Perceptions of Brazilian Agricultural School Teachers
Toward Attributes of Educational Innovations

Francisco Carlos T. Leite
Ph.D. Candidate
CAPES Foundation Scholar – Brasilia/Brazil
Department of Agricultural and Extension Education
The Pennsylvania State University
415 Agricultural Administration Building
University Park, PA 16802
E-mail: fleite@psu.edu

Connie D. Baggett
Rama B. Radhakrishna
Associate Professors
Department of Agricultural and Extension Education
The Pennsylvania State University
415 Agricultural Administration Building
University Park, PA 16802
Tel: (814) 863-7877
Fax: (814) 863-4753
E-mail: brr100@psu.edu

Abstract

This qualitative study examines the perceptions of federally supported agricultural school teachers in July and August of 2002 toward the attributes of two educational innovations brought by the educational reform currently taking place in Brazil – the separation between academic and professional education and the emergence of the competency based modular curriculum.

The framework for the study was Rogers’ (1995) diffusion of innovations theory, focusing specifically on the five attributes of innovation as defined by Rogers: relative advantage, compatibility, complexity, trialability, and observability.

Compatibility and relative advantage were the major attributes contributing to teachers’ reactions on the innovations. Teachers have demonstrated high degree of philosophical and ideological incompatibility with the separation between academic and professional education. Lack of teacher preparation programs was found to be the biggest operational flaw in the implementation of the reform.
Introduction

Brazil is experiencing a remarkable educational reform since the passage of the Law of Directives and Basics of the National Education in December, 1996. Such a reform has brought deep structural and curricular changes in the country’s educational system as a whole. The separation between academic and vocational education and the establishment of the competency based curriculum with modular organization are the key changes affecting agricultural education from the structural and curricular perspectives, respectively. Both changes are new to the Brazilian educational milieu, and as such, can be considered as educational innovations, since “an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 1995, p. 11).

Before the reform, secondary vocational education programs were integrated and delivered with academic education. Under this approach, all secondary level vocational programs comprised both vocational and general education subjects (such as history, biology, chemistry, math, Portuguese language, and so on). Curriculum was organized around disciplines in annual cycles. A typical secondary level program consisted of three cycles of one year each.

After the reform, a new system of vocational education (from now on called professional education) was instituted in parallel to a system of general education not allowing the integration between them in the same program anymore (Kuenzer, 2000). On the other hand, the discipline based annual curriculum was replaced by a competency based modular curriculum. Figure 1 graphically shows both the structural and the curricular dimensions of such a reform.

Figure 1. Schematic representation of the innovations brought about by the reform in the Brazilian educational system.

Agricultural education is now part of a broader educational category named professional education. The absence of a specific educational policy has the potential to cause harm to agricultural education because of its specific characteristics and peculiarities (Rodrigues, 1999). Among such particularities are the profile of its students (from rural areas, low income families, family agriculture linked), the fact that agricultural schools are usually
located in rural areas, and that the overwhelming majority of them are residential schools with some farmland (Sobral, 1998). The residential characteristic of most agricultural schools is currently essential to operate the school farm system and represents, in many cases, the only opportunity for youth from rural areas or from less privileged families to attend school.

This study focuses on the two educational innovations brought about by the reform in the Brazilian professional education as related to agricultural education, and specifically on their characteristics as perceived by agricultural education teachers. Research devoted to investigate how the properties of innovations affect their rate of adoption can be of great value in predicting people’s reaction to an innovation (Rogers, 1995).

**Theoretical Framework**

*Research on the Attributes of Innovations*

Attributes are characteristics by which an innovation can be described. Such attributes, as perceived by individuals, help to explain the different rates of adoption of innovations (Rogers, 1995). The question of *perception* is critical to research in the attributes of innovations. Rogers’ (1995) states that the *perceptions* of the attributes of an innovation, not the attributes as classified by experts or change agents, affect its rate of adoption. The behavior of individuals is predicated on how they *perceive* the primary attributes of an innovation (Moore & Benbasat, 1991). From a philosophical perspective, *perception* is circumscribed to the meaning of the experience of an individual, since reality is inextricably related to one’s consciousness of it (Creswell, 1998).

