

## Utilizing NotebookLM as an AI Tool to Increase the Productivity of Lecturers Teaching Introductory Economics Courses

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### Abstract

Introduction to Economics (IE) courses are often challenging for lecturers due to their dense material and limited credit allocation, covering both micro and macroeconomic aspects. This study aims to explore the effectiveness of NotebookLM, a Large Language Model (LLM)-based tool, in improving lecturer productivity in preparing IEE course materials. Using a descriptive case study approach, the tool was applied to the Introduction Chapter of the IEE module. The results show that NotebookLM significantly reduced material preparation time by providing quick summaries, identifying references, and extracting key points, allowing lecturers to control the flow of the material more efficiently. Furthermore, the tool proved effective in generating trigger questions that increased student engagement in the module and accelerated their understanding of graphical illustrations. This use of AI technology demonstrates lecturers' ability to adapt to digital innovation, which has become increasingly crucial post-COVID-19 pandemic. The results of this study indicate that exploring dense, quantitative material can be facilitated with AI tools, potentially creating a more focused and enjoyable learning experience for students.

Keywords: NotebookLM; Lecturer\_productivity; Economics\_ Introduction; AI

### 1. Introduction

Introduction to Economics (IE) is a fundamental course required for all students in the Faculty of Economics (FE) at various universities in Indonesia. Historically, this course has served as an important foundation for understanding macroeconomic and microeconomic concepts, which are crucial for various study programs such as Accounting, Management, and Development Economics. The integrated teaching of IEE (Micro and Macro) in its early development, as implemented at the Faculty of Economics, Airlangga University, in 1984, often faced significant challenges. The high course load (6 credits) per semester, combined with dense and complex material, resulted in high student failure rates [1].

Recognizing these challenges, two years later, the Faculty of Economics, Airlangga University, implemented a new curriculum policy, separating IEE into Micro and Macro, each worth 3 credits and taught in the same semester. This policy proved successful in improving student understanding, which in turn positively impacted graduation rates. The effectiveness of this approach is also supported by the increasing availability of Indonesian-language textbooks, both by local and international authors, which encourages a reading culture among students. This practice of separating courses was later widely adopted by various public and private universities in Indonesia, resulting in increasingly diverse collections of Micro and Macro Economics books in libraries.

A similar experience, particularly in the teaching of Micro Economics and Macro Economics, occurred at the Faculty of Economics and Business (FEB) at the University of Muhammadiyah Bandung (UM Bandung). In 2020, during the Covid-19 pandemic, separate teaching of Micro Economics and Macro Economics was successful. The lecturer even innovated by creating learning videos, allowing students to review the material, especially for economic concepts that rely heavily on graphs and mathematical approaches. This approach proved to facilitate understanding of the material, even for complex topics such as the balance of a four-sector economy.

However, satisfaction with this effective teaching method ended with changes to the curriculum in the Accounting Study Program at the Faculty of Economics and Business at UM Bandung. The latest curriculum, effective from the 2022/2023 academic year, once again combines the two courses into one, PIE, with a very limited weighting of only 2 credits. As a result, the vast and dense material of Microeconomics and Macroeconomics can only be taught partially, far from the ideal coverage required. Ironically, Accounting students are required to have a deep understanding of PIE as a crucial foundation for economic analysis and the ability to predict future economic trends, essential competencies for professional accountants.

Field research shows that this shallow understanding negatively impacts student quality. During thesis guidance, many students demonstrate significant weaknesses in linking theory to practice [2]. They struggle to understand the cause-and-effect relationships between variables and are unable to apply economic concepts to analyze real-world phenomena [3]. These difficulties pose significant challenges for lecturers, particularly in producing competent graduates in the fast-paced millennial era. Time constraints, material density, and high difficulty levels result in a superficial understanding of Introductory Economics (IE), thus failing to significantly contribute to graduate competency.

