

Conceptual Development - An Empirical Study from a Second Order Perspective

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Introduction

It is not uncommon for people with formal trainings in science to relapse into lay interpretations of physical phenomena. For example, students who have successfully completed university physics courses still hold the lay view that that, on release, heavy objects will reach the ground before lighter ones because 'heavy things have a bigger force' than light objects (Biggs 1989), and that an object travelling at a constant velocity implies a resultant net force acting in the direction of motion (Marton 1988). In economics, it is also observed that students, who have successfully completed ECON101, still believe it is the inherent value residing in a product that determines its price (Dahlgren 1997). A gap appears to exist between knowledge change in an academic context (inert knowledge) and knowledge application in a real world context (active knowledge). What are the conditions that facilitate/hinder the conversion of inert knowledge into active knowledge? Researchers on conceptual change agree on the importance of prior experience in this process of active learning.

“...‘(L)earning comes about through the learner's active involvement in knowledge construction’ (Driver 1989, p. 481); and the pupils' previous and alternative ideas play a fundamental role in the learning process, as learning is possible only on the basis of what the learner already knows.” (Mortimer 1995)

The above quotation suggests that the learners are not a blank sheet in the learning process. They bring in prior beliefs and experiences (cognitive and affective) which influence their interpretations of the content. When they are introduced to a new, discipline-specific way of understanding the reality, this new perspective often competes with their existing perspectives. Some researchers (Taber 2011) characterise learning as a process of conceptual (or theory) change, in that the naive theories (for example, theories the learner holds in explaining and handling reality at an early age) are replaced by more sophisticated, rational theories acquired at a later age. However, Mortimer (1995) argued for a co-existence of the multiple perspectives, which form what he called the person's conceptual profile. The differences between experts and novice lie not in the absence or presence of some of these perspectives but in how effectively the individual shifts and selects the perspective appropriate for the situation. Mortimer used the conception of matter in science education to explain this idea of conceptual profile change (1995). Mortimer's argument is applicable in economics education on which this paper is focused, and can be illustrated with an example, involving the concept of 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). In the discipline of economics demand is a relational concept; it “expresses the relationship between the amount of something ... desired ... and the amount [of another thing] that must be sacrificed to obtain it” (Kourilsky 1993). Most commonly, the amount to be sacrificed is measured by the price charged. In most textbooks, demand thus describes the desired amount supported by a willingness to pay. And the amount desired at a particular price is termed as quantity demanded, to distinguish it from demand, which expresses a relationship between the quantity demanded at each of a number of possible prices. Interestingly, there is an “intermediate” position between the everyday life notion and the technical economic definition of demand. In finance and economic news reporting, the reporter often uses the term demand to refer to the concept of demand (1) and quantity demanded (2) interchangeably in the *same* article, as illustrated below.

*“THE nation's car industry has suffered a double hit, with Ford slashing 240 jobs because of reduced **demand (1)** ... Ford Australia returned to profitability in 2009 ... although Ford's share of the market dropped below 10 per cent for the first time last year, despite overall vehicle **demand (2)** exceeding one million.” (The Australian, 15 April 2011)*

*“There would also be a second round of effects (of soaring oil prices) ... that would hit hard in the highly indebted Western economies as **demand (1)** would slump and consumers would retrench ... (A)ccording to the report, an oil rise to between \$US115 and \$US120 a barrel ... would result in **demand (2)** destruction and the loss of output. This would push **demand (1)** down further...” (The Australian, 19 April 2011)*

To an expert in economics, the shift from one perspective to another to make sense of the occasions is often effortless and might even be unnoticeable. But to the novice (e.g. commencing economics students), they should be forgiven for being confused in their usage of the concept of demand in developing an argument. An email from an

introductory economics student asking about the effect of the Global Finance Crisis on the demand of minerals illustrates this confusion:

*"Oh so now Australia has been in a new mining boom, is it? The price of mining export has increased a lot now, so the export will be affected, is it? Because the price is too high, the **demand** will decrease ..."*
(Monday, 23 May 2011)

