The Implementation of Educational Reform in Brazil’s Agricultural Schools:  
A Study of Agricultural Teachers’ Perceptions¹

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Abstract

This study addressed the perceptions of Brazilian federally supported agricultural school teachers towards two concepts enforced by the reform of professional education in Brazil: the separation between academic and professional education and the modular competency based curriculum. Rogers’ (1995) five attributes of innovations (relative advantage, compatibility, complexity, trialability, and observability), and Moore and Benbasat (1991) voluntariness of use were used as a framework for the study. The study used a two-phase sequential mixed model exploratory design (Tashakkori & Teddlie, 1998), collecting and analyzing both qualitative and quantitative data. A multinomial logistic regression model estimated the effects of the independent variables on the rate of adoption of innovations.

Rogers’ (1995) five attributes contributed to explain 74.4% of the rate of adoption of innovations, but did not explain the non-adoption. Trialability was the only attribute that did not show statistical significance as a predictor of adoption. Moore and Benbasat’s (1991) voluntariness of use did not contribute to explain the rate of adoption. Teaching experience was the only demographic characteristic that showed statistical significance in predicting the adoption.

Lack of training was the major limitation indicated by the teachers in the reform implementation process. The authoritarian manner in which the reform was implemented was incompatible with teachers’ values and beliefs. Teachers perceived the reform as more complex than the previous situation. Competency based evaluation was the premier complexity factor. Teachers have also indicated that the reform has brought an extra load of work for teachers and students.

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Introduction

Agricultural education in Brazil is recognized as formal education programs at the secondary level, usually delivered in agricultural schools, designed to prepare people to work in production agriculture. Agricultural schools are typically residential schools located in rural areas with some farmland in its structure (Leite, 1999; Sobral, 1998). The National Directory of Schools of the Primary Sector (Instituto Nacional de Estudos e Pesquisas Educacionais, 2000b) shows a total of 256 agricultural schools with an enrollment of 54,809 students at the secondary level.

Brazilian agricultural education at the secondary level underwent a structural reform since the passage of the Law of Directives and Basics of National Education (LDB) in 1996 by the Brazilian Congress. Two main innovations were brought by the reform: 1) the separation between professional (formerly known as vocational) and academic education, and 2) the establishment of competency based curricula. The pedagogical practice was expected to move from a discipline-based content delivery model to a competency-based model, having the curriculum as the central axis (Domingues, Toschi, & Oliveira, 2000). Brazilian literature (Oliveira, 2000; Sousa, 2002) suggests that a high degree of resistance exists among federally supported agricultural schools toward adoption of the educational innovations brought about by the reform.

The innovations brought about by the reform can be categorized into two dimensions: a structural dimension represented by the segregation between general and professional education, and a curricular dimension represented by the establishment of the competency based curricula (Ferretti, 2000b; Oliveira, 2000). From the structural dimension, general and professional education are no longer in the same network, since the new legal mandate has instituted a system of professional education in parallel to the system of general education (Kuenzer, 2000). From the curricular dimension, the curriculum is considered the central axis of the reform (Domingues et al., 2000), to the point the emergence of competency based curriculum is considered a new paradigm in the professional education (Ministério da Educação, 2000).

This study tackles the reform of Brazilian professional education under Rogers’ (1995) diffusion of innovations theory. Rogers’ (1995) pointed out that much effort has been made in determining the characteristics of the different adopter categories, while relatively little effort has been devoted to analyzing the attributes of innovations. This study focused on the characteristics of innovations and specifically on its attributes as a path to analyze people’s reactions to an innovation (Rogers, 1995).

Theoretical Framework

Rogers (1962; 1995) and Rogers and Shoemaker (1971) found five attributes that explained from 49 to 87% the differences in the rate of adoption of innovations: relative advantage, compatibility, complexity, trialability, and observability. Research relative to the attributes of innovations can be of great value in predicting people’s reactions to an innovation, which can be modified by the way in which an innovation is named and positioned, and how it is related to existing beliefs (Rogers, 1995).

Rogers (1995) assumes five attributes of innovations 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).

Several studies (Amudi, 1999; Carlson, 1965; Holloway, 1977; Lee, 2001) have supported, in different degrees, the importance of Rogers’ five attributes as predictors of the rate of adoption of innovations in educational settings. Moore and Benbasat (1991) found that the way individuals perceive the primary attributes was critical in determining their behavior toward an innovation. 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). Consideration must be given to whether individuals are free to implement personal adoption or rejection decisions, which represents “voluntariness of use” (Moore & Benbasat, 1991).

