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# Sources of Students' Misconceptions in Economics

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Misconceptions in learning can arise from a variety of sources. This article examines the five sources of misconceptions that may be relevant for understanding learners' misconceptions in economics classes in junior colleges in Singapore: students' prior knowledge, their perceptions of what economics is about, their "linguistic mindset", the influence of student learning preferences, and their perceptions of how graphs are used in economics. Understanding the origin of students' misconceptions can help junior college teachers anticipate and correct their students' misconceptions.

Economics teachers often encounter students' answers that do not make sense or are erroneous explanations of economic phenomena. These answers reveal understanding which is not consistent with generally accepted views or interpretations in economics. How do students' misconceptions in economics arise?

Tang (2003) proposes that conceptual development is not a simple process of taking in a new conception, and replacing the old with the new because preconditions such as students' prior knowledge, learning preference and mental model of the subject may interfere with their receptivity to new knowledge and cause students to generate misconceptions. This article considers students' prior knowledge, their perceptions of economics, the gap between everyday language usage and economic terms, the role

of learning preferences, and students' ideas about the use of graphs in economic analysis as possible reasons for students' misconceptions in economics.

## **Students' prior knowledge**

As students would have participated in economic activities such as making purchases and saving from their childhood days, they may have formed personal interpretations of the functioning of the economy from such experiences. Hence, before students begin their economics course in school, they have possibly already developed naïve beliefs and preconceptions related to the subject matter of economics. Their conceptions might be considered as alternative conceptions, or experience-based explanations constructed by learners to make a range of natural phenomena and objects intelligible. These mental frameworks are loose and grounded in students' common sense ideas about how the world works, with an internal consistency which makes students resistant to change and predisposed to making misconceptions in economics.

That students can develop misconceptions arising from lay conceptions and narrow perspectives is illustrated in the findings below by Tang (2003) on how commencing students in economics in the Queensland University of Technology understand the fundamental economic concept of allocative efficiency after

attending the introductory economics course for two semesters. Table A shows the analysis of students' answers to a structured question on a competitive poultry market which has been taken over by one firm. The answers were taken from the final

examination at the end of their first year in university. The observations by Tang suggest that students' preconceived erroneous notions had persisted despite one year of formal coursework in economics for 67.5% of the students.

Table A: Student conceptions of allocative efficiency (based on Tang, 2003)

	<b>Students' answer of what allocative efficiency means</b>	<b>Causes of misconceptions</b>	<b>Observations</b>	<b>Percentage of respondents</b>
1	When consumer welfare is maximized.....at equilibrium output in a market	Equating the concept of social welfare to consumer welfare	Only one side is considered: consumer perspective	4%
2	When firm's profit is maximized (utilizing resources efficiently)	Lay conception of efficiency as efficiency of a firm in making profit	Only one side is considered: profit perspective	12%
3	At the firm's minimum Average Total Cost	Lay concept of efficiency as technical efficiency	Only one side is considered: cost perspective	23.8%
4	In market, at $P_e$ $Q_e$ where consumer and producer surplus is shared equally (i.e., equal distribution of social surplus of production)	Distorting concept of efficiency with the notion of equality or equity	Both sides of exchange considered; incorrect focusing since focus should be on efficiency not	23%
5	Clearing of the market i.e. no surplus and no shortage at the equilibrium output	Distorting the concept of efficiency with the concept of 'equilibrium'	Both sides of exchange considered; incorrect focusing	4.7%
6	Where Marginal Social Benefit (MSB) is equal to Marginal Social Cost (MSC). At any other level, there will be a reduction of social surplus or deadweight loss (i.e., maximisation of social surplus of production)	Correct answer according to theory in textbook	Both sides of exchange considered; correct focusing	32.5%

The above table shows that students' conceptions of the basic concept of allocative efficiency were distorted in five different ways. Only the sixth answer was correct. The findings suggest that lay interpretations prevailed in their thinking despite one year of formal coursework.