The above discussion illustrates a language related barrier to conceptual change. It appears that in economics (and in other disciplines) prior conceptions of a term or a phenomenon as embodied in our everyday life language often compete with the discipline-specific conception, creating barriers to full understanding the concept and knowledge transfer. In the study reported in this paper we investigated commencing economics students' conceptions of another fundamental economic concept of efficiency. Why did we investigate this concept? The concept of efficiency provides a framework for evaluating competing methods of resolving the fundamental economic questions of "what", "how" and "for whom" to produce¹. As we will discuss later, students failing to correctly apply this framework to interpret market related phenomena may form serious misconception about the price mechanism and about economics as a discipline in general. By mapping their different ways of making sense of this concept, we are able to identify the sources of their misunderstanding and as a result in a much better position to facilitate a full understanding of this concept. The next section presents the method and findings of this study. In the penultimate section we will use Kourilsky's (1993) framework to further discuss the language barrier to conceptual change in economics education, and its implications for effective teaching and learning.

The study

The objective of this study² is to carry out such a diagnosis of learning outcomes by investigating how commencing students in economics understand the fundamental economic concept of 'allocative efficiency' and their sources of misunderstanding. We analysed students' written responses to one question in an introductory level economics final examination. The question of interest is about a competitive poultry market, which has been taken over by one firm. In part (a) of the question, students were asked to locate the equilibrium price and output in the competitive market before the takeover, and in part (b), to explain if this equilibrium output also represents the allocatively efficient output. This is followed by parts (c) and (d), which focus on the impact of the takeover on the equilibrium price, output, consumer and producer surpluses in the monopolised market. In part (e), students are asked to explain whether or not "equilibrium" and "allocative efficiency" are the same or different concepts, based on their previous answers. The exam question is presented in Appendix 1. The data are written answers to parts (b) and (e), taken from the first 90 examination scripts in alphabetical order according to students' surnames.

Data Analysis Stage one of data analysis involved reading all written answers several times, focusing on students' interpretations of allocative efficiency to uncover similarities and differences in the meaning they attached to the concept. A number of distinct meanings of the concept were identified. Written statements signifying the same meaning were pooled together. Each statement was then compared with others in the same pool, and contrasted with the statements in other pools. This process resulted in six non-overlapping descriptive categories. These categories emerged from the raw data rather than being imposed by the researchers; they constitute the outcome space of students' conceptualisation of the concept. In the second stage of categorisation, the categories were taken back to the raw data, and students' written statements were classified according to which of these six categories they belong. This classification process was conducted independently by two experienced economics lecturers. Their classifications were then compared, and differences of opinions discussed. After discussion, a total of 126 statements were identically categorised by the two researchers which represents an agreement rate of 88% (Table 1).

Result The meanings and structures of student conceptualisations of allocative efficiency and the causes of misconceptions are discussed below.

¹ Social and public policies can be discussed from many perspectives - social, psychological, historical and political. The economic perspective contributes to and enriches this discussions.

² The study reported here is an excerpt of a earlier paper by Tang, T. (2003). "Understanding Students' Misunderstanding in Economics." *Economic Analysis and Policy* 33(1): 157-171.

Category 1 *Social Surplus Perspective*

Economists define allocative efficiency as a market outcome where the net social welfare (or social surplus) of production is maximised. Analytically, this occurs at the output level, where marginal social cost equals marginal social benefit (in the absence of externality). This conception is illustrated in the following example:

'In a perfectly competitive market equilibrium output is the allocatively efficient output. This is because in a perfectly competitive market, $D_m =$ Marginal Benefit, $S_m =$ Marginal Revenue. In this market, consumer and producer surplus is maximised and there is no deadweight loss.' (LB³)

