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**FACTORS INFLUENCING THE ADOPTION OF EDUCATIONAL REFORM
IN BRAZIL'S FEDERALLY SUPPORTED AGRICULTURAL SCHOOLS**

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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 (phase one-qualitative, and phase two-quantitative) sequential mixed model exploratory design (Tashakkori & Teddlie, 1998). Cluster and stratified random sampling techniques were employed to collect data from schools and individuals. A 28-question interview protocol and a 61-item questionnaire were developed by the researcher to collect data. Categorized qualitative data were explored through a de-contextualization/re-contextualization process. Descriptive and correlational statistics were used to analyze 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.

Teachers were more likely to adopt the modular competency based curriculum than the separation between academic and vocational education. 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. It was recommended to replicate this study with both federally and state supported agricultural schools. It was also recommended to implement systematic needs assessment at the school level to inform the development of adequate teacher training programs.

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I dedicate this dissertation to my wife Sandra and my two daughters Ana Clara and Maria Julia. This degree does not belong solely to myself – it belongs to us.

During the four years of graduate work we truly lived in deep communion. We have shared all new (both good and not so good) experiences, sacrificed together, were happy (and also not so happy) together ...

How many hours housekeeping and food servicing... How many hours as a barista, a dishwasher ... What made this possible? Love, dedication, and a sense of a shared future.

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CHAPTER 1

Introduction

Brazilian professional education is currently undergoing a new transformation since the passage of the new Law of Directives and Basics of National Education (LDB) in 1996 by the Brazilian Congress. The two main innovations brought by the reform were 1) the separation between professional and academic education, and 2) the establishment of competency based curricula. Curriculum is the central axis on which the reform is grounded (Domingues, Toschi, & Oliveira, 2000). The pedagogical practice is expected to move from the discipline-based content delivery model to the competency-building model (Figure 1-1). The new model is closely related to the modular organization of the curriculum, assuming each module as a complete formative unit. According to the Ministry of Education (n.d.), professional education curricula should be flexible and have modular organization allowing students the freedom to take diverse paths and enter in or drop out of the sequence at any point.

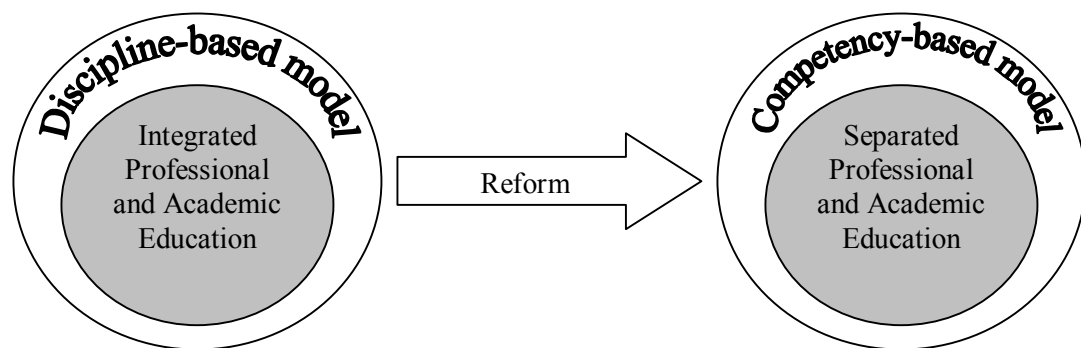


Figure 1-1: Schematic Representation of the Reform in the Brazilian Educational System

Professional education reform is being implemented as part of Brazil's major structural reform in the educational system. The Presidential Decree N. 2208 of April 17, 1997 set up the goals and operational guidelines for professional education as mandated in the LDB. National curricula directives for professional education were established in 1999. In 2000, the Brazilian Ministry of Education published the national curricula references for professional education, including agricultural education. Figure 1-2 summarizes the legal framework of Brazilian professional education.

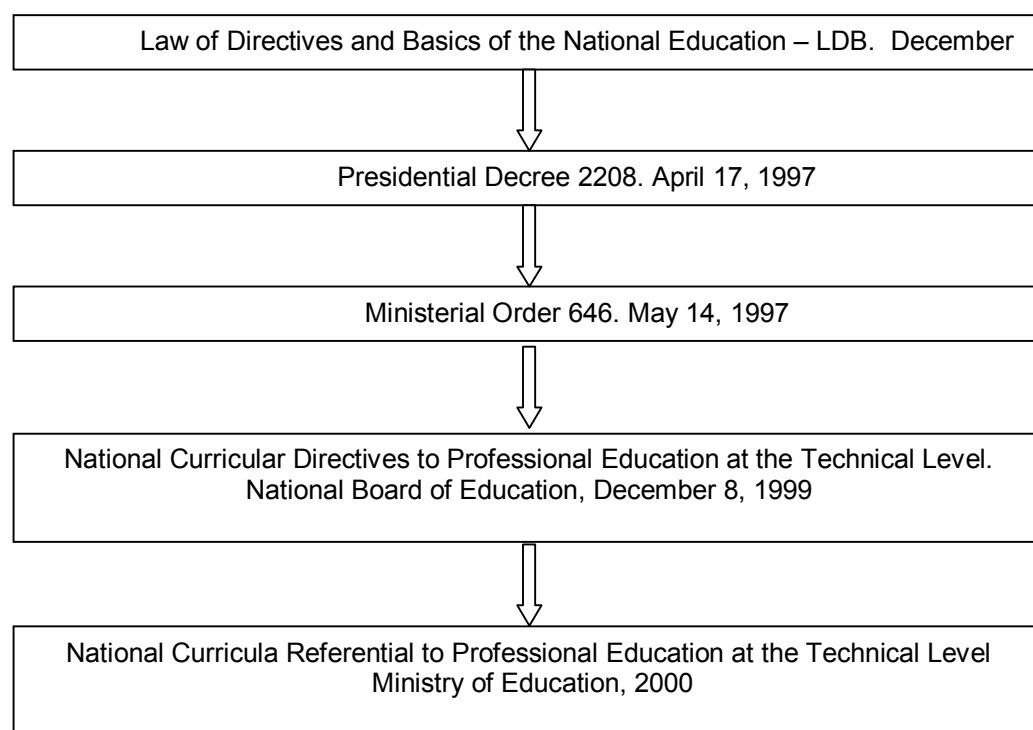


Figure 1-2: Basic Legal Framework of Brazilian Professional Education

As of January 2002, all professional schools are required by law to operate under the new curricular directives and standards. Federally supported agricultural schools are required to implement the reform based upon the criteria and standards set by the

Ministerial Order No. 646 of May 14, 1997. Such an order requires that every federally supported school should develop an implementation plan that takes into consideration the school's financial, material, and human resources. Despite this administrative requirement, the literature suggests that a high degree of resistance exists among federally supported professional schools toward adoption of the educational innovations brought about by the reform (Oliveira, 2000). According to J. R. Sousa (personal communication, February 20, 2002), President of the Council of the Principals of Federal Agro-technical Schools, the rate of adoption varies greatly among federal agro-technical schools.

Educational innovation is any new educational practice (Carlson, 1965). Rogers (1995) defines innovation as any idea, practice, or object that is perceived as new by an individual or other unit of adoption. Since the separation between professional and academic education, and competency based curriculum are new educational practices in the Brazilian system, they can be considered educational innovations.

Attributes are the general characteristics by which any innovation may be described (Rogers & Shoemaker, 1971). It is the attributes, not as seen by experts but as perceived by the potential adopters, which really matters (Rogers & Shoemaker, 1971). Moore and Benbasat (1991) support this aspect stating that the behavior of individuals is predicated by how they perceive the primary attributes of an innovation.

Rogers (1995) suggests five general attributes that explain from 49 to 87 percent of the variance in the rate of adoption of innovations in general: 1) *Relative advantage*, or the degree to which an innovation is perceived as better than the idea it supersedes, 2)

Compatibility, or the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of the receivers, 3) *Complexity*, or the degree to which an innovation is perceived as difficult to understand and use, 4) *Trialability*, or the degree to which an innovation may be experimented with on a limited basis, and 5) *Observability*, or the degree to which the results of an innovation are visible to others.

Rogers' (1995) work has been widely cited as the theoretical basis in diffusion of educational innovations research (Amudi, 1999; Carlson, 1965; Holloway, 1977; Lee, 2001). Education ranks fourth among the main diffusion traditions in terms of the number of publications, numbering 359 publications as of 1994 (Rogers, 1995). However, Rogers (1995) pointed out that much effort has been spent in determining the characteristics of the different adopter categories, while relatively little effort has been devoted to analyzing the attributes of innovations. Research on the attributes of innovations can be of great value in predicting people's reactions to an innovation (Rogers, 1995).

Assessing and understanding the existence of the gap between what is being proposed in terms of educational policy and what is being implemented in the schools (Oliveira, 2000) can be highly valuable to the Brazilian educational system. Identifying how school teachers perceive the primary attributes of an educational innovation can also help both educational administrators and policymakers to foresee the outcomes and take corrective actions to ensure achievement of the best possible results.

Organization of Brazilian Professional Education

Professional education is assumed to be an educational modality separated from general education and organized into three levels: basic, technical, and technological (Figure 1-3). The basic level comprises programs directed toward youth and adults and does not require previous schooling. The main objective of this level is to re-qualify people to meet the demands of the world of work. Professional education programs at the basic level do not require formal curricular regulation in Brazil.

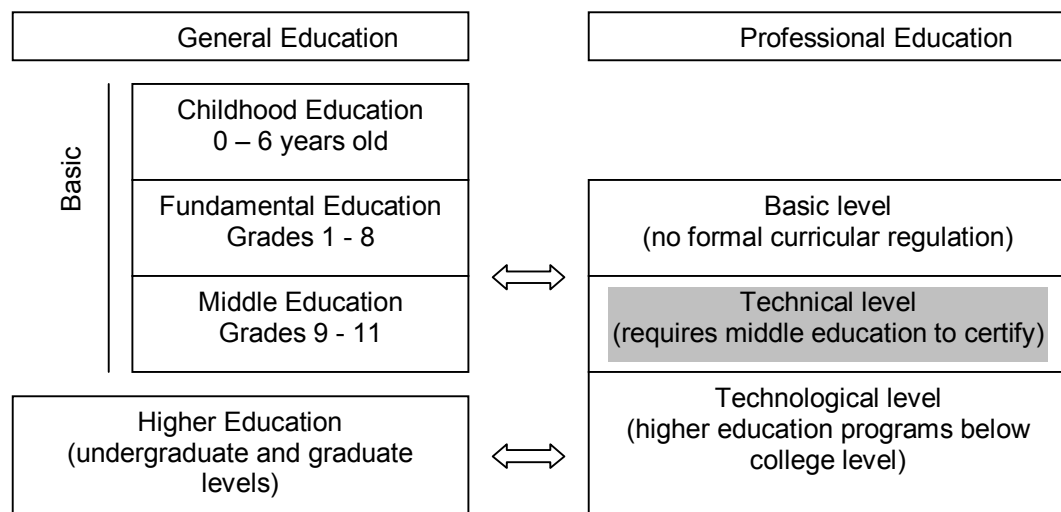


Figure 1-3: Simplified Brazilian Educational Organization Model, with Indication of the Focus of this Study (shading area)

Professional education at the technical level includes programs designed for youth and adults who are enrolled in or have graduated from middle education. Graduation in professional education at the technical level requires proof of completing middle education. Individuals who graduate from professional education at the technical level receive the technician degree.

The highest level of professional education is at the technological level, recognized by the legislation as higher education comprising programs below the college level. Individuals who graduate from professional education at the technological level receive the degree of “tecnólogo.” Professional education at the technological level is closely linked to undergraduate and graduate education programs. Many institutions which offer professional education at the technological level also offer undergraduate and/or graduate programs.

Agricultural Education in Brazil

Agricultural education is embodied in the professional education modality. Agricultural education in Brazil is restricted to agricultural schools, which 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 technical level (Instituto Nacional de Estudos e Pesquisas Educacionais, 2000a). Figure 1-4 illustrates the distribution of these schools throughout the country.

Such a network of agricultural schools is supported and administered by federal (25%), state (46%), and municipal (15%) governments, as well as private organizations (14%). Federally supported agricultural schools accounts for 51% of the total students registered in agricultural programs throughout the country (Table 3-1) and are divided

into two sub-groups: the federal agro-technical schools and the federal university-bounded schools. The former is operated under direct supervision of the Ministry of Education, while the latter under the supervision of the Federal University's administration.

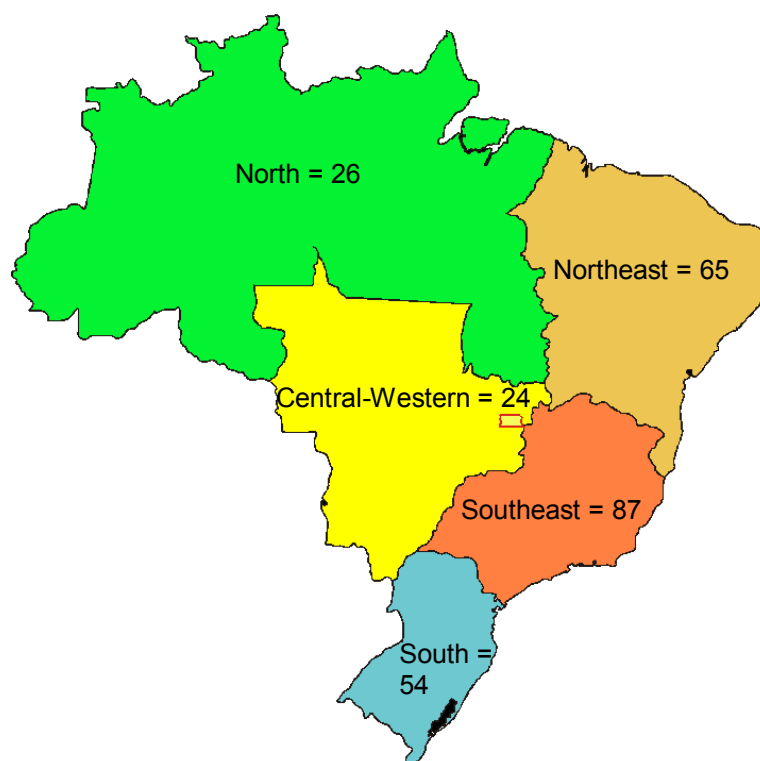


Figure 1-4: Geographic Distribution of Agricultural Schools with Technical-Level Programs

Purpose of the Study and Research Objectives

The focus of this study was to understand the adoption process of two concepts enforced by the reform of professional education in Brazil, related to agricultural

education at the technical level: the separation between general and professional education, and the competency based curriculum. The primary purpose was determine to what extent Rogers' (1995) five attributes of innovations explain 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 the educational innovations. Finally, this study described the demographic characteristics of Brazilian federally supported agricultural school teachers.

Three research questions were developed to address the purposes of the study:

1) To what extent do 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, teaching experience) have impacted their perceptions about the innovations brought about by the professional education reform?

Assumptions

1. The reform of professional education is an authority innovation-decision type (Rogers, 1995), in which the choices to adopt or reject are made by a relatively few

individuals in a system who possess power, status, or technical expertise. The individual member of the system has little or no influence; he or she simply implements the decision.

Limitations of the Study

This study is limited to federally supported agricultural schools in Brazil offering agricultural education programs at the professional technical education level. Therefore, the findings can not be generalized to non-federally supported agricultural schools in Brazil. Also, this study does not purport to evaluate the implementation of the reform in the Brazilian professional education because of its infancy stage of implementation. Findings will be limited to people's perceptions about the innovation that has influenced the rate of adoption.

Operational Definitions

Articulation – Curricular interface that makes feasible a fluent, adjusted, and smooth transition between general and professional education modalities. Articulation assumes a communion of finalities as well as a planned and combined action between middle education and professional education at the technical level (Conselho Nacional de Educação, 1999).

Educational modality – Group of educational programs with common aims. Educational modalities are subsystems within the educational system.

Federal agro-technical school – Self-governed schools supported by the Federal government and linked directly to the Ministry of Education. Federal agro-technical schools offer agricultural education programs at the technical level, programs at the basic level and middle education (Secretaria de Educação Média e Tecnológica, 2002).

Innovation – An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. The perceived newness of the idea for the individual determines his or her reaction to it (Rogers, 1995).

Innovation-decision process – Series of actions and choices over time through which an individual (or an organization) evaluates a new idea and decides whether or not to incorporate the innovation into ongoing practice (Rogers, 1995).