My observations of students' responses in economics classes in several junior colleges in Singapore also suggest that the prior knowledge of students seems to interfere with their learning. For instance, students tend to have the consumers' perspective but not the producers' so that in their mental models there is a demand side but not a supply side of the market. Students also view firms invariably as price-setters who will lower price to sell more of their product, without considering that firms may be price takers with limited market power. They go on to assume that firms will earn more revenue from selling more (which is not always the case with a price fall). Such observations evidenced that students have definite conceptions of how the economy works before they start their economics course and that their prior knowledge in the form of such layperson conceptions impedes their grasp of economic theory.

The examples below taken from responses by local students during lesson observations in junior colleges illustrate how students' prior knowledge interferes with their grasp of economic ideas.

Example One: "When the price of furniture drops, the quantity demanded will not rise. My family won't buy any new furniture as we already have our own furniture!"

In this example, a student challenges the law of demand based on his personal experience as a consumer. The student only

sees from the perspective of his household and has not considered market-wide demand. He has limited his thinking to his family's consumption behavior without factoring into the discussion the overall market demand which comprise market segments like homes, hotels and businesses.

Example Two: "So, my teacher says a change in price leads to a change in quantity demanded. Then later she says demand and supply determine price. So which happens first? The businessman sets the price first, right?"

In this example, a student expresses dissonance between theory and his perception of how prices are determined. Here, again, the student has based his thinking on his layperson interpretation of the real world. To him, the businessman sets the price since he has seen advertisements showing the prices of goods and services being sold by firms. "A change in price leads to a change in quantity demanded" is a statement of the law of demand which predicts that consumers would respond to a change in incentive, in this case, a change in price. The missing piece in the puzzle is the law of supply which relates to how producers vary the quantity supplied in response to a price change. Taking into account both demand and supply forces, the market mechanism determines the price. However, students' prior knowledge tells him that the businessman sets the price and so the explanation of the price mechanism seems to him to be far removed from reality.

Layperson interpretations are deep-seated, often constructed by students in their childhood. Aside from encouraging students to read widely, participation in experiments and simulations can help to give them experiences that challenge their lay ideas. For example, students typically cannot

imagine how in a free market buyers and sellers arrive at the equilibrium price without any orchestration. To help them experience the working of a free market, teachers can conduct “trading” in classroom pit markets.

### **Students’ perceptions of economics**

The way students go about learning a subject is likely influenced by their beliefs and ideas of how to learn it; students’ mental models of what economics is about and their perceptions of the objectives and limitations of economics may directly impact how they learn economics. For example, a student who sees the study of economics as accumulating a body of knowledge may learn economics by memorizing material which he may not have fully understood. Economics, as a science of choice, revolves around decision making of economic agents who weigh between costs and benefits, a key idea that many students fail to grasp. That tools of analysis, economic models and laws may be used to analyze economic activities in almost all sectors of the economy like transport, health, business, and education may be bewildering to the novice. The use of assumptions and awareness of limitations of analysis based on these assumptions can also baffle learners. Summarily, the complexity of subject matter and procedures in economics can be challenging to students.

In the preliminary study by Shanahan and Meyer (2001) to throw light on the learning process of economics students, insights from findings suggest that on entry to university, students show considerable variation in their perceptions of what economics is and what economists do and that such variations may explain variations in students’ results. Before the start of formal teaching in 1998, 894 incoming first-year students of the University of South

Australia were asked to respond to statements in terms of their most recent school experiences, and where possible, in the context of studying economics. There were four categories of statements. Of interest to our study is the category on what students perceive economists do. The mean of the responses to each statement in this category is given in brackets, on a scale of 1 to 5, where 1 represents strongly disagree, 3, neutral and 5 strongly agree.