Category 2 *Consumer Perspective*

In this conception students distort the concept of 'social welfare' by equating it with their everyday notion of 'social welfare' as 'consumer welfare'. That is, 'consumer welfare' and 'social welfare' are erroneously taken as equivalent. According to this conception, market efficiency is determined from the perspective of consumers; i.e. the market is efficient when consumers' welfare (or consumer surplus) is maximised. Example:

'... Allocative efficiency ... does happen in a PC [perfectly competitive] market. The equilibrium ... also indicates efficiency. *Consumers are getting a max surplus at Q_e [equilibrium output]. ...*' (AJC)

Category 3 *Profit Perspective*

The lay notion of 'efficiency' in running a business in terms of efficient utilisation of its resources is evident in this conceptualisation of 'efficiency'. From a profit perspective, if the firm can use its resources most 'efficiently', then it can maximise its profit, and the firm is said to have achieved allocative efficiency. This conception represents the mirror image of the consumer perspective (category 2), which focuses on the value side of production. Example:

'...Allocative efficiency refers to whether any resources are wasted and can be moved into other areas to make a greater profit. ... As in the case of the monopolist poultry farmer, all the available resources were being maximised and could not have been used more efficiently elsewhere to make a *greater profit*. ...' (AB2)

Category 4 *Cost Perspective*

This is another lay notion of 'efficiency', this time, with a focus on cost of production. To students holding this conception, allocative efficiency is achieved if the firm can efficiently utilise its resources to minimise the production cost (specifically, average total cost). In this sample, this is one of the two commonly held misconceptions. Example:

'No, [equilibrium and allocative efficiency are] different concepts because equilibrium is where S and D is equal and allocative efficiency is where inputs are used in a technologically efficient way to give *the lowest cost*, but in monopoly there is always resource wastage of some degree.' (RSC)

Category 5 *Equity Perspective*

This conception has a heavy ethical overtone. According to an equity perspective, the market is efficient if it is equitable, which occurs when the social surplus of production is equally shared between producers and consumers. This lay notion of a fair market represents a normative conceptualisation of a positive economic concept. Example:

'Yes. In a perfectly competitive industry, this is the allocatively efficient output. Producers charge the price, P_e ... see at Q_e [where] *consumer and producer surplus is also shared equally*.' (IRD)

Category 6 *Equilibrium Perspective*

In standard textbook analysis of a competitive market, at the level of output where demand and supply intersect, the market is in equilibrium. At competitive equilibrium, allocative efficiency is also achieved because net social welfare is maximised, *not* because the market is cleared. However, students holding the equilibrium perspective incorrectly take the equality of demand and supply as the condition for equilibrium *and* allocative efficiency, without conceptually differentiating the two concepts. This mistake arises from students' fixation on the demand/supply cross as the ideal market outcome in their analysis of other market structures. Example:

³ The letters in the brackets are initials of the student in the sample.

'Yes, the equilibrium output is the allocative efficiency output. This is because there is *not surplus and no shortage* due to the demand for poultry and supply of poultry being exactly the same at the equilibrium point.' (PRC)

Table 1 below summarises the structures and meanings of the six categories. Note that “N” in the table denotes the number of occurrences of each conception that were agreed upon by the two independent judges.

	Structure of conceptualisation – The focus is on:	Meaning of conceptualisation	N
1 Social Surplus Perspective	Social surplus of production	Maximisation of net social surplus of production	41
2 Consumer Perspective	Consumer welfare	Maximisation of consumer welfare	5
3 Profit Perspective	Producer's profit	Maximisation of firm's profit	15
4 Cost Perspective	Cost of production	Minimisation of average total cost (ATC)	30
5 Equity Perspective	Welfare distribution	Equal distribution of social surplus of production	29
6 Equilibrium Perspective	Market equilibrium	Clearing of the market	6
Total			126