Rogers (1995) assumes five attributes of innovations described originally in his 1962 work, defined as follows:

Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes …. Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters …. Complexity is the degree to which an innovation is perceived as difficult to understand and use …. Trialability is the degree to which an innovation may be experimented with on a limited basis …. Observability is the degree to which the results of an innovation are visible to others (Rogers, 1995, pp. 15-16).

These five attributes were tested as predictors of the rate of adoption of educational innovations by Carlson (1965). He found that Rogers’ (1962) five attributes partially accounted for the varying rates of adoption of educational innovations. Studying high school principals, Holloway (1977) used Rogers’ (1962) five attributes of innovations as theoretical framework. He found that Rogers’ framework is empirically derived in an educational setting.

Moore and Benbasat (1991) relied primarily on Rogers’ five attributes of innovations in a study designed to develop an instrument to measure various perceptions that an individual may have of adopting an information technology innovation. They identified two additional constructs beyond Rogers’ attributes which they thought were important in the decision to adopt an innovation: Image and voluntariness of use. As noted in their study, some researchers, including Rogers, consider *image* as an aspect of *relative advantage.*
the other hand, consideration must be given to whether individuals are free to implement personal adoption or rejection decisions, which represents *voluntariness of use* (Moore & Benbasat, 1991).

Studying the adoption of innovations by teachers in a private school in Saudi Arabia, Amudi (1999) used Rogers’ (1995) five attributes of innovations. She found four major factors affecting the adoption of innovations by teachers: 1) the existence of training and support programs on how to implement the innovation, 2) the trialability of the innovation with the consequent opportunity to adjust it to their students and to themselves, 3) the observability of the innovation results in the students, in terms of motivation and academic success, and 4) the relative advantage of the innovation in the sense that it works better with the students than what they were already doing (Amudi, 1999). The first of Amudi’s (1999) factors can be placed into Rogers’ (1995) compatibility attribute, because it represents a need of the potential adopters.

*Findings in the Brazilian literature*

Reviewed Brazilian literature provided support for the importance of individuals’ perceptions about Rogers’ five attributes of innovations. Relative advantage was present in the reviewed literature impacting the perceptions in both positive and negative aspects in the structural and curricular dimensions.

In the positive aspect, curricular flexibility (Ministério da Educação, 2000) and the disappearance of the ambiguity present in previous professional education programs (Castro, 1999) were the leading positive factors. In the negative aspect, the increase in the dichotomy between technical and general education, the schools’ loss of identity, and the modular organization of the curriculum were the major perceived factors (Ferretti, 2000; Kuenzer, 2000; Oliveira, 2000). The modular organization of the curriculum directed to another aspect related to observability—an increase in the drop out rate, which occurred earlier than before (Oliveira, 2000).

The reform was seen as both consistent and inconsistent with the existing values (Castro, 1999; Kuenzer, 2000). Kuenzer (2000) noted that this perpetuated and crystallized social differences. Incompatibilities with past experiences (unsuccessful previous reforms), lack of programs to prepare teachers and a fixed and long term financial source to support the changes were also pointed out as major compatibility problems (Domingues, Toschi, & Oliveira, 2000; Kuenzer, 2000; Oliveira, 2000). Specifically related to agricultural education, Sobral (1998) noted that agricultural schools, after the reform, will prepare professionals for the corporations and large scale agricultural enterprises, as opposed to small and medium size ones.

Reviewed literature also showed evidences of the innovations being perceived as complex, with a high degree of sophistication, and requiring a great amount of interdisciplinary work (Domingues et al., 2000; Laudares & Tomas, 2001; Oliveira, 2000). This was particularly evident in the curricular dimension, which is seen as so complex to the point that expands a gap between what is being proposed in terms of educational innovations and what is being implemented in the schools. The theoretical aspects of the changes are so sophisticated that serious difficulties resulted relative to the schools’ understanding and application of the innovations (Oliveira, 2000).
Purpose of the Study

The primary purpose of this study was to examine how Brazilian federally supported agricultural school teachers perceive two innovations brought about by the reform in the country’s professional education system: 1) the separation between academic and professional education, and 2) the modular competency based curriculum. Rogers’ (1995) five attributes of innovations were the framework on which the study is grounded.

