INTERNATIONAL AGRICULTURE KNOWLEDGE OF GRADUATING SENIORS IN A U.S. LAND GRANT UNIVERSITY

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Abstract

A higher education challenge grant from the Cooperative State Research Service of the U.S. Department of Agriculture was awarded to the College of Agriculture (COA) at Louisiana State University (LSU) to foster student awareness of the global agricultural environment. A series of workshops was held to assist COA faculty voluntarily add an international dimension to their courses/curricula. To measure the international agriculture knowledge of graduating seniors in the COA, an exit questionnaire was developed, tested, and administered on a voluntary basis. The findings indicated that the responding students were somewhat deficient in their knowledge of international agriculture. It was difficult to develop a single instrument to measure knowledge of international agriculture among students in the diverse curricula of the COA, even though only small knowledge differences were found by disciplinary area.

Introduction

A number of factors suggest that today’s college of agriculture student should become more knowledgeable of the international aspects of agriculture. An increasing number of businesses are becoming involved in handling imported products or are producing goods for export. The passage of NAFTA (North American Free Trade Agreement) and recent changes in GATT (General Agreement on Tariffs and Trade) have encouraged U.S. agricultural firms to develop
plants in other countries or to become involved in formal relationships with firms abroad. Other factors include growth in the proportion of the U.S. population with international exposure and knowledge, increased sensitivity to and acceptance of cultural diversity in the U.S., and improved preparation among U.S. citizens for leadership roles in a global society (King & Martin, 1994). These and other comparable changes are encouraging firms to seek new employees who are more internationally literate. As the demand for internationally literate employees grows, both in the U.S. and abroad, it becomes more important for graduates from U.S. colleges of agriculture to know more about agriculture and food consumption in other countries, and to have a sound understanding of the U.S. role in the international food market.

Several recent studies have addressed the need for increased international knowledge among graduates of U.S. colleges of agriculture (Bjoraker, 1987; Brandt, 1987; Kellogg, 1984; Merritt, 1984; Moos, 1982; Scully, 1985). Surveys of agribusiness employers indicate that knowledge of international agriculture, other cultures, and global issues is an important factor influencing selection among prospective employees (LSU Office of Research, 1995).

Some U.S. colleges of agriculture have courses that are expressly designed and taught to provide students knowledge of or experiences with international agriculture, and/or an understanding of how U.S. agriculture fits into the international food and fiber market. The international content in these courses likely differs within and among colleges. Students in colleges of agriculture also have contact, both inside and outside the classroom, with students and faculty who have had personal experiences in other countries. Such opportunities can enable students to become more knowledgeable of international agriculture. “Agricultural Globalization” is a term that describes the incorporation of international content, materials, activities, and understanding into a college of agriculture’s teaching, research, and public service functions for the purpose of enhancing the relevance of the college and its various functions in an interdependent world (Henson & Noel, 1990).

A review of previous work on the subject of determining students’ knowledge of international agriculture indicates limited effort in the development of an appropriate measurement instrument that can be used across traditional agricultural disciplines/departments. Student performance in specific international agriculture courses, and/or a specific discipline, is relatively easy to measure and some work was found in this area. For example, Mason et al. (1994) developed an instrument to measure the international perspective of sophomore students in agronomy. The instrument contained questions on world demographics, trade, environmental issues, crop origin, and comparisons of agriculture in the U.S. and other countries. They used the instrument with 277 students in agronomy classes at the University of Nebraska, and found that overall knowledge, and knowledge on most of the topics was low.

A higher education challenge grant from the U.S. Department of Agriculture to the Louisiana State University College of Agriculture (hereinafter referred to as COA or College) in 1995 included (a) a series of globalization workshops to encourage faculty and departments/schools in the College to voluntarily add more international content to their courses and curricula, and (b) an evaluation of the international agriculture knowledge of graduating College seniors to include the design, testing, and use of an appropriate measurement instrument. Results of the evaluation are reported in this article.

Objectives and Methods

The purpose of this study was to measure the international agriculture knowledge of graduating seniors in the College of Agriculture at Louisiana State University, a U.S. land grant university.
The specific objectives of the study were:

1. Develop, test, and administer a questionnaire to measure the international agriculture knowledge of seniors graduating from the College.

2. Determine the international agriculture knowledge of seniors graduating from the College.

3. Identify relationships of COA graduating seniors’ curriculum, gender, and grade point average with their international agriculture knowledge.

An instrument to measure international agriculture knowledge of graduating seniors in the College was developed, pretested, and administered. Potential questions were solicited from faculty in one-third of the departments/schools in the College. Questions selected for the instrument were those considered appropriate to students in any of the 14 departments/schools of the College. These questions were reviewed by a different sample of College faculty using the appropriateness criterion. The instrument was then pretested on a small sample of upper class students (who were not part of the survey) within two departments in the College, and then further revised.