Table 1 Structures and Meanings of the Six Conceptualisations

Discussion

The outcome of the phenomenographic analysis is the finite, qualitative distinct categories of conceptions of a phenomenon, which represent a form of collective intellect, or perspectives commonly experienced - collective perspectives (Marton and Pong 2005). The six conceptions of efficiency identified in this study capture the collective perspectives held by our students. These collective perspectives reflect aspects of students' experiences associated with the term efficiency. As revealed in students' answers to an exam question, this study also attempted to investigate the sources of these conceptions. Two of the six conceptions, namely the social surplus and equilibrium perspectives, are instruction induced, as the ideas of net social surplus and equilibrium are not commonly encountered outside formal training in economics. The other four conceptions are the result of interpretations of terms as experienced in their everyday life. In *daily* situations, the understanding of efficiency as the capacity of a firm to minimise cost of production or to maximise profit is perfectly valid. Similarly, maximisation of social welfare can be meaningfully interpreted as maximisation of “consumer welfare”. The equity perspective, it is speculated, arises because the terms efficiency and optimality are used interchangeably in economics classes. This perspective therefore represents an ethical interpretation of the normative concept of optimal allocation, namely, an optimal allocation should be ethical.

We can safely assume the students in this sample had all received instructions on the concept of efficiency. But as demonstrated in this study, not all of them could correctly apply this concept even in an academic context. Can we re-teach this concept to replace their prior perspectives with the official, discipline-specific perspective to bring about better learning outcome? We examined this question by further investigating two strategies of students' handling of the various conceptions in their answers. The first is in relation to concept distortion, and the second concerns the notion of multiple conceptions.

Concept distortion

The concept of deadweight loss (DWL) is a subsidiary concept used to provide further evidence for non-optimal (or inefficient) allocation of resources. The DWL in an imperfect market is graphically represented by the area (usually a triangle) bound by the marginal cost curve, marginal benefit curve and the equilibrium output, which represents a

welfare loss *to the society*. In the examination, parts (c) and (d) of the question require students to identify the impacts of monopolisation in terms of consumer surplus, producer surplus and DWL. These two parts were, in general, well answered, indicating that the majority of students have acquired the concept of DWL, and have no difficulty in correctly identifying the DWL ‘triangle’ as an explanation of the allocative inefficiency of a monopoly. From this, one may be led to think that the students have properly understood the concept of DWL. However, students’ written responses in part (e) reveal misinterpretations of the concept of DWL, reflecting their misinterpretation of allocative efficiency. Three such misinterpretations of the concept of DWL are identified and discussed below.

DWL related to profit The student (below) understands DWL from the firm’s angle: There is a deadweight loss *to the firm* since ‘the producers aren’t maximising profits’. His interpretation of DWL clearly implies and is consistent with his profit perspective.

‘Because the [monopoly] firm controls the market, equilibrium and allocative efficiency are different. Even though profits might be made when $MR=MC$ there is still the dead weight loss, and *the producers aren’t maximising profits.*’ (AB1)

DWL related to equilibrium In this quotation below, the student describes DWL as a ‘*loss to society*’ which is interpreted as a waste due to the existence of shortage or surplus (the student uses ‘wastage’ for surplus in his answer) of output. It is an interpretation consistent with the equilibrium perspective.

‘The output in (a) is also the allocatively efficient output since there is *no loss to society*. All consumer demand has been supplied and there is no shortage or wastage of output at this quantity.’ (CC)

DWL related to cost Here, DWL is a loss to the firm and is due to firm’s ‘*inefficient practises [sic]*’, and ‘*disincentive to economise*’ which in turn is due to lack of competition.

‘... In monopoly even though the market (the firm) is in equilibrium, allocative efficiency is not achieved. It is not achieved because of deadweight loss ... because of the *inefficient practises [sic]*, and *disincentive to economise.*’ (HJC)

When the student has formed a conception about a phenomenon, she is capable of distorting other aspects of the phenomenon to make them compatible with their perspective. Therefore, to the student concerned, an explanation containing an inappropriate interpretation of a concept can appear logical and coherent. As such, a conception can be resistant to change.

