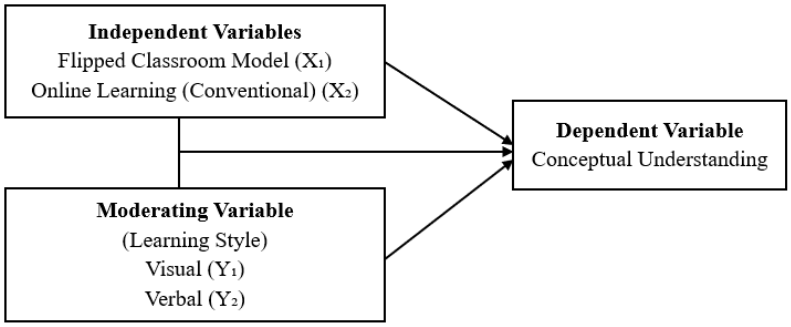

Figure 1. Research Model

RESEARCH METHOD

Study Design

This study was designed using a quasi-experimental research method with a 2x2 factorial pretest-posttest non-equivalent control group design. This quasi-experimental design was used because the researcher could not fully control the research subjects and the selection and grouping of research subjects, both in the experimental group and the control group, was not conducted randomly.

Table 1. 2x2 Factorial Quasi-experimental Design

		Learning Model	
Moderating Variable	**Independent Variable**	***Flipped Classroom* (*Full Online*) (X_1)**	**Conventional Learning (*Full Online*) (X_2)**
Learning Style	Visual (Y_1)	X1, Y1	X2, Y1
	Verbal (Y_2)	X1, Y2	X2, Y2

Description: x1, y1: Group given the flipped classroom model treatment (experimental group) with a visual learning style x1, y2: Group given the flipped classroom model treatment (experimental group) with a verbal learning style x2, y1: Group given online learning treatment (control group) with a visual learning style x2, y2: Group given online learning treatment (control group) with a verbal learning style.

The research subjects involved second-semester students of the economics education program at PGRI University Jombang in the microeconomics course, covering the topic of demand and supply elasticity, totaling 121 students consisting of 61 students for the experimental class and 60 students for the control class, as well as 30 students for the instrument trial class. The subjects in this study Two groups of students were allocated to the experimental and control classes (intact group). The implementation of the flipped classroom model was carried out over four sessions (four weeks) with a learning structure that included pre-class, in-class, and post-class stages. In the pre-class stage, students studied the material through short learning videos (10–15 minutes) and reading materials uploaded on the Learning Management System (LMS). In the in-class stage, learning focused on guided discussions and conceptual problem-solving, with the

lecturer acting as a facilitator, while students played an active role in analysing and discussing the material. In the post-class stage, students completed reinforcement exercises and brief reflections through the LMS to deepen their understanding of the concepts.

The experimental procedure consists of three stages, namely pre-experiment, experiment implementation, and post-experiment. In the pre-experiment stage, the researcher conducts preliminary observations on the learning conditions of the demand and supply elasticity material, including facilities, classroom management, and the forms of evaluation used. The experiment implementation stage begins with identifying students' learning styles using an instrument adapted from the Index of Learning Style (ILS) to categorize students into visual and verbal groups. Subsequently, students in the experimental and control classes are given a pretest to determine their initial abilities related to understanding the concepts of demand and supply elasticity.

The experiment group received treatment in the form of implementing the flipped classroom model, while the control class followed conventional full online learning. In the post-experimental stage, data on learning styles, pretest, and posttest results were analysed according to the established techniques to examine the influence of the flipped classroom model and differences in concept understanding based on visual and verbal learning styles. The results of this analysis were used to compare the effectiveness of full online-based flipped classroom learning on understanding the concepts of demand and supply elasticity compared to conventional learning.

Instrument

To determine the learning styles of learners in this study, an instrument adapted from the Index of Learning Style (ILS) developed by Felder and Solomon (Solomon & Felder, 1999) was used. This ILS instrument consists of 44 questions and is used to measure the type of learners' learning styles.

Table 2. Learning Style of the Experimental Group

No	Learning Style	Count
1	Visual	37
2	Verbal	24
	Total	61

Source: Processed Data (2025)

Table 3. Learning Style of the Control Group

No	Learning Style	Count
1	Visual	36
2	Verbal	24
	Total	60

Source: Processed Data (2025)

The concept comprehension test to measure understanding of concepts is in the form of multiple choice. The concept comprehension test was developed by the researcher based on the subject matter being studied and uses operational verbs at the

comprehension level (C-2 domain) according to the revised Bloom's taxonomy. The concept comprehension test instruments required in this study are pretest and posttest. The number of concept comprehension test items developed is 20.

The concept comprehension test is made the same for both the pretest and posttest; however, the question numbers and the position of the choices are not the same or are made random. In the pretest, the concept comprehension instrument is used to measure the learner's initial ability before receiving treatment. Meanwhile, in the posttest, the concept comprehension instrument is used to measure the extent of the learner's ability after receiving treatment. After conducting the posttest, the researcher can use the data from both tests, then analyse and determine whether there is any change or divers in the learners' concept comprehension later the treat.

In testing the validity of the instrument, content validity and construct validity are used. Content validity refers to the degree of adequacy of the concept to be measured. Testing content validity is observed by examining whether the important content and domain are represented in each item of the question (sample). For the instrument to truly have content validity, justification from expert judgement is required. To test construct validity, validity and reliability analysis using the Alpha model is conducted. Item validity is used to see whether the instrument used is valid or not. This validity test is used as an item analysis, namely by correlating each item's score with the total score, which is the sum of the scores of each item, using Pearson's Product Moment correlation technique (r) ≥ 0.3. The results of the instrument validation from the trial class can be seen in the following table.

