

# An efficient format for a problem based introductory economics course

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# **An efficient format for a problem based introductory economics course**

Geert Woltjer

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*Abstract:* Problem-based learning is rather labor intensive for teaching staff. In addition, the problem-based structure does not work always optimally in practice. Brainstorming during pre-discussion of tasks becomes very superficial, preparation of the students is far from optimal, and post-discussion is more focused on repeating what is already in the book than on the task being discussed. However, these problems can be solved.

This paper discusses a number of innovations in the format of the standard problem-based course. The uses of a large case study and the role of lectures in this, a virtual learning environment, subgroup activities, mind maps in post-discussion, and writing will be discussed. The combination of these innovations increases the efficiency of the group meetings and provides an opportunity to reduce the number of tutor group meetings. The approach that is discussed here is both useful for people who want to introduce problem-based learning as a learning approach in an efficient way as for those who want to improve on an existing problem based learning system.

Key-words: introductory economics, problem-based learning, virtual learning environment

JEL-codes: A2, A23

## 1 Introduction

Universiteit Maastricht is using problem-based learning as its main teaching system. In the problem-based learning system students study with the help of tasks or problems, that can be theoretical or practical in character, in so-called tutor groups, i.e. groups of about 14 students headed by a staff member. Each tutor group meets once or twice a week for two hours. Students find their tasks in the course manual as prepared by senior staff members. The discussion of each task is distributed over two tutor group meetings. During the first meeting the students *pre-discuss* the task. In contrast with the case study approach, students start discussing the task before they study. The task can be a rather open presentation of an ill-defined problem, but in economics most tasks are focused on the theory they have to prepare, where the literature they have to read is prescribed implicitly or explicitly. The students have to make a first analysis of the problem and try to get a grasp on the main problem in the task. They brainstorm about possible options and bring in what they already know and understand. In this way prior knowledge is activated and shared among the students. Finally, students formulate learning goals for self-study.

After the first session students start to search for information in order to find answers on the learning goals. In the ideology of problem-based learning the students should engage in self-directed learning, without prescribed texts. However, in practice most introductory economics courses prescribe a main textbook, and students mainly prepare the material provided. During the second tutor group meeting the *post-discussion* takes place. Students report about what they learned during their self-study activities. If everything is ideal, they will integrate the new knowledge in the context of the tasks discussed. This post-discussion takes the first part of a normal tutor group meeting; where the second part is used for the pre-discussion of the new task(s). Therefore, the tasks are guiding the learning process of the students. They are expected to motivate the students and bring them to active learning strategies (Moust et al. 2001). The basic value of problem-based learning compared with traditional learning is that “knowledge is acquired in the meaningful context of a problem and that students have to work actively with this knowledge focusing on that problem.” (Gerritsen 1999:128)

Students chair the tutor group meetings themselves. For our course one student makes minutes of the tutor group meeting. The tutor has to facilitate the group process and provides feedback on the quality of the argumentation. Junior staff mainly tutors introductory courses, where a tutor instruction prepared by senior staff guides the tutor in its tutoring role.

Although the system has a lot of advantages, it is not without problems. An important problem is the relatively high teaching load when large classes are being taught in small tutor groups of about 14 students, even though the small group teaching requires less contact hours between staff and student than normal lecture/seminar based courses. Another problem is that, although students acquire better skills to apply their knowledge, there is a tendency that students learn less in the problem-based system (Dochy et al. 2003). This problem may be related with the fact that in practice problem-based learning does not always generate the active study approach that should emerge. Gerritsen (1999) finds that at Nijmegen University most students did only superficially study the literature and about 40% of the students were not prepared for the post-discussion at all. This implies that the post-discussion cannot reach much depth. Especially in introductory courses most problems are only designed as a starting point for studying a well-defined amount of literature and are not designed to think and argue about. As a consequence students use less and less time to pre-discuss the tasks and focus the post-discussion more on discussing the literature than on the tasks.

Mulders (1995) and Savery and Duffy (1995) argue that students should be confronted with real problems already in an early stage of their study. In this paper I will argue that real world problems can be used in introductory economics courses if we introduce some innovations in the process of

problem-based learning. Those innovations must stimulate a better pre-discussion, a better preparation and a more structured post-discussion. First, I will discuss how lectures can provide the relevant information for the analysis of real world problems. Then we focus on online multiple-choice tests to force students to prepare for the tutor group meetings and to give them the opportunity to get feedback about their study activities. Causal schemes of the main relationships, prepared in subgroups, have the same role, but also help to improve the quality of the post-discussion. Discussing minutes of the group meeting before the start of each session both rehearses material automatically and provides an opportunity for feedback. Writing assignments may help to integrate and digest the information provided during the course. Finally, assessment of the students must be focused on all aspects, i.e. multiple-choice questions about the textbook and the real world case next to grades for participation and the writing assignments. The combination of those innovations improves the quality of the problem-based system.