Middle education – Final stage of Brazilian basic education (Lei No. 9394, 1996). It corresponds to grades 9 - 11 in the U.S. educational system.

Professional education – Educational modality comprising three levels, delivered in articulation with general education, devoted to the continuous development of aptitudes necessary to the professional life (Decreto No. 2208, 1997). Professional education has the same meaning as vocational education.

Rate of adoption – Is the relative speed with which an innovation is adopted by members of a social system (Rogers, 1995). The adoption period will be considered as the interlude between the enactment of the Presidential Decree 2208 on April 17, 1997, and December 31, 2001, which is the deadline to all schools operate under the new legal rules.

CHAPTER 2

Review of the Literature

The purpose of this chapter was to set up the theoretical framework of the study according to innovation-decision processes paradigm as set forth by Rogers (1995). This chapter also reviews the Brazilian literature on how individuals perceive the reform of professional education. The focus is the separation between professional and academic education, and the establishment of competency based curricula.

Carlson (1965) named new educational practice as educational innovation. Since educational reform brings new educational practices, it can also be named educational innovation. Holloway (1977) identified three categories of investigation that have emerged in the diffusion of innovations tradition: 1) characteristics of the adopters, 2) characteristics of the innovations, and 3) characteristics of the change process. According to Rogers (1995),

The diffusion research literature indicates that much effort has been spent in studying “people” differences in innovativeness (that is, in determining the characteristics of the different adopter categories) but that relatively little effort has been devoted to analyzing “innovation” differences (that is, in investigating how the properties of innovations affect their rate of adoption). This latter type of research can be of great value in predicting people’s reactions to an innovation.

These reactions can be modified by the way in which an innovation is named and positioned, and how it is related to existing beliefs (p. 204).

Rogers (1995) defined diffusion of innovation as the process by which an innovation is communicated through certain channels over time among the members of a social system. He emphasized four main elements in the diffusion of innovations, which are identifiable in every diffusion research study. They are: the innovation itself, the communication channels, time, and the social system. This study is focused on the innovation itself as an element of the diffusion process, and specifically on the characteristics that affect its rate of adoption (Figure 2-1).

In order to confirm the decision to adopt or reject an innovation, all units of analysis go over a series of actions and choices over time through which they evaluate a new idea and decide whether or not to incorporate the innovation into ongoing practice. This behavior, which consists essentially of dealing with the uncertainty that is inherently involved in deciding about a new alternative, is called innovation-decision process (Rogers, 1995). Figure 2-1 illustrates the innovation-decision process.

Characteristics of Innovations and Their Rate of Adoption

Characteristics are the attributes 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). Rate of adoption is the relative speed with which an innovation is adopted by members of a social system (Rogers, 1995).

The issue of perception of the attributes of innovations by individuals appears in the literature as a critical point:

Primary attributes are intrinsic to an innovation independent of their perception by potential adopters. The behavior of individuals, however, is predicated by how they **perceive** these primary attributes. Because different adopters might perceive primary characteristics in different ways, their eventual behaviors might differ (Moore & Benbasat, 1991).

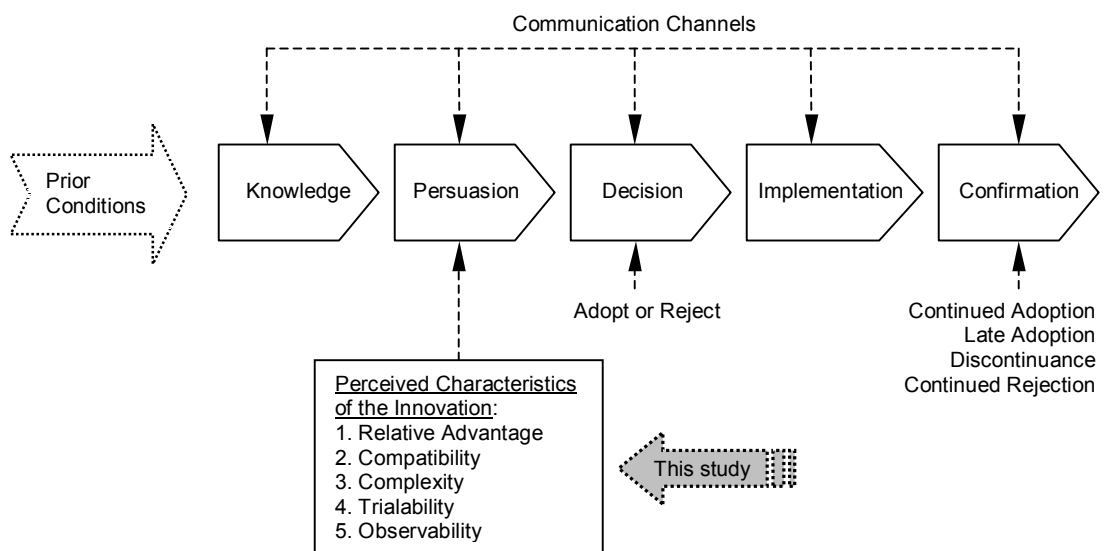


Figure 2-1: The Innovation-Decision Process (Rogers, 1995) and the Focus of this Study

Rogers (1995) indicated five attributes of innovations, earlier identified in his previous work (Rogers, 1962), that explain from 49 to 87 percent of the difference in the rate of adoption of innovations. They are: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability (Figure 2-1). Rogers (1995) defined the five attributes of innovations 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 (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 the theoretical framework. He found that Rogers' framework is empirically derived in an educational setting, with the addition of a new attribute – status – occurring as a cohesive unit in an empirical analysis in that educational setting.

Moore and Benbasat (1991) relied primarily on Rogers' five attributes of innovations in a study designed to develop an instrument to measure the various perceptions that an individual may have of adopting an information technology innovation. They identified two further constructs beyond Rogers' attributes which were thought important in the decision to adopt an innovation: Image and voluntariness of use. As they noted in the study, some researchers, including Rogers, considers *image* as an aspect of *relative advantage*. On 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).

Two recent studies (Amudi, 1999; Lee, 2001) also made use of Rogers' (1995) five attributes as the basis to analyze factors affecting the rate of adoption of innovations in educational settings. Studying the adoption of innovations in a private school in Saudi Arabia, Amudi (1999) 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. Three out of the four factors found by Amudi (1999) are directly related to the characteristics of the innovation. The first factor – presence of training and support programs – can be considered as an intervening factor in the perceptions of teachers toward the innovation.

Developing a model to facilitate the implementation of innovations in a higher education setting, Lee (2001) justified the use of Rogers' (1995) framework because of its methodological elegance. He noticed that because most educational innovations are developed outside of the educational environment, its compatibility with the values of the school is a critical factor affecting the rate of adoption.

Figure 2-2 graphically summarizes the literature in the diffusion of innovations research. This graphical summary emphasizes the research in the characteristics of innovations, the focus of this study.

The Authority Innovation-Decision Type

Most diffusion efforts in educational settings are classified as authority innovation-decisions (Rogers & Shoemaker, 1971). “Authority innovation-decisions are choices to adopt or reject an innovation that are made by a relatively few individuals in a system who possess power, status, or technical expertise. The individual member of the system ... simply implements the decision” (Rogers, 1995).

In most cases involving school settings, this type of innovation-decision is made by the principal, an administrator, or a special supervising committee such as school board who is in a position of authority over teachers or teaching faculty (Lee, 2001). New policies imposed by local, state, and federal organizations or governments are also authority innovation-decisions (Amudi, 1999).

The Reform of Professional Education in the Brazilian Literature

A major reform in the Brazilian professional education system started in late 1996 with the passage of the Law of Directives and Basics of the National Education by the Brazilian Congress.

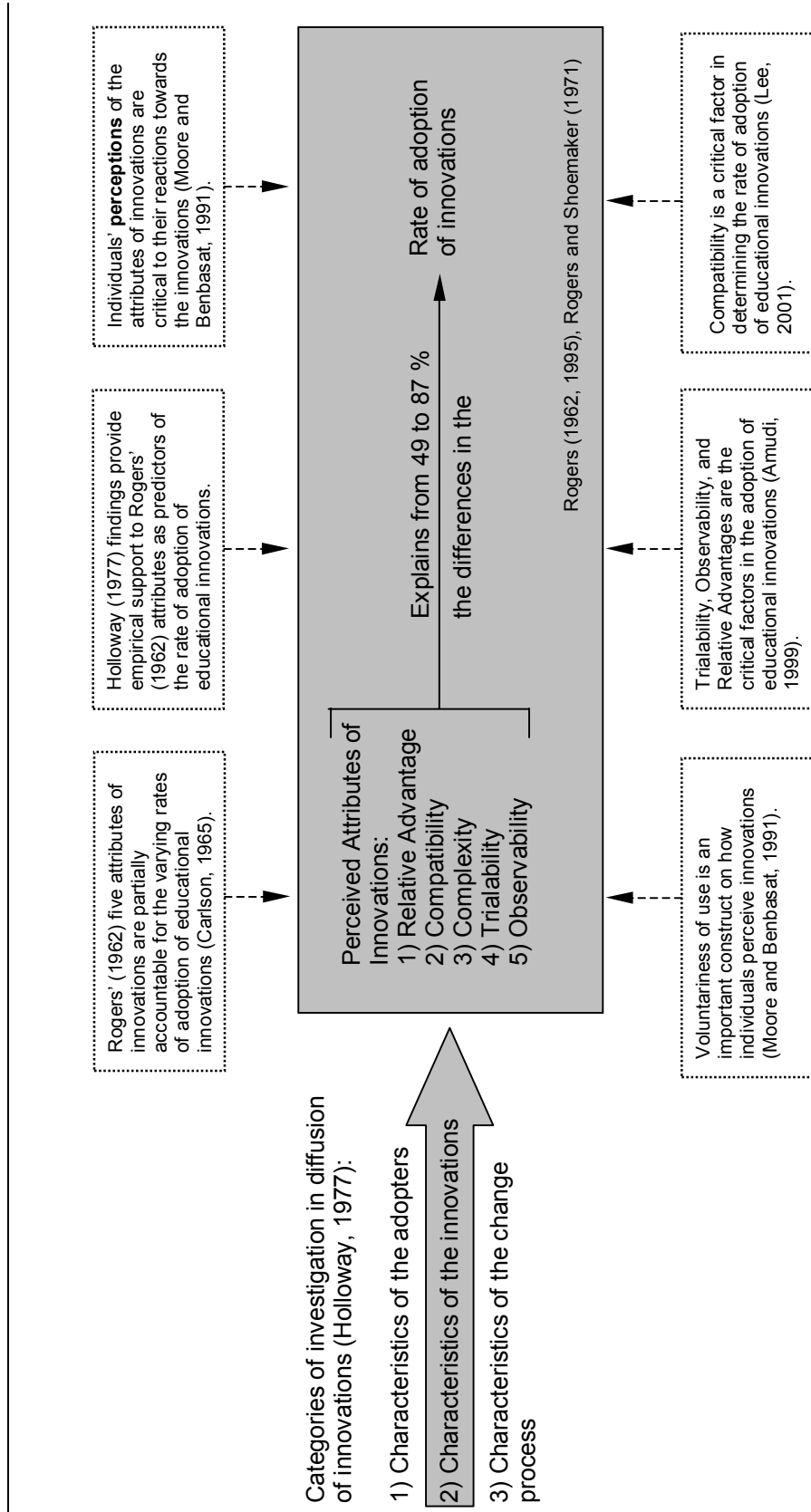


Figure 2–2: Summary of Supporting Literature in the Characteristics of Innovations Research

However, what actually have promoted structural reforms in the Brazilian educational system in recent years are the measures implemented by the executive power at the federal level (Ferretti, 2000b). The Presidential Decree No. 2208, which set up the goals and operational guidelines for professional education, is a good example of this tradition.

Brazilian literature (Castro, 1999; Conselho Nacional de Educação, 1999; Domingues et al., 2000; Ferretti, 2000a; Ferretti, 2000b; Kuenzer, 2000; Laudares & Tomas, 2001; Ministério da Educação, 2000, n.d.; Oliveira, 2000) highlights two major dimensions of the reform of professional education: the structural and the curricular dimensions. The structural dimension is represented by the segregation between general and professional education brought by the new legal framework.

The curricular dimension is represented by the establishment of competency based curricula, launched through the National Curricular Directives to Professional Education at the Technical Level (1999).

The Structural Dimension: Separation Between General and Professional Education

From the structural perspective, reform includes the separation of general and professional education (Ferretti, 2000b). Kuenzer (2000) pointed out that 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. As a result, integration between professional and general education is no longer encouraged (Kuenzer, 2000). Kuenzer claimed that there is a need to surpass the historical polarization between techniques and humanities that splits schools into those

that teach how to think and those that teach how to do. Accordingly, the structural segregation between professional and general education does not create environmental conditions that favor such a polarization. On the other hand, Castro (1999) argued that the structural segregation between professional and general education extinguished the ambiguity of the previous professional education programs. From now on, the academic high school will prepare students only to pursue higher education, while professional high school will prepare students only for immediate employment (Castro, 1999).

The issue of consistence with the existing values is presented in the discussion about the structural changes in professional education. Castro (1999), acknowledged that students attending professional education were those of lower socioeconomic status and that professional education programs were moving in the right direction. Consequently, the kind of programs that professional education is supposed to deliver under the new structure is congruent with the kind of occupations students with low socioeconomic level can expect. Conversely, Kuenzer (2000) argued that schools that concentrate on skills development for immediate employment are sometimes acclaimed as democratic, but actually have perpetuated and crystallized social differences. She relied on Gramsci to affirm that schools were antidemocratic not by the content they teach, but by their purpose, the one that prepared people according to the role they were supposed to play in the society, assigning different programs to different people based on their class origin (Kuenzer, 2000).

Ferretti (2000b) argued that the relationship brought about by the reform has promoted a split between general and professional education from the structural

perspective. In a qualitative study with teachers, administrators, staff, students, and parents of three professional schools, Oliveira (2000) found a great degree of resistance to the implementation of the reform. About 80 percent of the opinions collected through interviews were unfavorable to the reform. The reform was causing a loss of identity to the schools, as perceived by them. The segregation between general and professional education and the new modular structure of the professional education curricula were among the leading negative perceptions relative to the reform (Oliveira, 2000).

The Curricular Dimension: Establishment of Competency Based Curricula

The curriculum is perceived by the subjects as the most important element in defining the school practice and, as such, the element that was most affected by the reform (Oliveira, 2000). The curriculum is considered the central axis of the reform, according to Domingues, Toschi, and Oliveira (2000). It brought two major changes in relation to the previous situation: Pedagogical and curricular autonomy to schools and the need of interdisciplinary work towards the curriculum (Domingues et al., 2000).

In fact, official documents call the emergence of competency based curriculum as a new paradigm in the professional education (Ministério da Educação, 2000). The National Curricula Referential to Professional Education at the Technical Level stated that the curriculum should no longer rely on contents or disciplines, but rather on competencies. Contents should be the inputs to develop and support competencies. The competency-model is the keystone in the curricular directives to professional education (Ferretti, 2000a).

Historical and Philosophical Foundations of Competency Based Education

The literature has plenty indications about the origins and evolution of the notion of competency applied to education. Some authors (Brundrett, 2000) tracked the origins of competency based education back in the 1920s due to the drive for technical and rational management systems; others (Flowers, 1990) considered the work of John Dewey in the early 1900's as the starting point of the competency based approach in education.

However, there was agreement in the literature (Alaniz, 2002; Araújo, 2002; Brundrett, 2000; Flowers, 1990; Hyland, 1994; Maués, Wondje, & Gauthier, 2002; Ramos, 2001) in recognizing the 1960's as the resurgence point of competency based movement. David McClelland, a Harvard University professor, is recognized as the 1960's prime-mover in the development of the concept of the centrality of competencies, who argued that traditional academic examinations did not predict job performance or success in life. Hyland (1994) suggested that the Competency Based Education and Training (CBET) in England had its roots in the American movement in the 1960s, which he called performance based education, performance pedagogy or pedagogy of the domain. Ramos (2001) asserted that British CBTE and American competency based movement had at least three common elements: a conservative ideology, a foundation in the conductive psychology, and the purpose to serve to the specific needs of the industry. On the other hand, Brundrett (2000) argued two crucial differences between the American and British traditions. First, whereas American tradition focused on people, British tradition stressed the job as the center of competency definition; second,

American tradition was concerned with the behavior of *superior performance*, while British tradition was concerned with performance criteria indicating *minimum competence levels*.