Table 4. Validation Results of Pretest-Posttest Question Instruments

No	Instrument Item	R Value	Description
1	Exercise 1	0.388	Appropriate
2	Exercise 2	0.508	Appropriate
3	Exercise 3	0.444	Appropriate
4	Exercise 4	0.417	Appropriate
5	Exercise 5	0.396	Appropriate
6	Exercise 6	0.426	Appropriate
7	Exercise 7	0.424	Appropriate
8	Exercise 8	0.468	Appropriate
9	Exercise 9	0.380	Appropriate
10	Exercise 10	0.421	Appropriate
11	Exercise 11	0.615	Appropriate
12	Exercise 12	0.468	Appropriate
13	Exercise 13	0.376	Appropriate
14	Exercise 14	0.389	Appropriate
15	Exercise 15	0.614	Appropriate
16	Exercise 16	0.444	Appropriate
17	Exercise 17	0.623	Appropriate
18	Exercise 18	0.545	Appropriate
19	Exercise 19	0.389	Appropriate
20	Exercise 20	0.377	Appropriate

Source: Processed Data (2025)

From the table above, it can be concluded that all the instrument items are valid because they have a value of r > 0.3. To determine the reliability of the questions, the Alpha formula is used with the r variable. If the Alpha R > 0.6, then the instrument is declared reliable. The outcom of the reliability test for the pretest and posttest instruments can look in the table 5.

Table 5. Pretest-Posttest Reliability Results

Cronbach Alpha	N of Item
.780	15

From the table 5, the Alpha value is 0.780 > 0.6, so it can be noticed that the instrument is proper. Based on the results of the validation and reliability tests of the instrument above, all pretest-posttest question items can be used for research.

Data Analysis

Data description was carried out using descriptive data analysis with the help of SPSS version 20. The descriptive analysis includes the mean and standard deviation. The data in this study consisted of conceptual understanding scores. Before these data were statistically tested, a prerequisite test, namely the normality test, was conducted to determine whether the obtained data were normally distributed. To determine whether the distribution of the research data is normal or not, the Kolmogorov-Smirnov normality test was performed. The normality assumption is met if the probability (ρ) of the calculation result is greater than 0.05. After conducting the normality test, a variance homogeneity test was carried out to determine whether the obtained data are homogeneous (having the same variance) or not. Data homogeneity is indicated by a probability value (ρ) above the 0.05 threshold.

The data to be analyzed are the posttest scores of concept comprehension tests and the results of the learning style instrument. The data analysis technique used to determine the effect of the flipped classroom learning model based on learning styles on the understanding of elasticity concepts is the two-way Analysis of Variance (ANOVA) statistical analysis, which includes the Test of Between Subjects Effect and the interaction graph between independent and dependent variables. This calculation technique is also used to encourage the interaction between variables. The aspect for decision the presence or absence of differences between independent and dependent variables are based on a significance level of 5% or α = 0.05.

RESULTS AND DISCUSSION

Results

The research results indicate that the learning model has a significant effect on students' conceptual understanding (ANOVA, F = 15.804; p < 0.05). Visual and verbal learning styles do not have a significant effect on conceptual understanding (F = 0.001; p > 0.05). However, there is a significant interaction between the learning model and learning style on students' conceptual understanding (F = 4.358; p < 0.05). Overall, these key findings were identified through the following stages.

Table 6. Allocation of Study Subjects by Learning Models

Learning Model	Frequency (Student)	Percentage (%)
Flipped Classroom (full online)	61	50.4 %
Conventional (*full online*)	60	49.6 %
Total	121	100%

Source: Processed Data (2025)

Based on Table 6, the distribution of research subjects for the two learning models used is shown, where the flipped classroom model (full online) consists of 61 people or 50.4%, while the conventional model (full online) consists of 60 people or 49.6%. In addition to learning models, the distribution of research subjects is also observed from learning style distribution. Learning styles are grouped into research subjects with a visual learning style and research subjects with a verbal learning style regardless of their level. The distribution of the learning style questionnaire data for the experimental group is presented in Table 7.

Table 7. Distribution of Learning Styles in the Experimental Group

Learning Style	Frequency	Percentage
Visual	37	60.6%
Verbal	24	39.4%
Total	61	100%

Source: Processed Data (2025)

Table 8. Distribution of Learning Styles in the Control Group

Learning Style	Frequency	Percentage
Visual	36	60%
Verbal	24	40%
Total	60	100%

Source: Processed Data (2025)

Pretestt Data Overview of Concept Understanding

Before conducting the research, the subjects, both those using the flipped classroom model (fully online) and those using the conventional learning model (fully online), were given a pre-test.

Table 9. Descriptive Analysis of Pre-Test Data

Model	N	Mean	Std. Deviation	Std. Error Mean
Flipped Classroom	61	37.87	11.813	1.513
Conventional	60	41.42	14.085	1.818

Source: Processed Data (2025)

By looking at the results in Table 9, the pre-test data show that the mean for the experimental group using the flipped classroom (fully online) was 37.87 with a standard

deviation of 11.813. Meanwhile, the pre-test data for the control group using the conventional model (fully online) was 41.42 with a standard deviation of 14.085. The pre-test data, which includes the mean for both groups, cannot yet be used as a basis to interpret that the pre-test results of the two groups have a significant difference.

The normality test results using the Kolmogorov-Smirnov test on the experimental group yielded a significance value (sig.) of 0.159. This result is greater than 0.05, so the pretest data of the experimental group is declared to be normally distributed. The normality test results using the Kolmogorov-Smirnov test on the control group yielded a significance value (sig.) of 0.463. This result is greater than 0.05, so the pretest data of the control group is also declared to be normally distributed. Therefore, from the normality test results, the data shows that the normality of both groups is normally distributed.

The results of the data homogeneity test using the Levene Test based on the mean showed a significance value (sig.) of 0.178, which is greater than 0.05, indicating that the pretest data of the two groups are homogeneous. After determining that the pretest data are normally distributed and have homogeneous variance, a two-sample independent t-test was conducted on the pre-test data. The results of the t-test analysis are presented in Table 10.

Table 10. Two-Sample t-Test Results for Pretest Data

			Value_Pretest	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		1.836	
	Sig.		.178	
t-test for Equality of Means	t		-1.502	-1.500
	df		119	114.832
	Sig. (2-tailed)		.136	.136
	Mean Difference		-3.548	-3.548
	Std. Error Difference		2.362	2.365
	95% Confidence Interval of the Difference	Lower	-8.224	-8.233
		Upper	1.129	1.137

Source: Processed Data (2025)

Focused on the data from the independent two-sample t-test in Table 10. above, the (sig.) for the pre-test results between the flipped classroom (full online) group and the learners applying the conventional model (full online) group is 0.136. This means the sig. value > 0.05, so the pre-test results for the experimental group using the flipped classroom (full online) learning model and the control group applying the conventional (full online) model show no significant difference. Thus, it can be said that the initial abilities of the experimental group and the control group are the same.

