Optimising Macroeconomic Learning through Integration of Contextual Case Studies and Mathematical Modelling

Dede Ruslan¹, Kiki Hardiansyah Siregar²

¹ Universitas Negeri Medan, ² Universitas Pembangunan Pancabudi Medan *Corresponding author E-mail: dederuslan0407@gmail.com*

Article History:

Received: May, 2025 Revised: May, 2025 Accepted: May, 2025

Abstract: Macroeconomics learning often faces challenges in conveying complex abstract concepts to students. This paper aims to optimise macroeconomic learning by integrating contextual case study approach and simple mathematical modelling. This educational service method involves training and mentoring students in analysing real cases of economic policy using mathematical models to improve their understanding and literacy of economic policy. The evaluation results showed a significant improvement in analytical skills and understanding of macroeconomic concepts, especially related to the impact of endid and monetary policies. This approach is recommended as an innovative learning model to improve the quality of macroeconomic education.

Keywords:

Macroeconomic Learning, Case Study, Mathematical Modelling, Policy Literacy, Economic Education

Introduction

Macroeconomic learning is an essential component of economic education that addresses major phenomena such as economic growth, inflation, unemployment, and fiscal and monetary policy. This material is important because it provides an understanding of how a country's economy functions as a whole and how government policies can affect macroeconomic conditions. However, students often face difficulties in understanding these abstract and complex concepts, especially if learning is only delivered theoretically and lacks context (Ruslan, 2015)

This difficulty arises because macroeconomics involves various interrelated and dynamic variables, and requires an understanding of policy interactions and their impact on the economy at large. Therefore, a more applicable and contextualised learning approach is needed to help students relate theory to real situations. Approaches such as case studies have proven to be effective in linking theoretical concepts with real practices, so that students can understand how macroeconomic theory is applied in various actual economic situations, such as financial crises, inflation fluctuations, or economic stimulus policies. (Erekson et.al, 1996), (Xu and Liu, 2023)

Moreover, the integration of mathematical modelling in macroeconomic learning provides additional benefits by visualising and simulating the impact of economic policies quantitatively. Mathematical modelling helps students understand the relationship between economic variables and see how changes in one variable caffect other variables systemically. Thus, students not only understand the theory conceptually, but are also able to perform more in-depth quantitative analyses and predictions. (Brazhnikov et.al, 2018), (Ravshanova, 2023)

Research and learning practices show that combining contextual case studies with mathematical modelling can improve the effectiveness of macroeconomic learning. For example, the use of a case study related to Bank Indonesia's monetary policy in controlling post-pandemic inflation, which is then analysed through a simple mathematical model, helps students understand the implications of the policy in a real and measurable way. This approach also encourages students to be more active and critical in learning, improving analytical skills, and strengthening economic policy literacy, which is very important for future economists and policymakers. Rian et.al, 2025), (Becker, 2000).

Overall, optimising macroeconomic learning through the integration of case studies and mathematical modelling is an innovative learning strategy that can overcome the limitations of traditional learning. This approach not only enriches students' learning experience, but also prepares them to face real challenges in a complex and dynamic economic world.

Literature Review

A. Macroeconomic Learning

Macroeconomic learning is a fundamental part of economic education that focuses on analysing aggregate economic phenomena and government policies in regulating the national economy. Macroeconomic studies include important variables such as economic growth, inflation, unemployment, balance of payments, and fiscal and monetary policies that play a role in maintaining economic stability and growth (Rahardja, Prathama & Manurung, 2018). Through this course, students are expected to understand how various macro factors interact with each other and how government policies can affect broad economic conditions. Literature shows that interactive and applied macroeconomic learning can significantly improve students' understanding. Traditional approaches that only rely on theoretical lectures are often ineffective in explaining abstract and dynamic concepts in macroeconomics, making it difficult for students to connect theory with real practice (Mankiw, 2019). Therefore, learning methods that involve interactive discussions, case studies, and simulations are crucial to bring the material to life and provide relevant context (Hasan et.al,2018)

Case studies, as one of the applied learning methods, allow students to analyse real economic situations such as financial crises, inflation fluctuations, or the impact of fiscal and monetary policies, so that theory can be understood in a concrete and actual context (Yin, 2014). In addition, mathematical modelling in macroeconomics learning helps students visualise the relationships between economic variables and simulate the impact of policies quantitatively, thereby strengthening data-driven analysis and decision-making skills (Blanchard, 2017).