Literature also supports the importance of individuals’ perceptions about some of Rogers’ five attributes of innovations as predictors of the rate of adoption of educational innovations. Relative advantage had both positive and negative impacts in the structural and curricular dimensions. Curricular flexibility (Ministério da Educação, 2000) and the disappearance of the ambiguity present in previous professional education programs (Castro, 1999) were viewed as positive factors, while 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 negative factors (Ferretti, 2000a; Kuenzer, 2000; Oliveira, 2000). The modular curriculum directs to another aspect related to observability— an increase in the drop out rate, which occurs earlier than before (Oliveira, 2000).

The reform was viewed as both consistent and inconsistent with the existing values (Castro, 1999; Kuenzer, 2000). Kuenzer made the point that it perpetuated and crystallized social differences. Incompatibilities with past experiences (unsuccessful previous reforms), lack of programs to prepare teachers and a fixed and lasting financial source to support the changes were also pointed out as major compatibilities problems (Domingues et al., 2000; Kuenzer, 2000; Oliveira, 2000). Finally, 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).

Purpose and Objectives

The focus of this study was to examine two concepts enforced by the reform of professional education in Brazil, relative to agricultural education at the technical level: the separation between general and professional education, and the competency based curriculum. The primary purpose was to determine to what extent each of Rogers’ (1995) five attributes of innovations explained the different rates of adoption of the innovations brought about by the reform of professional education in Brazil. This study also explored the contribution of voluntariness of use (Moore and Benbasat, 1991), as a special attribute, in explaining the different rates of adoption of innovations. Three research questions were developed to address the purposes of the study:
1) To what extent Rogers’ (1995) five attributes of innovations explained the different rates of adoption of the innovations brought about by the professional education reform in Brazilian federally supported agricultural schools?

2) To what extent has voluntariness of use (Moore and Benbasat, 1991) contributed to explaining the rate of adoption of the innovations brought about by the professional education reform in Brazilian federally supported agricultural schools?

3) To what extent demographic characteristics of teachers (gender, age, educational level, and teaching experience) have influenced their perceptions about the innovations brought about by the professional education reform?

**Methods**

A sequential mixed model exploratory investigation design (Tashakkori & Teddlie, 1998) was used to collect qualitative and quantitative data that were analyzed in a complementary manner. Sequential mixed models employ multiple approaches to data collection, analysis and inference in a sequence of separated phases. Phase two of this study (quantitative) was dependent on the findings from the first phase (qualitative). Data and methodological triangulation (Denzin, 1978) were used in the study design as a tool to search for convergence of results.

The target population consisted of all teachers of Brazilian federally supported agricultural schools. In phase one (qualitative), the multi-stage sampling technique was used to randomly select one federally supported agricultural school in each of Brazil’s five geographical regions. A total of five schools were randomly selected. In each of these schools, four teachers were randomly selected to be interviewed by the researcher. The frame was obtained from the teachers directory in each school.

In phase two (quantitative) schools were first clustered according to their locality in the five geographical regions of the country. Then, a proportional random sample of 15 schools was chosen to be surveyed during phase two of the study. The number of stratified randomly selected schools allowed for at least one school being selected per region. The researcher made telephone contacts with all 15 principals of the selected schools, with a threefold objective: 1) to invite the schools to participate in the study, 2) identify a contact person who was responsible for receiving, distributing to teachers, collecting the responses, and mailing questionnaires back to the researcher, and 3) obtain the frame of teachers in each school. The contact person in each school furnished the frame for teachers. Questionnaires were mailed to the entire population of teachers (N=479) in the 15 randomly selected schools.

An open-ended format interview protocol was developed with 28 guiding questions to collect data in the first phase of the study. A panel of four experts reviewed the interview questions and protocol for content validity. Questions were arranged into five blocks, each block related to one of Rogers’ (1995) attributes of innovations – relative advantage, compatibility, complexity, trialability, and observability. A final section was designed to search for the voluntariness of adoption (Moore and Benbasat, 1991) and the existence of constructs, outside of Rogers’ (1995) five attributes of innovations.