Assumption Testing Analysis

Data Normality Testing

Table 11. Normality Test Results for Posttest Data of the Flipped Classroom Model

		_Postest Result
N		61
Normal Parameters[a,b]	Mean	57.38
	Std. Deviation	11.015
Most Extreme Differences	Absolute	.119
	Positive	.115
	Negative	-.119
Kolmogorov-Smirnov Z		.927
Asymp. Sig. (2-tailed)		.356

Source: Processed Data (2025)

The results of the Kolmogorov-Smirnov test were as follows: (1) the significance value (sig.) of the post-test scores from the experimental group treated with the flipped classroom learning model (fully online) was 0.356 > 0.05, so it be look that the scores data from the experimental group treated with the flipped classroom learning model (fully online) are normally distributed.

Table 12. Normality Test Results for Posttest Data of the Conventional Model

		Postest Result
N		60
Normal Parameters[a,b]	Mean	49.58
	Std. Deviation	13.286
Most Extreme Differences	Absolute	.129
	Positive	.098
	Negative	-.129
Kolmogorov-Smirnov Z		1.001
Asymp. Sig. (2-tailed)		.269

Source: Processed Data (2025)

The results of the Kolmogorov-Smirnov test showed: (1) the significance value (sig.) of the post-test scores from the control group treated with the conventional learning model (full online) was 0.269 > 0.05, so it seen that the score data from the control group treated with the conventional learning model (full online) are normally distributed.

Table 13. Final Test Normality Results by Learning Style

Learning Style	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Visual	.098	73	.079	.979	73	.258
Result Postest Verbal	.121	48	.074	.959	48	.096

Source: Processed Data (2025)

The Lilliefors significance correlation test from Kolmogorov-Smirnov shows that: (1) the significance value of the posttest concept understanding based on visual learning style is 0.079 > 0.05, and (2) the significance value of the posttest concept understanding based on verbal learning style is 0.074 > 0.05. Therefore, it can be concluded that the posttest data on concept understanding from students with both visual and verbal learning styles are normally distributed.

Homogenity Testing

Table 14. Homogeneity Test Outcome of Learning Style Data with Flipped Classroom and Conventional Model

	Levene Statistic	df1	df2	Sig.
According on Mean	1.216	1	119	.272
Based on Median	1.131	1	119	.290
Result_Postest Based on Median and with adjusted df	1.131	1	114.799	.290
Based on trimmed mean	1.251	1	119	.266

Source: Processed Data (2025)

Because the significance level of 0.272 > 0.05, it can be concluded that the post-test data on concept understanding with the flipped classroom and conventional model are homogeneous.

Table 15. Homogeneity Test Results of Posttest Data on Concept Understanding with Visual Learning Style and Verbal Learning Style

	Levene Statistic	df1	df2	Sig.
According on Mean	1.620	1	119	.206
Based on Median	1.506	1	119	.222
Result_Postest Based on Median and with adjusted df	1.506	1	118.917	.222
Based on trimmed mean	1.550	1	119	.216

Source: Processed Data (2025)

The homogeneity of variance test table before shows that frm on the mean of the posttest concept understanding data with flipped classroom and conventional models,

the Levene test value is 1.620; df1=1, df2=119; and the significance level is 0.206. With a significance level of 0.206 > 0.05, it can be concluded that the posttest concept understanding data in the communtiy students with visual and verbal learning styles are homogeneous.

Variable Influence Test

Table 16. Results of the Individual Variable Influence Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2447.903[a]	3	815.968	5.827	.001
Intercept	331562.762	1	331562.762	2367.680	.000
Learning Model	2213.181	1	2213.181	15.804	.000
Learning Style	.171	1	.171	.001	.972
Learning Model * Learning Styles	610.282	1	610.282	4.358	.039
Error	16384.328	117	140.037		
Total	365325.000	121			
Corrected Total	18832.231	120			

Source: Processed Data (2025)

The learning model has a significant effect on students' conceptual understanding (F = 15.804; Sig. = 0.000), whereas learning style does not have a significant effect (F = 0.001; Sig. = 0.972). However, there is a significant interaction between the learning model and learning style (F = 4.358; Sig. = 0.039), indicating that the effect of the learning model on conceptual understanding is influenced by students' learning styles.

The Influence of the Flipped Classroom Learning Model and the Conventional Learning Model on Students' Conceptual Understanding.

The proposed hypothesis is that there is a difference in learners' conceptual understanding between classes given the flipped classroom learning model and the conventional learning model. Based on the ANOVA test analysis in Table 4.11, the F value is 15.804 with a significance probability of 0.000. This significance probability is far below the significance level of 0.05. Thus, it can be concluded that Ho is rejected. This means that there is a difference in learners' conceptual understanding between classes given the flipped classroom learning model and the conventional learning model.

The Influence of Learning Styles of Students with Visual and Verbal Learning Styles on Learners' Conceptual Understanding.

Based on the ANOVA test analysis, the calculated F value is 0.001 with a significance probability value of 0.972. This significance probability value is greater than the significance level α of 0.05. Therefore, it can be concluded that Ho is accepted. This means there is no difference in concept understanding between learners with a visual learning style and those with a verbal learning style.

The Interaction Between the Flipped Classroom Model and Learning Styles in Students' Conceptual Understanding.

Based on the results of the ANOVA test analysis, the calculated F value is 4.358 with a significance probability value of 0.039. This significance probability value is still less than 0.05. Thus, it can be concluded that Ho is rejected. This means there is an interaction between the flipped classroom model and learning styles on students' concept understanding. The interaction between the flipped classroom model and learning styles in students' concept understanding can be seen in Figure 2.