The combination of these two approaches - contextual case studies and mathematical modelling - has begun to be implemented in various economics curricula in an effort to optimise macroeconomic learning. This approach not only enhances students' conceptual understanding, but also equips them with the analytical skills and critical abilities needed to face real economic challenges in the future. Thus, interactive and applicable macroeconomic learning is key in shaping strong and relevant economic policy literacy for students as future economic actors and policy makers.

B. Case Studies in Economic Education

Case study is a learning method that allows students to analyse real situations in depth, develop critical thinking skills, and connect theory with practice effectively (Yin, 2014). In the context of macroeconomic learning, the use of case studies such as the global financial crisis, inflation fluctuations, or fiscal and monetary policies implemented by the government provides a concrete picture of complex and interrelated economic dynamics. This approach helps students understand how macroeconomic variables interact in real conditions and how government policies can affect the economy at large.

In addition, case studies encourage students to be active in the learning process by analysing real data, identifying problems, and finding relevant solutions based on the current economic context. This is in line with the benefits of economics that allow one to analyse economic phenomena that occur around them, such as price changes, inflation, and unemployment, so as to form a rational mindset and make wiser decisions. Thus, case studies not only enrich students' conceptual understanding, but also improve critical and applicative analysis skills that are needed in the world of economics and business.

The development of case-based teaching materials in macroeconomic learning has also been proven valid and effective in improving students' macroeconomic literacy, as shown in research on the development of case-based teaching materials in macroeconomic studies courses at Universitas Nusantara PGRI Kediri. This teaching material allows students to collaborate, identify, and analyse economic problems according to the current situation, so that learning becomes more relevant and meaningful (Anas,2021).

Thus, the integration of case studies in macroeconomic learning is an important strategy to optimise students' understanding of macroeconomic phenomena in a real and applicable manner, while equipping them with the critical and analytical thinking skills needed to face economic challenges in the real world.

C. Mathematical Modelling in Macroeconomics

Mathematical modelling in macroeconomics, such as the Phillips Curve model and the Solow growth model, provides a very useful quantitative tool to analyse the relationship between economic variables and simulate the impact of policies systematically (Blanchard, 2017). The Solow model, for example, explains how capital accumulation, population growth and technological progress affect a country's longterm economic growth, helping to understand the factors that determine prosperity and living standards, (Kusuma, 2018). Meanwhile, the Phillips Curve model describes the trade-off between inflation and unemployment, which is crucial in formulating monetary and fiscal policies.

This mathematical approach allows policy makers and students to visualise and test various economic scenarios using mathematical equations, such as differential equations and systems of simultaneous equations, which represent the interaction of key economic variables such as consumption, investment, inflation, and unemployment Kusuma, 2018). Thus, mathematical modelling not only clarifies complex relationships in macroeconomics, but also strengthens the understanding of abstract concepts through concrete and measurable simulations.

The integration of mathematical modelling in macroeconomic learning provides significant added value. Students can more easily understand economic dynamics and policy impacts through model visualisation and simulation experiments, thus improving their analytical skills and data-driven decision-making. In addition, mathematical modelling also helps develop more systematic and structured arguments in understanding economic phenomena, as well as projecting various possible policy outcomes quantitatively.

Overall, mathematical modelling is an important tool in macroeconomic education that supports interactive and applicable learning, while strengthening students' economic literacy in analysing and formulating effective and efficient economic policies.

Methods

A. Service Design

This community service was conducted in a university environment targeting students majoring in economics. The method used is interactive training that combines contextual case studies and simple mathematical modelling.

B. Implementation

- 1. Stage 1: Brief presentation of macroeconomic theory.
- 2. Stage 2: Presentation of actual case studies, such as the analysis of Bank Indonesia's policy in controlling inflation after the COVID-19 pandemic.
- 3. Stage 3: Assistance to students in building simple mathematical models using Excel to simulate the impact of fiscal and monetary policies.
- 4. Stage 4: Discussion and reflection on simulation results and policy implications.

C. Evaluation

Evaluation of the effectiveness of learning is carried out using the pre-test and post-test method which aims to measure the increase in understanding of macroeconomic concepts and economic policy literacy of participants before and after attending the training. The pre-test was given at the beginning of the session to determine the students' initial level of understanding of the material to be learned, while the post-test was given after the training was completed to measure the extent of the increase in their knowledge and analytical skills on macroeconomic concepts and related policies.

In addition to testing through written tests, evaluation was also conducted through participatory observation during the training process. These observations involved direct observation of participants' activities and interactions, such as the level of engagement in case study discussions, ability to build and use mathematical models, and responses to economic policy simulations. The participatory observation approach allows facilitators to identify learning barriers, participant motivation, and the effectiveness of teaching methods in real-time.