Multiple Conceptions

Our data also revealed the existence of multiple conceptions in the case of 20 students. These students can shift comfortably from one conception to another in their explanation. The shift can occur within the same answer (intra-contextual shift) or between answers to different parts of the question (inter-contextual shift) (Pong, 1999). Here we illustrate these conception shifts below.

Inter-contextual shift

In the example below, the student (IRD) uses the Distribution Perspective (‘surplus ... shared equally’) of the concept in his answer to part (b), and spontaneously shifts to the Social Surplus Perspective (‘existence of ... deadweight loss’) in part (e).

‘Yes. In a PC [i.e. perfectly competitive] industry, this [i.e. the equilibrium output] is the allocative efficiency output. Producers charge the price, P_e ... They sell at Q_e . Consumer and producer surplus is also shared equally.’ [**Distribution Perspective**] [Answer to part (b)]

Equilibrium and allocative efficiency are definitely not the same concepts. As shown ... the monopoly is in equilibrium, i.e. $MR=MC$. However it is not allocative efficiency, as shown by the existence of a loss of welfare as dead weight loss [**Social Surplus Perspective**].’ [Answer to part (e)]

Intra-contextual shift

In the following example, the Equilibrium Perspective is manifest in part (b). But at the beginning of part (e), he shifts to the Social Surplus Perspective (inter-contextual shift), then immediately shifts to the Cost Perspective, before finally going back to the Equilibrium Perspective (intra-contextual shift).

‘Yes it is the allocative efficiency output ... in this graph supply produces exactly where Demand want supply to produce. Therefore efficiency $S=D$ and $MC=MR$ ’. [**Equilibrium Perspective**] (VC)

'The equilibrium and allocative efficiency are different concepts. Because in monopoly equilibrium, inefficiency exists (as mentioned above) due to $MB > MC$ [Social Surplus Perspective] therefore the resources used is not employed efficiently and can be employed alternatively at a lower cost [Cost Perspective]. Therefore leads to inefficiency in monopoly. It is also due to the fact that monopoly is not producing at capacity [Cost Perspective], it reduces qty produced to increase price. Therefore what is produced is below Demand [Equilibrium Perspective].' (VC)

The student's ideas about a concept particularly when acquired in their daily life context can be so ingrained that they can comfortably shift from one conceptualisation to another in their explanations without being aware of their inconsistency. This lack of awareness represents a barrier to conceptual change in economics and other disciplines, the implications of which will be discussed below.

Implications for Teaching

Kourilsky (1993) in his investigation of barriers to conception application identified three mindsets that hinder learning in economics: (a) a linguistic mindset, (b) a physical mindset and (c) a resistive mindset. He used scarcity to illustrate the linguistic barrier. In our daily life, scarcity is typically understood as some absolute quality of a good, but in economics it is a *relative* concept – availability relative to desirability. The physical mindset is illustrated with a common mistake made by students when they take an upward shifting of the supply curve as an *increase* in supply. An example of resistive mindset used by Kourilsky is the difficulty of appreciating the implications of a sunk cost. And the resistive mindset, Kourilsky argued, is often derived from the ethical, socio-psychological dimension of our language.

The findings of the present study provide further empirical evidence for the existence of the linguistic and resistive mindsets. Economists borrow terms from our everyday life language to represent concepts such as scarcity, cost, demand and investment. These terms have their precise and often technical definitions in economics, which possess meanings different from their everyday usage. The present study found that the term "efficiency" can lend itself to various interpretations, depending on its linguistic and moralistic contexts. For example, the consumer, profit and cost perspectives represent a linguistic barrier. The equity perspective has an ethical overtone which develops a resistive mindset. The study also found that students can distort or shift their conceptions to make them appear to be internally logical.

We teach students because we do not want them to "re-invent the wheel". Knowledge in art, sciences and other fields that took hundreds of years of accumulation of human experience and experimentation, students can acquire in a few years. However, human experiences on which knowledge is built, as shown in this and other studies, can become barriers to acquisition and transfer of knowledge. What are the implications for teaching for conceptual change?