Given the disciplinary orientation of individual faculty in the College, the development of generic-type questions was emphasized. The authors selected those questions which they felt were not discipline-focused. The 11 questions selected fell into three categories: (a) economic relationships between the U.S. and other countries, (b) food and nutritional needs of countries, and (c) currencies, locations, time zones, and metric measurements. Three demographic questions were also included as part of the survey: graduation curriculum, gender, and grade point average. The questions were answered by graduating seniors from departments/schools during “exit” interviews conducted by the Associate Dean of the College.

The survey instrument was completed by small numbers of graduating seniors in the fall 1994 through fall 1995 semesters, and by larger numbers in the fall 1996 and spring 1997 semesters. A total of 93 students completed the questionnaire. Since the decision to respond to the survey was voluntary, a large number of students did not complete it for time and other reasons. Responding and non-responding graduating seniors appeared to be similar in grade point average and gender, but dissimilar by curriculum. The authors, therefore, have no basis for assuming differences in international agriculture knowledge between the two groups. Chi-square analyses were used to evaluate the association of gender, grade point average, and graduation curriculum with the responses of graduating seniors to the 11 questions.

Results

Responses of graduating seniors to the questionnaire are presented for the three categories of questions. For each question in a category, the question as asked is stated, and the percentages of students selecting specific answers are shown. The correct answer and response percentage are italicized.

Knowledge of World Economic Relationships

Graduating seniors were asked to respond to five economic-type questions relating to the United States and other countries:

1. As a percentage of the federal budget, the amount of money (foreign aid) the U.S. has given to other countries has (increased - 82%, decreased - 18%) over the last four decades.

2. When the U.S. helps other countries grow food, what is likely to happen to agricultural exports from the U.S. to those same countries (decrease - 65%, increase - 35%)?

3. Other things being equal, when the value of the U.S. dollar rises relative to the yen, the U.S. trade imbalance with Japan is likely to (worsen - 40%, be unchanged - 12%, improve - 48%).
4. With which of the following four countries does the U.S. currently not have a free trade agreement (Canada - 5%, Israel - 67%, Mexico - 9%, United Kingdom - 19%)?

5. Thanks to the NAFTA trade agreement, Levi Strauss can now more cheaply manufacture textiles in (Brazil - 3%, Europe - 11%, Canada - 2%, Mexico - 84%).

In response to Question # 1, the large majority of the students erroneously felt (82%) that U.S. foreign aid had increased over the last 40 years. Nearly two thirds of the graduating seniors incorrectly believed that U.S. agricultural aid to other countries harms agriculture trade with those same countries (question # 2). This is also a common misconception among agricultural producers. While 40% of the students were aware that an increase in the value of the dollar relative to the yen worsens the U.S. trade imbalance with Japan, the majority incorrectly believed that the trade imbalance with Japan would be unchanged (12%) or improved (48%).

The two trade-related questions brought mixed results. While the students mostly recognized that NAFTA would allow U.S. firms to produce more cheaply in Mexico, two thirds of the students incorrectly selected Israel as a country with which the U.S. does not have a free trade agreement. Only 19% correctly selected the United Kingdom.

Knowledge of World Food and Nutrition Needs

The students did better on the food needs and nutrition questions:

1. Which one of the following agricultural commodities is most widely consumed around the world (corn - 9%, rice - 76%, wheat - 15%)?

2. A typical meal in a poor country consists of: (Meat, vegetable and a dairy product - 0%, Cereal grains and a side dish of vegetables - 70%, Meat or fish and cereal grains - 23%, An egg or dairy product, vegetables, and fruit - 7%).

3. The focal point of individuals for meeting daily food needs in developing countries is (the business community - 7%, the local community - 22%, the family - 41%, the government - 30%).

4. Which one of the following four countries has had to depend on imports to meet its food needs over the past 20 years (Bangladesh - 17%, India - 31%, Rumania - 7%, Thailand - 0%, Don’t Know - 46%).

Students were, in general, knowledgeable of agricultural commodity use and what people consume in poor countries. Nearly three-fourths of them knew that rice, cereal grains, and vegetables are staple foods around the world.

Given that government (30% of respondents) and the business community (7% of the respondents) are much less important in developing countries than in mature economies, these two choices should have been unacceptable. However, the remaining choices received 63% of the responses, with “families” getting 41%, and community 22%.

Only 17% of the students correctly identified Bangladesh as the country consistently needing food imports. It is one of the poorest and most food deficient countries in the world (Chad and Rwanda are also food deficient but were not on the list.). To the students’ credit, however, none chose Thailand as consistently needing food imports. Thirty-one percent chose India, and 7% chose Rumania.