In phase two, a seven-section survey instrument using closed- and open-ended questions was developed to collect data from the population of teachers (N=479). Questions on Rogers’ (1995) five attributes of innovations (Sections I-V) were designed to measure the constructs using a five-point Likert scale. Section VI elicited information on voluntariness of use and rate of adoption (dependent variable of the study, measured as nominal data) and obtained information on other constructs, outside of Rogers’ (1995) five attributes of
innovations. This was accomplished through the only open-ended, fill-in format question in the instrument. Section VII was designed to collect demographic data of the participants – gender, age, educational level, area of teaching, years of teaching experience, and area of residence. Data obtained from phase one and findings in the literature served as the basis for the quantitative survey instrument development. A panel of eight experts reviewed the instrument for content and face validity. The instrument was pilot tested in Brazil and had acceptable reliability (Cronbach Alpha of .85).

Qualitative data (phase one) were collected during summer 2002. Data were transcribed from the audio tapes using Microsoft Word®. The QSR NUD*IST Vivo software package for qualitative research was used to code the data. Data interpretation was conducted through three major steps. Initially, coded data were retrieved and organized by code to allow the exploration of each set of data, putting it into categories. Second, the researcher explored the categories that were created in the first step. Finally, the researcher searched for patterns, themes, paradoxes, and contrasts with the goal of transforming categorized data into meaningful data. Findings from the qualitative analysis were used to develop the instrument for the second phase (quantitative) of the study.

Quantitative data (phase two) were collected during spring 2003 by mailing the questionnaire to the 479 Brazilian supported agricultural teachers selected for the study. Procedures suggested by Dillman (2000) were followed to collect data. A total of 297 usable questionnaires were returned (62% response rate). A random sample of 20 nonrespondents (11%) was double-dipped and asked to answer five survey questions (one question in each of the questionnaire’s five first sections). Since no differences were found between respondents and nonrespondents, findings of this study were generalized to the population (Linder, Murphy, & Briers, 2001; Miller & Smith, 1983). Data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS) software for Windows. Descriptive and inferential statistics were used to analyze the data. Independent and dependent t-tests were used to compare means. Intercorrelations between Rogers’ (1995) five attributes of innovations were analyzed using Pearson correlation. A chi-square test was used to analyze the relationship between the willingness to implement the modular competency based curriculum and to separate academic and professional education. A multinomial logistic regression model was developed to estimate the effects of the independent and moderator variables in the rate of adoption of innovations.

**Findings**

**Research Question 1**: To what extent Rogers’ (1995) five attributes of innovations explained the different rates of adoption of the innovations brought about by the professional education reform in Brazilian federally supported agricultural schools?

Study’s independent variables (relative advantage, compatibility, complexity, trialability, and observability) explained 77.4% the differences in the rate of adoption of the innovations. Trialability was the only one of the Rogers’ (1995) five attributes of innovations that did not show statistical significance ($p=.574$) as a predictor for the rate of adoption in the logistic regression model. The multinomial logistic regression model developed in the study did not explain the non-adoption of the innovations.

Findings suggest that the trial period did not provide enough opportunities for teachers to experiment with the innovations. Findings also suggest that teachers do not
perceive the innovations brought about by the reform as better than the previous situation. The separation between academic and professional education is perceived as not compatible with teachers’ values and beliefs (70% in the qualitative phase and 55.7% in the quantitative phase). Lack of training opportunities during the implementation period was the premier issue voluntarily raised in the qualitative phase; in the quantitative phase, 73.8% of teachers agreed that they were not provided tools to effectively test the innovations. A significant relationship \( r = 0.408; p < 0.001 \) was found between the supply of tools to effectively test the innovations and the adequacy of the training programs, suggesting a convergence of results between qualitative and quantitative data.

The manner in which the reform was implemented was also viewed as incompatibility. During the qualitative phase of the study, 50% of the interviewees mentioned that the reform was imposed on teachers, while 65.4% of the teachers in the quantitative phase agreed that the reform was not implemented in a participatory manner.

Sixty percent of the interviewees in the qualitative phase, and 70.4% of the teachers in the quantitative phase of the study considered the reform more complex than the previous one, clearly indicating a convergence of results. Competency based evaluation is indicated as complex in both qualitative (mentioned by 80% of the interviewees) and quantitative (64% considered competency based evaluation as “complex to very complex”) data. Three aspects emerged from the interviewees’ perceptions in the qualitative phase, about the complexity of competency based evaluation: 1) the concept of competency was not clear and was not always clearly differentiated from skill; 2) it was laborious and time consuming, leading to extra work for teachers and 3) it brought teachers excessive individual responsibility in judging students. Interdisciplinary work is considered not complex for 75% of the interviewees, but it was difficult to implement on a daily basis.