We often hear colleagues complaining to other colleagues about their students: "No matter how many times I had explained it to them, they still didn't get it!" Fraser (1995) also shares this frustration and puts it down to the difficulties of correcting the misconceptions his students possess: "I find teaching of science fairly easy. I have no difficulties with science education; my difficulties are with science re-education" (quoted in Gooding and Metz 2011). And Gooding and Metz (2011) added that "... to break down students' misconceptions, teachers must first identify those misconceptions ..." (p.36).

Our study provides more empirical evidence that the learner possesses prior alternative conceptions, and hence, teaching and learning is more than a simple process of transmission of knowledge. We agree with Gooding and Metz that identifying misconceptions or alternative conceptions is critical to effective teaching and learning. However, we disagree with them when they say effective teaching is to "break down" those alternative conceptions. In our study we found students possess multiple perspectives and can shift their perspective (Pong 1999) or comfortably distort aspects of the phenomenon to fit with their perspective (Svensson 1989). We also argue that alternative perspectives can appear to have their 'internal logic' to a student, which explains why they are difficult to change or replace.

Teaching strategies aimed to change or replace prior conceptions simply by re-stating the logical structure of a concept amounts to rejecting the learner's existing perspectives. Such a rational approach to conceptual change is known as "cold conceptual change" (Pintrich, Marx et al. 1993). Learning has a cognitive and an affective domain. To facilitate conceptual change, we should not only focus on the cognitive side of learning. A constructivist approach to facilitating learning should look after the motivation and value aspects of learning, and involve some or all of these following processes (Davis 2001):

1. Reveal student preconceptions
2. Discuss and evaluate preconceptions
3. Create conceptual conflict with those preconceptions
4. Encourage and guide conceptual restructuring

The central idea of Davis is to place, by way of reflective learning tasks, the learner's current experience (preconception or prior perspectives) at the centre. These learning activities should be designed to confront their existing beliefs by creating mismatch and conceptual conflict so as to provide opportunities for student to reflect on their experience. This way the instructor will have a greater chance to guide students to be aware of their prior perspectives. Pintrich and his colleagues (1993) call this process "hot conceptual change" by utilising the learner's affective domain. Murphy and Alexander (2008) made a similar observation: "the strongest effects on knowledge and beliefs results from interventions that directly addressed, in some way, students' initial understandings [rather than] approaches that focused more on the presentation of accurate scientific information ..." (cited in Taber 2011, p.572).

A digression: Let us re-visit a question posed earlier: Why is a full understanding of the concept of efficiency important in economics education? It is noted that four of the six perspectives identified in the present study all have a distributional overtone – efficiency or optimality occurs when the consumer is getting the most benefit, or when the producer is getting the most profit, or when the consumer and producer get the equal share of the surplus of production. In another qualitative study (Tang and Robinson 2010), we interviewed students to extract their understanding of the market mechanism. We found two ways of understanding the market mechanism: a zero-sum conception and an allocative conception. Students holding a zero-sum conception can only see the market as an arena of competition between the consumer and the producer – the gain of one party is the loss of the other. The zero-sum conception is firmly consistent with a distribution perspective of the concept of efficiency. In sharp contrast, students with an allocative conception are able to appreciate the function of a price change to influence the behaviours of consumers and producers to bring about maximisation of social welfare. We speculate there is an association between the first four perspectives of efficiency and the zero-sum conception of the market. Any market outcome has its distributional dimension. But if students can only see the distributional effect of a market (a fixation on the distribution), they will likely develop a popular (mistaken) belief that the producer and the consumer have opposing interests, that the market economy is biased in favour of the rich (business) against the poor (workers), and that the mainstream neo-classical economics promotes greed. If the student can develop an awareness of their conceptual profile regarding the concept of efficiency, they will be more likely to acquire a full understanding of the central tenets underpinning neo-classical economics.