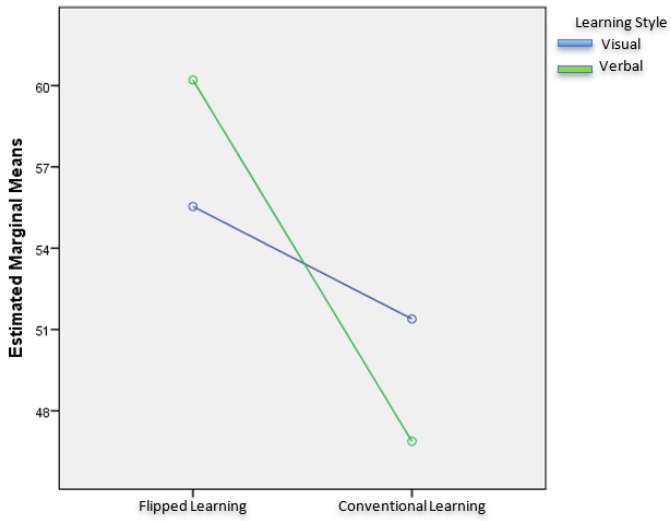

Figure 2. The Interaction Between Flipped Classroom Models and Learning Styles in Students' Conceptual Understanding

Based on figure 2, it is known that the flipped classroom shows a more positive contribution compared to conventional learning as it can better accommodate students' learning styles, resulting in higher scores.

Discussion

The Influence of Learning Models on Learners' Conceptual Understanding

Based on the results of the hypothesis test from this study, it shows that there is a significant difference in learners' conceptual understanding between the group of students taught using the flipped classroom learning model and the group of students taught using the conventional learning model. These research findings mean that the flipped classroom learning model has a better effect on students' concept understanding compared to the conventional learning model.

Theoretically, this research provides evidence that the flipped classroom model enhances conceptual understanding in accordance with constructivist theory and active learning, which emphasise that knowledge is actively constructed by learners through interaction with materials and the learning environment. In a flipped classroom, the initial process of understanding concepts no longer occurs in class, but through pre-class activities that allow students to independently access economic materials at their own learning pace. This condition gives students the opportunity to engage in lower-order cognitive processes, such as understanding definitions and basic concepts, before the class meeting takes place. Consequently, classroom learning time can be used for higher-

order cognitive activities, such as analysis and problem-solving, which directly contribute to deepening the understanding of the concepts of demand and supply elasticity.

These results are supported by the research of Long et al., (2017) and Umezawa et al., (2016) which states that through the flipped classroom model, students' understanding of the topics studied can be increased by quickly conducting online tests with the students. This indicates that conceptual understanding can be enhanced through flipped classroom learning by utilising out-of-class activities using e-learning media. Kaviza, (2018) also concluded that implementing the flipped classroom model results in improved student performance. Barber, (2015) and Goh & Tan, (2015) states that the flipped classroom model provides more opportunities for students to learn anywhere and anytime and can be repeated until students truly understand the material (Annajmi & Dedi Kuswandi, 2024; Kurniawati et al., 2022).

Learning through the Distance Education system (PJJ) with minimal face-to-face meetings or even without direct face-to-face meetings during this pandemic makes the use of communication technology and teaching materials extremely important (Aveiro-Róbalo, 2022; Mukhametzyanov, 2022; Pirzado et al., 2024). Communication technology and teaching materials are used as a means to deliver course content or material to students. In this study, the research sample is divided into a control class and an experimental class. The control class uses conventional learning, while the experimental class uses a flipped classroom learning model assisted by instructional videos uploaded to Google Classroom.

The presence of multimedia technology has changed the way students learn (Chen & Wang, 2021; Khamparia & Pandey, 2017; Sivakami & Gunasekaran, 2025). To engage students in studying the material before lectures, the material provided to students is in digital form in various formats, such as Word, PDF, PowerPoint, and Video. In the flipped classroom, the chosen learning media is video media. In addition, the flipped classroom is a teaching method used to overcome difficulties encountered by students when studying independently at home. Through the flipped classroom model, lecturers can optimise classroom learning to guide students in problem-solving. In class, students will discuss in groups to solve problems, therefore this method is suitable for solving student-related homework problems. This is because the homework that is usually done at home with the flipped classroom model is actually completed.

Differences in Conceptual Understanding between Learners with Visual Learning Style and Verbal Learning Style

Based on the results of the hypothesis test from this study, it shows that there is no difference in concept understanding between students with a visual learning style and those with a verbal learning style. The findings of this study indicate that groups of students with visual learning styles and those with verbal learning styles have a similar or relatively equal understanding of the concepts in elasticity material.

These findings reinforce the superiority of constructivist theory in student learning. The theory posits that conceptual understanding is formed through the active construction of knowledge by learners. In this context, flipped learning successfully accommodates this, even for visual and verbal learning styles. More in depth, this study found that the elasticity material in the economics education studies studied by students

was built within the framework of direct engagement in discussions and problem-solving that represent the relationship between price changes and the response of quantity demanded or supplied, thereby enhancing deeper conceptual understanding.

Similar research conducted by Strelan et al., (2020) and Wang & Liu, (2019) found that learning styles do not affect participant satisfaction and do not predict satisfaction with either traditional or flipped classroom approaches. Satisfaction scores for the four components of the flipped classroom did not differ significantly according to learning style. The average satisfaction score for the flipped classroom approach was higher than that of the traditional approach across all learning style groups. All participants in the flipped classroom were more satisfied with the online component and teacher-student interaction than the student group with the discussion and presentation components.

With the availability of media limited by their learning tendencies. Learning styles can influence the way students construct their knowledge in the learning process Drissi & Amirat, (2016). Learning style is the way students learn, thus it is greatly influenced by the media or tools used to obtain information. Learning styles vary depending on the media used in the learning process. In each learning style, the tendency largely depends on the media used. People who lean towards a visual learning style need learning media that allows them to understand simply by seeing it (Caser et al., 2025). The limitations of learning media, as previously explained, are unable to facilitate students in exploring information according to their learning style.

The interaction between Learning Models and Learning Styles on Learners' Conceptual Understanding

The results of the two-way ANOVA test for the interaction between the flipped classroom model and learning styles on concept understanding indicate that there is an interaction between the flipped classroom model and learning styles on concept understanding. This means that the learning model will influence the understanding of the concept. The learning model and the learner's learning style are interrelated, and both must be synchronised to ensure effective learning for the learner.

Empirically, in the study of elasticity, the flipped classroom model provides space for students to construct initial knowledge independently in the pre-class material phase, then deepen and reconstruct conceptual understanding through discussion, case analysis, and problem solving when face-to-face sessions occur later. The interaction between the flipped classroom model and learning styles shows that the effectiveness of knowledge construction (Constructivist Theory) in elasticity is influenced by the alignment between the design of learning activities and the way students process information. Therefore, the internal aspects of students play an important role.