An substantial majority of teachers in the qualitative phase (70%) felt that there was an increase in the work load for teachers due to 1) an increase in the number of students in many schools (with no new teachers’ hired) and 2) the modular organization of the curriculum that has concentrated activities were reduced from 3 to 1.5 years. This perception was supported by 84.7% of the teachers in the quantitative phase of the study. Increase in the work load for students was also noted by 55% of the interviewees in the qualitative phase and 50% of teachers in the quantitative phase; according to them, students are overloaded in school work because they have to attend two different educational programs at the same time – one academic and another professional. Moreover, the modules of professional education are intensive and concentrated, which brings additional load of school work.

After the reform, federally supported agricultural schools offer three options for student enrollment: 1) students enroll in both academic and professional education programs in the school, keeping two separate registration entries (concomitance in the school option); 2) students enroll in professional education in the agricultural school and in academic education in other school, attending both programs at the same time in different schools (concomitance in different schools option) and; 3) students who have previously completed secondary level academic education may enroll only in professional education programs (sequential or post-middle option).

The concomitance in different schools and the sequential options for enrollment were found to have brought a great degree of heterogeneity in the student enrollment. This is due to the fact that in these options students who took or had taken academic education in other schools are entitled to come to agricultural schools to take professional education. Schools in
rural areas, small villages, and towns in Brazil, as in many developing countries, often suffer from a lack of adequately prepared teachers. This, in turn, reflected negatively on the quality standards of academic education. In many cases, students who do not take an academic education program in federally supported agricultural schools, come from these lower standard academic education schools. Such heterogeneity in the student enrollment (students with different quality of academic preparation) was seen as a problem for schools located far from cities (more than 30 miles from cities with 500,000 more inhabitants).

Research Question 2: To what extent has voluntariness of use (Moore and Benbasat, 1991) contributed to explaining the rate of adoption of the innovations brought about by the professional education reform in Brazilian federally supported agricultural schools?

Voluntariness of use (Moore and Benbasat, 1991) did not contribute to explaining the rate of adoption of the innovations studied; it explained only 0.4% the rate of adoption. Teachers were asked to respond that if the reform was voluntary whether they would have chosen to separate academic and professional education and to implement the modular competency based curriculum. They were more likely to voluntarily adopt the modular competency based curriculum than they were to adopt the separation between academic and professional education ($\chi^2 = 41.18; df = 1; p < .001$). Eighty percent of interviewees in the qualitative phase indicated that they would have voluntarily adopted the modular competency based curriculum and only 20% indicated their willingness to voluntarily adopt the separation academic-professional education.

Research Question 3: To what extent demographic characteristics of teachers (gender, age, educational level, and teaching experience) have influenced their perceptions about the innovations brought about by the professional education reform?

Gender, age, and educational level did not have an impact on the rate of adoption. Teaching experience, which has showed statistical significance ($p=.048$) in the complete multinomial logistic regression model contributed to explaining, by itself, 2.2% of the rate of adoption of the innovations.

Conclusions

Overall, this study supports Rogers’ (1995) claim that the five attributes of innovations – relative advantage, compatibility, complexity, trialability, and observability – explained from 49 to 87 percent of the difference in the rate of adoption of innovations. Findings of this study indicated that Rogers’ (1995) five attributes of innovations collectively contributed to explaining 74.4% of the rate of adoption of the innovations. Trialability was the only attribute that did not show statistical significance ($p=.574$) as a predictor for the rate of adoption.

Findings of this study did not support Moore and Benbasat (1991) study on voluntariness of use. Multinomial logistic regression analysis indicated that voluntariness of use did not contribute to explaining the rate of adoption of the innovations studied. It explained only 0.4% of the rate of adoption.

Teaching experience, measured in years of teaching (continuous scale), was the only demographic characteristic that showed statistical significance in predicting the adoption of innovations ($p=.048$), and explained 2.2% of the rate of adoption of the innovations.

