Graduate Education in Ecological Economics

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Abstract

Interest in graduate education in ecological economics is increasing. However, no formal plan of study for a Ph.D. in ecological economics has been disseminated. The lack of a formal plan is problematic as the field of ecological economics matures, interest grows, and new programs are being developed.

This paper attempts to fill a void by creating a program of study addressing the proficiencies a graduate student in ecological economics should have upon completion of his/her Ph.D. based on the US educational system. The plan of study presented in this paper has been developed to make the graduate of an ecological economics program as competitive on the labor market as students awarded traditional economics degrees. The plan I describe is created to meet the requirements necessary for a Ph.D. in ecological economics. Further, fields of specialization are suggested to complement the core of an ecological economics program, to enhance the education process and to give the student with an ecological economics degree a higher level of marketability.

Keywords: Ecological Economics, Education, Graduate Training
1. Introduction

As ecological economists we should have an interest in the process and development of a curriculum for graduate education within the discipline. Graduate school plays a vital role in economic discourse by certifying economists as professionals, establishing economists’ view of argumentation and guiding them to what is important to study and what is not (Colander and Klamer, 1987). What economists do is what they were trained to do in their graduate programs (Hansen, 1991). Therefore, a well formulated course of study is necessary.

However, other than anecdotal information, no formal plan of study for a Ph.D. in ecological economics has been disseminated. The lack of a formal plan is problematic as the field of ecological economics matures, interest grows, and new programs are being developed. This paper attempts to fill a void by creating a program of study addressing the proficiencies a graduate student in ecological economics should have upon completion of his/her Ph.D. The plan of study presented here (Figure 1), based on the U.S. standard of sixty credits beyond a masters degree, is developed to make the graduate of an ecological economics program as competitive on the labor market as students awarded traditional economics degrees. The five proficiencies that a student should be able to demonstrate are: 1) gaining access to existing knowledge, 2) displaying command of existing knowledge, 3) displaying the ability to draw out existing knowledge, 4) using existing knowledge to explore issues, and 5) creating new knowledge (Becker, Highsmith, Kennedy, and Walstad, 1991). The program of study I describe will meet each of these standards. Further, fields of
specialization are suggested to complement the core of an ecological economics program, to enhance the education process and to give the student with an ecological economics degree a higher level of marketability.

The curriculum presented in this paper is designed to train graduate students in economics. However, an alternative curriculum that emphasizes the natural sciences slightly more can just as easily be developed. But, in the end, most will agree that economics is the driving factor for ecological degradation. Therefore, a solid foundation in economics for a doctoral degree in ecological economics is necessary.

Opinions in graduate economic education are seldom made public, but when they are, the views are most critical (Colander and Klamer, 1987). Let me emphasize that the views presented here are my own personal views and are presented with the hopes of fostering discussion about the basic educational requirements for an advanced degree in ecological economics.

The following sections will outline the core of a program in ecological economics, consisting of required courses and comprehensive exams, the fields of study, and the underlying objectives.
Figure 1. Ecological Economics Graduate Plan of Study.
2. The Common Core

There is a substantial nucleus of subject matter which should be common to all economists. The core of a program, taken by all graduate students, provides the fundamentals of that discipline. The goal of graduate education is to launch the student on a lifetime of self-education. Only the fundamentals sufficiently provide the groundwork for later self-education (Bowen, 1953). The common core consists primarily of economic theory, science, and statistical and research methods.

2.1 Economic Theory Sequence

The main economic theory courses are in microeconomics and macroeconomics, presenting the important issues in each particular field. This requirement is particularly important for ecological economists. Conventional theory should be taught to students so that, if for no other reason, they will be able to combat conventional theory competently.