Based on comparative analysis, this study shows that the influence of learning models on conceptual understanding is not uniform and depends on students' learning styles. For students with a visual learning style, the implementation of the flipped classroom model results in higher conceptual understanding compared to conventional online learning. This can occur because the flipped classroom provides pre-class materials in the form of videos and visual representations that support visual information processing, helping students build initial schemas before in-class learning. The opposite is true as well.

On the other hand, groups of students with a verbal learning style in the flipped classroom also showed advantages compared to conventional learning, although with a different mechanism. Verbal students benefit from discussion activities, question and answer sessions, and more intensive concept clarification during the classroom learning phase, which is a key feature of the flipped classroom. In conventional learning, verbal interaction tends to be limited to lecturer explanations, making it more difficult for verbal students to elaborate on the concepts of elasticity material.

The findings from the implementation of research in the experimental class using the flipped classroom model show that, in addition to better concept comprehension, the thinking skills identified during discussions were also good. This aligns with the views of Atwa et al., (2022) who stated that the application of flipped classroom learning, which is computer-based, can promote the improvement of students' academic achievement and critical thinking skills. Furthermore, Florence & Kolski, (2021) stated that the implementation of the flipped classroom learning model provides an engaging learning experience, making it effective in helping students learn and understand the teaching material.

The flipped classroom learning model, which heavily utilizes computer media, is suitable for implementation in both schools and universities. This is because students in Indonesia are already very familiar with computer technology, so computers can be used as a tool to enhance academic performance and practical skills. Students' fondness for technology and digital media can have a positive impact on educational success.

CONCLUSION

Fundamental Finding: Based on the research findings, it can be concluded that the flipped classroom learning model has a better impact on learners' understanding of concepts in elasticity of demand and supply material compared to the conventional learning model, as seen from the higher posttest mean scores. **Implication:** The study also shows that there is no difference in concept understanding between visual and verbal learners, indicating that both learning styles respond to understanding instruction relatively the same. Furthermore, there is an interaction between the flipped classroom model and learning styles on concept understanding, affirming that this model is effective for various learner characteristics. Overall, the implementation of the flipped classroom has been proven to enhance concept understanding for both visual and verbal learners. **Limitation:** This research has limitations in that the population is only drawn from one university. This means that the results cannot yet be generalized. It is very important to expand the population to ensure the effectiveness of the flipped classroom based on learning styles. This can be addressed by future researchers. **Future Research:** it is recommended that the flipped classroom learning model be applied to other courses, different study program, or combined with other independent variables relevant to the characteristics of technology-based learning. Further research could also explore the effectiveness of this model in the context of using specific e-learning applications, students' technological readiness, or psychological factors such as learning autonomy and self-confidence. Practically, several options can be implemented such as flipped classrooms as a standard online learning strategy for conceptual courses with the implementation of a structured learning video bank available in the LMS. The presence of reflection mechanisms and regular feedback features is important.

ACKNOWLEDGEMENT

The author expresses gratitude to Universitas Negeri Malang, its academic advisors, faculty members, and the Indonesia Endowment Fund for Education (LPDP) for their invaluable support and guidance throughout my doctoral journey.

REFERENCES

Agbokou, K. (2023). On the Nature of Elasticity Function: An Investigation and a Kernel Estimation. *Journal of Applied Mathematics*, *2023*. https://doi.org/10.1155/2023/1346602

Ajayi, I. H., Iahad, N. A., Ahmad, N., & Yusof, A. F. (2017). A conceptual model for flipped classroom: Influence on continuance use intention. *International Conference on Research and Innovation in Information Systems, ICRIIS*. https://doi.org/10.1109/ICRIIS.2017.8002523

Annajmi, A., & Dedi Kuswandi. (2024). Flipped Classroom; Inovasi Pengaturan Lingkungan Belajar dalam Pembelajaran Matematika . *DIAJAR: Jurnal Pendidikan Dan Pembelajaran*, *3*(1 SE-Articles), 116–124. https://doi.org/10.54259/diajar.v3i1.2227

Atikah, N., Akriani, W., & Isran, D. (2022). Pengaruh Metode Pembelajaran Flipped Classroom Terhadap Pemahaman Konsep Matematika Mahasiswa. *Jurnal Pendidikan Islam Al-Affan*, *3*, 12–18. https://doi.org/10.69775/jpia.v3i1.88

Atwa, Z., Sulayeh, Y., Abdelhadi, A., Jazar, H. A., & Eriqat, S. (2022). Flipped Classroom Effects on Grade 9 Students' Critical Thinking Skills, Psychological Stress, and Academic Achievement. *International Journal of Instruction*, *15*(2), 737–750. https://doi.org/10.29333/iji.2022.15240a

Aveiro-Róbalo, T. R. (2022). Distance learning and its relation to medical education in the present times. *Seminars in Medical Writing and Education*, *1*. https://doi.org/10.56294/mw202210

Awini, G., Mensah, K., Majeed, M., Mahmoud, M. A., & Braimah, S. M. (2024). The use of innovative pedagogies in attaining un sustainable development goal 4: Quality education for learning outcomes in emerging markets. In *Digital Analytics Applications for Sustainable Training and Education* (pp. 257–274). https://www.scopus.com/inward/record.uri?eid=2-s2.0-85200925364&partnerID=40&md5=064b6b6971f10d3183b8753a72c3cc13

Barber, W. (2015). Building community in flipped classrooms: A narrative exploration of digital moments in online learning. In W. C. (Ed.), *Proceedings of the International Conference on e-Learning, ICEL* (Vols. 2015-January, pp. 24–30). Academic Conferences Limited. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84940661894&partnerID=40&md5=4d6a0a7e1111b7fd0274d2295da0d389

Berti, A. E. (2016). Sketching a possible learning progression for the cognitive component of financial education in the broader context of economic education. In *International Handbook of Financial Literacy* (pp. 515–530). Springer Singapore. https://doi.org/10.1007/978-981-10-0360-8_33

Bhardwaj, V., Zhang, S., Tan, Y. Q., & Pandey, V. (2025). Redefining learning: student-centered strategies for academic and personal growth. *Frontiers in Education*, *10*. https://doi.org/10.3389/feduc.2025.1518602