- An economist studies people and how they make choices. (3.1)
- An economist compares current and historical data to determine answers to social problems. (3.5)
- An economist observes and reviews information, and drawing from information from the past, predicts where the economy will be in the future. (4.0)
- An economist uses data and existing models to predict future events. (3.9)
- An economist alters models so that they are consistent with the data that has been gathered.(4.0)
- Economists analyze complex phenomena in the real world in abstract forms by means of graphs or equations. (3.4)
- The simplification of a complex phenomenon can provide an insight into that phenomenon that would not otherwise be possible. (3.4)

The findings suggest considerable variation in respondents’ understandings of what economists do and economics as a way of thinking.

Students with a flawed understanding of economics and the way economists approach problem solving are likely to generate many misconceptions in the subject. For example, students may find it hard to

reconcile their experiences and observations of consumer and producer behavior in the real world with comparative statistics that isolate key variables to explain economic behavior. It may also be puzzling to such students that economists predict likely outcomes based on economic “laws” only to challenge the analysis with critical evaluation and limitations. As economic recommendations are necessarily context-specific, students may encounter dissonance as they expect generalized solutions only to be told that the solution depends on the assumptions and the conditions present in each case.

The following two examples taken from lesson observations of junior college economics classes illustrate how students’ misperceptions of what economics is about impedes their learning of the subject.

Example One: “Why must we always add *ceteris paribus* to our sentences?”

A student asks her teacher in exasperation why the assumption “*ceteris paribus*” (meaning “all things remaining the same”) must be written in their essay answers. This student does not seem to know that economists use models to explain how the economy works and to predict future economic outcomes. In economic models, simplifying assumptions are made to focus on selected variables of the phenomenon being studied. The *ceteris paribus* assumption is used for partial equilibrium analysis: the analysis of the equilibrium position of a sector or a group in an economy. This analysis studies only a few selected variables at a time. In other words, this method considers the changes in one or two variables keeping all others constant, i.e., *ceteris paribus* (others remaining the same). This assumption is always stated as a caveat since the analysis

is only partial, involving some, not all, of the factors.

Example Two: “When the price of Coke rises, the demand for Pepsi will increase. This in turn will cause a rise in the price of Pepsi and a subsequent fall in the quantity demanded of Pepsi and rise in the quantity demanded of Coke.”

A student confuses a change in quantity that consumers demand in response to a price change with their response to the change in the price of a substitute. In analyzing the market for one good (Coke), economists also consider the impact of changes in the market for Coke on the markets for related goods which may be substitutes or complements. Using comparative statistics, the increase in the price of Coke will lead to an increase in demand for Pepsi with the price of Pepsi unchanged. Students tend to move on to another round of changes, ignoring the assumptions of comparative statistics, to declare that the increase in demand for Pepsi raises its price, and then predict a subsequent fall in the quantity demanded of Pepsi, leading to the conclusion that the initial increase in the price of Coke triggers a rise in quantity demanded for Coke! The student has confused an increase in demand for Pepsi arising from the price change of a substitute (Coke) with a fall in quantity demanded of Pepsi arising from a price increase in Pepsi.

Addressing students’ pre-conceived notions of what economics is about and presenting to them economics as a way of thinking should be a top priority for all teachers of first-year economics courses. Teachers’ explanations and modelling may effectively remove the misconceived notions of some students. Other learners may need to participate in economic research and

project work to experience the economic approach first hand for disciplinary issues to be resolved.

### **Students' "linguistic mindset"**

Prior conceptions of a term or a phenomenon that are embodied in our everyday language often compete with discipline-specific conceptions, creating barriers to understanding concepts in economics. A mindset identified by Kourilsky (1993) is the "linguistic mindset" which derives from "natural linguistic use and the subsequent psychological tendency to identify with the natural language use of the term or concept" (p. 26). Economists borrow terms such as scarcity, cost, demand and investment from our everyday language to represent specific economic concepts. These terms have their precise definitions in economics which are different from their everyday usage. Unless the differences in meanings are highlighted to learners, they are bound to be confused, leading to development of misconceptions.