Flowers (1990) summarized in his literature review that competency based education was introduced in the U.S. as a response to 1) public dissatisfaction with schools and 2) public perceptions of teacher incompetence. Moreover, competency based education assures that students learn the skills needed to become successful, productive workers. So, competency based education is a means to accomplish one of vocational education's goals: providing well-trained workers for industry (Flowers, 1990).

Three different (and often conflicting) schools of thought should be considered in establishing a philosophical foundation to competency based education: realism, pragmatism, and behaviorism. A blend of common, conflicting, and complementary elements from these traditions constitutes the tripod that provides philosophical support for competency based education.

The realism's views about the independent reality and the objectivity of knowledge have been praised in the industrial and technological age. As a result, schools tend to see their major task as the training and preparation of professional and technicians in a society where professionalism and technical skills are highly prized. Realism as a philosophy of education was devoted to establishing and refining definitive scientific knowledge through an understanding of facts and ways of ordering and classifying knowledge. The competency based claim for efficiency and efficacy of education to meet the demands of the industry can be related to scientific realism as a philosophy of

education. From this perspective the way knowledge is ordered, classified, and presented through the curriculum, determines its efficacy. Teachers are expected to be experts in imparting useful and necessary knowledge (Ozmon & Craver, 1999).

From pragmatism, the literature (Araújo, 2002; Bell & Mitchell, 2001; Flowers, 1990; Hyland, 1993; McAshan, 1979; Monjan & Gassner, 1979; Ramos, 2001) asserts the centrality of Dewey's and Rousseau's thoughts as major influences in competency based education. Ramos (2001) argued that European educators were more influenced by Rousseau's perspective and, as a result, have developed a more "person-centered" competency based approach. On the other hand, American educators have developed a different framework combining Dewey's ideas with a cognitive psychology approach concerned with objectives, resulting in an outcome based perspective. One key feature of competency based education that had come directly from pragmatism is the experiential framework, especially the educational connection between nature/environment and experience. Another hallmark that competency based education model have borrowed from pragmatism is its focus on *individual interest*. Rousseau's landmark, the question of individual interest appeared in Dewey's thoughts as the concept of uniqueness, which was one of the most controversial areas in competence based education.

Araújo (2002) argued that the notion of individuality borrowed from Dewey exalts individuality to the detriment of the social and historical conditions of the individual. On the other hand, Ozmon & Craver (1999) argued that what Dewey actually said was that individuality and sociality were interrelated: Both were possibilities and not guarantees. Another controversial point to be considered about pragmatism as a

philosophical root to competency based education refers to instrumentalism. The practical orientation in competency based education was often translated as immediateness and/or utilitarianism: What is needed are practical solutions to practical (and immediate) problems. As a result, Maués (2002) argued that competency based education was driven by market forces that require education to adjust continuously to their needs.

Behaviorism influenced competence based education from its belief that behavior was caused by environmental conditions; it provided the basis for the use of functional analyses to produce competence frameworks. Such frameworks separated mental and physical components of performance. Attempt to appraise them individually, led to seriously underestimating the role of knowledge and understanding (Hyland, 1993). However, behaviorism's major influence in competency based education lies on the performance-based approach that originated from Bloom's application of Skinner's psychology in determining educational objectives.

Theoretical and Methodological Foundations, and the Concept of Competency Based Education

Behaviorism, as a learning theory, also provided competence based education as its major foundation. The prevalent behaviorist construct of competence rests on a description of performance (behavior) and the situation in which it is to take place, in a form that lends itself to demonstration and observation (Norris, 1991).

The chief influences of the behaviorist ideas on educational theory and practice have been in the use of behavior-modification techniques and in the reformulation of

curricula in terms of behavioral objectives (Hyland, 1994). Bloom's (1956) taxonomy of educational objectives that postulated hierarchical progression from knowledge of facts to knowledge of principles remains as a sacred point to many competency based education approaches. Bloom's taxonomy of educational objectives was the pedagogical form of Skinner's behavioral psychology. Behaviorism as a learning theory applied to competence based education has been highly criticized for 1) concentrating efforts only on observable behavior (abandoning unobservable mental events), 2) emphasizing terminal outcomes to the detriment of the learning process, and 3) reducing the nature of knowledge to behavior.

Besides behaviorism, functionalism and constructivism were among the theoretical and methodological foundations of competency based education. Functional psychology (no longer regarded as a separate psychological doctrine) has borrowed competency based education's concern about outcomes, or the extent to which one has the ability to learn and solve problems. From the functional psychology standpoint, competency should be seen as something one should be able to do. When determining competencies, the classical functional analysis method was widely utilized; such a method focused on the role or function of people, under valuating the cognitive aspects that drives the process. The main characteristic of functional analysis is that it was devoted to describe the outcomes, not the processes; only what was attained matters, not how it was attained (Ramos, 2001).

French constructivism that emerged from the work of Bertrand Schwartz is the third theoretical-methodological matrix for competency based education. Such a

methodology was grounded in the simultaneous analysis of new required competencies and in-service training tactic that fostered their construction. The strategy was to analyze existing dysfunctions in performing a job in order to create a stimulus to learning that leads to overcome the gap between the actual and the expected performance (Maués et al., 2002). Two major advantages pointed out in the literature (Manfredi, 1998; Ramos, 2001) are 1) it analyzed competencies from the workers' perspective, and 2) individual training only made sense if immersed in a collective training program. However, the same authors argued that what really happens in practical terms was the establishment of rigid methodologies limited to the purpose of job evaluation.

The major influence of French constructivism in the Brazilian approach for competency based education was the notion of three categories of competencies: basic, general, and specific competencies. Basic competencies, as applied to Brazilian competency based approach, were the ones that constituted the foundation needed for any kind of job; they should be developed through academic education. General competencies are the ones that are required of all jobs in the same occupational area; they are tied to the idea of polyvalence and should be developed through both academic and professional education. Finally, specific competencies are the ones that give identity to a profession, and should be developed exclusively through professional education (Araújo, 2002).

Brazilian competency based approach theoretical framework was heavily drawn from Piaget's genetic epistemology and Chomsky's transformational-generative grammar linguistic theory (Berger, 2000). The basis behind this framework was the notion that knowledge is constructed either by an innate competence (Chomsky) or by external

stimuli (Piaget). Ramos (2001) purported that Piagetian constructivism with a blend of Chomskyian linguist competence theory was the dominant theoretical approach in current Brazilian competency based educational doctrine. She also found an analogical parallel with Chomsky's theory that distinguish competency from performance. However, when defining competency as an abstract, innate system, one can easily ignore the social conditions of its production, diffusion, and reproduction.

Flowers (1990) indicated that most models of competency based education contained the following elements: a) performance-based, b) responsive to individual needs, c) provisions for immediate feedback, d) based upon task analysis, e) containing measurable objectives, and f) criterion-referenced assessment. Such elements are present in the definition of competency based education adopted by Bell (2001): "competency based education is defined as a program of study with clearly defined, concrete, measurable objectives of which every student participating in the program must have demonstrated mastery upon program completion" (Bell and Mitchell, 2001, p. 5). The same elements were also implicit in the three-step model Berger (1998) uses to depict the process of curriculum building into the Brazilian competency based approach: 1) analyze the requirements of a given occupation, 2) construct a competency-reference matrix, and 3) use the competency-reference matrix as input to a new curriculum design. Figure 2-3 summarizes the philosophical, theoretical, and methodological traditions that contribute to build the concept of competency based education.

Berger (2000) defined competency as actions and mental operations at the cognitive, affective, and psychomotor domains that are associated with knowledge and experience, and that generate skills.

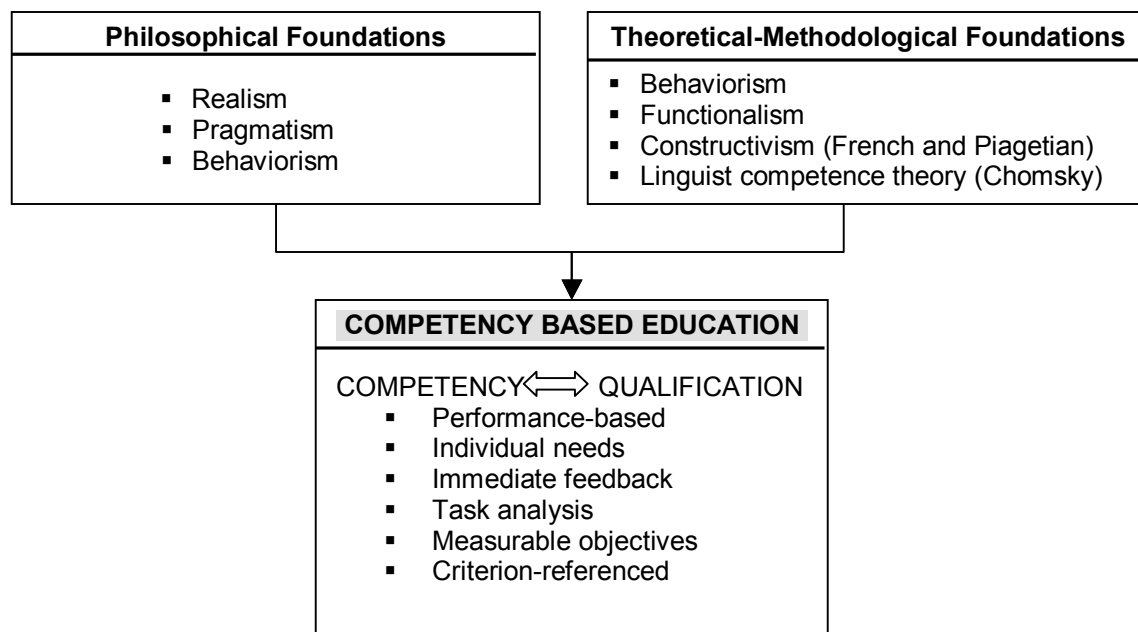


Figure 2-3: Philosophical, Theoretical, and Methodological Foundations of Competency Based Education

From Berger's (2000) perspective, competencies can be understood as constructs that enables the connection between individual knowledge and the knowledge previously constructed by humankind. Laudares and Tomas (2001) argued that the concept of competency is linked to the execution of complex tasks that required a high level intellectual activity. The competent worker is the one who is able to use technology properly and is able to transfer competencies across situations (Laudares & Tomas, 2001). The Brazilian Ministry of Education defined competency as actions and mental operations that articulate knowledge, skills, and values/attitudes, that are mobilized in

order to attain normal or distinctive quality standards expected by the productive area of any profession (Ministério da Educação, 2000). The National Board of Education defined competency as “the capacity to articulate, mobilize, and apply values, knowledge, and skills needed to promote an efficient and efficacious performance required by the nature of a given work” (Ministério da Educação, 2000, p. 96). Figure 2-4 graphically depicts the concept of competency adopted by the Brazilian Ministry of Education.

The complexity of the curricular dimension of the reform expands a gap between what are being proposed in terms of educational innovations and what was being implemented in the schools; the theoretical aspects of the changes were so sophisticated that serious difficulties resulted relative to the schools’ understanding and application of the innovations (Oliveira, 2000).

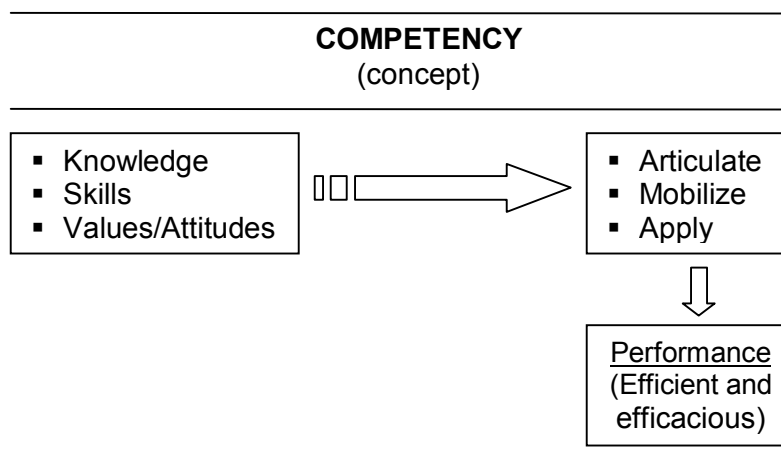


Figure 2-4: Concept of Competency Adopted by the Brazilian Ministry of Education

Despite the complexity of the matter, there was no systematic teacher preparation programs associated with the reform constituting a serious constraint to its implementation (Domingues et al., 2000). The lack of programs to prepare teachers and a fixed and lasting financial source to support the changes have been highlighted as reasons for failure in the diffusion of previous innovations as well as potential flaws to the current reform (Domingues et al., 2000; Kuenzer, 2000; Oliveira, 2000).

The literature also points out some incompatibilities of the reform with past experiences. Domingues et al. (2000) indicated that previous curricular reforms were characterized as government programs, which started and ended according to the presidential term. Because of this, teachers tended to not be effectively engaged in the change process. In addition, teachers have been treated as recipients rather than change agents in reform proposals, which enforced their lack of commitment to the change process (Domingues et al., 2000).

A five-year trial period before the mandatory adoption of the reform was allowed by the Ministry of Education (Portaria No. 646, 1997), which meant trialability was granted by law. A higher and earlier drop-out rates, linked to results observability, was identified by Oliveira (2000). *Figure 2–5* summarizes the findings in the reviewed Brazilian literature related to Rogers' five attributes of innovations.

Summary

This study was on characteristics of an innovation, as categorized by Holloway (1977). Rogers (1962, 1995) and Rogers and Shoemaker (1971) found five attributes that

explains from 49 to 87% the differences in the rate of adoption of innovations: Relative advantage, compatibility, complexity, trialability, and observability. Research in 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).

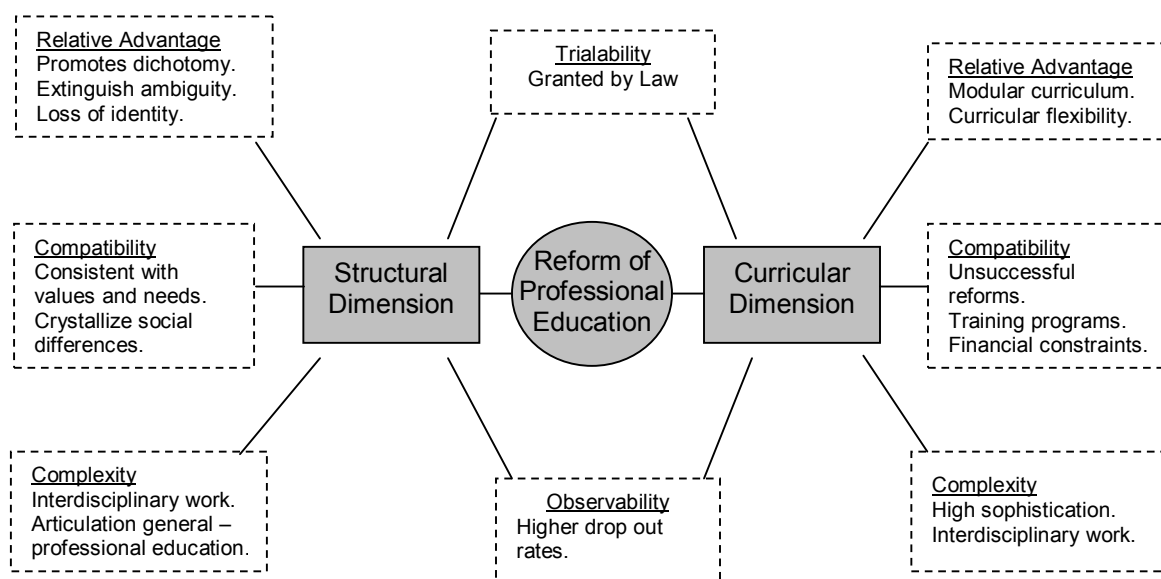


Figure 2–5: Findings in the Reviewed Brazilian Literature Related to Rogers' (1995) Five Attributes of Innovations

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. They also found voluntariness of use as an important factor in determining the decision in whether adopt or not adopt an innovation.

Reviewed Brazilian literature also provided support for the importance of individuals' perceptions about some of Rogers' five attributes of innovations as predictors of the rate of adoption of educational innovations. The reform of professional education that started in 1996 has brought innovations in two major aspects: Structural and curricular dimensions. A five-year trial period was granted by the law, before the adoption became mandatory.