The combination of pre-test/post-test and participatory observation provides a comprehensive picture of the success of learning, both in terms of increasing conceptual knowledge and applicative skills of participants. The results of this evaluation become the basis for improving and developing more optimal macroeconomic learning methods in the future.

Results

A. Improvement of Concept Understanding

The results of the initial evaluation through the pre-test showed that the average score of students in understanding macroeconomic concepts was at 55%. This figure indicates that most students have a limited understanding of macroeconomic material before attending the training. However, after attending the training that integrated the contextual case study approach and mathematical modelling, there was a significant increase in the post-test score, which reached an average of 78%.

This increase of 23 percentage points indicates the effectiveness of the learning method used in helping students understand macroeconomic concepts in a more indepth and applicable manner. With a more interactive and contextual approach, students are not only able to master the theory conceptually, but also able to link the theory with real economic phenomena and perform quantitative analysis through mathematical modelling. These results strengthen the evidence that the integration of case studies and mathematical modelling can significantly improve the understanding of macroeconomic concepts and economic policy literacy among students.

B. Effectiveness of Case Studies

The case study-based learning approach proved to be effective in helping students link macroeconomic theory with real conditions that occur in the field. Through case study analysis, students can concretely understand how economic policies, such as changes in interest rates, have a direct impact on macroeconomic variables such as inflation and unemployment rates. For example, they can see how monetary policy that tightens interest rates can suppress inflation, but at the same time potentially increase the unemployment rate in the short term.



Picture 1. Brief presentation of macroeconomic theory with case method

Picture 2. Group Discussion Case Method



Picture 3. Assistance to students in building simple mathematical models



Picture 4. Discussion and reflection on simulation results and policy implications

Case studies provide a rich and relevant context, making previously abstract material easier for students to understand and internalise. By studying real cases, students not only gain theoretical knowledge, but also develop critical analysis and problem-solving skills that are essential in understanding macroeconomic dynamics. This approach also encourages students' active involvement in discussion and reflection, which ultimately strengthens their understanding of macroeconomic concepts and their application in economic policy.

C. The Role of Mathematical Modelling

Mathematical modelling plays an important role in learning macroeconomics by providing a concrete tool to visualise the complex relationships between economic variables. Through this modelling, students can see how changes in one variable, such as interest rates or government spending, can systematically affect other variables such as inflation, unemployment and economic growth.

In addition, mathematical modelling allows students to simulate various

economic policy scenarios, allowing them to observe and analyse the potential impact of such policies before they are actually implemented. This simulation process not only deepens conceptual understanding, but also hones students' quantitative analysis and critical thinking skills in assessing the effectiveness and consequences of economic policies.

Thus, the integration of mathematical modelling in macroeconomic learning not only helps simplify abstract concepts, but also equips students with analytical skills that are essential for understanding and formulating appropriate and effective economic policies.

D. Learning Implications

The integration of case studies and mathematical modelling in macroeconomic learning offers a highly effective strategy to improve the quality of students' understanding of complex macroeconomic concepts. This approach not only helps students understand the theory in depth, but also relates the theory to real situations and practical applications in the economic world.

One of the important implications of this learning method is the improvement of economic policy literacy among students. Strong policy literacy is crucial for aspiring economists and policymakers, as it enables them to analyse, evaluate and formulate appropriate policies based on a comprehensive understanding of macroeconomic dynamics. With this ability, they can contribute more effectively to decision-making that impacts the stability and growth of the national economy.

In addition, this approach also encourages the development of critical thinking skills, quantitative analysis, and applicable problem solving, so that students are better prepared to face real challenges in the world of work and government.

Therefore, the integration of case studies and mathematical modelling should be made an integral part of the macroeconomic learning curriculum to form competent and insightful human resources in the field of economics and public policy.

Conclusion

A learning approach that integrates contextual case studies and mathematical modelling has proven effective in improving the understanding of macroeconomic concepts as well as economic policy literacy among students. This method not only enriches the learning experience by connecting theory and real practice, but also develops quantitative analysis and critical thinking skills that are needed in understanding macroeconomic dynamics and government policies.

Based on the evaluation results that show significant improvement in students' understanding and analytical skills, it is recommended that this learning method be widely adopted in the economics education curriculum. The implementation of this approach will help produce graduates who are more competent, critical, and ready to face the challenges and complexities of real economic policies in the future. In addition, the development of teaching materials and training for lecturers in applying this method also needs to be strengthened so that the quality of macroeconomic learning is more optimal and relevant to the needs of the world of work and public policy.