For example, scarcity is typically understood as some absolute quality of a good, but in economics, it is a relative concept – availability relative to desirability. Another common example relates to the use of the term demand. There are at least two perspectives of the concept of demand. "Demand" as used in everyday life context refers to "a mindset of something that is adamantly desired or insisted upon" (Kourilsky 1993, p. 27). In the discipline of economics, demand must be "backed by willingness and ability to pay (Sloman 2006, p. 35). In addition, economists distinguish between movements along and shifts of the demand curve, the former reflecting changes in the amount consumers want to buy arising from price changes and the latter, changes in the amount consumers want arising from

non-price factors (Sloman 2006).

The above distinctions in economics compound the confusion that students experience in deciphering the meaning of each term.

The following example taken from lesson observations of junior college economics classes illustrates how students' lack of understanding of the economic way of thinking impedes their learning of the subject.

#### **Example: "Huh, zero economic profit? No profit? Then why go into business?"**

In this example, a student expresses confusion over the concept of "zero economic profit." Of course, it is illogical for a firm to run its business if it earns no profit but does zero economic profit mean no profit in economics? Zero economic profit is the economist's way of saying that the profit earned by the firm gives just enough incentive for the firm to remain in business. Firms include minimum return to the entrepreneur as part of the total cost so that even at zero economic profit, there is a surplus earned by the entrepreneur.

When students are introduced to a new, discipline-specific way of understanding reality, linguistic issues often cause this new perspective to compete with their existing understanding of specific terms. Teachers who anticipate these difficulties and highlight the distinctions between the meaning of these terms in economics and in ordinary usage at the start of new topics will be able to pre-empt confusion and misconceptions among students. Simulations can also be conducted in class to clarify concepts like equilibrium, signaling, shortages and surpluses.

### **The influence of student learning preferences**

A study by Ziegert (2000) suggests that the influence of personality on student learning preferences is another possible source of student misconceptions in economics.

In the Myers-Briggs Type Indicator (MBTI) framework for classifying personality types, the sensing (S) –intuitive (N) preference refers to the way individuals take in information. People who tested as sensing on the MBTI focus on details and specifics, often work sequentially, prefer experience-rooted learning and have a practical and present orientation. The intuitive type takes in information through hunches or intuition. They like the big picture focusing on patterns and concepts first, rather than details. They like solving problems and enjoy change. Data from United States show that 75% of people tested by the MBTI assessment are sensing types and the rest are intuitive types.

The Thinking (T) and Feeling (F) scale of the MBTI refers to ways in which individuals evaluate and make decisions. Thinkers tend to decide impartially, based on facts and analysis, with an emphasis on fairness. Feeling types decide on the basis of personal values and emphasize harmony. Decision making is subjective and personal. feeling types like collaboration while thinking types like competition in the classroom. Feeling types learn best after they have developed a relationship with their instructor and classmates. Thinking and feeling types are evenly spread in the US population.

Ziegert's research findings suggest that thinking students outperform feeling students on both course grades and exams in

economics. Intuitive students perform better than do sensing students on exams, and sensing students earn higher course grades than do intuitive students. This suggests that personality types may have preferred methods of testing and that a mismatch of learning and teaching styles may impact student performance adversely. For example, if the majority of students have the sensing preference, and thus prefer to learn in concrete terms, but principles of microeconomics tend to be presented theory first, then sensing students may be at a disadvantage relative to intuitive students. This is because the intuitive students can conceptualize the big picture from economic theory but the sensing students may prefer the study of specific economic facts and details. The nature of economic analysis, being rational and clear-cut, may predispose the thinking students to decision making using the economic way of thinking. For example, the thinking students can express the utility derived from goods and services in monetary values and make conclusions about markets and competition via analyzing economic surplus and efficiency of markets. In contrast, feeling students may be less enamored by this type of economic analysis since it concentrates on only a few key factors, measures utility in hard cash and tends not to include the welfare of the marginalized in the discussion.