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, the curricular flexibility (Ministério da Educação, 2000) and the disappearance of the ambiguity present in previous professional education programs (Castro, 1999) were the leading advantageous 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, 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 seen in the reviewed Brazilian literature 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, reviewed literature 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).

CHAPTER 3

Methodology

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 the educational innovations. Three research questions were developed to address the purposes of the study:

1) To what extent do 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, teaching experience) have impacted their perceptions about the innovations brought about by the professional education reform?

Research Design

This study focused on teachers' reaction to the innovations rather than determining their characteristics according to different adopter categories. A sequential mixed model exploratory investigation design (Tashakkori & Teddlie, 1998) was used to sequentially collect qualitative and quantitative data that were analyzed in a complementary manner. Figure 3-1 summarizes the research design for the study.

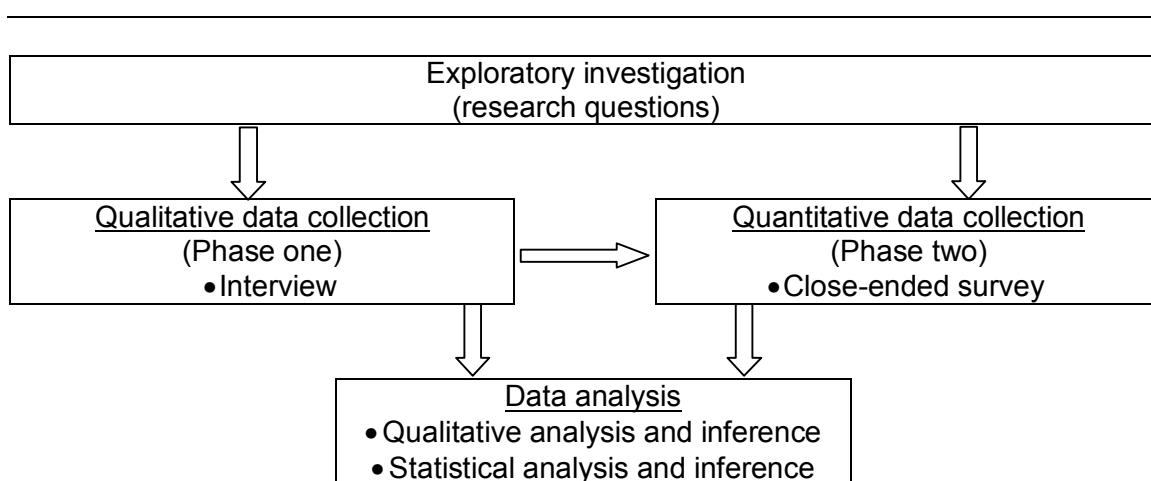


Figure 3-1: Research Design

The exploratory character of the study design originated from Patton (1990) naturalistic inquiry design. It was relabeled by Tashakkori and Teddlie (1998) exploratory investigation to distinguish studies without a priori hypothesis from those with a priori hypothesis (confirmatory investigation). In exploratory investigations, the purpose of the study is typically stated in terms of research questions as it was done in this study.

Mixed model studies are products of the pragmatist paradigm and combine qualitative and quantitative approaches within different phases of the research process (Tashakkori & Teddlie, 1998). This concept goes beyond the pure methodological aspect of combining qualitative and quantitative approaches in the research methodology, incorporating the epistemological aspect of mixing research paradigms. Mixed methodologies design uses the advantages of both the qualitative and the quantitative paradigms (Creswell, 1995). Complementarity (examining overlapping and different facets of a phenomenon), initiation (discovering paradoxes, contradictions, fresh perspectives), and expansion (adding breadth to the study) (Greene, Caracelli, & Graham, 1989) were also identified as purposes for the use of mixed methods in the study's design. Sequential mixed models employ multiple approaches to data collection, analysis and inference in a sequence of separated phases. Each phase may be dependent on the finding, conceptual development, or material that was generated in a previous phase (Tashakkori & Teddlie, 1998). Phase two of this study (quantitative) was dependent on the findings of its first phase (qualitative).

Data and methodological triangulation (Denzin, 1978) were used in the study design as a tool to search for convergence of results. Triangulation allows collecting information about different events and relationships from different points of view, and is perhaps the best way to elicit the various and divergent constructions of reality that exist within the context of a study (Erlandson, 1993). The literature recognizes triangulation as a valuable research strategy to add trustworthiness and credibility to a study (Ary, Jacobs, & Razavieh, 1996; Babbie, 2001).

The issue of internal validity is critical to this nonexperimental research. The use of mixed methodologies in a study allows the researcher the flexibility to evaluate internal validity according to both quantitative and qualitative criteria as appropriate (Tashakkori & Teddlie, 1998). From the qualitative perspective, validity is related to the compatibility of the constructed realities that exist in the minds of the inquiry's respondents with those that are attributed to them. This relationship is termed "credibility" – a credible study is one that adequately represents both the areas in which these realities converge and the points on which they diverge (Erlandson, 1993). From the quantitative perspective, validity is related to the appropriateness, meaningfulness, and usefulness of an empirical measure in adequately reflecting the real meaning of the concept under consideration (Ary et al., 1996; Babbie, 2001). Table 3-1 summarizes the variables and data analysis techniques for this study.

Population and Sample

The target population for this study was the teachers of Brazilian federally supported agricultural schools. Table 3-2 presents the summary of Brazilian federally supported agricultural schools and students at the technical level, according to the 2000 Census of Professional Education (Instituto Nacional de Estudos e Pesquisas Educacionais, 2000a).

Table 3-1: Variables in the Study

Research Questions	Independent and Moderator Variables ⁽¹⁾	Type of Data	Analysis Technique	Dependent Variable
1) To what extent has Rogers' (1995) five attributes of innovations explained the different rates of adoption of the innovations brought about by the reform of professional education in Brazilian federally supported agricultural schools?	<p><u>Independent variables:</u></p> <ol style="list-style-type: none"> 1. Relative advantage 2. Compatibility 3. Complexity 4. Trialability 5. Observability 	Interval/Ratio	<ul style="list-style-type: none"> • Measures of central tendency and dispersion. • Multinomial logistic regression 	Rate of adoption (Interval/Ratio, collected as nominal data)
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?	<p><u>Moderator variables:</u></p> <ol style="list-style-type: none"> 1. Presence of special attribute: <ul style="list-style-type: none"> Voluntariness <p>of use.</p>	Interval/Ratio	<ul style="list-style-type: none"> • Measures of central tendency and dispersion. • Multinomial logistic regression 	Rate of adoption (Interval/Ratio, collected as nominal data)
3) To what extent demographic characteristics of teachers (gender, age, educational level, teaching experience) have impacted their perceptions about the innovations brought about by the professional education reform?	<p><u>Moderator variables:</u></p> <ol style="list-style-type: none"> 1. Gender 2. Age 3. Education 4. Teaching experience 	Nominal Interval/Ratio Ordinal Interval/Ratio	Measures of central tendency and dispersion	Measures of central tendency and dispersion

⁽¹⁾ The independent and moderator variables in objectives 1 and 2 will be measured using two concepts: 1) Separation between general and professional education, and 2) Implementation of the modular competency based curriculum.

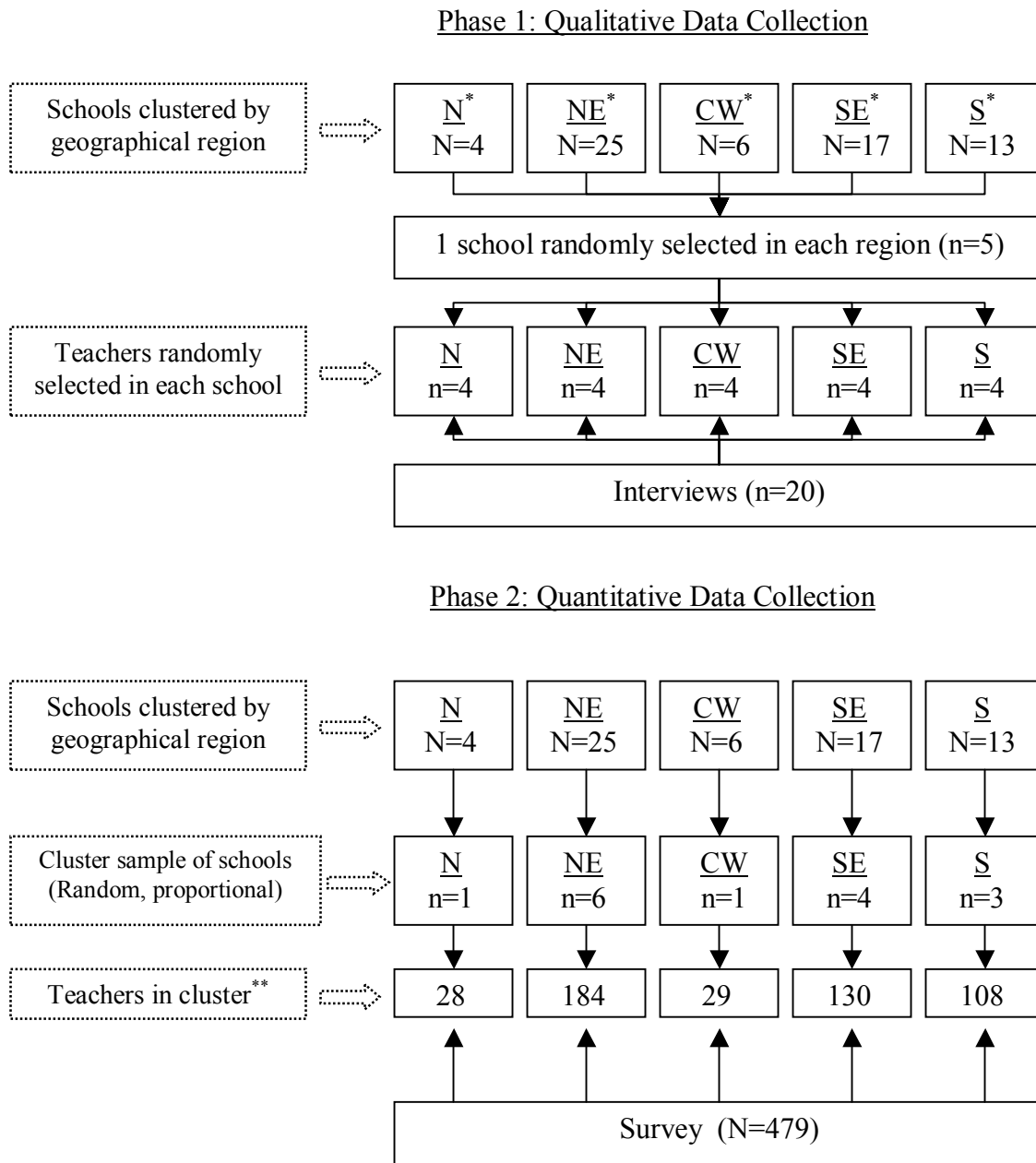
Since it was not possible to obtain a reliable frame of the population of teachers in all federally supported agricultural schools, the two-stage cluster sampling technique was used to randomly select schools in all geographical regions of Brazil for both phases of the study. Figure 3-2 depicts the sampling procedures involved in the study.

Table 3-2: Brazilian Agricultural Schools and Students by Geographical Region

Geographical Region	Country's Total Ag. Schools		Federally Supported Ag. Schools	
	Number of Schools	Students Registered	Number of Schools	Students Registered
North	26	4,246	4	2,743
Northeast	65	9,633	25	7,295
Central-Western	24	6,440	6	3,304
Southeast	87	18,967	17	9,107
South	54	15,523	13	5,688
<i>Total</i>	<i>256</i>	<i>54,809</i>	<i>65</i>	<i>28,137</i>

Phase One

The cluster sampling technique was used to randomly select one federally supported agricultural school in each of the five geographical regions of the country. The cluster of schools per region is shown on Table 3-2. A total of five schools were randomly selected. In each of these schools, four teachers – two from the academic and two from the professional subject area – were randomly selected to be interviewed by the researcher. The frame was obtained from the directory of teachers in each school. A total of 20 randomly selected teachers were interviewed during phase one of the study.



* N = North; NE = Northeast; CW = Central-Western; SE = Southeast; S = South

** Frame obtained direct from school

Figure 3-2: Sampling Procedures

Phase Two

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. This procedure ensured that the sample was truly proportionally representative of the population of federally supported agricultural schools throughout the country and contributed to maximizing the external validity of the study (Dillman, 2000). Schools that have been selected to participate in phase one did not take part in the random selection process in phase two. This procedure was adopted to maximize opportunities of having other schools' participation in the study. Table 3-3 shows the cluster and sample of federally supported agricultural schools in phase two of the study.

The researcher made telephone contacts with all 15 principals of the selected schools. The objective of the telephone contacts was threefold: 1) formally 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 in a bulk package, and 3) obtain the frame of teachers in each school. One school from the Northeast region did not agree to participate, and as a result a new school from the same region was randomly selected and did agree to participate in the study. During the phone calls, the researcher explained the objectives of the study to the principals and defined parameters for confidentiality of the data.

Identified contact persons were the principal or, in most cases, the school academic supervisor. The researcher explained in detail the objectives of the study and the procedures to be followed with the questionnaires and data collection to contact persons. This was done to ensure the confidentiality of the data, the voluntariness of participation, and to maximize the response rate. The contact person in each school furnished the research with the teachers' frame. The frame of teachers in the selected schools, as provided by the contact persons, is shown on Table 3-3. All the teachers in each of the 15 randomly selected schools were selected (N=479). Questionnaires were mailed to the entire population of teachers (N=479) in the 15 randomly selected schools. Figure 3-2 graphically represents the sampling procedures for both phases of this study.

Table 3-3: Brazilian Federally Supported Agricultural Schools Cluster Sample

Geographical Region	Total of Schools		Cluster Sample	Total of Teachers ⁽¹⁾	Teachers in Cluster ⁽²⁾
	f	%			
North	4	7	1	128	28
Northeast	25	38	6	798	184
Central-Western	6	9	1	191	29
Southwest	17	26	4	542	130
South	13	20	3	415	108
<i>Total</i>	<i>65</i>	<i>100</i>	<i>15</i>	<i>2,074</i>	<i>479</i>

⁽¹⁾ Presumed teacher population based on average of 31.9 teachers per school.

⁽²⁾ Frame obtained directly from schools.

Since both qualitative and quantitative data collection procedures were used over a short period of time, maturation did not constitute a threat to internal validity. To control for selection bias, schools were randomly selected in both phases of the study.

The triangulation of data in search of convergence of results confirmed the accuracy and trustworthiness of the information (Creswell, 1995).

Instrumentation

Qualitative Interview Protocol

Since the major focus of this study was on teachers' reaction to the adoption of educational innovations, qualitative data played a critical role. An open-ended format interview protocol was developed with 28 guiding questions. Rogers' (1995) diffusion of innovations theory, findings relative to adoption in the Brazilian literature, Holloway's (1977), and Moore and Benbasat (1991) studies were used as the basis for the development of the protocol. The qualitative interview protocol (see Appendix A) was approved by the University Office for Research Protection for the use of human subjects (Approval # 14629).

Three introductory questions set the stage for the topic. Key questions were arranged into five blocks, each block related to one of Rogers' (1995) attributes of innovations – relative advantage, compatibility, complexity, trialability, and observability. Each of the five blocks of questions related to Rogers' (1995) attributes of innovations was grouped into primary, probing, and closing questions. A final section was designed to search for the voluntariness of adoption and the existence of constructs, outside of Rogers' (1995) five attributes of innovations, which contributed to explaining the rate of adoption of the innovations.

A panel of four experts reviewed the interview questions and protocol for content validity. Experts were selected among faculty members in the department of agricultural and extension education at Penn State. Criteria to select experts were experience in research and in the subject area. The protocol allowed the researcher the flexibility to pursue an in-depth exploration of specific points that emerged on a one-on-one case basis. This flexibility follows Rubin and Rubin's (1995) view that "qualitative interviewing design is flexible, interactive, and continuous, rather than prepared in advance and locked in stone" (Rubin & Rubin, 1995, p. 43). Data collected in the qualitative phase was used to construct the survey questions for phase two of the study.