Conceptual Profile Change or Conceptual Change

Many educators see learning and conceptual change as almost synonymous (Taber 2011). In contrast to knowledge accumulation, learning for conceptual change involves a shift or restructuring of existing framework that the learner uses in solving problem, interpreting a phenomenon or functioning effectively in their world. Another issue pertinent to effective teaching and learning concerns the role of prior everyday life conceptions in the process of conception change. In the process of learning, does the acquired discipline-specific perspective replace the everyday life perspectives or does it co-exist with them? As discussed in the introduction, Mortimer (1995) argues that it is more appropriate to describe the process as "conceptual profile change" than "conceptual change". To the extent that this thesis is tenable, the implication is that learning is not a simple replacing of a prior everyday life, naive or inferior concept by a more rational, sophisticated one, but about raising the learner's consciousness of the various perspectives associated with the concept (i.e. the learners' conceptual profile) so that the learner is more likely to use the perspective appropriate to the context.

Our study provides empirical evidence that students simultaneously possess alternative perspectives. More importantly these alternative perspectives can appear to the learner to possess internal consistency; they can be resistant to change or replacement. Our analysis of their cause shows that these alternative perspectives have a "common-sense root" (Mortimer 1995, p.283). Since their prior perspectives are an integral part of their everyday language and hence are meaningful to their daily situations, it makes more sense to conceptualise learning as a process involving the enhancement of their cognitive structure by integrating the discipline-specific perspective with their prior perspective, than a rational replacement process. Taber (2011) makes the same point when he pointed out that:

“Conceptual change [is seen] less about changes in the available conceptual resources, but more about shifts in which of those resources are cued in different contexts.” (p.570)

Effective learning therefore is about an increase in the learner’s awareness of these various and often competing conceptions and perspectives, and their ability to apply a conception appropriate to the context.

Conclusion

The study identified the conceptual profile of commencing economics students in relation to the economic concept of efficiency. It shows that the alternative perspectives have their “common sense root” in their everyday life use of the term efficiency. These students can distort a concept and shift their perspectives to make sense of a phenomenon, and as a result, alternative conceptions have their internal consistency and resistant to change. Mortimer distinguishes two moments of the teaching/learning process. The first is the orchestration of learning activities for the concept change; these activities can be across the various stages of the Bloom’s taxonomy, which most of us are familiar with. The second and the more important moment occurs when the student confronts their existing perspectives with a new perspective and is conscious of their conceptual profile, i.e. being aware of the alternative perspectives or meanings of a concept and its relevance to different contexts. Learning in terms of knowledge transfer occurs in the second moment when the student can appropriately shift from one perspective to another.

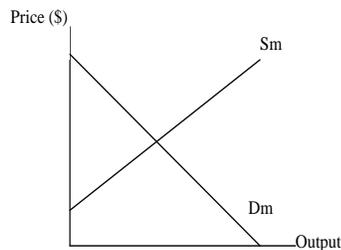
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Appendix 1

Question 31 (Economics 2 Final Examination, semester 2 1999)

The poultry market is perfectly competitive. The diagram below shows the market demand (D_m) for and market supply (S_m) of poultry.



- (a) Copy the diagram on to your exam answer booklet, and in it indicate the equilibrium market price and output. (2 marks)
- (b) Is the equilibrium output in (a) also the allocative efficient output? Explain briefly. (2 marks)

Suppose all poultry farms were taken over by a firm and as a result this firm has become the SOLE producer of poultry meats.

- (c) Assuming no change in cost or demand conditions, derive the profit maximisation price and output of the firm on a separate diagram. Explain your answer. (3 marks)
- (d) Using the concepts of consumer and producer surplus, illustrate and explain the impacts of the takeover on the welfare of consumers, producers, and society as a whole. (3 marks)
- (e) Based on the above answers, would you say equilibrium and allocative efficiency are the same or different concepts? Explain. (3 marks)
- (f) Suggest one pricing strategy by which the firm can increase its profit and maximise net social welfare at the same time. Illustrate and explain your answer. (3 marks)