These courses should be offered sequentially over two semesters. The first semester could cover traditional neoclassical theory, immersing the student fully in conventional economics. The second semester would then provide the ecological economic counter point if one exists. Alternatively, the course material could be presented in a point-counter point format spanning the two semesters and progressing by complexity of topic. Regardless of the orientation, the objective is to provide students the traditional fundamentals so they can adequately tear down the neoclassical viewpoint from a position of authority.
Major issues of contention between traditional neoclassical economics and ecological economics should be stressed. Neoclassical economics claims to be a positive theory based on beliefs similar to modern era physics; economics is science and economists use the scientific method concentrated on the Homo economicus model – humans are rational, isolated, and self-interested. The neoclassical approach to economics, embodied in the two fundamental theorems of welfare economics, takes the viewpoint that people are naturally self-interested through the encouragement of an efficient market system in which rationality, freedom, and voluntary exchange rule. Markets solve all societal problems through the assumptions of perfect competition with full employment and the existence of perfect information. Utility functions are examined independently. Price signals are used to determine the marginal social cost on the supply side and marginal social cost on the demand side. The goal of all economic policy is to promote continuous economic growth, which will solve all inequality, environmental, and social problems. Further, methodological individualism reigns as microfoundations have been integrated into microeconomic and macroeconomic theory. Optimal behavior should prevail at the microeconomic level with expectations formed rationally at the macroeconomic level (Chen, 2002). With all these goals and solutions, what could be wrong with neoclassical economic theory?

Ecological economics examines economic issues from a normative perspective, where the Homo economicus model must use interdependent utility functions due to his interaction and dependency on the environment. Therefore,
human behavior must be studied within the environmental system because of this coherence, not at the mutually exclusive individual level that the neoclassical approach takes. Ecological economics takes sustainable economic growth as a goal and understands that growth cannot solve all the worlds’ problems. The economy has limits to growth as Nicholas Georgescu-Roegen eloquently developed in *The Entropy Law and the Economic Process* (1971). General equilibrium theory is unrealistic but used in neoclassical economics because it is “close enough” to infer analysis of a market economy. However, “close enough” is not good enough, and this is what ecological economics attempts to change through interdisciplinary work and theory.

Another area of contention with traditional neoclassical economics is that pricing and investment theories must account for the reality of strategic competition. This area of research has been expanded due to the renewed popularity of game theory. Asymmetric information should replace perfect information because the economy deals with humans who bring emotion and habits into the decision-making process. Joseph Stiglitz, 2001 Nobel Prize Winner in Economics, has popularized this area of research.

A final area of contention, at least for discussion here, is that of full employment. The assumption of full employment by neoclassical theory is unrealistic since an excess supply in the labor market exists. The contentions that a leisure-work trade-off exists at every wage level and that there is a job for everyone desiring employment are absurd. Perfect markets are the exception, not the rule. Finally, ecological economics understands that economics is co-
evolutionary, that the economic system and the environment evolve over time and are dependent on each other.

2.2 Quantitative Sequence

It becomes clear that a solid foundation of theory in microeconomics and macroeconomics is necessary for graduate education in ecological economics, but is not sufficient for the ecological economist. Complementing the economic theory coursework, students should be well-grounded in statistical and research methods. A four sequence course will fill this need. A four course sequence might seem a bit much to some; however, I argue that this requirement is necessary for a student with a degree in ecological economics to compete on the labor market against those students with traditional economics degrees. The first course should cover techniques in mathematical methods such as applied mathematics, differential equations, linear programming, basic probability and advanced mathematical material. The opportunity to take an exam to opt out of this course should be available for advanced students. The next two courses should be in econometrics, more specifically applied econometrics. A student in ecological economics should be able to perform the necessary tests for economic analysis, and not just mathematical proofs. Rounding out the sequence, a course in research and communication should be required. The purpose of graduate education is to prepare students to conduct research (Hansen, 1991). While research methods should be intertwined in all coursework at the graduate level, there is usually little emphasis placed on the process of writing or presenting a paper (CGEE, 1991). A formal course that not only
prepares students to do scholarly research such as grant proposal and journal writing, but to present that research orally, is necessary to fully prepare them for their careers in either academia or the private sector. In addition, this course should be used to prepare students interested in academia by having them teach classes and be critiqued on their performance.