General Knowledge

General knowledge questions covered population, currencies, locations, time zones, and measurement units.
1. The current world population is approximately (4 billion - 16%, 6 billion - 66%, 8 billion - 18%) people.

2. You have a container that weighs 160 pounds and has a volume of 20 gallons. What are these measurements in kilograms and liters? (72 kilograms and 76 liters - 51%, 330 kilograms and 7 liters - 9%, None of the above - 16%, and Don’t know - 24%)

3. If it is 6 am in Baton Rouge, it is: (2 am in Alaska - 33%, 2 p.m. in South Africa - 18%, Noon in Japan - 8%, Don’t know - 41%)

4. Match country and currency: (Australia (35% chose dollar), India (52% chose Rupee), Israel (66% chose Shekel), Japan (97% chose Yen), and Mexico (98% chose Peso) (Currency choices: Dollar, Nila, Peso, Pounds, Rand, Rupee, Shekel, and Yen).

5. Match country and continents in which located: (Belize (14% chose North America), Cambodia (67% chose Asia), Finland (89% chose Europe), Iceland (55% chose Europe), New Zealand (81% chose Australia), Paraguay (79% chose South America), and Zimbabwe (97% chose Africa) (Continent choices: Africa, Asia, Australia, Europe, North America, and South America).

Two thirds of the respondents correctly estimated the current world population at 6 billion, while 16% chose 4 billion, and 18% chose 8 billion. Half of the seniors correctly converted pounds and gallons into metric equivalents. Knowledge of time zone differences was much lower as only a third of students correctly recognized that Alaska was four hours earlier than Central time.

Respondents did well in recognizing the continents wherein the designated countries were located, with the exception of Belize and Iceland. Most students did not recognize that Belize was in North America, and that Iceland was actually a part of Europe.

Relationships between International Agriculture Knowledge of Graduating Seniors and Selected Demographics

Fifty-four respondents were female, the remainder male. Thirty-six were graduating in human ecology; 16 in agronomy; 14 in agricultural economics; 12 in the animal sciences; 8 in forestry, wildlife and fisheries; 3 in vocational education; 2 in food science; 1 in rural sociology; and 1 in horticulture. Of those responding, 49 had GPAs of 3.0 or lower, and 45 had GPAs exceeding 3.0.

The chi-square test was used to assess the relationships between graduation curriculum, gender, and grade point average and the international agriculture knowledge of graduating seniors. The restrictions of this test--no zero expected values and no more than 20% expected values of 5 or less (Conover 1980)--force the elimination of categories with zero-expected values, and the combining of other categories to remove low expected values. In several instances, recombining of categories eliminated or reduced these violations, while in other cases no recombining of categories was possible. Therefore, suspected significant differences in distribution could not be evaluated. In those cases where minor violations remained, they are noted in footnotes to the tables.

Graduating seniors’ responses to the statement regarding change in proportion of the federal budget being contributed to foreign aid differed statistically by gender and grade point average (Table 1). Male graduating seniors were more likely to respond correctly, as were seniors with grade point averages greater than 3.0.

Responses to the statement regarding the impact of U.S. agricultural aid to developing countries
on U.S. agricultural exports differed by graduation curriculum and gender. Students from animal systems and food science more accurately responded to this statement than students in the other departments/schools. Again, male students responded more accurately than female students (Table 2).

Student responses to the statement regarding the impact of NAFTA on production costs in selected countries differed by gender. A larger proportion of males than females responded correctly (Table 3).

Graduating seniors’ responses to statements regarding the correct identification of currency with its country differed only for Israel (Table 4). Students with GPAs less than 3.0 were more likely to choose the correct currency for Israel than students with higher GPAs.

Table 1.

Relationships between Students’ Gender and Grade Point Average and Students’ Responses to the Question on Change in U.S. Foreign Aid’s Share of the Federal Budget over last 40 years.

<table>
<thead>
<tr>
<th>Student Characteristic</th>
<th>Correct N</th>
<th>Incorrect N</th>
<th>Chi-Square</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>47</td>
<td>2.640</td>
<td>0.10</td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade Point Average</td>
<td></td>
<td></td>
<td>10.334</td>
<td>0.001^a</td>
</tr>
<tr>
<td>2.0-3.0</td>
<td>3</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3.0</td>
<td>14</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (%)</td>
<td>18</td>
<td>82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^a Chi-Square violation in percentage of expected values of less than 5.

Table 2.

Relationships Between Students’ Graduation Curriculum and Gender and Students’ Responses to the Question on Estimation of Influence of U.S. Agricultural Aid on U.S. Exports to Aided Countries.