Methods and Data Sources

This study utilized qualitative research methods and was part of a sequential mixed model study (Tashakkori & Teddlie, 1998). A cluster sampling technique was used to select schools participating in the study. The 65 Brazilian federally supported agricultural schools were clustered according to the five geographical regions of the country. One school was then randomly selected in each region, resulting in five randomly selected schools.

Data were collected via one-to-one in-depth interviews. Four teachers in each school were randomly selected by the researcher to be interviewed. The frame of teachers was obtained through the school administration. Teachers’ frame was clustered into two categories: those who teach professional subjects and those who teach academic subjects. Teachers working in both areas were sorted to the area where he or she had most of his or her assignment. A total of 20 teachers were interviewed – 10 from the professional subjects area and 10 from the academic subjects area – following Creswell’s (1998) recommendation to the number of interviews to be conducted in a grounded theory approach. Interviews were conducted between July 22 and August 9, 2002.

An open-ended format interview protocol was developed with twenty eight guiding questions. Rogers’ (1995) diffusion of innovations theory, findings on the Brazilian literature, and Holloway’s (1977) and Moore and Benbasat (1991) studies were used as the basis for the development of the protocol. Questions were arranged into five blocks, each block related to one Rogers’ (1995) attribute of innovations. A panel of four experts reviewed the interview protocol for content validity. The protocol allowed the researcher the flexibility to pursue in-depth exploration of specific points that popped up on a one-to-one case basis. This flexibility follows Rubin and Rubin’s (1995) view that “qualitative interviewing design is flexible, iterative, and continuous, rather than prepared in advance and locked in stone” (Rubin and Rubin, 1995, p. 43).

Babbie (2001) sees a qualitative interview as “an interaction between an interviewer and a respondent in which the interviewer has a general plan of inquiry but not a specific set of questions that must be asked with particular words and in a particular order” (Babbie, 2001, p. 291). With this in mind, the researcher introduced himself as a graduate student from Penn State, explained the objectives of the study, and described his background as agricultural education teacher and administrator in Brazil at the beginning of each interview. This helped in establishing a rapport between interviewer and respondent. Each interview took an average time of 55 minutes and was tape recorded. Data were coded using the N-Vivo software.
Findings

Findings reported in this study are related to the first phase of a two-phase sequential mixed model study (Tashakkori & Teddlie, 1998). Such findings provided data to help to develop a survey instrument to conduct the study’s second phase.

Perceptions on Relative Advantage

Three points have emerged as advantages brought about by the reform, as related to the previous situation. Sixteen interviewees (80%) have expressed that the reform have improved the school structure. New facilities, machinery, and equipment were provided. The curricular flexibility, as a result of the modular organization of the curriculum, is the second major advantage as perceived by 70% of the interviewees. Nine of the respondents mentioned that the reform has obligated the schools to strengthen the ties with the world of work, especially with local agricultural enterprises, which in their perceptions is a very positive point.

It is opportune to report that the improvement in the schools’ structure was made possible due to a $500 million dollar program (Technical and Vocational Education Reform Program – PROEP), half of the funds coming from an Inter American Development Bank loan. According to four respondents, to take advantage of these funds, federally supported agricultural schools had to formally pledge to reduce the number of academic education students and increase the number of professional education students. The reduction in the number of academic education students is perceived as a disadvantage. In fact, the Ministerial Order N. 646 requires all federal schools to reduce academic education enrollment by 50% and increase professional education enrollment by 50%, as of 1997, in a five-year period (Ministry of Education, 1997).

The reform has promoted an increase in the number of students in agricultural schools. In one of the schools visited, an expansion of 200% in the number of students was reported. As a result of this increment, 70% of the interviewees stated that the reform has brought overload of work for teachers. According to them, this happens because the schools were not allowed to hire more teachers to face the increase in the number of students. This is one of the major disadvantages pointed out by the teachers.

Likewise, students are overloaded in school work according to the interviewees. In their perception, this is because many students now have to attend two different educational programs at the same time – one academic and the other professional. Moreover, the modules of professional education are intensive and concentrated, which bring peaks of school work. This situation is evident in the following comment from one of the interviewees:

“Students are being furnished with excessive and diverse information in a short period of time, without opportunity to reflect....They are taking with them (Babbie) only few pieces of many things.”