## **2 Real world problems and lectures**

Most teachers at economics faculties assume that students have to master a set of basic principles before they are able to do sound economic analyses (see for example Hamilton 2003, McMillin 2003, Siegfried and Sanderson 2003). This idea is not consistent with the basic philosophy of the hardliners in problem-based learning, but is a fact, and I personally agree with this idea. This implies that students have to focus their study-activities at least partly on mastering the theories discussed in the textbooks. The consequence of a textbook orientation is a tendency towards textbook exercises as problems. The introduction of real world cases seems much too difficult in introductory courses. It is not obvious that students in an introductory course in economics have the capabilities or have the time to find relevant information. But when information is structured carefully and the number of real world cases is small, the real world applications may make the textbook much more relevant. By using only one or two case studies to introduce the relevant economic theories, students have more time to digest the relevant real world information during the course without being overloaded.

With this idea in mind, I selected the crude oil market from the perspective of an international oil company as our case study (see Woltjer 2004), but many other case studies will do as well. We provide students with real world tasks about one main case study and want them to discuss this case during the tutor group meetings. For each task students have to read prescribed chapters of the textbook.

The content of those chapters is useful in discussing the task, but the students will require more information. In order to prevent drowning we supply them with relevant information in a very structured way. When a relevant article was available, this was included in a reader. However, it is not easy to find useful information from the perspective of an introductory course that is not too difficult or too time-consuming to read. Therefore, a senior staff member did most of the reading and gave lectures where a carefully selected amount of relevant information was provided. For example, technologies involved, the organization structure of a company, and overviews of relevant data were provided through the lectures. During the lectures also some theories that were relevant for the case but not included in a standard textbook, were discussed. During the lectures, we also showed some videos about technological backgrounds. Because lectures have more or less the same role as the literature students have to read, it is important that the lectures are carefully planned between the pre-discussion and post-discussion of a task. In this way a rather long interval between the tutor group meetings (for example, a week) is an advantage.

Students should also be stimulated to find relevant information by themselves. For the writing assignments the students were required to use Internet (and library) resources, and in practice most students did use them. We selected a number of relevant links for each task that could be used for the post-discussion. Finally, we stimulated students to search on the Internet for information. In practice, most students only used the links provided in the course.

In summary, through careful design of teaching materials, it is possible to use real world cases without abandoning the idea that students are required to study a textbook.

### **3 Online multiple-choice tests**

When relatively open tasks are used in combination with required literature students tend to focus the post-discussion on the textbook. Students that prepared the textbook well explain to the less-prepared students about what is already in the textbook. Although this may be useful, it is not the idea behind problem-based learning, nor is it time well spend by the tutor.

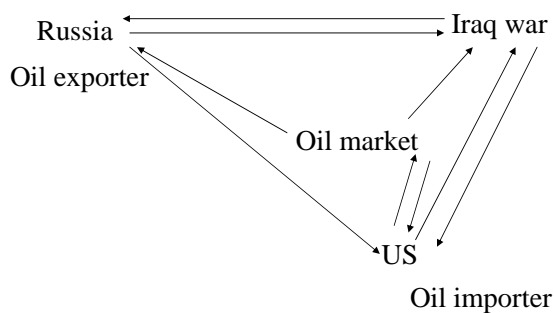
In order to prevent this waste of time, we require students to pass an individual multiple-choice test with a random selection of questions on the Virtual Learning Environment (VLE) before each post-discussion. This requires a lot of the textbook. It should be readable for the students, contain a large database of questions that can be imported into the VLE, while it should have an application-oriented approach to enable students to apply the theories discussed in the textbook to the tasks. A book that uses a lot of real-world examples, like the idea of the “Economic Naturalist” (Frank 2002) as implemented in the textbook by Frank and Bernanke (2003), is very useful from this perspective (see Becker 2000).

The implementation of the multiple-choice tests is as follows. Before the meeting of the post-discussion, the students have to pass a multiple-choice test of about 25 questions, with a student-specific random selection of questions about the chapters to be studied before the post-discussion. Students can do this test only once, but are allowed to do one test as an exercise before the final test. The first time we implemented the idea, we allowed students to do the tests till they passed, but this had the effect that some students just repeated doing the tests instead of first reading for the textbook and then doing the test. Because a multiple-choice question database always has a bias to topics where it is easy to generate large numbers of questions, doing the tests is not sufficient as a preparation for the tutor group meetings.

Our experience with the tests shows that most students were much better prepared than during the normal problem-based courses. Most students liked the incentive provided. Furthermore, the post-discussion focused mainly on the tasks, not on the textbook. But this may also be caused by a lot of the other innovations that were implemented.