Based on this phenomenon, this study aims to address the crucial challenges of IEE teaching. We will explore the role of NotebookLM as an innovative tool to improve the productivity of IEE lecturers. By optimizing the teaching process, it is hoped that superior human resources (HR) with a strong and relevant understanding of economics will be created for national progress [4].

#### Problem Formulation

How can NotebookLM improve lecturer productivity in preparing and presenting Introductory Economics (IE), particularly within the context of a dense curriculum (2 credits), in the Accounting Study Program, FEB UM Bandung?

#### Research Objective:

To analyze the role of NotebookLM as a tool for lecturers in improving the productivity of preparing and presenting Introductory Economics (IE) materials within the 2-credit curriculum in the Accounting Study Program, FEB UM Bandung.

## 2. Methodology

This research uses a qualitative approach with a case study design [5] to explore and analyze in-depth the implementation of NotebookLM by lecturers teaching the Introduction to Economics (PIE) course. This design was chosen because it allows researchers to

comprehensively understand how an innovative tool is applied in a specific teaching context, namely the Faculty of Economics and Business (FEB) at the University of Muhammadiyah Bandung (UM Bandung).

### **2.1. Research Subjects and Focus**

The subjects of this research are lecturers teaching the PIE course in the Accounting Study Program, FEB, UM Bandung. The research focus is limited to two key aspects: PIE teaching preparation and material creation. This limitation was established because mastery of module structure and a deep understanding of the basic concepts of PIE are key prerequisites for lecturers to develop effective Semester Lesson Plans (RPS).

The context of curriculum changes in the 2025/2026 academic year, which requires students to take General Basic Courses (MKDU) in the odd semester, makes this research highly relevant. The limited time available for PIE materials demands innovation in teaching preparation methods. Therefore, this study aims to examine the role of NotebookLM as a solution to increase lecturers' productivity in preparing teaching materials.

### **2.2. NotebookLM Usage Procedure**

The NotebookLM operationalization process in this study is divided into three main phases:

1. **Preparation Phase:** Lecturers begin by accessing the NotebookLM platform and creating a new notebook [6]. Next, lecturers upload the primary teaching resource, the PIE module, to the platform.
2. **Content Analysis and Development Phase:** After the module is uploaded, lecturers review the summary automatically generated by NotebookLM. Lecturers can then convert notes into a question-and-answer format (ranging from simple questions to critical ones), create mind maps of relevant material, and explore relationships between topics using the chat feature. During this phase, lecturers also verify the accuracy of data and citations to ensure the accuracy of the produced material [7].
3. **Production and Collaboration Phase:** Based on the analysis, lecturers generate critical arguments and counterarguments (eg, the pros and cons of expansionary fiscal policy) [8] draft syllabi or course materials, and even create varied audio materials. NotebookLM is also used to collaborate with the PIE teaching team to refine the materials.

Through this systematic approach and procedure, this study is expected to provide a clear picture of NotebookLM's effectiveness as an innovative tool for lecturers in addressing the challenges of a dense curriculum.

## **3. Result and Discussion**

### **3.1. Result**

1. **The use of notebooklm can help lecturers develop provocative questions that encourage students to read the module and think critically. The questions in Chapter 1: Overview of Micro and Macroeconomics, resulting from notebooklm, are as follows:**

#### **Critical Questions Regarding Basic Concepts of Economics**

- a. According to Paul P.A. Samuelson, economics is the study of how individuals and societies make choices [9]. Given that resources are limited, why does this definition emphasize the importance of being efficient in every choice made?
- b. Economics is known as the "Oldest Art and the Youngest Science." Explain the meaning of the title "Oldest Art" based on human behavior, and why is economics ultimately crowned the "Youngest Science" in the social sciences.
- c. Economics is also called the Queen of Social Sciences. What is the main reason behind this title, and how does the role of data in economics support this claim?.