Another major disadvantage pointed out by 70% of the interviewees was the heterogeneity of the body of students in terms of quality of their academic preparation. This is an issue not found in the revised literature. After the reform, technical schools were
allowed (and even stimulated) to recruit students that have already completed secondary level academic education. They were also allowed and encouraged to accept students currently enrolled in secondary level academic program in one school and those who want to attend technical schools only to take professional education. However, agricultural schools have the characteristic of being usually located in rural areas, far from cities and in some cases even from towns. As a result, students who come to agricultural schools are, very often, those who attended or are attending rural schools. In Brazil, as in many developing countries, rural schools often suffer from a lack of adequately prepared teachers due to a number of factors. This, in turn, reflects on the quality standards of academic education they provide. To a certain extent, agricultural schools have functioned as an opportunity to bring students to a higher level of academic education preparation. With the separation between academic and professional education, this is no longer possible for all students.

Perceptions on Compatibility

The separation between academic and professional education was indicated by 18 interviewees (90%) as incompatible with their values and beliefs. Besides generating heterogeneity in the student body as reported under the relative advantage section, federally supported agricultural education teachers believe that the separation between academic and professional education restricts the opportunities for educational attainment. Since agricultural schools are often the only path to higher education for many rural youth, reducing the offer of secondary level academic programs in agricultural schools also reduces the opportunities to pursue higher education. As a result, the separation between academic and professional education also contributes to reinforce social differences, another incompatibility pointed out by the interviewees. The statement of one interviewee is elucidating:

“I think the separation between academic and professional education was cruel to the students.... They need an integral and holistic education in order to be able to fully exercise the freedom of personal, educational, and professional choice.”

The competency-based orientation in the curriculum required the schools to break down previous 3-year comprehensive secondary level professional programs into a number of professional habilitations (example: the 3-year agricultural technician program was broken down into technician in crop production, technician in livestock production, technician in horticulture, and so on). Agricultural schools start preparing “specialist technicians” as opposed to the “generalist technicians” prepared under the situation previous to the reform. On the views of 12 interviewees (60%), the preparation of “specialist technicians” serves to the interests of large scale agricultural enterprises to the detriment of family agriculture and small farmers. In addition, they envisioned the preparation of specialist technicians as restrictive to professional mobility, as a specialist technician is narrowly prepared for a very specific set of positions in the labor market. Conversely, a generalist technician is suitable to a wide set of opportunities in the agricultural sciences field. These are two aspects that are incompatible with the teachers’ values and beliefs.

Teachers also expressed their disagreement with what they called excessive technicality on the philosophical basis of the competency based model as implemented in
Brazil. According to them, this is incongruent with their educational philosophy because it creates a relationship of subservience to the labor market. Two comments from the interviewees help to advance their perceptions:

“I fear this reform. Everything is becoming technicalities with no academic or scientific basis.”

“It is too much ‘market’ for too little education. Market without quality education is synonym to slavery.”

Teachers see the way the reform has been implemented did not meet their needs. Virtually all interviewees (100%) declared that there were no teacher training programs at all. The most they had were group studies and discussions among the school team, with some eventual lecture from an outside member. Interviewees in two different schools stated that some individuals in the school were invited to go to the Ministry of Education headquarters to attend training sessions. However those people, who attended the training, did not share properly the training received. The general feeling among interviewees (65%) was that the Brazilian Ministry of Education itself was not prepared to implement the reform, because it did not offer much support to the schools. Lack of training is a restrictive perception also affecting complexity and trialability as attributes of innovations.

Perceptions on Complexity

Competency based assessment is the major complexity point brought about by the reform, as mentioned by 100% of the interviewees. They see competency based assessment as very difficult to carry out due to three factors: 1) the concept of competency is not very clear, 2) it brings excessive individual responsibility to the teacher, and 3) it is extremely laborious and time consuming, requiring a lot of paperwork. In fact, they are frightened to attest if the student is or is not “competent” and cause damage to his or her professional/educational life. According to their perception, the previous system of assigning only numeric grades did not have the potential to cause that much harm to the student, because the final result was an average grade, with shared responsibility among all teachers. Moreover, they are requested to write a qualitative and comprehensive assessment for each and every student, but they still have to assign a numeric grade because the office of the registrar did not change their system.