Caser, A. L., Paleb, J. G. C., Briones, M. C. A., & Patacsil, F. F. (2025). Exploring Student Perspectives on Effective Visual Materials, Associated Challenges, and Coping Strategies Using Text Analytics. *International Journal of Pedagogy and Curriculum*, *32*(1), 237–255. https://doi.org/10.18848/2327-7963/CGP/v32i01/237-255

Chelnokova, E. A., Shobonova, L. Y., Kuznetsova, S. N., Kuznetsov, V. P., & Potashnik, Y. S. (2022). Paradigm of Formation of Economic Competence of a Teacher of Professional Training in the Economic Profile. In *Advances in Science, Technology and Innovation* (pp. 171–175). https://doi.org/10.1007/978-3-030-90324-4_28

Chen, X., & Wang, Y. (2021). The application of multimedia technology in english teaching in senior middle schools in the computer age. *ACM International Conference Proceeding Series*, 762–765. https://doi.org/10.1145/3482632.3483012

Dahlan, D., Budiwati, N., & Kurniawati, S. (2014). Pengembangan Model Kurikulum Pendidikan Ekonomi Untuk Menyiapkan Guru Profesional Di Sekolah Bertaraf Internasional. *PARAMETER: Jurnal Pendidikan Universitas Negeri Jakarta*, *25*, 56–61. https://doi.org/10.21009/parameter.252.01

Danim, S. (2024). *Teori Belajar dan Pembelajaran di Perguruan Tinggi*. Wawasan Ilmu.

Dennis, M., & Montagnino, C. (2025). Student-centric policies in higher education: TEAMS model and other solutions. In *Student-Centric Policies in Higher Education: TEAMS Model and Other Solutions*. IGI Global. https://doi.org/10.4018/979-8-3693-7635-5

Diningrat, S. W. M., Setyosari, P., Ulfa, S., & Widiati, U. (2023). The Effect of an Extended Flipped Classroom Model for Fully Online Learning and its interaction with Working Memory Capacity on Students' Reading Comprehension. *Journal of New Approaches in Educational Research*, *12*(1), 77–99. https://doi.org/10.7821/naer.2023.1.1073

Doshi, V. P., & Roy, B. (2016). Realizing Students' Understanding through Rule Based Reasoning. In R. M.S.V.S.B., R. S.V., G. D., & R. K.R.P. (Eds.), *Proceedings - 6th International Advanced Computing Conference, IACC 2016* (pp. 56–61). Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/IACC.2016.21

Drissi, S., & Amirat, A. (2016). An experimental study to evaluate learning style personalisation in web-based adaptive e-learning systems. *International Journal of Innovation and Learning*, *20*(1), 1–25. https://doi.org/10.1504/IJIL.2016.076669

Florence, E. A., & Kolski, T. (2021). Investigating the Flipped Classroom Model in a High School Writing Course: Action Research to Impact Student Writing Achievement and Engagement. *TechTrends*, *65*(6), 1042–1052. https://doi.org/10.1007/s11528-021-00662-0

Fuentes-Penna, A., Cárdenas, R. G., & Rascón, A. C. (2025). Quality education and inclusive education. In *Machine and Deep Learning Solutions for Achieving the Sustainable Development Goals* (pp. 63–78). IGI Global. https://doi.org/10.4018/979-8-3693-8161-8.ch004

Goh, K. S., & Tan, L. F. (2015). Comparing teachers' and students' perception of flipped classroom in Singapore. In L. Y-J., S. H.-Y., Y. C., O. H., C. W., J. M.-F., M. S., W. Y.-T., K. S.C., G. X., K. B., M. Y., S. N., W. Y., L. C.P., C. C.H.C., L. J., N. M., R. M.M.T., … Z. L. (Eds.), *Proceedings of the 23rd International Conference on Computers in Education, ICCE 2015* (pp. 172–177). Asia-Pacific Society for Computers in Education. https://www.scopus.com/inward/record.uri?eid=2-s2.0-

85039898354&partnerID=40&md5=31bf939e89fb6001584e28b14d5b7ebf

Greig, A., & Priddle, J. (2019). Mapping students' development in response to sustainability education: A conceptual model. *Sustainability (Switzerland)*, *11*(16). https://doi.org/10.3390/su11164324

Handayani, S., Hussin, M., & Norman, H. (2024). Evaluating teaching readiness using the TPACK model: factor, reliability and validity analyses for Indonesian economics teacher candidates. *Perspektivy Nauki i Obrazovania*, *68*(2), 679–698. https://doi.org/10.32744/pse.2024.2.41

Hanif, M., Mustaji, M., & Arianto, F. (2025). A Systematic Review of the Impact of Flipped Learning on the Emotional Attributes of College Students. *Journal of Learning for Development*, *12*(2), 386–402. https://doi.org/10.56059/jl4d.v12i2.1495

Hasanudin, C., & Fitrianingsih, A. (2019). Analisis Gaya Belajar Mahasiswa Pada Pembelajaran Flipped Classroom. *Jurnal Pendidikan Edutama*, *6*, 31. https://doi.org/10.30734/jpe.v6i1.364

Johnson, G. M. (2007). Learning style under two web-based study conditions. *Educational Psychology*, *27*(5), 617–634. https://doi.org/10.1080/01443410701309159

Juniantari, M., Pujawan, I. G. N., & Widhiasih, I. D. A. G. (2019). Pengaruh Pendekatan Flipped Classroom Terhadap Pemahaman Konsep Matematika Siswa Sma. *Journal of Education Technology*, *2*(4 SE-Articles), 197–204. https://doi.org/10.23887/jet.v2i4.17855

Kaviza, M. (2018). Kesan Penggunaan Teknik Peer Instruction dengan Pendekatan Kelas Flipped terhadap Pencapaian Pemahaman Konsep Sejarah. *Journal of ICT in Education*, *5 SE-Art*, 14–26. https://doi.org/10.37134/jictie.vol5.3.2018

Khamparia, A., & Pandey, B. (2017). Impact of interactive multimedia in E-learning technologies: Role of multimedia in E-learning. In *Enhancing Academic Research With Knowledge Management Principles* (pp. 199–227). https://doi.org/10.4018/978-1-5225-2489-2.ch007

Kinteki, R., Setyosari, P., & Ulfa, S. (2019). The effect of flipped classroom models and self efficacy on students concept understanding and application of the hydrology. *Ecology, Environment and Conservation*, *25*, S115–S121.