Quantitative Survey Instrument

An instrument using closed- and open-ended questions was developed to collect data from the population of teachers in the 15 randomly selected federally supported agricultural schools. Data obtained from the qualitative phase of the study, Rogers' (1995) diffusion of innovations theory, findings in the Brazilian literature, Moore and Benbasat (1991), and Holloway (1977) instruments served as the basis for the quantitative survey instrument development. The survey process was approved by the University Office for Research Protection for the use of human subjects (Approval # 15894).

The instrument contained seven sections. The first five sections contained statements related to Rogers' (1995) five attributes of innovations, in the following order: Section I – Relative Advantage; Section II – Compatibility; Section III – Complexity; Section IV – Trialability, and; Section V – Observability. Questions on Rogers' (1995)

five attributes of innovations (Sections I-V) were designed to measure the constructs using five-point Likert scales at the interval/ratio level. Section VI elicited information on voluntariness of use and rate of adoption (dependent variable of the study), collected as nominal data. Section VI also obtained information on other constructs, outside Rogers' (1995) five attributes of innovations, which contributed to explaining the rate of adoption of the 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.

A panel of eight experts at Penn State reviewed the initial instrument for content and face validity. The panel consisted of five faculty members, two senior graduate students at the department of agricultural and extension education, and one international program specialist in the College of Agricultural Sciences. The survey instrument was revised based on the comments and suggestions from the panel members.

Pilot Testing of the Instrument

A pilot test was conducted in early spring 2003 to identify problems regarding content and accuracy of the statements and to obtain an estimate of the reliability of the instrument. Pilot test also helped to determine the usability of the instrument under realistic conditions (Fowler, 1993). The instrument was pilot tested with Brazilian federally supported agricultural school teachers from one school not participating in the study. Forty copies of the survey were sent to all teachers in the pilot test school. After

two weeks, a total of 30 teachers responded. A revised 61 items instrument was used to collect data for phase two of the study.

Data from the pilot study were checked for consistency of entry, cleaned, and entered into and analyzed using the Statistical Package for Social Sciences (SPSS) version 10.1 for Windows. Eight items (four in Section I and four in Section II) were reverse coded for analysis when related to negatively worded statements. Negative item-total correlations were deleted for individual section and overall reliability estimation. A total of 6 items (14%) were deleted. The overall Cronbach Alpha coefficient obtained from the study was .85. Table 3- shows the instrument reliability for both pilot and study.

Table 3-4: Summary of Reliability – Phase Two Survey Instrument

Sections	Pilot Test (n=30)		Study Reliability (n=297)	
	# of Items	Alpha	# of Items	Alpha
I - Relative Advantage	12	.77	10	.74
II - Compatibility	10	.67	10	.79
III - Complexity	7	.72	7	.82
IV - Trialability	5	.70	5	.82
V - Observability	9	.58	5	.52
Overall reliability	43	.63	37	.85

Data Collection and Analysis

Phase One

The researcher established phone contacts with the administration of each of the five randomly selected schools. Telephone contacts had three objectives: 1) to explain to the schools' administration the objective and procedures of the study, 2) to get permission for visiting the school and interviewing teachers, and 3) to schedule a date for the visit. Visits to the five schools took place between July 22 and August 9, 2002. The researcher spent two days interviewing four teachers in each school. A total of 20 teachers were interviewed – 10 from professional subject area and 10 from academic subject area – following Creswell's (1998) recommendation to the number of interviews to be conducted in a grounded theory approach. Each interview took an average time of 55 minutes and was audio taped.

Once in the school, the researcher obtained the frame of teachers from the school's administration and randomly selected four teachers to be interviewed – two from the professional subject area and two from the academic subject area. Randomly selected teachers were then asked for consent for participating in the study; an informed consent was discussed on an individual basis and signed by the teacher. All teachers originally selected agreed to participate in the study.

Interviews were conducted in a room assigned by the school administration. 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. The confidential character of all provided information and

the fact that the researcher had no current professional or administrative link with the Brazilian federal government or the school's administration was emphasized at the beginning of each interview. The intent was to make interviewees feel more comfortable in expressing their true thoughts and opinions. The introductory part of each interview was important to the process of establishing a rapport between the interviewer and the respondent.

Rapport is a major concern in qualitative interviewing, and as such it was prudently approached by the researcher throughout the data collection process. The rapport should be established on the ability to convey empathy and understanding without judgment (Patton, 2002). According to Seidman (1998), in establishing a rapport, the interviewer-interviewee interaction should not strive for a full "we" relationship. If a full "we" relationship prevails, interviewer would become an equal participant and the result would be a conversation, in which the question of whose experience is being related and whose meaning is being made is critically confounded (Seidman, 1998). The researcher established and maintained a balanced role as an interviewer in order not to undermine the interview content neutrality.

The interview protocol format allowed the researcher flexibility in probing and determining when it was appropriate to explore certain points in greater depth on a case by case base. This action is in agreement with Patton's (2002) view that the interviewer is "free to build a conversation within a particular subject area, to word questions spontaneously, and to establish a conversational style but with the focus on a particular subject that has been predetermined" (Patton, 2002, p. 343). Babbie (2001) also sees

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).

Questions were asked in five blocks, following the order of the interview protocol – relative advantage, compatibility, complexity, trialability, and observability. Each block was open with a key question on the attribute being approached. Key questions were explored further by a number of probing questions for each block. The flexibility to explore certain points in greater depth, as mentioned earlier, was exercised through probing questions. Each block was closed by a set of closing questions with two purposes: 1) to summarize the topic object of the block and 2) to offer a transition to the next block of questions.

Each individual interview ended with a set of questions identified as closing remarks. At the beginning of the closing remarks each interviewee was asked to answer if there were other important aspects that may have influenced his or her perception of the reform not covered during the interview. They were also asked if the adoption of the reform was voluntary, would they adopt it. The final purpose of the closing remarks was to summarize with the interviewee the main points of the interview, to reassure the confidentiality of the data, and thanks for participating.

Qualitative analysis had the primary objective to transform data into findings that help in developing the quantitative phase (phase two) of the study. To be analyzed, data were transcribed from the audio tapes using Microsoft Word. Data were transcribed in the Portuguese language to minimize the risk of lose meaning during the translation process.

Data analysis began with the process of coding data in the Portuguese language. The purpose of coding data was to aid in the generation, organization, retrieval, and interpretation of concepts from and with the data (Coffey & Atkinson, 1996). The QSR NUD*IST Vivo software package for qualitative research version 1.3 was used to code the data. Transcripts were read several times to help the researcher gain a holistic sense of all interviews. During the process of reading the transcripts, the researcher started labeling passages considered interesting.

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. To explore categories means to think about links among categories, expand, transform and re-conceptualize data. This corresponds to Tesch's (1990) recontextualization process as explained by Coffey (1996): after having de-contextualized data extracts from their original context (while retaining meaning), segmented data are then organized and sorted as part of a process of recontextualization (Coffey & Atkinson, 1996). Finally, the researcher searched for patterns, themes, paradoxes, and contrasts with the goal of transforming categorized data into meaningful data.

Please note that data codes and categories were not cast in stone. During the interpretation process, categories were abandoned, changed, re-sorted, renamed, and so on (Coffey & Atkinson, 1996). Also, throughout the analysis process, the researcher attempted to "saturate" the categories, which is a process of going through the data

several times and continuing to recode until no additional information or insight into the category can be provided (Frank-Alston, 2000).

Findings from the qualitative analysis were used to develop the instrument for the second phase (quantitative) of the study. First, the major issues that emerged from the interviews (phase one) were examined for consistency in the literature. Second, the issues that were similar and consistent with the issues found in the literature served as a basis for developing the survey for the quantitative part. Finally, the findings from the qualitative phase gave meaning and contextualization for quantitative phase of the study.

Phase Two

Quantitative data were collected by mailing the questionnaire to the 479 Brazilian federally supported agricultural teachers selected for the study. Teachers were asked to mail the completed survey instrument within five days of the reception date, which represents a 10-day period between the original mailing and the reception date of the questionnaires by the researcher. Questionnaires received within this 10-day period were considered as early respondents. The data was collected in accordance per guidelines of the Office for Research Protection at The Pennsylvania State University.

The survey package including a cover letter, a copy of the survey instrument, and a return-addressed envelope were mailed in early May, 2003 to the 15 randomly selected schools. Packages were mailed to the contact person in each school as previously described. The researcher made telephone and e-mail contacts with contact persons in each of the schools to ensure the correct procedures with the instruments and to emphasize the importance of high response rate within the five-day response period.

Contact person in each school was requested to send the completed instruments to a central location in Brazil. A collaborator was asked to collect data from all the schools and send them back to the researcher in the United States.

Of the 479 questionnaires mailed to Brazilian federally supported agricultural school teachers, a total of 297 usable questionnaires were returned (62% response rate). The return rate within the 10-day initial mailing period was 57.6%, with 276 of the 297 responding. After the researcher has made phone calls for all 15 schools, additional 21 questionnaires (4.4%) were received.

A random sample of 20 nonrespondents (11%) were contacted by telephone and asked to answer five survey questions (one question in each of the questionnaire's five first sections). This is a technique recommended by Miller and Smith (1983) – “Double-Dip Nonrespondents” – and by Lindner, Murphy, and Briers (2001) to handling nonresponse issues. According to both studies, if comparison between respondents and nonrespondents data are similar, it can be generalized to the population (Linder, Murphy, & Briers, 2001; Miller & Smith, 1983). Since no differences were found between respondents and nonrespondents, findings of this study can be generalized to the general population.

Data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS) software for Windows, version 10.1. Descriptive and inferential statistics were used to analyze the data. Descriptive statistics used were frequency distributions, percentages, means, and standard deviations. 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.

Since the dependent variable was multinomial with three mutually excluded levels, a multinomial logistic regression model was developed to estimate the effects of the independent and moderator variables in the rate of adoption of innovations. This technique is appropriated to predict polytomous dependent variables by one or several independent variables, which is the case for this study.

CHAPTER 4

Findings

The focus of this study was to examine Brazilian federally supported agricultural school teachers' perceptions toward two concepts enforced by the reform of professional education in Brazil: the separation between general and professional education, and the competency based curriculum. Specifically, this study investigated to what extent 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 the educational innovations.

The findings are reported according to the phases of the study. First, findings from qualitative data collected during phase one of the study are presented. Qualitative data are first reported according to Rogers' (1995) five attributes of innovations. All qualitative issues are then summarized in a table ordered by descendent number of mentions. The last part of the qualitative analysis describes all major issues that emerged from the interviews.

Second, findings from quantitative data collected during phase two of the study are reported. A final section triangulates the qualitative and quantitative data, summarizing the findings from both phases of the study.

Phase One – Qualitative Findings

Primary and probing questions in the interview protocol addressed each of Rogers' (1995) five attributes of innovations. This section reports interviewees responses related to each of these attributes and makes connections with the issues emerged during the interview process. Findings are linked to the two concepts addressed in this study: the separation between academic and professional education and the competency based curriculum.

Relative Advantage

“Do you think the changes brought about by the reform (the separation between academic and professional education, and the modular competency based curriculum) makes the current situation better, worse, or about the same as compared to the situation before the reform? Why? Can you list some advantages and disadvantages of both situations?” was asked as primary question. Interviewees reported ten different points related to this question.

An overwhelming majority of teachers felt that students were less practical-oriented (75%), more heterogeneity was found in the student enrollment (70%), and there was an increase in the work load for teachers (70%), were the major disadvantages brought about by the reform. Improvement in the school structure and curricular flexibility was perceived as major advantages by 45% and 30% of the interviewees, respectively. None of the teachers reported salary benefits as a result of the reform.

Teachers also saw the preparation of specialist technicians as a disadvantage (60%) to both students and local communities. Increase in the work load for students was

also noted as a disadvantage by 55% of the interviewees. Thirteen interviewees (65%) saw the separation between academic and vocational education as a major source of disadvantage of the reform. Table 4-1 summarizes the data on key issues that emerged from relative advantage.

Table 4-1: Qualitative Issues on Relative Advantage

Issues Raised by Interviewees	# of Mentions		Separation Acad.–Prof. Education	Modular CB Curriculum
	Disadvantage	Advantage		
Students less practical-oriented	15	0	✓	✓
Heterogeneity in the student enrollment	14	0	✓	
Teachers overloaded in work	14	0	✓	✓
Preparation of specialist technician	12	1	✓	✓
Students overloaded in work	11	0	✓	✓
Improvement in the school structure	0	9		
Reform's disadvantages overweight its advantages	8	0	✓	
Curriculum is more flexible	0	6		✓
Restriction for educational attainment	4	0	✓	
Strengthen ties with the world of work	2	4		✓

Improvement in the school structure was the major advantage, noted by 9 interviewees (45%). 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 in the Portuguese language), half of the funds coming from an Inter American Development Bank loan.

Compatibility

Primary question on compatibility: “Are the changes brought about by the reform (separation between academic and professional education and the modular competency based curriculum) compatible with your educational values and past experiences? Are they compatible with your needs, with the needs of your students and the school community?” Probing questions explored the “why” aspect of the primary questions’ answers.

Ninety-five percent of the interviewed teachers indicated a lack of training programs as a reason for not implementing and understanding the reform. The separation between academic and professional education emerged as a major factor of incompatibility with the values of 70% of the interviewees, followed by the imposed manner under which the reform was implemented (50%). On the other hand, eleven interviewees (55%) indicated the modular competency based curriculum is compatible with their existing values and beliefs. Data on compatibility are depicted in Table 4-2.

Restrictions for educational attainment and professional mobility, and the preparation of specialist technicians were also considered as incompatibility factors by 35% of the interviewees.

Table 4-2: Qualitative Issues on Compatibility

Issues Raised by Interviewees	# of Mentions		Separation Acad.–Prof. Education	Modular CB Curriculum
	Not compatible	Compatible		
Training needs not met	19	0	✓	✓
Separation academic-professional education	14	4	✓	
Modular CB curriculum	1	11		✓
Reform was imposed	10	0	✓	✓
Restrictions for professional mobility	7	0	✓	✓
Restrictions for educational attainment	7	0	✓	
Preparation of specialist technician	7	0	✓	✓
Does not match local needs	3	0	✓	
Institutional support (including the Ministry of Education)	3	0	✓	✓
Incompatible with past experiences	2	0	✓	

Complexity

“Do you think the separation between academic and professional education, and the modular competency based curriculum is more complex, less complex, or have the same degree of complexity as the situation previous the reform? Can you indicate the major points of complexity, according to your perception?”

For twelve interviewees (60%), the current situation is more complex than it was before the reform. Competency based evaluation was considered as a major complexity factor by 80% of the interviewed teachers. Interdisciplinary work was also viewed as an issue related to complexity. However, interviewees did not see interdisciplinary work as

complex by itself. Fifteen (75%) felt that interdisciplinary work was not complex, but difficult to implement in the daily practice. What they saw as complex was limiting the practice of interdisciplinary work to the interpersonal relationships among teachers, as will be discussed later in this chapter. Table 4-3 summarizes the data on interviewees' perceptions on complexity.

Table 4-3: Qualitative Issues on Complexity

Issues Raised by Interviewees	# of Mentions		Separation Acad.–Prof. Education	Modular CB Curriculum
	Complex	Somewhat Complex		
Competency based evaluation	16	4		✓
Interdisciplinary work	0	15	✓	✓
Reform, as compared to the previous situation	12	5	✓	✓

Trialability

The degree to which teachers had the opportunity to experiment, innovations brought about by the reform on a limited basis was primarily explored through the following question: “Do you think the legal period granted as trial period (April 1997 – December 2001) was enough to experiment the changes brought about by the reform? Please, explain your answer.”

For 70% of the interviewees, the trial period granted by law to implement the reform was not enough. Two factors emerged as constraints to the effectiveness of the trial period: lack of training opportunities, as cited by 85% of the interviewees, and lack

of institutional support, including support from the Ministry of Education, as pointed out by eight interviewees (40%). Data on trialability is shown in Table 4-4.

Table 4-4: Qualitative Issues on Trialability

Issues Raised by Interviewees	# of Mentions		Separation Acad.–Prof. Education	Modular CB Curriculum
	Enough	Not enough		
Training opportunities	0	17	✓	✓
Length of the trial period	1	14	✓	✓
Institutional support (including support from the Ministry of Education)	0	8	✓	✓

Observability

Interviewees were asked to answer the following primary questions to address their perceptions on the visibility of the results of the reform: “What are the results you perceive from the reform? Can you list some of these results, if any?”