<table>
<thead>
<tr>
<th>Student Characteristic</th>
<th>Correct N</th>
<th>Incorrect N</th>
<th>Chi-Square</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduation Curriculum</td>
<td></td>
<td></td>
<td>11.152</td>
<td>0.025^a</td>
</tr>
<tr>
<td>Animal Systems, Food Science</td>
<td>8</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Ecology</td>
<td>7</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forestry, Wildlife, Fisheries</td>
<td>9</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horticulture, Agronomy</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>4.089</td>
<td>0.043</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (%)</td>
<td>35</td>
<td>65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^a Chi-Square violation in percentage of expected values of less than 5.
Table 3.

Relationship of Students’ Gender with Students’ Responses to the Question on Estimation of Change in Production Costs Resulting from NAFTA.

<table>
<thead>
<tr>
<th>Student Characteristic</th>
<th>Correct N</th>
<th>Incorrect N</th>
<th>Chi-Square</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>4.997</td>
<td>0.025a</td>
</tr>
<tr>
<td>Female</td>
<td>39</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (%)</td>
<td>81</td>
<td>19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Chi-Square violation in percentage of expected values of less than 5.

Table 4.

Relationship of Students’ Grade Point Average with Students’ Responses to the Question on the Identification of Currency of Israel.

<table>
<thead>
<tr>
<th>Student Characteristic</th>
<th>Correct N</th>
<th>Incorrect N</th>
<th>Chi-Square</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Point Average</td>
<td></td>
<td></td>
<td>5.584</td>
<td>0.018</td>
</tr>
<tr>
<td>2.0-3.0</td>
<td>36</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3.0</td>
<td>24</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall (%)</td>
<td>66</td>
<td>34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summary, Conclusions, and Limitations

The results of the study indicate that the sample of graduating seniors in the College may be somewhat deficient in their knowledge of international agriculture. This finding is not unexpected given that most courses taken by the majority of students present only a cursory treatment of issues related to international agriculture. Despite recent efforts to globalize curricula, courses, and instruction, the LSU College of Agriculture has much to do in accomplishing this objective.

Some seniors responding to the questionnaire did not feel that they had a satisfactory knowledge of international agriculture. In particular, two students admitted they had a very low level of knowledge. Others indicated a desire for more training in international agriculture as they recognized its growing importance.

The authors found it difficult to develop a single instrument to appropriately measure graduating seniors’ knowledge of international agriculture given the diversity of disciplines in the College. Included in the College are traditional departments, such as agronomy and animal science, as well as the Schools of Human Ecology, Vocational Education, and Forestry, Wildlife and Fisheries. One or more of the latter are assigned to other colleges at other land grant universities. Forty-six percent of the respondents to the survey were graduating from three departments/schools in the College -- human ecology, agronomy, and agricultural economics. Further investigation is needed on the selection of questions for the questionnaire, and its reliability with respect to disciplinary areas.

While the instrument used in this study was constructed and reviewed by a diverse group of faculty in the College, it represents only a preliminary step in the process of measuring
knowledge of international agriculture among graduating seniors in a college of agriculture. Additional work is needed to enlist input on the survey instrument from major employers, large multinational agribusiness firms, and other agencies that employ or are influential in the employment of graduates from an agricultural college. Potential employers can indicate what knowledge of international aspects of agriculture they expect prospective employees to have at the undergraduate level.

Only limited differences in international agriculture knowledge were found by disciplinary area. While knowledge level, as measured by the instrument, was relatively low throughout the College, some disciplines may need to work harder than others to improve the international agriculture knowledge of their students.

Male graduating seniors appeared to be slightly more knowledgeable than female graduating seniors. Whether this difference represents more interest in international issues among males than females cannot be ascertained from the study. Research is needed to address this issue.

Grade point average was not consistently related to the level of international agriculture knowledge of graduating seniors. Whereas higher GPA students more accurately answered some statements, lower GPA students did better on other statements. Since the knowledge required to reply to these statements can be obtained from sources other than college courses, it is unlikely that grade point average would be consistently associated with international agriculture knowledge.

The researchers encountered several limitations during the course of the study. One was the large proportion of graduating seniors over the study period who either did not participate in the Associate Dean’s exit interview process, or chose not to respond to the questionnaire at the close of the interview. A second limitation was the difficulty in developing questions which were not in some way biased toward students in a given discipline. A third limitation was the validity criterion imposed by the chi-square test.

This preliminary attempt to measure the international agriculture knowledge of graduating seniors was designed to assist teaching faculty and policy makers in course/curriculum development to better prepare students for an international work environment. Responses to the three sets of questions indicate a need for more training on the impact of macro-economic factors on agriculture in the U.S. and other countries. In general, it was found that students need additional preparation to raise their knowledge of international agriculture. Colleges of agriculture and faculty will have to be creative in developing curricula and courses which fulfill this need without adding to curriculum length and course complexity.

References


Note: Louisiana Agricultural Experiment Station Manuscript #97-05-0369.