### **4 Mind maps**

Although students have to prepare individually, group interaction is also very important for learning. Therefore, a lot of activities are planned to take place in small subgroups of 3 or 4 students, without tutor. One of those activities is the preparation of a mind map, or a conceptual or causal schema about learning goals. We define the mind map here broadly as a conceptual or causal scheme summarizing the main relationships. At the end of the pre-discussion, the tutor distributes the learning goals over the subgroups, and each subgroup is expected to prepare those learning goals in depth by preparing a mind map. Those mind maps show the main points of the analysis in one picture. Such a causal scheme can be easily created in PowerPoint and the subgroups publish them on the VLE before the post-discussion of the tasks. The post-discussion starts with the presentation of the mind map made by the subgroup, where the students and tutors must be instructed explicitly not to spend too much time on those presentations. The preparation of mind maps by subgroups not only decreases the load for the tutor group meetings, but also helps the students to get active involvement with classmates during the learning process (Becker 1997: 1359).



**Figure 1 A simple mind map**

Let us elaborate the idea of the mind map post-discussion a little bit more. A mind map makes very explicit what students think. Figure 1 shows an extremely simple example. Students have to tell their story around this mind map. They have to tell that Russia has oil interests in Iraq. They may tell about the interests of both the US and Russia in oil prices that are not too low. And they may discuss the effects of the Iraq war on oil prices in the short and long run. They have to explain all of the arrows in figure 1 and will find out that the figure is far from complete.

The discussion in the tutor group can be focused on the quality of the presented mind map. Does the mind map represent the essential relationships? Are the causalities correct? The tutor has an important role in stimulating discussion about this type of issues. Normally, students become aware that the mind maps can be improved a lot. Some students were a little bit frustrated about this, but it is the essence of the learning process. The mind map makes explicit the confusions that would be hidden in a normal post-discussion. In practice, the input of the tutor was very important in this type of discussion.

In conclusion, the use of mind maps is meant to focus the post-discussion on the learning goals and to stimulate creative and precise thinking about the problem. The mind map helps to focus the discussion on the task instead of the textbook. It is obvious that mind maps are not the only type of assignment that can be used to do the job.

## 5 Minutes

We require one student to make minutes both of the pre-discussion and the post-discussion of the tasks. This is standard practice at our faculty, but in practice a lot of those minutes are rather superficial. We require the students to publish the minutes on the VLE. By using the first five or ten minutes of the tutor group meetings to discuss the minutes of the last session, students can be rewarded for the quality of their minutes and the tutor has the opportunity to correct for misunderstandings. Finally, the discussion of the minutes of the last session may help to rehearse and integrate the issues of the last session with the issues of the current session.

## 6 Writing assignments

Integration of knowledge is very important. Writing skills are an excellent way to integrate and digest knowledge (Hansen 1993). One of the basic ideas of the course was that students should become aware of the complexity of the real world and learned to use economic theory to organize some of those complexities. When the case is well-designed, the formulation of the tasks already helps students to do this. Also lectures may pay attention to a lot of relationships. However, the best way to integrate is to write a paper. We require students to write two small papers in the context of a language training, and one more extended paper as a way of integrating different parts of the course. Because we developed the course for business students and we use a business perspective in the tasks to approach economic problems, it was an obvious to have the integrating paper also from the perspective of a company. We require students to write an environmental analysis for a large international oil company.

The final paper is an excellent opportunity for work in subgroups. We require students to write a coherent paper in their subgroups. They have to write the introduction and conclusion together,

while each student is individually responsible for one of the chapters. In each chapter economic theory as well as library and Internet resources must be used. The students are graded on their individual chapter taking into account how it fits into the whole paper. In this way students have to work in subgroups without their grades depending too much on the quality of their subgroup members.

In order to give the integration effort by the paper some cachet, the subgroups present their paper during the last tutor group meeting. Each student presents his own chapter, and one or two students present the introduction and conclusion. In this way the last tutor group meeting provides an integrating perspective over the whole course, and the course ends in a natural climax.

## 7 Assessment

If you ask students to think for themselves and to do group work, a multiple-choice exam alone provides the incorrect incentives. A multiple-choice test is perfectly satisfactory as a test of the study activities on the textbook or to test insights gained through lectures. But the course grade must also include other aspects of the course. Therefore, we include also open questions in the written exam, while grades for general participation and the writing assignment are part of the final grade of the course.

## 8 Concluding comments

The problem-based learning system that uses a required textbook can be centered on real world issues without becoming too difficult. Using one large case study instead of many case studies limits the amount of information that has to be digested for real world applications. Multiple-choice tests and mind maps require students to prepare the tutor group meetings. They stimulate a focus on the tasks instead of on the textbook. Well-structured lectures, web links and additional literature provide the student with the necessary information about the case without requiring too much effort by the students. The mind maps, essays, post-discussion and minutes provide students with the opportunity to digest the information. And a course grade that includes multiple-choice questions, open questions, essays and participation helps to motivate students to do what was expected to them during the course.

This system has been used in a 140 hours introductory course of economics where this system has been used provided an introduction into economics in a short period of time. Microeconomics, macroeconomics, international economics and public sector economics were discussed in nine tutor group meetings of two hours and seven lectures. It seems that the chosen problem-based format is a very time-efficient manner to introduce problem-based learning into introductory economics courses, although there is no reason not to apply the same format in other courses as well.

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