For seven interviewees (35%) there were no perceptible results from the reform; they felt that all changes were part of the reform process, but not as results. To these seven interviewees, it is too early to talk about results. On the other hand, the remaining thirteen interviewees identified a number of characteristics that they perceived as results of the reform.

Less practical-oriented students was the major perceived result of the reform, cited by 45% of the interviewees. Six interviewees (30%) reported an increase in the number of students in the schools, followed by an improvement in the school structure,

mentioned by five interviewees (25%). Table 4-5 reports the data on interviewees' perceptions about the observable results of the reform.

Table 4-5: Qualitative Issues on Observability

Issues Raised by Interviewees	# of Mentions	Separation Acad.–Prof. Education	Modular CB Curriculum
Students less practical-oriented	9	✓	✓
No apparent result	7	✓	✓
Increase in the number of students	6	✓	✓
Improvement in the school structure	5	✓	✓
Teachers overloaded in work	4	✓	✓
Students overloaded in work	4	✓	✓
Restriction for professional mobility	4	✓	✓
Shortage in staff and teacher personnel	4	✓	✓

Qualitative Exploration of Voluntariness of Use

Following Moore and Benbasat's (1991) perspective on voluntariness of adoption, interviewees were asked if they would have voluntarily adopted the separation between academic and vocational education and the modular competency based curriculum. Responses to this question provide information relative to the degree of resistance to the adoption of the innovations brought about by the reform.

Findings from the interviews indicated a high degree of resistance to the separation between academic and professional education. Only four interviewees (20%)

indicated that they would have totally adopted the separation between academic and professional education. The remaining sixteen interviewees affirmed they would have adopted such separation with some changes in its form (35%), or would not have adopted the separation between academic and professional education at all (45%).

Conversely, sixteen interviewees (80%) have shown a willingness to fully adopt the modular competency based curriculum. Only one interviewee (5%) affirmed that he would not have adopted the modular competency based curriculum if it was a voluntary decision. Data on this construct is summarized on Table 4-6.

Table 4-6: Voluntariness of Adoption

If the reform was voluntary:	# of Mentions	
	Separation Acad. – Profes. Education	Modular Competency Based Curriculum
I would have adopted in full	4	16
I would have adopted after some changes	7	3
I would not have adopted	9	1

Table 4-7 summarizes all qualitative issues on five Rogers' (1995) attributes of innovations. Data on Table 4-7 are organized in descendent order of number of mentions.

Table 4-7: Summary of Qualitative Issues on Rogers' (1995) Five Attributes of Innovations (n=20)

Issues Raised by Interviewees	Attributes of Innovations					Total of Mentions
	Relative Advantage	Compatibility	Complexity	Triability	Observability	
Training needs not met		19		17		36
Students less practical-oriented	15				9	24
Competency based evaluation			20			20
Preparation of specialist technician	13	7				20
Teachers overloaded in work	14				4	18
Separation between academic and professional education		18				18
Reform as compared to the previous situation			17			17
Modular competency based curriculum		16				16
Interdisciplinary work			15			15
Length of the trial period				15		15
Students overloaded in work	11				4	15
Heterogeneity in the student enrollment	14					14
Improvement in the school structure	9				5	14

Table 4-7: Continued.

Issues Raised by Interviewees	Attributes of Innovations					Total of Mentions
	Relative Advantage	Compatibility	Complexity	Triability	Observability	
Institutional support (including the Ministry of Education)		3		8		11
Restrictions for educational attainment	4	7				11
Restrictions for professional mobility		7			4	11
Reform was imposed		10				10
Reform's disadvantages overweight its advantages	8					8
No apparent result					7	7
Curriculum is more flexible	6					6
Increase in the number of students					6	6
Strengthen ties with the world of work	6					6
Shortage in staff and teacher personnel					4	4
Does not match local needs		3				3
Incompatibility with past experiences		2				2
Total of Mentions	100	92	52	40	43	327

Qualitative Issues

Eight major issues emerged from the interviews. These eight issues were mentioned by more than 50% of the interviewees and presented in the following order: lack of training, competency based evaluation, heterogeneity in the student enrollment, generalist versus specialist technician, interdisciplinary work, students less practical-oriented, teachers overloaded with work, and students overloaded with work.

Lack of training – Nineteen of 20 interviewees indicated that there was no training program for the implementation of the reform. Participants in all schools affirmed that they had an opportunity to participate in activities such as group study, group discussion, and watch videos about the reform. However, these activities occurred at the school level, without any systematical planning or external support. With the exception of one case, interviewees did not see these activities as training activities. The following transcriptions help clarify this lack of training:

Interviewee 1D: No training, no courses, no lectures, no nothing!

Interviewee 1E: No, we did not have any training. Some colleagues have studied more in depth and promoted group study and discussion sessions on the topic among us.

Interviewee 2B: ... absolutely no training, unless you consider watching videos, study and discussion on the topic among team members, as training.

Lack of training is also seen as a major problem in the process of implementation of the reform. Interviewees saw the lack of training as a gap between their needs and the effectiveness of the implementation process, as stated below.

Interviewee 1C: The lack of initiatives to prepare teachers was a great disadvantage [in the implementation process]. As a result, we are almost in 2003 and the reform is not fully implemented.

Interviewee 4C: From my perspective, lack of teacher training is the biggest flaw in this reform. We have money for new buildings and equipments, and virtually none for teacher and staff preparation.

Competency based evaluation – The issue of competency based evaluation was considered “somewhat” complex by four interviewees and emerged as a major source of complexity of the reform for sixteen interviewees. Three aspects emerged from the interviewees’ perceptions 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. Interviewees perceived the issue of competency as a dichotomous situation between “competence” and “incompetence.” In fact, interviewees were frightened to say if a student was “competent” or “incompetent” and this may cause damage to the student’s professional life, as depicted in the following comment:

Interviewee 4B: How can you attest if a person is competent or incompetent?... a single wrong word in a student portfolio and you can send him or her to professional marginality.

According to the interviewees’ perceptions, the previous system of assigning only numerical 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. They also showed inconsistency between the qualitative requirements of competency based evaluation and the registrar’s office requirement of a numerical grade, as illustrated in the following comment of one of the interviewees:

Interviewee 1A: OK, let’s suppose we all do qualitative competency based evaluation. When you have to submit your evaluation to the registrar’s office, they require you to have a numerical grade – they do not care about qualitative evaluation. So, there is an

inconsistence between how they are requiring us to evaluate the students and how they are requiring us to report our evaluation.

One interviewee mentioned competency based evaluation as having the potential to improve evaluation from being quantitative to more qualitative. The following extracts help to illustrate the interviewees' general perceptions about competency based evaluation:

Interviewee 1B: It is too complex to identify, differentiate, and apply competencies and skills. The difference between competency and skill is not very clear for us.... As a result, evaluation continues restricted as an activity devoted to measure and to assign numerical grades.

Interviewee 3E: I think competency based evaluation is very laborious, because it is individual and descriptive. At the same time, I think it puts a lot of extra responsibility on our shoulder, as teachers.

Interviewee 4B: I believe competency based evaluation is better because it is more efficient. However, it is more laborious.

Heterogeneity in the student enrollment – After the reform, federally supported agricultural schools were required to reduce academic education enrollment by 50% and increase professional education enrollment by 50% (Ministry of Education, 1997). As a result, federally supported agricultural schools now offer three options for student enrollment: 1) students enroll in both academic and professional education programs in the school, keeping two separate registration entries. This option is called “concomitance in the school;” 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. This option is called “concomitance in different schools” and; 3) students who have previously completed secondary level academic education may enroll

only in professional education programs. This option is called “sequential” or “post-middle.”

The concomitance in different schools and the sequential options for enrollment have brought a great degree of heterogeneity in the student enrollment, according to the interviewees. Federally supported agricultural schools are traditionally known for providing high quality education (both academic and professional). Such schools were traditionally devoted to primarily serving students from rural areas and/or low income families, due to its characteristics (residential full-time schools) and geographical location.

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) is seen as a disadvantage and as incompatible by 14 interviewees in four different schools.

Interviewee 2B: Students who do not take middle education here [in the school] are academically weak. This brings us two consequences: performance problems [to the students] and a considerably amount of extra work for the teachers.

Interviewee 1C: When all students were taking academic education here at the school, as before the reform, we had the opportunity to equalize their academic preparation and at the same time to encourage them to pursue professional education.

Interviewee 3A: Students who are registered here only for professional education are academically very weak. Actually, you can do almost nothing with those students that make them different from a peon.

Interviewee 2A: Students that do not take academic education here are many times discriminated against by other students ... they are often labeled as fools.

Four interviewees in one school indicated that they do not have problems with heterogeneity in academic preparation in the student enrollment, and all of them gave the same reason for this: the school is located in a region in which all secondary schools have about the same quality level in terms of academic standards. The comment of one of them summarizes the perception of all four:

Interviewee 1E: It is not worthwhile to offer academic education in our school. We are located in an with good quality secondary schools, and with a high level of academic standards. There is no difference in terms of academic performance between the students who take academic education here or in other schools. In our case, it is better to concentrate efforts and resources in the professional education area.

Generalist versus Specialist technician – This issue emerged as a concern for 12 interviewees, as a matter of both disadvantage and incompatibility with their beliefs. They also perceive this issue as changing schools' identity and not meeting local and regional needs.

Before the reform, technicians were prepared under a 3-year integrated academic-professional education program. During these 3 years, students were professionally prepared in agriculture, livestock production, and related/supporting areas. Such a comprehensive program prepared a “generalist technician,” able to work in a vast array of agriculture-related activities.

After the reform, schools were required to break down the previous 3-year comprehensive program into a number of professional minors in order to prepare technicians available to the job market in a shorter period of time (1.5 years as opposed to the 3-year previous period). Since then, the comprehensive program preparing the

“generalist technician” was broken down into technicians in crop production, technician in livestock production, technicians in dairy production, technicians in horticulture, and so on. A technician prepared under this new approach is known as a “specialist technician” in a dichotomous reference to the previous “generalist technician.”

Preparation of specialist technician is seen as negative by 12 interviewees. According to them, specialist technicians serve the interests of large scale agricultural enterprises to the detriment of family agriculture and small farmers, traditionally the major customers of secondary agricultural education in Brazil. They envision the preparation of specialist technicians as restrictive to professional mobility, narrowing preparation for a very specific set of positions in the labor market. Conversely, according to their perceptions, a generalist technician is suitable to a wide set of opportunities in the agricultural sciences field. Interviewees emphasized that the preparation of specialist technicians did not fit the diversified needs of farmers around the schools.

Interviewee 1A: Before, with the preparation of a generalist technician, small and family farmers were better served. I do not believe in this fragmentation that leads to specialist technicians.

Interviewee 2A: It is too much “market” for too little education. Market without education is a synonym of slavery.

Interviewee 1E: We believe that a generalist technician has better opportunities for professional mobility.

Interviewee 4C: Here, in our region, small and family farmers prevail. This reality requires a generalist technician.

Interviewee 4D: This segmentation in minors does not help at all. We are not in a stage to need specialist professionals; we need a professional that knows a bit of everything, because our agriculture is highly diversified.

Interdisciplinary work – Fifteen interviewees indicated that they are not engaged in any interdisciplinary work. However, interviewees indicated that they do interdisciplinary work on a limited basis. To them, to work interdisciplinary depends on both personal relationship among teachers and the nature of the subject matter:

Interviewee 1C: Interdisciplinary practice is sporadic and occurs only among certain disciplines.... Actually, I think we should call “interfriendship work” rather than “interdisciplinary work.” Personal relationships ultimately define this practice.

Interviewee 2E: We do not practice interdisciplinary work as a group. Only a few teachers, who are friends, do this.

Interviewee 4A: Interdisciplinary work depends on the relationships among teachers.

Interviewee 2C: Interdisciplinary is an always spoken word that rarely transforms itself in action.

Interviewee 1B: 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.

Interviewees also pointed out a very interesting point on interdisciplinary work: interdisciplinary implies to expose one’s deficiencies to a group, which requires a great deal of trust and confidence among group members

Interviewee 1A: When practicing interdisciplinary work you are subject to expose your deficiencies and weaknesses, and it is not easy. We fear exposing ourselves that much! To do so, we need to be highly confident as a group member.

Students less practical-oriented – One of the major goals of the reform was to prepare more practical-oriented, competency based students for the labor market, in a shorter time frame. For 15 interviewees, the reform has failed in preparing more practically oriented graduates in the agricultural education field. This perception is based upon the fact that opportunities for students to participate in experiential-based learning activities in the school have been drastically reduced.

Interviewees in three schools reported that the schools' farm structure has been dismantled or is facing serious constraints due to lack of personnel to run the production units. They also reported that teachers no longer have time available to dedicate to field activities. According to them, students also do not have time available to participate in practical activities due to the modular organization of the curriculum:

Interviewee 2C: After all this change [reform] students are overloaded in classroom work and have neither time nor opportunity to practice what they learn in classroom. All students time is spent into classrooms, and this is not good because practice is the keystone for a good technician.

Interviewee 3D: Students themselves complain: 'we do not have time to practice. We have too much lectures and homework to do.'

Interviewee 4C: Neither teachers nor students are able to dedicate time to practical activities anymore. This is not good for a technician preparation program. A program like this should have a balanced theory-practice relationship.

Experiential learning activities have been replaced by technical visits, field days, demonstrations, and the like. This is seen as a disadvantage because of the lack of hands-on experience.

Interviewee 3A: Students are less practical-oriented. They see professional subjects only in classroom settings, in demonstrations or technical visits. They no longer have active participation in practical activities as they had before the reform.

Interviewee 2C: The reform has killed practical activities in the school. I use to say that if this situation persists, in near future students will know cows only through pictures.

Teachers overloaded in work – This is a question closely related to the previous issue. Fourteen interviewees reported that teachers are overloaded in work, due mainly to two factors. First, the reform has brought an increase in the number of students in many schools and no new teachers were hired. Second, the modular organization of the curriculum has concentrated activities that were reduced from 3 years to 1.5 years. As a

result, courses are taught in a more intensive schedule, with a greater number of sessions. The combination of these two factors – increase in the number of students with no new teachers, and increase in the number of sessions taught in a more intensive schedule – brings more work for teachers and reduces time availability for teachers to prepare and deliver experiential-based activities.

Interviewee 2A: The modular organization of the curriculum has created a sort of concentration of activities for the teachers, because of its intensiveness and the increase in the number of sessions.

Interviewee 3C: New students, new sessions, new curricula, new everything. Just no new teachers. In other words, more work to the same group of teachers.

Interviewee 4B: Classroom workload has increased as well as the student/teacher ratio. Each of us has more students to work with. No new teachers were hired to face the increase in the number of students.

Interviewee 3E: The problem is not exactly the amount of classroom workload. The problem is the concentration of activities that the modular curriculum has brought.

Two additional aspects were identified by the interviewees as related to the overload of work for teachers: the heterogeneity in the student enrollment and the competency based evaluation. The two comments below clarify the teachers' perceptions:

Interviewee 2B: We have to work more intensively with the concomitance in different schools and with the sequential options students, because they have lower academic standards. We need to equalize them with the rest of the students. This is one factor that causes overload of work for us.

Interviewee 3D: Well, this reform has brought an increase in our load of work.... In my opinion this is due to two factors: our classroom workload has increased, and the competency based evaluation is more laborious than the traditional form of evaluate.

Students overloaded in work – Eleven interviewees reported they perceive students are overloaded in school work. This issue is interrelated to the fact that students are less practical-oriented, and to the fact teachers are overloaded in work.

According to the interviewees' perceptions, 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 school work. This situation is evident in the following comments:

Interviewee 1A: Students are overloaded in school work. They have no time to reflect... They are taking with them [learning] only few pieces of many things.

Interviewee 1C: Students who are registered in the concomitance in different schools option are the ones who suffer most with excess of school work.... Time is spent in the classroom in two different schools, and as a result the load of classroom work, are cumulative for those students. Their performance is remarkably lower because of this excess of work.

Interviewee 1D: The students are overloaded in work because of the intensive and concentrated nature of the modular curriculum. What they had 3 years to learn in the previous system, they now have to learn in 1.5 years after the reform!

Besides the eight major issues mentioned by more than fifty percent of the interviewees, a number of other relevant issues emerged from the interviews. Nine interviewees in all schools have mentioned that the reform was imposed on teachers. According to them, this is one major factor of resistance to the adoption of the reform. They do not see themselves as active participants in the reform process:

Interviewee 3C: We were never called to participate in the process. We were only notified about the changes, never asked for participation.