The interdisciplinary work proclaimed by the reform is the other complexity point brought by the interviewees. A total of 15 teachers (75%) indicated interdisciplinary work as a source of complexity. According to them, to work interdisciplinary depends on the relationship among teachers, and on the nature of the subject matter. They also pointed out a very interesting point: to work interdisciplinary implies to expose one’s deficiencies to a group, which is not easy to do and requires a great deal of trust and confidence among group members. Interviewees stated that if they had had the opportunity to be trained on how to apply interdisciplinary work into the classroom they probably would feel more comfortable with the topic. The following two verbatim transcriptions will help to understand the teacher dilemma:
“If you look at the lesson plans and at the school strategic plan, it [interdisciplinary work] is there. But if you look into a real classroom work it is rare. And it is not our fault; we do not know how to carry it out!”

“I did not change my classroom practice at all. I just pretend, for official purposes, that I am working like this [interdisciplinary work].... It is very complex, and I do not know how to implement it.”

**Perceptions on Trialability**

The Law has granted a 5-year trial period to implement the reform (Ministry of Education, 1997). The majority of the interviewees think the trial period was enough in time length, but ineffective in outcomes. Five interviewees even think the trial period could be shorter. However, 75% of the interviewees expressed the feeling that during the trial period they were not supplied with the tools to effectively try all innovations.

Again, the general feeling is that the Brazilian Ministry of Education did not provide support for implementing the reform, as showed in the comment of one teacher:

“We were orphans from the Ministry of Education. They simply sent us a package with a message: ‘do this by yourselves; you have five years to learn.’ This is how we felt.’

They praised very much the support the got from peers and from the school administration, but they felt it was not enough. They linked the inefficacy of the trial period, although enough in time length, to the lack of systematic training programs.

**Perceptions on Observability**

Four out of seven points that emerged on observability are closely related to those that emerged on relative advantage. Interviewees pointed out the following as major observable results of the reform: 1) improvement in the school structure, 2) increase in the number of students, 3) closer relationship with the world of work, 4) extra amount of work for teachers and students, 5) shortage in staff personnel to run the school farm, 6) students less practical/ experiential orientated, and 7) students have a different profile in terms of socio-economic status, family background, and origin.

A very specific point related to agricultural schools was highlighted as one of the consequences of the reform. In three different schools, interviewees have noted that due to the fact students are overloaded with school work, they do not have as much time as before to participate in practical activities at the production units in the school farm. Indeed, many agricultural schools rely partially on students’ work to run the school farm. Because it is no longer possible in the same intensity as before, and schools were not allowed to hire new staff members, a shortage in staff to run the school farm became evident.

Due to the fact that teachers got an extra amount of work and the modules are intensive and concentrated, according to 55% of the interviewees, an unexpected observable result emerged: students are having more theoretical than practical preparation. The amount of time students spend in classrooms have increased to the detriment of the time available to
work on supervised agricultural experiences in the school farm. As a result, students are being less experiential-oriented, as would be expected from a secondary level technician.

Finally, 45% of the interviewees have indicated they observed a change in the profile of students being admitted to the schools after the reform. According to them, the number of students that come from agriculture-related families has decreased, as well as those coming from rural areas. They also observe that students are coming from families of higher socio economic status than before. Figure 2 presents a summary of the findings of this study.

Conclusions

The degree of resistance among federally supported agricultural school teachers towards the adoption of the two educational innovations – separation between academic and vocational education, and the competency based modular curriculum – varies according to the innovation. Compatibility and relative advantage appear to be the leading attributes driving their perceptions about the adoption of the innovations.

Overall, Brazilian federally supported agricultural school teachers are favorable to the modular organization of the curriculum which they perceive as advantageous because it brings flexibility to the curriculum. They see the competency-based approach as bringing excessive technicality to the educational process, benefiting mainly large scale agricultural enterprises and restricting students’ opportunities for professional mobility. This is one major factor of incompatibility with their values and beliefs. The competency-based assessment approach is seen as the major factor of complexity. However, they believe that adequate training programs might lessen their frustration on the degree of complexity of competency based assessment.