### **Questions Regarding the Scope and Problems of Economics**

- a. Economics is divided into microeconomics (partial) and macroeconomics (aggregate). In the context of the main problems of economics, explain the fundamental differences between the main problems studied in macroeconomics (scarcity) and those studied in microeconomics (what, how, for whom)!
- b. To address the complexities of the real world, economics uses assumptions and modeling. Explain what is meant by the ceteris paribus assumption and provide an example of why this limitation (assumption) is absolutely necessary in analyzing an economic phenomenon, such as commodity demand.

### **Questions Regarding the History and Economic System**

- a. The development of macroeconomics is dominated by three main schools of thought (Classical, Keynesian, and Monetarist). What major event led to the failure of the Classical School's teachings, which believed that free markets guarantee full employment?
- b. The Monetarist School, pioneered by Milton Friedman, criticized the concept of Keynesian Fiscal Policy. What is the main reason Monetarists reject Fiscal Policy (including the concept of Crowding-Out) and why do they believe that Monetary Policy is more successful in reducing unemployment?
- c. A Mixed (Socialist) economic system emerged as a middle ground between pure capitalism and communism. What are the main characteristics that distinguish a pure capitalist economic system (based on individual freedom) from a Mixed/Socialist economic system regarding business ownership?

### **Questions Regarding Macroeconomic Issues and Policies**

- a. Why is economic growth defined as a long-term macroeconomic issue? Name the key factors (besides capital and labor) that significantly support the success of increasing a country's economic growth.
- b. There are four main problems in macroeconomics, one of which is unemployment. If a country faces high unemployment, describe two expansionary macroeconomic policy measures (one fiscal and one monetary) that the government can take, and explain the mechanisms by which each policy can reduce unemployment.
- c. Usury is considered a major obstacle to economic progress. Explain how interest (categorized as usury) in bank lending mechanisms can cause cost-push inflation.

- d. As a target of macropolicy, the government has several objectives. Explain why the government needs to monitor the activities of large corporations and provide "common goods" such as roads.
- e. Economic actors can be viewed from both micro and macro perspectives. Explain the differences between the primary objectives of the producer sector from a microeconomic perspective and the role and characteristics of the household sector from a macroeconomic perspective.

**2. Notebooklm can explain the meaning of the graphs in the module. For example, the differences in labor market concepts according to the Classical and Keynesian perspectives are as follows:**

Based on available sources, the differences in views on the labor market between the Classical and Keynesian Schools can be explained primarily through graphical analysis and their underlying assumptions.

a. Classical School View (Flexible Labor Market)

The Classical School believes in the importance of implementing a free market system, arguing that market mechanisms will ensure full employment and economic stability. A key element of this belief is the existence of flexibility in the goods, money, and labor markets.

**Classical Graphical Representation:**

The source presents Figure 2: Labor Market, which illustrates the Classical view of equilibrium:

- Equilibrium: Labor market equilibrium occurs when labor demand  $\left(D_L\right)$  intersects labor supply  $\left(S_L\right)$  at point  $\mathbf{E} \left(L_2, W_1\right)$ .
- Full Employment Condition: Because economic activity is always at full employment, the equilibrium point  $S\left(L_2, W_1\right)$  represents full employment.
- Wage Adjustment Mechanism: If a temporary condition occurs where wages are at a higher level, for example  $\mathbf{W}_2$ , then labor demand  $\left(D_L\right)$  is at point A and labor supply  $\left(S_L\right)$  is at point B. This results in unemployment of  $AB \ S \left(L_1L_3\right)$ . However, through market mechanisms, adjustment immediately occurs with wages falling from  $SW_2$  to  $SW_1$ , returning conditions to equilibrium at point E.

In the Classical view, unemployment that occurs (beyond Classical full employment) is voluntary unemployment (those who choose not to look for work at a given wage level).

b. Keynesian School View (Rigid/Inflexible Labor Market)

The Keynesian School rejects the concept of a Classical free market economy. The Classical Failure (as evidenced by the Great Depression of 1929-1932) demonstrated that markets do not always guarantee full employment.

**Keynes argued that unemployment always occurs because:**

- Wage levels are inflexible.
- Lack of flexibility in the labor market.