2.3 Science Sequence

Due to the fact that ecological economics is inherently interdisciplinary in nature, a two-course science requirement should be part of an ecological economics program. Ecosystems are complex, dynamic, interconnected, and unpredictable, where change is the rule, not the exception. To conserve and manage natural resources the human race must learn to work within the forces of change. In order to understand how new ideas and discoveries fit into the overall schemes of the environment and human life, change and how rapidly it occurs must be understood. Therefore, if students are going to be ecological economists, an ecology course should be required to provide an understanding of the services an ecosystem provides, as well as its limitations. This requirement involves students in interdisciplinary coursework from the start of their graduate careers. A second science course, of the students’ own choosing, would also be required. For example, courses in biology, chemistry, or physics that applied to the students interests would be an appropriate choice.

2.4 Ecological Economics Sequence

A degree in ecological economics would not be complete without specialized coursework in ecological economics. In the spring of 2002, I had the
privilege of speaking with then International Society of Ecological Economics president John Proops and Pamela Lenox, a graduate student in the ecological economics program at Rensselaer Polytechnic Institute, on developing an ecological economics course. The following sequence developed from our conversation. The first course in the sequence would be based around four topics: 1) thermodynamics in respect to the production process, 2) ethics in regards to consumption, 3) biodiversity in respect to complexity and self organization, and 4) epistemology in respect to policy-making.

The second course would consist of a series of seminars designed not only to inform, but as a forum to discuss and debate. The first half of the course would cover case studies examining issues like the globalization debate, the environmental Kuznets curve, the U.S. energy policy, and the greening of transportation. The second half of the course would consist of debates on issues in ecological economics. For example, topics like the place of sustainable development, first and third world issues, and tools for ecological economics would be discussed. The seminar style provides a flexible structure in which rapidly developing and evolving research can be presented. This sequence of courses would provide graduate students a firm foundation on what ecological economics is and the types of topics with which ecological economists are concerned.

2.5 Comprehensive Exams

All of the common core courses will provide a graduate student in ecological economics an excellent foundation upon which to build. Graduate
programs should be directed toward enabling the student to acquire the fundamentals for which further building will be possible (Bowen, 1953). To test the base knowledge of students, a series of comprehensive exams should be given for Microeconomics, Macroeconomics, Econometrics, and Ecological Economics. The exams rely largely on broad general questions requiring lengthy discussion, thus measuring a student’s understanding of the fundamentals. Two other comprehensive examinations should be required to measure a student’s understanding in the two specialized fields of his/her choosing. Fields of specialization will be discussed with more detail in the following section.

3. Fields of Specialization

Fields of specialization play multiple roles in graduate education. Fields allow an expanded teaching of theory and econometrics, linking theory and empirical techniques with real world applications (CGEE, 1991). Although ecological economics is considered to be a small, specialized area of study within the field of economics, it is the core of a new and rapidly developing approach to economics that can be incorporated into many other specialized fields of study. Areas of specialization beyond ecological economics will permit the student to be more competitive on the labor market by illustrating an ability to learn and apply their knowledge of ecological economics to other fields of study within economics. Therefore, a minimum of two fields of specialization should be required to complete an ecological economics degree program. Following are some suggested fields of specialization and ideas on the development and relevancy of the field.
One obvious choice for a specialized field would be environmental economics. This field of specialization should be a requirement for graduation due to the relative closeness to ecological economics. Ecological economics focuses on the economy as a social system imbedded in its environmental surroundings, whereas environmental economics focuses on the environment as a subsystem of the economy. Requiring a specialization in environmental economics would confirm these differences in the mind of the student and prepare him/her for a career after graduate school. This specialization would require that a student take courses in environmental economics, as well as natural resource economics. The student would learn the traditional material in these courses and how ecological economics can be applied. Several articles on these topics have recently appeared in *Ecological Economics* (Caviglia-Harris, Kahn, and Green, 2003; Zhongmin, Guodong, Zhiqiang, Zhiyong, and Loomis, 2003; Rosenberger, Peterson, Clarke, and Brown, 2003; and Button, 2002).