Kioupi, V., & Voulvoulis, N. (2019). Education for sustainable development: A systemic framework for connecting the SDGs to educational outcomes. *Sustainability (Switzerland)*, *11*(21). https://doi.org/10.3390/su11216104

Kurniawati, I. L., Setyosari, P., Dasna, I. W., & Praherdhiono, H. (2022). *Problem-Based Flipped Classroom Dalam Pembelajaran Sains*. Deepublish. https://books.google.co.id/books?id=F7NNEQAAQBAJ

Kwon, O. Y. (2021). Flipped learning: an alternative pedagogical approach in the untact age. *Journal of Exercise Rehabilitation*, *17*(4), 22–225. https://doi.org/10.12965/jer.2142296.148

Liu, T. (2021). Convolutional Neural Network-Assisted Strategies for Improving Teaching Quality of College English Flipped Class. *Wireless Communications and Mobile Computing*, *2021*. https://doi.org/10.1155/2021/1929077

Long, T., Cummins, J., & Waugh, M. (2017). Use of the flipped classroom instructional model in higher education: instructors' perspectives. *Journal of Computing in Higher Education*, *29*(2), 179–200. https://doi.org/10.1007/s12528-016-9119-8

Milaszewicz, D., & Zakrzewska, M. (2017). Nature of case study as the accelerator for

transmission of economic knowledge and entrepreneurship. *Balkan Region Conference on Engineering and Business Education*, *3*(1), 115–120. https://doi.org/10.1515/cplbu-2017-0016

Moos van Wyk, M. (2015). Teaching Economics. In *International Encyclopedia of the Social & Behavioral Sciences: Second Edition* (pp. 83–88). https://doi.org/10.1016/B978-0-08-097086-8.92072-5

Moreno, M. S., & Martínez, A. M. (2022). Analysis of the Flipped Classroom Model as a Proposal for Teaching Innovation. *Journal of Higher Education Theory and Practice*, *22*(10), 30–37. https://doi.org/10.33423/jhetp.v22i10.5385

Mukhametzyanov, I. (2022). Distance Learning during the Pandemic. Organizational and Managerial Problems. *Proceedings - 2022 2nd International Conference on Technology Enhanced Learning in Higher Education, TELE 2022*, 245–247. https://doi.org/10.1109/TELE55498.2022.9801008

Naldi, F., & Susanti, A. (2018). Pengaruh Model Pembelajaran Co-op Co-op terhadap Pemahaman Konsep Ditinjau dari Gaya Belajar Visual, Audio, Kinestetik Siswa Kelas VIII SMPN 43 Merangin. *Edumatica : Jurnal Pendidikan Matematika*, *8*(1 SE-Articles), 23–35. https://doi.org/10.22437/edumatica.v8i01.4115

Newman, P. (2018). Elasticity. In *The New Palgrave Dictionary of Economics, Third Edition* (pp. 3573–3576). https://doi.org/10.1057/978-1-349-95189-5_144

Nurlia, S., Nurrahmah, A., & Rosa, N. M. (2021). Peran Gaya Belajar Terhadap Kemampuan Pemahaman Konsep Matematika Siswa Kelas XI SMK Al-Khairiyah 2. *Prosiding Diskusi Panel Nasional Pendidikan Matematika*. https://proceeding.unindra.ac.id/index.php/DPNPMunindra/article/view/5541

Pirzado, A., Sahito, Z., & Abbasi, M. K. (2024). Teaching-learning through the distance education system an exploration of what, why, and how possibilities in the era of industry 4.0. In *Innovative Pedagogical Practices for Higher Education 4.0: Solutions and Demands of the Modern Classroom* (pp. 193–209). https://doi.org/10.1201/9781003400691-12

Prakoso, A. F., Fitrayati, D., Pamungkas, H. P., Dewi, R. M., Ginanjar, A. E., & Irawan, N. (2025). The Bumpy Road In Improving Students' Learning Performance During Blended Learning. *Journal of Educators Online*, *22*(4). https://doi.org/10.9743/JEO.2025.22.4.13

Prakoso, A. F., Subroto, W. T., Andriansyah, E. H., Sari, V. B. M., Ginanjar, A. E., & Srisuk, P. (2025). How do anxiety and self-efficacy affect the problem-solving skills of undergraduate economics students as prospective teachers in Indonesia? The role of metacognition as a mediating variable. *Cogent Education*, *12*(1). https://doi.org/10.1080/2331186X.2025.2521160

Prasetya, J. D., Purnamasari, D. I., Dwinagara, B., Cahyadi, T. A., & Ardian, A. (2025). The Regulation of the Minister of Higher Education, Science, and Technology No. 39/2025: Harmonization of the Internal Quality Assurance System Instruments at UPN "Veteran" Yogyakarta. In *RSF Conference Series : Business, Management and Social Sciences* (Vol. 5, Issue 2, pp. 347–355). Research Synergy Foundation PP - Bandung. https://doi.org/https://doi.org/10.31098/bmss.v5i2.986

Pratama, W., Putra, A. E., Sanjaya, J. L. V., Kartolo, J. R., Dean, T. A., & Ningsih, R. Y. (2024). Pengaruh Gaya Belajar terhadap Pemahaman Mata Kuliah Algorithm And

Programming pada Mahasiswa . *Jurnal Basicedu*, *8*(6 SE-Articles), 4786–4796. https://doi.org/10.31004/basicedu.v8i6.9053

Pujianto, A. A., Degeng, I. N. S., & Sugito, S. (2020). Pengaruh penggunaan aplikasi Plantnet dan gaya belajar terhadap hasil belajar. *Jurnal Inovasi Teknologi Pendidikan*, *7*(1 SE-Articles), 12–22. https://doi.org/10.21831/jitp.v7i1.31365

Rahayu, S., Setyosari, P., Hidayat, A., & Kuswandi, D. (2022). The Effectiveness of Creative Problem Solving-Flipped Classroom for Enhancing Students' Creative Thinking Skills of Online Physics Educational Learning. *Jurnal Pendidikan IPA Indonesia*, *11*(4), 649–656. https://doi.org/10.15294/jpii.v11i4.39709

Reinoso, R., Delgado-Iglesias, J., & Fernández, I. (2021). Effect of flipped teaching on the performance and perceptions of pre-service teachers on a biology course. *Information and Learning Science*, *122*(1–2), 82–102. https://doi.org/10.1108/ILS-07-2020-0173