While the MBTI is just one framework to help teachers identify students' learning styles and preferences, it is important for teachers to think about the ways different students in their classrooms learn. Further research on this possible source of misconceptions will help teachers plan curriculum that can better match students' learning preferences. The conscious use of a mix of pedagogies to cater to the range of learning styles can help to reduce the generation of misconceptions by students.

For example, the use of real world examples in tandem with presentation of economic theory should be a staple in any economics course to cater to sensing students who learn better with specific contextual information and intuitive students who function better with patterns and big picture ideas. Thinking students can benefit from role play and simulations to develop empathy for interest groups affected by various policies while Feeling students can debate issues to strengthen their critical thinking abilities .

### **Students' perceptions of graphs in economics**

Some students find economics courses more difficult than other subjects because of the extensive use of graphs in economic analysis. Reading a graph is a "complex activity" according to Glazer (2011, p. 185). The literature review by Glazer (2011) on challenges with graph interpretation presents a broad sweep of the difficulties encountered by students in the use of graphs that would apply in all subjects. These difficulties range from elementary problems like confusing the slope and the height, not being able to calculate the area under a curve, to more complex problems like interpreting several line graphs simultaneously.

In economics, graph interpretation goes beyond just being able to tell what the graph shows because students need understanding of both geometry and economic concepts to understand economic analysis graphically. Too often, lecturers race through content and graphs to cover the syllabus on time. Teachers cannot assume that students can understand concepts and also use diagrams to illustrate these concepts or that graphical representations aid in their understanding of concepts.

Another complication in the use of

graphs in economics is that students not only need to be able to interpret graphs and use them for economic analysis, those who are competent in graph interpretation in mathematics and the sciences need to make a mental switch when they use graphs in economics. This is due to different conventions in graph drawing in economics. Students who have a mathematics background cannot be expected to transfer their knowledge to economics and when they do so they may be confused. A study by Strober, Cook and Fuller (1997) was conducted to examine the types of errors that novice economics students in Stanford University make in graphical analysis in a simple supply-demand problem. One of the findings was that incorrectly assuming that economics graphs were like mathematics graphs adversely affected students' interpretations of measurement and directional terms like "increase" and "decrease" or "up and 'down.'" To prevent inappropriate transfer of mathematics knowledge, economics teachers need to explain why supply and demand graphs should not be equated with the graphs of mathematical functions.

One big obstacle to overcome is that students need to know that the dependent variable is on the vertical axis in mathematics but in simple supply-demand diagrams, it is on the horizontal axis. If students do not understand this point, then they will shift curves up instead of out or down instead of back. Teachers should also explain that the figures used in economics are graphical representations, approximations that serve as visual tools for problem-solving. They are not graphs drawn from precise sets of ordered pairs, as is the case with mathematical functions. To preempt students who are strong in mathematics from having to consciously struggle to reconcile between graphs in

mathematics and economics, teachers should highlight these differences to them at the start of the economics course.

More attention to teaching students how to master the skill of graph interpretation in economics would be a step in the right direction since a common complaint among junior college teachers in Singapore is that students make a lot of mistakes in using and interpreting graphs.

### Conclusion

The relative impact of the five sources of misconceptions discussed above depends on the individual student's learning profile. For students struggling with language proficiency problems, the confusion that can arise from discipline-specific meanings of common terms may be especially daunting. The obstacles posed by handling of graphs and the influence of students' learning preferences may be less formidable for the majority of students. Unresolved disciplinary issues may severely hamper student learning but the greatest barrier to overcome is likely to be the naive interpretations of every first learner in economics as these are deep-seated, resist change and compete intensely with theory-based interpretations.

Knowledge of these five sources of misconceptions provides a starting point for teachers to select teaching methods that can overcome the obstacles that many students face in learning economics. Teachers need to address students' misconceptions by incorporating strategies to pre-empt, surface or clarify concepts which students tend to find confusing. They should also help their students to correct misconceptions when these arise in the course of their study.

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