**Keynesian Graphical Representation:**

While the source does not provide a specific Keynesian graph for the labor market, it does provide Figure 7: Voluntary and Involuntary Unemployment, which is used to demonstrate Keynes's critique of the Classical full employment view:

- Sticky Wages: Keynes argued that the labor market is not perfectly competitive (due to unions or other factors).
- High Wage Equilibrium: If unions raise wages from the Classical full employment level  $\left(W_0\right)$  to a higher wage level ( $\mathbf{W}$ ), then:  
 Labor Demand Decreases to SOL IS.  
 Labor Supply Increases to SO L<sub>25</sub>.
- Involuntary Unemployment: The difference between labor supply and labor demand,
- which is  $\mathbf{L_1 L_2}$ , is called involuntary unemployment. Keynes argued that this unemployment occurs because wages cannot flexibly fall back to SW<sub>05</sub>.
- Voluntary Unemployment: The difference between L<sub>25</sub> and the total available labor force (SNS) is called voluntary unemployment ( $\mathbf{L_2N/S}$ ).

Feature	Classical School	Keynesian School
<b>Wage Flexibility</b>	Wages are very flexible. Wage adjustment (downward) is guaranteed to bring the market back to the equilibrium SW <sub>1S</sub> and full employment SL <sub>2S</sub> .	Wages are not flexible (rigid). A wage increase from SW <sub>0S</sub> to SWS (due to labor unions) creates unemployment.
<b>Normal Market Condition</b>	Always reaches full employment.	Equilibrium can occur below full employment.
<b>Type of Unemployment Recognized</b>	Primarily voluntary unemployment (the difference between SL <sub>0S</sub> and SNS) in Figure 7.	Identifies the existence of involuntary unemployment (the difference SL <sub>1 L_2S</sub> in Figure 7) which arises due to wage rigidity.

**3. Notebooklm cannot display images or graphs, but it can interpret them. This can be exemplified by the following statement:**

The Production Possibility Curve (PFC) is an important model in economies that illustrates the limits of a country's ability to produce goods and services. Since I cannot provide an image, here is a description of the Production Possibility Curve (PFC) and its significance in economics, based on the description found in the source:

**Overview and Definition of the Production Possibility Curve (PFC)**

**Definition:** The PFC is defined as a curve that illustrates the limits of a country's ability to produce goods and services within a given time period, with the aim of achieving prosperity.

**Basic Assumption:** In studying the PFC as an economic model, Notebooklm cannot display images or graphs, but it can interpret them. This can be exemplified by the following statement:

The Production Possibility Curve (PFC) is an important model in economics that illustrates the limits of a country's ability to produce goods and services.

Since I cannot provide an image, here is a description of the Production Possibilities Curve (PCP) and its significance in economics, based on the description in the source:

## Description and Definition of the Production Possibilities Curve (PCP)

Definition: The PCP is defined as a curve that depicts the limits of a country's ability to produce goods and services within a certain time period, with the aim of achieving prosperity.

Basic Assumptions: In studying the PCP as an economic model, several assumptions (limitations) must be met:

- a. Only two goods are produced.
- b. All factors of production are used.
- c. Full employment is achieved.
- d. A specific technology is used.

Goods Described: According to Samuelson, the PCP can classify various types of goods into two: butter and guns. This division is based on the premise that every country produces goods in peacetime (symbolized by butter) and goods in wartime (symbolized by guns).

As an illustration, the points on the PCP can represent:

- Point A: Indicates that a country uses all factors of production to produce agricultural goods.
- Point B: Indicates that all factors of production are used to produce industrial goods.
- Other alternative goods used in the graph are agricultural goods and industrial goods.

Curve Shape: The Production Possibilities Curve is concave to the origin (zero point).

### The Meaning of the Production Possibilities Curve in Economics

The primary meaning of the Production Possibilities Curve encompasses the principles of scarcity and opportunity cost, and is used as a tool for analyzing economic growth.