Interviewee 4A: Many people are resistant to this reform. I think this is because nobody was called to participate in the planning process. We feel like this reform is not ours.

Interviewee 1B: They simply throw this reform over us.

Interviewee 2C: The reform was issued as an order. No discussion, no explanation, no preparation.

Some teachers feel that the Ministry of Education was not prepared to implement the reform. Two interviewees reported the lack of support from the Ministry of Education in the process of implementation:

Interviewee 1E: We had no support from the Ministry of Education at all. What we felt was the Ministry of Education itself did not know how to implement the reform.

Interviewee 2A: 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 was how we felt.

Another interesting perspective that emerged from the interviews (mentioned by five different interviewees) was related to job security. Since the Ministry of Education has mandated a reduction in academic education enrollment by 50% as of 1997 in a five year period, academic subject teachers fear losing their jobs. They believe that the separation between academic and professional education has created the conditions for agricultural schools to stop offering academic education programs in the near future. This is pointed out as another factor for resistance to adopting the reform:

Interviewee 1C: Academic subject teachers are concerned about job security; because of this, many of them are against the reform, especially against the separation between academic and professional education. The questions are: What will be done with them? Will they simply be dismissed?

Interviewee 1E: The group as a whole fears unemployment if stop offering academic education in the school.

The dichotomy between academic and professional education is an issue that emerged from the literature review. When asked if the reform helps to promote or extinguish such a dichotomy, interviewees beliefs separated themselves into three groups: those who believe that the reform has contributed neither to promote nor to extinguish the dichotomy (9 interviewees), those who have no opinion on the topic (seven interviewees),

and those who think the reform has helped to promote such a dichotomy (3 interviewees).

One interviewee indicated the reform has contributed to extinguishing the dichotomy between academic and professional education because the school is more identified with the job market.

Interviewee 2D: The reform promotes such a dichotomy. The reform puts academic and professional education in opposite fields, as they were concurrently from one another instead of being a complement to one another, as they actually are.

Interviewee 4D: I think the reform neither increased nor decreased the academic-professional dichotomy; it simply separated one from the other.

Nine interviewees reported that the reform has changed the school structure. They see this as positive because the schools have resources to invest in new buildings, laboratories, machines, and equipments. However, three of them have mentioned that this change in the school structure has brought a new requirement, not met by the reform:

Interviewee 2C: The problem is that now we have new buildings, new equipment, new laboratories... but we have no personnel to run all these novelties. The few ones we have in the school did not have an opportunity to be trained on how to operate the new facilities and technologies.

A different aspect related to the changes in the school structure identified by the interviewees, refers to the fact that teachers and students are overloaded in classroom work and have little time available to dedicate to practical activities: a shortage of personnel to run the production units has emerged as a problem. This issue is illustrated on the two following comments:

Interviewee 2C: The reform has taken students out of the field. Before the reform, we counted on their work to run the production units. Now, students are not available to help in the production units and no one single employee was hired to fulfill the need.

Interviewee 3E: Taking students out of the production units has caused an unbalance to the school. Before the reform, they were in some way a workforce for the school. Now, they were taken out of the production activity and nobody was hired in their place!

Finally, eight interviewees believe that the reform has changed the school identity, an issue also present in the literature review. This perception is closely related to the heterogeneity in the student enrollment and to the generalist versus specialist technician issues. Interviewees see that the students who are being registered in the school after the reform, come from a different segment of the social fabric and have different expectations. According to these interviewees, students are coming from both urban and rural areas but their links with small and family farmers have decreased:

Interviewee 1C: Students now come from areas closer to the school. Students from small and family farm origins who live far from the school are decreasing in number. This happens because these students [from small and family farms] do not have enough money to support themselves in two different schools at the same time [academic and professional education in separated schools].

Interviewee 1A: The social segment the school serves has changed with the reform. There are more students coming from urban areas with different expectations – they want to prepare themselves to go back to urban settings.

Interviewee 4C: The reform has opened the school to the society. This is a change in the school identity.

Another reason to the change in the student enrollment is the emergence of new courses outside of the agricultural sciences field in federally supported agricultural schools, as pointed out by six interviewees. They see this phenomenon as very positive:

Interviewee 3E: The information technology major that the school started offering has changed the face of our school. The school became more attractive to students.

Interviewee 3A: The new courses have opened the school to a wider audience, reaching a more diverse range of professions. The school has improved on its interactions with the job market.

Data from the National Board of Federal Agro-Technical Schools Principals (2002) indicated that 21.0% of the students registered in professional education in federal agro-technical schools are in programs other than in the agricultural sciences field.

Information technology major accounts for 13.8% of all professional education students registered outside of agricultural sciences, followed by community development (1.3%) and tourism (1.2%) majors (National Board of Federal Agro-technical Schools Principals, 2002).

Phase Two – Quantitative Findings

A total of 297 teachers returned usable questionnaires. Table 4-8 presents data on teachers' age and teaching experience. The age of the teachers ranged from 23-60 years, with most of them (80.9%) between the ages 31-50. The average age of teachers was 40.94 years. Slightly more than one-half (51.4%) of the teachers had taught for 14 years or less. The average number of years teaching was 14.65.

Table 4-8: Age and Teaching Experience

Variable	f	%	Mean	S.D.
<u>Age (years)</u>			40.94	7.43
23-30	27	9.2		
31-40	122	41.5		
41-50	116	39.4		
51-60	29	9.9		
	<u>294</u>	<u>100.0</u>		
<u>Teaching Experience (years)</u>			14.65	7.68
1-10	96	32.7		
11-20	129	43.8		
21-30	67	22.8		
31 and above	2	0.7		
	<u>294</u>	<u>100.0</u>		

A majority of the respondents were male (68.4%). All teachers reported having college-level education, and an overwhelming majority of them (88.9%) had some kind of graduate study. Forty-two percent of the teachers taught professional-subject area, 31.6% percent taught academic-subject area, and 26.3% taught both professional- and academic-subject areas. A large percentage of teachers (78.5%) reported living in urban areas. Table 4-9 summarizes the data on teachers' demographic variables.

Table 4-9: Demographic Profile of Teachers

Variable	f	%
<u>Gender</u>		
Male	203	68.4
Female	94	31.6
	<u>297</u>	<u>100.0</u>
<u>Highest Degree Attained</u>		
Bachelor	33	11.1
Specialist ^a	174	58.6
Master/Doctorate	90	30.3
	<u>297</u>	<u>100.0</u>
<u>Teaching Area</u>		
Academic	94	31.6
Professional	125	42.1
Both	78	26.3
	<u>297</u>	<u>100.0</u>
<u>Residence</u>		
Urban	233	78.5
Rural	64	21.5
	<u>297</u>	<u>100.0</u>

^a Graduate-level course below the Master's level, with a minimum of 360 hours of instruction, designed to address specific needs of the labor market in a short period of time.

Descriptive Analysis on Rogers' (1995) Five Attributes of Innovations

The major purpose of this study was to investigate teachers' perceptions of Rogers' (1995) five attributes of innovations as related to the innovations brought about by the reform of professional education in Brazil. The questionnaire contained 37 items relative to the five attributes of innovations. The means and standard deviations for each of the thirty-seven statements are provided in Appendix C. Table 4-10 presents the summated scores for Rogers' (1995) five attributes of innovations.

The summated scores for the five attributes of innovations as shown in Table 4-10 revealed that three attributes were (relative advantage, compatibility and trialability) below the theoretical midpoint. Complexity was the only attribute above the theoretical midpoint, while observability was close to the theoretical midpoint. The mean statement scores for the five attributes of innovations ranged from a low of 2.30 (trialability) to a high of 3.42 (complexity). These means suggest that the trial period did not provide enough opportunities for teachers to experiment with the innovations ($M=2.30$), and that the innovations were somewhat incompatible ($M=2.63$) with teachers' values, past experiences, and/or needs. Mean statement scores also suggest that teachers do not perceive the innovations brought about by the reform as better than the previous situation ($M=2.74$). Finally, teachers were not sure about the results of the reform ($M=3.10$).

Table 4-10: Teachers' Perceptions on Five Rogers' (1995) Attributes of Innovations

Attributes of Innovations	n	Summated Mean Score	Theoretical Midpoint	Standard Deviation	Mean Statement Score ^a	Mean Statement SD
Relative Advantage (10-50) ^b	289	27.40	30.00	3.88	2.74	.39
Compatibility (10-50) ^b	292	26.31	30.00	4.13	2.63	.41
Complexity ^c (7-35) ^b	290	23.91	21.00	6.19	3.42	.88
Trialability (5-25) ^b	260	11.52	15.00	3.93	2.30	.79
Observability (5-25) ^b	296	15.49	15.00	3.18	3.10	.64
Total Score (37-185)	243	104.44	111.00	12.44	2.82	.34

^a Responses to the statements were scored as follows: 1=strongly disagree; 2=disagree; 3=not sure; 4=agree; 5=strongly agree.

^b Numbers in parentheses indicate the possible range of perception scores for each of the five attributes of innovations.

^c Responses for statements in this section were scored continuously from 1=not complex to 5=very complex.

Relative Advantage

For 84.7% of the teachers, the reform has not lowered the workload of activities for teachers ($M=1.89$). Approximately 33% of the teachers agreed that the reform has strengthened the ties with the world of work ($M=2.73$), and 30.5% saw the reform as making easier for graduates to find a job ($M=2.73$). For 37.2% of the teachers, students are less practical-oriented ($M=2.87$), while 50% perceived that students are overloaded with school work after the reform ($M=3.08$). Means for the relative advantage section were computed on a scale ranging from 1=strongly disagree to 5=strongly agree. Frequencies, percentages, means and standard deviations for each of the ten statements in the relative advantage section are provided in Appendix C.

Teachers were asked to indicate their perceptions about the separation between academic and professional education and the modular competency based curriculum, related to two aspects: compared to the situation before the reform, and reform's impact on their job. A statistically significant difference was found ($p < .001$; $t = -3.70$) between how teachers perceive the separation between academic and professional education and the modular competency based curriculum, as being worse or better than the situation previous to the reform. Teachers perceived that the modular competency based curriculum was slightly better than the previous discipline based annual curriculum ($M=3.26$), and the separation between academic and professional education was slightly worse than the previous integrated vocational and academic education model ($M=2.92$). Table 4-11 summarizes the data on the reform's dimensions as compared to the previous situation.

Table 4-11: Reform's Dimensions Compared to the Previous Situation

Variable	f	%	Mean ^a	S.D.	t
The Separation Between Academic and Professional Education as Compared to the Previous Situation: ^b			2.92	1.56	-3.700*
Worse	124	42.1			
Same	51	17.3			
Better	119	40.5			
	<u>294</u>	<u>100.0</u>			
The Modular Competency Based Curriculum as Compared to the Previous Situation: ^b			3.26	1.47	
Worse	98	33.1			
Same	54	18.2			
Better	144	48.7			
	<u>296</u>	<u>100.0</u>			

^a 1=worse; 2=somewhat worse; 3=same; 4=somewhat better;5=better.

^b 1 and 2=worse; 3=same; 4 and 5=better.

* $p < .001$

No significant difference was found between how teachers perceived the separation between academic and professional education and the modular competency based curriculum, in terms of making their job easier or more difficult as compared to the situation before the reform. They perceived both the separation between academic and professional education ($M=3.43$) and the modular competency based curriculum ($M=3.52$) as making the teacher's job slightly more difficult than the previous situation. Table 4-12 presents the data on teachers' perceptions of the impact of the reform on their job, as related to the separation between academic and professional education and the modular competency based curriculum.

Table 4-12: Reform Dimension's Impact on Teacher's Job

Variable	f	%	Mean ^a	S.D.	t
The Separation Between Academic and Professional Education's Impact on Teacher's Job: ^b			3.43	1.23	-1.105
Easier	59	20.0			
Same	103	34.9			
More difficult	133	45.1			
	<u>295</u>	<u>100.0</u>			
The Modular Competency Based Curriculum's Impact on Teacher's Job: ^b			3.51	1.36	
Easier	69	23.2			
Same	65	21.9			
More difficult	163	54.9			
	<u>297</u>	<u>100.0</u>			

^a 1=easier; 2=somewhat easier; 3=same; 4=somewhat difficult; 5=more difficult.

^b 1 and 2=easier; 3=same; 4 and 5=more difficult.

Teachers were asked to rate their perceptions about the heterogeneity in the student enrollment as making their job more difficult, on a scale ranging from 1 to 5 (1=strongly disagree; 2=disagree; 3=not sure; 4=agree; 5=strongly agree). For 50.8% of the teachers, heterogeneity in the student enrollment makes their job more difficult ($M=3.24$). However, as indicated during phase one of this study, for schools located near urban centers with quality secondary schools, heterogeneity in the student enrollment was not a problem. To search for convergence of results, teachers were divided into two groups: those from schools located close to cities (30 miles or less from cities with 500,000 more inhabitants), and those from schools located far from cities (more than 30 miles from cities with 500,000 more inhabitants).

A statistically significant difference ($p < .001$; $t = -3.63$) was obtained between school location and how teachers perceived heterogeneity in the student enrollment.

Teachers from schools located far from cities agreed more ($M=3.42$) than teachers from schools located closer to cities ($M=2.98$), that heterogeneity in the student enrollment makes their job more difficult. Table 4-13 depicts the data on heterogeneity in the student enrollment.

Table 4-13: Heterogeneity in the Student Enrollment

Variable	n	Mean ^a	S.D	t
<u>Heterogeneity in the student enrollment</u>	296	3.23	1.26	
Close to cities	84	2.82	1.25	-3.63*
Far from cities	212	3.40	1.23	

^a 1=strongly disagree; 2=disagree; 3=not sure; 4=agree; 5=strongly agree.

* $p < .001$

Compatibility

Means in the compatibility section were computed on a scale ranging from 1=strongly disagree to 5=strongly agree. Lack of training and support were the major factors of inconsistency with teachers' needs. For 80.1% of teachers, training programs were inadequate ($M=1.96$), while 74.7% perceived that the Ministry of Education's support was inadequate ($M=2.11$). For 65.4% of the teachers, the reform implementation has not been done in a participatory manner ($M=2.38$). Teachers were not sure which was the best option for the student's professional future: the generalist technician ($M=3.10$) or the specialist technician ($M=2.97$). Frequencies, percentages, means and standard deviations for each of the ten statements in the compatibility section are provided in Appendix C.

Complexity

Teachers were asked to rate the overall complexity of the reform, as compared to the previous situation, according to three categories: more complex, less complex, and no difference in complexity between the two situations. The results are shown in Table 4-14.

For 70.4% of teachers, the reform is more complex than the previous situation, while 18.2% responded that there was no difference in complexity between the reform and the previous situation. On the other hand, 11.4% of teachers perceived the reform as less complex than the previous situation.

Table 4-14: Overall Reform Complexity

When compared to the previous situation:	f	%
Reform is more complex	209	70.4
There is no difference in complexity	54	18.2
Reform is less complex	34	11.4
	297	100.0

Teachers perceived competency based evaluation as a more complex issue in the reform. Sixty-four percent of the teachers considered competency based evaluation complex to very complex ($M=3.67$), closely followed by 61.9% who considered conducting individual qualitative assessment as required by competency based evaluation complex to very complex ($M=3.66$). Interdisciplinary work was seen as having average level of complexity ($M=3.17$). Means in the complexity section were calculated on a five-point scale ranging from 1=not complex to 5=very complex. Frequencies, percentages, means, and standard deviations for each of the seven statements in the complexity section are provided in Appendix C.

Trialability

Means for the trialability section were computed on a scale ranging from 1=strongly disagree to 5=strongly agree. For more than 70% of the teachers, the trial period did not provide many opportunities to try the innovations ($M=2.11$) and teachers were not provided tools to effectively test the innovations ($M=2.14$). A significant moderate relationship ($r=.408$; $p<.001$) was found between the supply of tools to effectively test the innovations and the adequacy of the training programs offered during the implementation of the reform (compatibility). Such a significant relationship means that teachers who disagreed in terms of the supply of tools to test the innovations also disagreed in terms of the adequacy of the training programs offered during the implementation period.

Sixty percent of the teachers ($M=2.52$) felt that the trial period did not help dispel uncertainties they had about the reform. For 52.4% of teachers, they did not know where they could go to find information on the implementation of the reform ($M=2.62$). For 26.1% of the teachers, there was frequent exchange of experiences among teachers during the trial period ($M=2.46$). Frequencies, percentages, means, and standard deviations for each of the five statements in the trialability section are provided in Appendix C.