Acknowledgements

On this occasion we would like to thank all parties who have been involved both directly and indirectly for the smooth running of this community service. Thank you to:

- 1. The Dean of the Faculty of Economics and the Head of the Accounting Education Study Program at FE Unimed who have supported the continuity in service related to the learning process that uses case studies in the Introduction to Macroeconomics course.
- 2. Students of Accounting Education Study Programme who have been directly involved in the learning process of Introduction to Macroeconomics.
- 3. All parties who have contributed starting from preparation until this service activity ends.

With the hope that this community service activity can provide benefits, especially in improving the learning process with a case study approach and mathematical models.

References

- Anas, M. (2021). Pengembangan Bahan Ajar Berbasis Kasus: Menuju Inovasi Pembelajaran Mata Kuliah Kajian Makro Ekonomi; P 113-124, Mei Vo; 10 No 1. <u>http://ejournal.unibabwi.ac.id/index.php/sosioedukasi/ondex</u>
- Becker, W. E., 2000. Teaching economics in the 21st century. *Journal of Economic Perspectives*, 14(1), pp. 109-119. <u>https://doi.org/10.1257/jep.14.1.109</u>

- Blanchard, O. (2017). Macroeconomics (Seventh Edition) (7th Edition). New York: Pearson.
- Brazhnikov M.A., Khorina I.V., Brazhnikova A.M., Brazhnikov A.M. (2018) Economic and Mathematical Modeling As a Tool of Development of Creative Abalities In The Analysis of Manahement Decision // Vestnik of Samara University. Economics and Management. - 2018. - Vol. 9. - N.3. <u>https://doi.org/10.18287/2542-0461-2018-9-3-%p</u>
- Daniela, Popescu (2014). "Teaching Economics The Case Method," Annals -Economy Series, Constantin Brancusi University, Faculty of Economics, vol. 6, pages 274-277, December.
- Dewi Kusuma Wardani, Trisno Martono, Duta Sabiila Rusydi, Laurensia Claudia Pratomo, Dwi Hendra Kusuma (2022), Improving Macroeconomics Problem-Solving Skill through Economics Learning Information System Media Al-Ishlah: Jurnal Pendidikan Vol.14, 4 (December, 2022), pp. 4899-4906ISSN: 2087-9490 EISSN: 2597-940X, <u>http://Doi.org/10.35445/alishlah.v 14i4.168</u>
- Erekson, O. H., Raynold, P., & Salemi, M. K. (1996). Pedagogical Issues in Teaching Macroeconomics. *The Journal of Economic Education*, 27(2), 100–107. <u>https://doi.org/10.2307/1183017</u>
- Hasan, S., Ikram, A., & Ullah, H. (2018). Impact of team-based learning on communication skills and teamwork among business management students in Pakistan. Cogent Education, 5(1), 144-163
- Kusuma, J. (2018). Pendekatan Matematika Model Ekonomi Makro. *Jurnal Matematika, Statistika Dan Komputasi*, 2(1), 1–7. https://doi.org/10.20956/jmsk.v2i1.3280
- Mankiw, N.G. (2019). Macroeconomics, 10th. New York: Worth Publishers
- Prathama Rahardja &Mandala Manurung, (2018) Teori Ekonomi Makro: Suatu Pengantar. Edisi Keempat Jakarta: Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia.
- Ravshanova Muhayyo Maxmanazarovna. (2023). The Value of Mathematical Modeling in Teaching Econometrics to Students of Higher Educational Institutions. *Eurasian Research Bulletin*, 19, 176–178. Retrieved from https://geniusjournals.org/index.php/erb/article/view/3950
- Riyan Hidayat, Ahmad Fauzi Mohd Ayub, Mohd Afifi bin Bahurudin Setambah, Nurul Hijja Mazlan. A meta-analysis of the effect of modelling activities on learning outcomes in mathematics[J]. STEM Education, 2025, 5(3): 401-424. htpps://doi.org/10.3934/steme.2025020

- Ruslan, Dede (2015) *Pengantar Ekonomi Makro*. UNIMED PRESS, Medan. ISBN ISBN : 978-(302-0888-7 4-1)
- Robert K. Yin. (2014). Case Study Research Design and Methods (5th ed.). Thousand Oaks, CA: Sage Publications. 282 pages.
- Xu, Y. L., Mao, B. X., & Liu, D. (2023). Research on the Teaching Reform of Macroeconomics Based on the OBE Concept. Creative Education, 14, 1230-1238. <u>https://doi.org/10.4236/ce.2023.146078</u>
- Yin, R. K. (2014). Case Study Research: Design and Methods. Sage Publications