#### 1. The Meaning of Scarcity and Opportunity Cost

The concave shape of the Production Possibilities Curve to the origin has important implications:

- This illustrates that an increase in the supply of one commodity will result in a decrease in another commodity with increasing changes. This reflects the concept of increasing opportunity cost (to obtain one more unit of good X, one must sacrifice an increasing number of units of good Y).
- Points along the curve (such as points A and B) indicate that the country is operating at the maximum capacity of its available resources (assuming full employment and all factors of production are used).

#### 2. Measuring Economic Growth

Graphically, the Production Possibilities Curve is used to show economic growth. Economic growth is the development of activities that result in increased production of goods and services and increased prosperity for the community.

The Ministry of Marine Affairs and Fisheries (KKP) can distinguish between potential growth and actual growth:

- Potential Growth: Described by the change in point from P to R.
- Actual Growth: Described by the change in point from M to N.

Furthermore, another way to measure economic growth is by comparing the gap between Potential National Income and Actual National Income. Potential National Income is the level of income achieved if the workforce is fully employed (a). The best results occur

when the Gross National Product (GNP) gap is above the curve, because actual national income can exceed potential national income.

3. Notebooklm cannot display images or graphs, but it can interpret them. This can be exemplified by the following statement:

The Production Possibility Curve (PVC) is an important model in economics that illustrates the limits of a country's ability to produce goods and services.

Since I cannot provide an image, here is a description of the Production Possibility Curve (PVC) and its significance in economics, based on the description found in the source:

#### Description and Definition of the Production Possibility Curve (PVC)

Definition: The PVC is defined as a curve that illustrates the limits of a country's ability to produce goods and services within a certain time period, with the aim of achieving prosperity.

Basic Assumptions: In studying the PVC as an economic model, several assumptions (limitations) must be met:

1. Only two goods are produced.
2. All factors of production are employed.
3. Full employment is achieved.
4. Using a specific technology.

Goods Described: According to Samuelson, the PVC can sort various types of goods into two:

butter and guns. This division is based on the premise that every country produces goods in peacetime (symbolized by butter) and goods in wartime (symbolized by weapons).

As an illustration, the points on the Production Possibility Curve (PFC) can indicate:

- Point A: Indicates that a country uses all factors of production to produce agricultural goods.
- Point B: Indicates that all factors of production are used to produce industrial goods.
- Other alternative goods used in the graph are agricultural goods and industrial goods.

Curve Shape: The Production Possibility Curve is concave to the origin (zero point).

The Importance of the PFC in Economics

The primary significance of the Production Possibility Curve encompasses the principles of scarcity and opportunity cost, and is used as a tool for analyzing economic growth.

1. The Importance of Scarcity and Opportunity Cost

The concave shape of the PFC curve to the origin has important significance:

- This illustrates that an increase in the supply of one commodity will result in a decrease in another commodity with a greater change. This reflects the concept of increasing opportunity cost (to obtain one more unit of good X, one must sacrifice an increasing number of units of good Y).
- Points along the curve (such as points A and B) indicate that the country is operating at the maximum capacity of its available resources (assuming full employment and all factors of production are used).

2. Measuring Economic Growth

Graphically, the GNP is used to show economic growth. Economic growth is the development of activities that result in increased production of goods and services and increased prosperity for the community.

The GNP can distinguish between potential growth and actual growth:

- Potential Growth: Described by the change in point from P to R.
- Actual Growth: Described by the change in point from M to N.

Another way to measure economic growth is by comparing the gap between Potential National Income and Actual National Income. Potential National Income is the level of income achieved if the workforce is fully employed (a). The best results occur when the GNP gap is above the curve, because actual national income can exceed potential national income.