Rosalina Eka Permatasari, Utiya Azizah, Mitarlis, & Findiyani Ernawati Asih. (2025). Improving Student Understanding and Edupreneurship Based on Analytical Chemistry Student Activity Sheets (SAS) Closed Case Study. *Proceeding of International Joint Conference on UNESA*, *3*(1 SE-Articles). https://proceeding.unesa.ac.id/index.php/pijcu/article/view/7127

Ruspayandi, T., Bantacut, T., Arifin, B., & Fahmi, I. (2022). Market-Approach-Based Policy to Achieve Rice Price Stability in Indonesia—Can It Be a Complement? *Economies*, *10*(12). https://doi.org/10.3390/economies10120296

Santoso, W. I., Zuhri, N. M., Khamdi, A., Puspita, N., Ayomi, N. M. S., & Kusuma, M. I. (2025). Price transmission analysis of premium rice in indonesia after the Covid-19 pandemic. *IOP Conference Series: Earth and Environmental Science*, *1471*(1). https://doi.org/10.1088/1755-1315/1471/1/012042

Scott, B., & Fox, M. E. (2023). Cases on economics education and tools for educators. In *Cases on Economics Education and Tools for Educators*. IGI Global. https://doi.org/10.4018/978-1-6684-7583-6

Selvakumar, P., Babitha, B. S., Varalakshmi, S., Mishra, B. R., Bhaskar, P., & Manjunath, T. C. (2025). Learning methods: Techniques for disadvantaged learners. In *Mitigating Learner Disadvantages in Teaching and Learning* (pp. 207–230). IGI Global. https://doi.org/10.4018/979-8-3693-8623-1.ch008

Shaffitri, L. R., Suryana, E. A., & Sinuraya, J. F. (2024). Market integration and rice price transmission in Indonesia. *BIO Web of Conferences*, *119*. https://doi.org/10.1051/bioconf/202411902007

Sirait, E. (2018). Pengaruh Gaya dan Kesiapan Belajar terhadap Pemahaman Konsep Matematika Siswa. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *7*. https://doi.org/10.30998/formatif.v7i3.2231

Siregar, T. M., Panjaitan, A. M., Mawarni, D., Pratisia, G., & Siregar, S. S. D. (2023). Analisis Pemahaman Persoalan Matematika Ekonomi Mengenai Elastisitas Permintaan Mahasiswa-Mahasiswi Unand International Accounting Class 2022. *Innovative: Journal Of Social Science Research*, *3*(2 SE-Articles), 6060–6067. https://j-innovative.org/index.php/Innovative/article/view/1064

Sivakami, N., & Gunasekaran, S. (2025). Innovative Instructional Strategies for The Digital Age: A Study on Multimedia-Enhanced Writing Pedagogy In English Language Classrooms. *International Journal of Basic and Applied Sciences*, *14*(2), 721–

728. https://doi.org/10.14419/m63na081

Solomon, B., & Felder, R. (1999). *Index of Learning Styles*.

Strelan, P., Osborn, A., & Palmer, E. (2020). Student satisfaction with courses and instructors in a flipped classroom: A meta-analysis. *Journal of Computer Assisted Learning*, *36*(3), 295–314. https://doi.org/10.1111/jcal.12421

Surjono, H. D., & Mahmudi, A. (2023). The Effect of Flipped Classroom Learning Model on Students' Understanding of Mathematical Concepts and Higher-Order Thinking Skills. *International Journal of Information and Education Technology*, *13*(12), 2014–2022. https://doi.org/10.18178/ijiet.2023.13.12.2016

Talbert, R., & Bergmann, J. (2023). FLIPPED LEARNING: A Guide for Higher Education Faculty. In *Flipped Learning: a Guide for Higher Education Faculty*. https://doi.org/10.4324/9781003444848

Torriti, J. (2019). Elasticity. In *Energy Fables: Challenging Ideas in the Energy Sector* (pp. 48–56). Taylor and Francis. https://doi.org/10.4324/9780429397813-6

Umezawa, K., Ishida, T., Aramoto, M., Kobayashi, M., Nakazawa, M., & Hirasawa, S. (2016). A method based on self-study log information for improving effectiveness of classroom component in flipped classroom approach. In *Blended Learning: Concepts, Methodologies, Tools, and Applications* (Vol. 4, pp. 1818–1834). IGI Global. https://doi.org/10.4018/978-1-5225-0783-3.ch086

Wang, R., & Liu, C. (2019). The relation of dental students' learning styles to their satisfaction with traditional and inverted classroom models. *BMC Medical Education*, *19*(1). https://doi.org/10.1186/s12909-019-1749-x

Wong, K., & Chu, D. W. K. (2014). Is the flipped classroom model effective in the perspectives of students' perceptions and benefits? *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *8595 LNCS*, 93–104. https://doi.org/10.1007/978-3-319-08961-4_10

Yonata, B., & Azizah, U. (2024). Shifting students' conceptions of the catalyst concept by carrying out discussion activities as reinforcement of STEM learning. *AIP Conference Proceedings*, *3116*(1). https://doi.org/10.1063/5.0210435

*__Henky Muktiadji (Corresponding Author)__
Doctoral of Learning Technology, Faculty of Education,
Universitas Negeri Malang,
Address: Jl. Cakrawala No.5, Malang, Indonesia
Email: henky.madji.1601219@students.um.ac.id

I Nyoman Sudana Degeng
Doctoral of Learning Technology of Learning Technology Faculty of Education,
Universitas Negeri Malang,
Address: Jl. Cakrawala No.5, Malang, Indonesia
Email: nyoman.sudana.d.fip@um.ac.id

Punaji Setyosari
Doctoral of Learning Technology of Learning Technology Faculty of Education, Universitas Negeri Malang,
Address: Jl. Cakrawala No.5, Malang, Indonesia
Email: punaji.setyosari.fip@um.ac.id

Dedi Kuswandi
Doctoral of Learning Technology of Learning Technology Faculty of Education, Universitas Negeri Malang,
Address: Jl. Cakrawala No.5, Malang, Indonesia
Email: dedi.kuswandi.fip@um.ac.id

Arina Salsabilla Haq
Louis-Leitz-Schule
Address: Weiner Str. 51, 700469, Stuttgart, Deutschland Germany
Email: arina.haq@gmx.de