The second field of specialization would be chosen according to the goals and the interests of the student. The following paragraphs offer a few suggestions as to which fields of specialization might be most appropriate for a student in an ecological economics graduate program.

A second field might be economic development. A series of courses could potentially be offered that relate to ecological economics. For instance, microeconomic and macroeconomic issues such as agricultural issues, patterns of industrialization, modernization and technological change, and models of migration all have direct consequences to the surrounding ecosystem. Other
topics relating to institutions could also be offered to study how policies affect the environment and economic growth. Economic development issues link to ecological economics very well (Xu, Cheng, Chen, and Templet, 2002; Huitric, Folke, and Kautsky, 2002; Arnold and Perez, 2001; Kammerbauer, Cordoba, Escolan, Flores, Ramirez, and Zeledon, 2001; Brummett and Williams, 2000).

Another possible field of specialization relating to ecological economics is industrial organization. Topics such as antitrust policy, economic and social regulation, deregulation, markets, and technology and innovation could be covered. Other areas with strong ties to ecological economics are the regulatory issues dealing with energy and transportation issues. All of these topics have, in one way or another, been issues in ecological economics and have strong environmental ties (Wang, 2002; van Rensburg, Mill, Common, and Lovett, 2002; Berry, 2002; Coulter, 2002; Lybbert, Barrett, and Narjisse, 2002; Gowdy and Mayumi, 2001; and Altman, 2001).

A fourth potential field is international economics. Coursework in regional and urban economics, international trade, and international finance could be studied. Issues of particular interest to ecological economists would be trade and the environment, globalization, and land degradation. Numerous research exists on the connection between international economics and ecological economics (Hubacek and Giljum, 2003; Spangenberg, Omann, and Hinterberger, 2002; Muradian, O'Connor, and Martinez-Alier, 2002; Liddle, 2001; van Beers and van den Bergh, 2001; and Jayadevappa and Chhatre, 2000).
My final suggestion for a field of specialization is labor economics. Topics such as worker motivation and behavior, technology, sustainable development, and employment could be examined. All of these topics relate to ecological economics and have had recent articles written about them in *Ecological Economics* (Lux, 2003; Nuppenau, 2002; Goodstein, 2002; Gowdy and O’Hara, 1997; and Brennan, 1997).

4. Conclusion

A formal graduate curriculum for ecological economics is necessary for the successful continuation of the discipline. There is a diversity of approaches within the field in both the American and European schools of thought. While this diversity is a strength, only through the prescription of a defined curriculum can ecological economics have a unified front. To date there is an obvious deficiency in standardizing graduate education in the field. I have attempted to fill this gaping hole by proposing a plan, following the U.S. academic requirements, to meet the minimal standards that should be required of candidates for a Ph.D. in ecological economics. Again, let me emphasize that the curriculum presented in this paper is in the hopes of generating discussion about the basic educational requirements for a degree in ecological economics. A new approach to economics requires an updated, interdisciplinary, curriculum.

Mainstream economics consists of theory and ideas with which economists at the top graduate programs are comfortable. The familiarity with the requirements for a traditional economics degree has given the established graduate program an aspect of exclusivity. Nevertheless, ecological economics
has become more accepted as a discipline within the field of economics, with a
growing popularity evidenced by the number of colleges and universities offering
graduate and certificate programs. Ecological economics is a discipline with
increasing national and international interest. However, a detailed curriculum
has never been developed, causing academic inequities and discontinuity. This
is a major void in the academic system for graduate study. Until this void is filled,
ecological economics will flounder in its ability to make a serious impact on
graduate study and in the marketplace.

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