### 3.2. Discussion

#### Result 1

The application of notebooklm in teaching the Overview of Micro and Macroeconomics material has advantages and disadvantages. Because notebooklm is a machine, it must be controlled by the user, namely the lecturer teaching the PIE course. The advantage of notebooklm is that it creates a student-centered learning system (SCL) because the lecturer is assisted by creating prompt questions according to the sub-chapter I discussed. This reduces the lecturer's task of lecturing in front of the class, while simply monitoring students' progress in using notebooklm via mobile phones. This method is believed to be well-received by students, as it is less stressful and gives the impression of learning while playing. This aligns with in-depth learning, which is designed to create a meaningful and enjoyable learning environment [10]. The lecturer then simply instructs students in groups to answer the prompt questions and provide corrections to students' arguments To further scientifically refine the prompt questions, the lecturer must refine the following findings:

1. What factors cause Samuelson's definition of economics to emphasize the importance of efficiency in making choices?
2. Why is economics called the oldest art of human behavior and the youngest science in the social sciences?
3. What is the main reason behind the title "The Queen of Social Sciences" in economics, and how does data play a role in supporting this claim?
4. Explain the fundamental difference between macroeconomic problems (scarcity) and microeconomic problems (what, how, for whom)!
5. Explain what is meant by the term *ceteris paribus* and why constraints or assumptions are absolutely necessary in modeling commodity demand!
6. What major event caused the failure of the Classical School's teachings, which believed that free markets guarantee full employment?
7. What factors caused monetarists to reject fiscal policy, and what are the advantages of monetarists in overcoming unemployment?
8. What are the main characteristics of pure and mixed capitalist economic systems related to business ownership?
9. Why is economic growth considered a long-term macroeconomic problem, and explain the key determinants of economic growth besides capital and labor!

10. Explain the mechanisms of expansionary fiscal and monetary policy in overcoming unemployment!
11. Explain how interest in bank lending mechanisms can cause cost-push inflation.
12. Explain why large companies providing common goods such as highways require government oversight.
13. Explain the differences in the primary objectives of producers from a microeconomic perspective and the household sector from a macroeconomic perspective, in terms of their roles and characteristics.

## Result 2

Notebookim's explanation of the labor market graph is quite comprehensive and comes directly from the module provided. It concludes with a summary at the end. This demonstrates that AI technology, as a machine, will work according to instructions and assist in drawing conclusions. The speed with which AI can assist in understanding the module's content supports lecturers' increased productivity in mastering the PIE module's content. This statement aligns with the revolutionary phenomenon of the 21st century: the potential of AI as more than just a technological tool, but a force capable of opening up space for creativity and innovation [11]. Its weakness is its inability to display the graph from Figure 1 of the labor market. This reality presents a challenge for lecturers to be prepared to practice graphing in class with students. Second, in writing the symbols, they are different from the symbols in Figure 7 in Chapter 1 module, so the lecturer's task is to correct them during lectures so as not to cause misperceptions among students.

## Result 3

Notebooklm cannot display Production Possibility Curve (PPC) graphs, but it can fully describe the PPC from the modules entered into the Notebookim program. This is an advantage because it can help lecturers explore information from the required textbooks used, especially in the modules. Furthermore, Notebooklm can assist lecturers in research and literature review. The downside is that anyone reading the module must have a high level of knowledge to verify the accuracy of the tool's writing.

Therefore, the graphs must be drawn together by lecturers and students to achieve satisfaction from the training [12]. Lecturers' contributions in class will also make it easier for students to memorize the graphs, while Notebooklm, which is essentially a machine, can be controlled by humans as noble servants of God. Furthermore, regulators must implement regulations regarding the use of Notebookim, an AI technology already present in human civilization.

## 4. Conclusion

In practical use of NotebookLM in Chapter I, we found it easy to formulate probing questions, explain labor market graphs from the Classical and Keynesian perspectives, and reveal Production Possibilities Curve (PPC) graphs in greater detail.

Despite its many conveniences, using NotebookLM requires caution. Users must remain vigilant by checking and verifying the original source of the information generated by this AI tool.

Furthermore, a major weakness of NotebookLM is its inability to directly display graphical visualizations. Therefore, these graphs must be prepared manually in advance to be matched with the information generated by NotebookLM.

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