Eighty percent of the interviewees stated they would have adopted the competency based modular curriculum more readily if the reform was voluntary, since the excessive technicality present on the model was corrected. On the other hand, 85% of the teachers affirmed they definitely would not have separated academic and professional education. In their perception, the separation between academic and professional education restricts opportunities for educational attainment, reinforces social differences, promotes academic heterogeneity in the student body, and brings an excessive amount of work for teachers and students. The separation between academic and professional education has strong incompatibilities with the teachers’ philosophical and ideological beliefs, and as such, has the potential to be a serious barrier to the success of the reform.

The lack of teacher preparation programs is the biggest operational flaw in the implementation of the reform. It impacts on teachers’ perceptions about the compatibility, complexity, and trialability attributes of the innovations. Adequate teacher preparation programs might have made the trialability period more effective, lessened teachers’ perceptions about the complexity of the innovations, and met their professional support needs to implement the innovations. It is also clear that the best strategy to deliver training programs is bringing instructors/lecturers to the school rather than taking a few school people to be trained outside and share learned information with the rest of school peers later on.
Student preparation is more theoretical than experiential-oriented. This trend can be a restrictive aspect on the future employability of graduates. Perceived change in the students’ family background and origin will require schools to redesign their agricultural programs to include not only education in agriculture, but also education about and beyond agriculture.
Figure 2. Summary of findings

<table>
<thead>
<tr>
<th>Relative Advantage</th>
<th>Compatibility</th>
<th>Complexity</th>
<th>Trialability</th>
<th>Observability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separation between academic and professional education</td>
<td>Restricts educational attainment (-)</td>
<td>Restricts professional mobility (-)</td>
<td>CB assessment very complex (-)</td>
<td>Competency based (CB) modular curriculum</td>
</tr>
<tr>
<td>Heterogeneous student body (-)</td>
<td>Reinforces social differences (-)</td>
<td>Interdisciplinary complex to apply (-)</td>
<td>Training not provided (-)</td>
<td>Improved school structure</td>
</tr>
<tr>
<td>Teachers overloaded in work (-)</td>
<td>Benefits large scale ag. enterprises (-)</td>
<td>Increase in the # of students</td>
<td>Trial period:</td>
<td>Increase in the # of students</td>
</tr>
<tr>
<td>Students overloaded in work (-)</td>
<td>Restricts professional mobility (-)</td>
<td>Closer to the world of work</td>
<td>• Enough time</td>
<td>Stud/Teachers overloaded in work</td>
</tr>
<tr>
<td>Curricular flexibility (+)</td>
<td>Lack of training did not meet teachers’ needs (-)</td>
<td>Shortage in staff personnel</td>
<td>• Ineffective outcomes</td>
<td>Students less experiential-oriented</td>
</tr>
<tr>
<td>Strengthens ties with world of work (+)</td>
<td>Qualit./Quant. assessment not compatible (-)</td>
<td>Students less experiential-oriented</td>
<td>Lack of training restricts efficacy of trial period (-)</td>
<td>Students with different profile</td>
</tr>
<tr>
<td>Improved school structure (+)</td>
<td>Improved school structure</td>
<td>Students less experiential-oriented</td>
<td>Training not provided (-)</td>
<td></td>
</tr>
</tbody>
</table>

(+) = positive perception  (-) = negative perception
References


Castro, C. M. (1999). O ensino profissional: Morto e sem missa de sétimo dia [Professional education: Dead without seventh day mass]. In M. H. G. d. Castro & A. M. Q. Davanzo (Eds.), Situação da educação básica no Brasil [The state of affairs of the Brazilian basic education], (pp. 111-118). Brasília, DF, Brazil: INEP.


Kuenzer, A. Z. (2000). O ensino médio agora é para a vida: Entre o pretendido, o dito e o feito [High school is now for life: Among what is intended, what is said, and what is done]. Educação e Sociedade, 21(70), 15-40.