Federally supported agricultural school teachers were more likely to adopt the modular competency based curriculum than they were to adopt the separation between academic and
vocational education. They also perceived that the competency based curriculum was better as compared to the previous discipline-based annual curriculum. The majority of teachers indicated that the competency based curriculum was compatible with their values and beliefs. Such a positive perception about the competency based curriculum may be related to the positive perception expressed by 6 interviewees (30%) in the qualitative phase that such a curriculum design is more flexible than the discipline based curricula.

Lack of adequate training programs was viewed as a major limitation to the implementation of the reform. Findings also suggested that no systematic and continuous effort was evident in providing adequate training for teachers during the implementation of the reform. Teachers felt that they were not provided with the necessary and required tools to effectively test the innovations; that the length of the trial period was not enough, and that the trial period did not help them to dispel uncertainties they had about the reform. Lack of adequate training was also a major factor of inconsistence with teachers’ needs and may have influenced their perceptions on the advantages and disadvantages of the reform.

Teachers felt that the reform was imposed upon them and was not implemented in a participatory manner. They did not see themselves as active participants in the reform process. This finding supports Datnow’s (2002) view that “reform models and their designers must approach teachers as assets and collaborators, not as obstacles or passive implementers of the reform” (Datnow, 2002, p. 233).

Teachers perceived the innovations brought about by the reform as more complex than the discipline-based curricula. Competency based evaluation was the premier complexity factor. Teachers perceived student qualitative assessment, as required by competency based evaluation, to be especially complex. Teachers perceived interdisciplinary work as having an average to low level of complexity, but it was difficult to implement in the daily practice because it relied on interpersonal relationships among teachers and the nature of the subject matter taught.

The heterogeneity in the student enrollment brought about by the reform was perceived by rural teachers as a factor that made their job even more difficult. Heterogeneity in the student enrollment refers primarily to students with different quality of academic preparation enrolled in the same program. This perception of rural teachers may be due to an idiosyncratic characteristic of Brazilian agricultural schools. Agricultural schools in Brazil are usually residential and dedicated to primarily serving students from rural areas and/or low income families, traditionally known for providing quality education (both academic and professional). Agricultural schools, when located far from cities, usually enrolled students who came from rural and/or small town and village schools, often suffering from a lack of adequately prepared teachers. This reflected negatively on the quality standards of academic education offered and may be a factor of the heterogeneity in the student enrollment.

Findings also indicated that professional education reform in Brazil has brought an extra work load for teachers and for students. Perceptions that emerged from the qualitative phase of the study suggested that teachers are overloaded with work due to a combination of two factors: an increase in the number of students in many schools and no new teachers were hired; and the modular organization of the curriculum has concentrated activities that were reduced from 3 years to 1.5 years. As a result, courses were taught in a more intensive schedule, with greater number of sessions with the same number of teachers. Findings also suggest that students are overloaded with school work because they must attend two different educational programs at the same time – one academic and another professional. Moreover,
the modules of professional education were intensive and concentrated, which required additional school work for students.

**Recommendations**

Findings of this study have implications for Brazilian agricultural education schools at the secondary level. Further research is needed to:

1) Replicate this study with Brazilian federally supported agricultural schools to explore the differences in the perceptions of the attributes of innovations between the adopters and non-adopters groups over time.

2) Replicate this study in the Brazilian state supported agricultural schools networks, particularly in those states that have large number of agricultural schools under their direct administrative and financial support. Data obtained from such studies should be triangulated with data obtained from this study in search for convergence or divergence of findings.

Educational administrators and policymakers at all levels should give high priority to the design and implementation of training programs on the implementation of the reform. Educational administrators and policymakers are strongly encouraged to actively involve universities in the process of planning and delivering training programs. Competency based evaluation deserves special attention as a subject for training, since it was found to be the major source of complexity for teachers.

When providing funds for reform implementation, it is recommended that policymakers create mechanisms to ensure financial support for teacher preparation programs. Ideally, funds for training programs would be made available prior to or at least simultaneously with funds for other reform’s activities.

Educational administrators and policymakers should take all necessary steps to ensure that teachers are active participants in all activities related to conception and the implementation of the reform. Following Datnow’s (2002) view, educational administrators and policymakers must approach teachers as assets and collaborators throughout the reform process.

It is important that educational administrators at the local and federal levels understand the excessive load of work the reform has brought for teachers and students. They must come up with solutions to address this issue, which may include a combination of actions such as relocation of school resources, change in administrative procedures, change in the school routine, and the hiring of new teachers and/or staff personnel.
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