Observability

Fifty-one percent of the teachers noted an increase in the number of students as a result of the reform ($M=3.23$), and 49.8% agreed that the students who attended the school after the reform have a different profile than those who attended the school prior

to the reform ($M=3.14$). However, teachers were not sure if they could tell others about the results of the reform ($M=2.99$), despite 44.5% have agreed that they can communicate to others the consequences of the reform ($M=3.14$). Means in the observability section were computed on a scale ranging from 1=strongly disagree to 5=strongly agree.

Frequencies, percentages, means and standard deviations for each of the five statements in the observability section are provided in Appendix C.

Descriptive Analysis on the Voluntariness of Use

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. Fifty-nine percent of the teachers responded that they would have chosen to implement the modular competency based curriculum, while 55.7% responded that they would have not chosen to separate academic and professional education. A chi-square test indicated that there is a statistically significant association ($\phi = .373$; $p < .001$) between the willingness to implement the modular competency based curriculum and to separate academic and professional education. Chi-square result suggests that teachers were more likely to implement the modular competency based curriculum than they were to separate academic and professional education. Data on voluntariness of use are summarized in Table 4-15.

Table 4-15: Crosstab on Voluntariness of Use

	Voluntary implementation of the modular competency based curriculum		Total	χ^2
	Yes	No		
Voluntary separation of academic and professional education	Yes	104	131	41.18 ^a
	No	70	165	
Total	174	122	296	

^a $df=1$; $\phi = .373$; $p < .001$

Quantitative Data Analysis

Rate of adoption was the dependent variable, collected and coded as categorical data with three levels: 1=have adopted the innovations, 2=have not adopted the innovations and 3=have partially adopted the innovations. The dependent variable was a multinomial variable with three mutually excluded levels.

Table 4-16 summarizes descriptive data on the study's independent and moderator variables. Rogers' (1995) five attributes of innovations (relative advantage, compatibility, complexity, trialability, and observability) were the independent variables for this study. They were treated as continuous variables and measured on a Likert-type scale ranging from 1 to 5. Independent variables are addressed through research question one.

Voluntariness of use, as indicated by Moore and Benbasat (1991), was addressed through research question number two and was treated as a moderator variable.

Voluntariness of use was measured relative to the two dimensions of the reform: the separation between academic and professional education and the modular competency

based curriculum. Teachers were asked to provide a yes/no response for each of the dimensions (1=yes; 2=no).

Demographic data on gender, age, education, and teaching experience were also collected to address research question number three. Gender was collected as categorical data and dummy coded for analysis (0=male; 1=female). Age was collected and entered into the model for analysis in integer years, meaning that the variable was treated as a continuous variable. Years of teaching experience was also collected and entered for analysis in integer years, as a continuous variable.

Data on education was collected in five categories: 1=secondary education; 2=bachelor; 3=specialization; 4=masters; 5=doctoral. Educational data were dummy coded for analysis into two categories: 0=less than masters, comprising secondary education, bachelor, and specialization; 1=masters and doctoral. Table 4-17 summarizes the data for the multinomial logistic regression model.

Table 4-16: Descriptive Statistics for the Variables Included in the Study

Variable	n	%	Mean	SD
<u>Attributes of Innovations</u>				
Relative Advantage ^a	289		2.74	.39
Compatibility ^a	292		2.63	.41
Complexity ^b	290		3.42	.88
Trialability ^a	260		2.30	.79
Observability ^a	296		3.10	.64
<u>Voluntariness of Use</u>				
Separation academic-professional education ^c	296		1.56	.50
Modular competency based curriculum ^c	296		1.41	.49
<u>Demographics</u>				
Age	294		40.94	7.43
Teacher experience	294		14.65	7.68
Gender (dummy coded):				
0=Male	203	68.4		
1=Female	94	31.6		
	297	100.0		
Education (dummy coded):				
0=Less than MS	207	69.7		
1=MS and PhD	90	30.3		
	297	100.0		

^a Mean computed on a scale from 1=strongly disagree to 5=strongly agree.

^b Mean computed on a scale from 1=not complex to 5=very complex.

^c 1=yes; 2=no

The complete multinomial logistic regression model is presented in Table 4-17. The model, involving all variables for the three research questions (research question 1=attributes of innovations; research question 2=voluntariness of use; research question 3=demographics), was statistically significant ($\chi^2 = 55.21$, $df = 22$) at the $p < .001$ level.

As shown in Table 4-17, the model explains the adoption of the innovations studied. However, the model does not explain the non-adoption of the innovations studied. None of the variables have shown statistical significance as predictors for non-adoption. The small n size under the “have not adopted” category may have had some effect on the prediction of non-adoption (see Table 4-18).

Statistical significance was found for relative advantage ($p=.034$), compatibility ($p=.020$), complexity ($p=.011$), and observability ($p=.005$) as predictors for the adoption of the innovations in this study. Years of teaching experience also showed a statistical significance ($p=.048$) as a predictor. Trialability did not show statistical significance ($p=.574$) as predictor for the adoption of the innovations.

Table 4-18 presents the predicted classification for the multinomial logistic regression model. Overall, the variables of the study correctly classify 77.6% of the adopters of the innovations.

Table 4-18: Classification for the Multinomial Logistic Regression Model

Observed	Predicted			Percent Correct
	Have Adopted	Have Not Adopted	Have Partially Adopted	
Have adopted	12	2	30	27.3
Have not adopted	0	1	17	5.6
Have partially adopted	4	0	171	97.7
Overall percentage (%)	6.8	1.3	92.0	77.6
Totals (n)	44.0	18.0	175.0	237.0

Research Question One – To what extent do Rogers’ (1995) five attributes of innovations explained the different rates of adoption of the innovations brought about by the reform of professional education in Brazilian federally supported agricultural schools? The multinomial logistic regression analysis considering only Rogers’ (1995) five attributes of innovations indicated that they contributed to explaining 74.4% of the rate of adoption of the innovations. Table 1 in Appendix D summarizes the adopters classification data on Rogers’ (1995) five attributes of innovations.

Research Question Two - What are the perceived constructs, if any, outside of Rogers’ (1995) five attributes of innovations, which may have contributed to explaining the rate of adoption of the innovations brought about by the reform of professional education in Brazilian federally supported agricultural schools? This question addressed the presence of voluntariness of use as a special attribute, as indicated by Moore and Benbasat (1991). 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, as shown in Table 2 in Appendix D.

Research Question Three - How have teacher’s demographic characteristics (gender, age, educational level, and teaching experience) impacted their perceptions about the innovations brought about by the reform of professional education? Gender, age, and educational level did not have an impact on the rate of adoption. Multinomial logistic regression analysis indicated that gender, age, and educational level together explained 3.0% of the rate of adoption of the innovations object of this study. Teaching experience, which has showed statistical significance ($p = .048$) in the complete

multinomial logistic regression model (see Table 4-17) contributed to explaining, by itself, 2.2% of the rate of adoption of the innovations object of this study. Table 3 in Appendix D summarizes the adopters' classification data on teacher's demographic characteristics as related to the adoption of the studied innovations.

Triangulation Qualitative-Quantitative Data

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 (see Table 4-17). Trialability was also the attribute that received the lower number of mentions during the interviews in the qualitative phase (see Table 4-7). Lack of training opportunities during the implementation period was the premier issue voluntarily raised in the qualitative phase (see Table 4-4). In the quantitative phase of this study, 73.8% of teachers agreed that they were not provided tools to effectively test the innovations (see Appendix C). Adequacy of training programs was measured in the quantitative phase as part of the compatibility section, to be consistent with Rogers' (1995) definition that compatibility is the degree to which an innovation is consistent with the adopters' needs. A significant relationship ($r=.408$; $p<.001$) 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. On the qualitative phase, 70% of the interviewees (14 individuals) indicated that the length of the trial period was not enough (see Table 4-4), while in the quantitative phase 60.4% of the teachers felt that the trial period did not help them to dispel uncertainties they had about the reform (see Appendix C).

Observability was the attribute that showed the highest statistical significance ($p=.005$) in the logistic regression model as a predictor for the rate of adoption (see Table 4-17). On the other hand, observability was ranked 4th in number of mentions among the five attributes of innovations in the qualitative phase of the study (see Table 4-7). An increase in the number of students was an issue that emerged in the qualitative phase with 6 interviewees (30%) as an observable result of the reform (see Table 4-5), and by 49.8% of the teachers in the quantitative phase of the study (see Appendix C). Quantitative data indicated that teachers were not sure if they could tell others about the results of the reform ($M=2.99$). Five of eight issues that emerged from the interviewees as related to observability (see Table 4-5) were also mentioned as a relative advantage or compatibility issues (see Table 4-7). Data on those five issues (students less practical-oriented, improvement in the school structure, teachers overloaded with work, students overloaded with work, and restriction for professional mobility) were collected and analyzed under the relative advantage and compatibility sections in the quantitative phase of the study.

Complexity was the attribute that showed the second highest statistical significance level ($p=.011$) as a predictor for adoption in the logistic regression model. Complexity was ranked 3rd among the five attributes of innovations in number of mentions during the interviews in the qualitative phase of the study. Sixty percent of the interviewees in the qualitative phase (see Table 4-3), and 70.4% of the teachers in the quantitative phase of the study (see Table 4-14) considered the reform more complex than the previous situation, clearly indicating a convergence of results. Competency

based evaluation is indicated as complex in both qualitative (mentioned by 80% of the interviewees, as shown in Table 4-3) and quantitative (64% considered competency based evaluation as “complex to very complex,” as shown in Appendix C) data.

Interdisciplinary work is considered not complex for 15 interviewees (75%) as indicated in Table 4-3, but it was difficult to implement on a daily basis. For teachers in the quantitative phase (see Appendix C), interdisciplinary work was seen as having an average level of complexity ($M=3.66$).

Compatibility was another attribute that showed statistical significance ($p=.020$) as a predictor for adoption in the logistic regression model and was ranked 2nd in number of mentions in the qualitative phase of the study (see Table 4-7). Lack of adequate training was the major factor of inconsistency with teachers’ needs that emerged from both qualitative and quantitative data: it was mentioned by 95% of the interviewees (19 interviewees) in the qualitative phase (see Table 4-2), and by 80.1% of the teachers in the quantitative phase (see Appendix C). For 50% of the interviewees (10 individuals) in the qualitative part, it was felt that the reform was imposed on teachers (see Table 4-2), while 65.4% of the teachers in the quantitative part (see Appendix C) felt that the reform implementation was not conducted in a participatory manner. Lack of institutional support was an issue raised by 74.4% of the teachers in the quantitative part of the study (see Appendix C), but mentioned by only 3 individuals (15%) during the interviews. Finally, 14 individuals (70%) during the qualitative phase of the study indicated that the separation between academic and professional education is not compatible with their existing values and beliefs, while 11 individuals (55%) indicated the modular

competency based curriculum as being compatible with their values and beliefs (see Table 4-2). On the quantitative side, 44.3% of the teachers disagreed that the separation between academic and professional education is compatible with their educational philosophy, while 50.5% indicated that the modular competency based curriculum is compatible with their educational philosophy (see Appendix C).

Relative advantage also showed a statistical significance ($p=.034$) as a predictor for adoption in the logistic regression model, and was ranked 1st in number of mentions in the qualitative phase of the study (see Table 4-7). Overall, 8 individuals (40%) in the qualitative phase (see Table 4-1), and 38.8% of the teachers in the quantitative phase of the study (see Appendix C) indicated that the reform's disadvantages outweigh its advantages. Qualitative and quantitative data on relative advantage also converged on two other issues: 1) 14 individuals (see Table 4-1) representing 70% of the interviewees in the qualitative phase and 84.7% of the teachers in the quantitative phase (see Appendix C) indicated that teachers are overloaded with work after the reform, and; 2) 11 individuals (see Table 4-1) representing 55% of the interviewees in the qualitative phase and 50.0% of the teachers in the quantitative phase (see Appendix C) indicated that students are overloaded with school work after the reform. However, a major issue emerged from the qualitative phase, mentioned by 15 of the 20 interviewees (75%), was not supported by the quantitative data: students were less practical-oriented (see Table 4-1). Only 37.2% of the teachers in the quantitative phase of the study agreed that students are less practical oriented (see Appendix C) as opposed to the 75% in the qualitative phase. Heterogeneity in the student enrollment was an issue mentioned by 14

interviewees (70%) during the qualitative phase of the study as a disadvantage brought by the reform (see Table 4-1). For 50.8% of the teachers in the quantitative phase, heterogeneity in the student enrollment makes their job more difficult (see Appendix C). A statistically significance difference was found between school location and how teachers perceived heterogeneity in the student enrollment ($p < .001$; $t = -3.63$).

Quantitative analysis (see Table 4-11) showed that more teachers perceived the modular competency based curriculum better than the previous discipline based annual curriculum ($p < .001$; $t = -3.70$), than they perceived the separation between academic and professional education. Forty-five percent of the interviewees (9 individuals) in the qualitative phase (see Table 4-1) and 32% of the teachers in the quantitative phase (see Appendix C) indicated an improvement in the school structure as a positive perception under relative advantage.

Voluntariness of use did not show statistical significance ($p=.979$ for the separation between academic-professional education; $p=.718$ for the competency based curriculum) as a predictor for the adoption of the innovations. It may be of value in summarizing the quantitative data that indicated teachers were more likely to voluntarily adopt the modular competency based curriculum (see Table 4-15) than they were to voluntarily adopt the separation between academic and professional education ($\chi^2 = 41.18$; $df = 1$; $p < .001$). Sixteen interviewees (80%) in the qualitative phase indicated that they would have voluntarily adopted the modular competency based curriculum and only 4 interviewees (20%) indicated their willingness to voluntarily adopt the separation academic-professional education (see Table 4-6).

CHAPTER 5

Summary, Conclusions and Recommendations

The focus of this study was to understand the adoption process of 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 of this study 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 professional education reform 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 the educational innovations. Three research questions were developed to address the purposes of the study:

1) To what extent do 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, teaching experience) have impacted their perceptions about the innovations brought about by the professional education reform?

This study used a sequential mixed model exploratory investigation design (Tashakkori & Teddlie, 1998) to collect qualitative (phase one) and quantitative data (phase two) that were analyzed in a complementary manner. The target population was the teachers of Brazilian federally supported agricultural schools. The cluster sampling technique was used to randomly select schools in all geographic regions of Brazil for both phases of the study.

In the first phase of the study, one federally supported agricultural school was randomly selected from each of the five geographic regions of the country. As a result, a total of five schools were randomly selected. In each of these schools, four teachers – two from the academic and two from the professional subject area – were randomly selected to be interviewed by the researcher. A total of 20 randomly selected teachers were interviewed during phase one of the study. An open-ended format, five-sections and 28 interview guiding questions protocol was developed. Rogers' (1995) diffusion of innovations theory, findings relative to adoption in the Brazilian literature, Holloway's (1977), and Moore and Benbasat (1991) studies were used as a basis for the development of the protocol. The interview protocol was reviewed by a panel of four experts for content validity. Data collected in phase one was used to construct the survey questions for phase two of the study. Qualitative data were transcribed and coded using the QSR NUD*IST Vivo software package for qualitative research version 1.3. Coded data were retrieved and organized into categories that were explored through a de-contextualization/re-contextualization process. The exploration allowed transforming categorized data into meaningful data.

In the second phase of the study, a stratified random sample of 15 schools was chosen to be surveyed. The number of stratified randomly selected schools allowed for at least one school being selected per region. All the teachers in each of the 15 randomly selected schools were selected (N=479) to participate in the study.

A seven-section questionnaire was developed to collect the data. The first five sections contained statements related to Rogers' (1995) five attributes of innovations, in the following order: Section I – Relative Advantage; Section II – Compatibility; Section III – Complexity; Section IV – Trialability, and; Section V – Observability. Section VI elicited information on voluntariness of use and rate of adoption (dependent variable of the study). Section VII was designed to collect demographic data about the participants – gender, age, educational level, area of teaching, years of teaching experience, and residence. Data obtained from the qualitative phase of the study, Rogers' (1995) diffusion of innovations theory, findings in the Brazilian literature, Moore and Benbasat (1991), and Holloway (1977) instruments served as the basis for the questionnaire development. The questionnaire was reviewed by a panel of eight experts at Penn State for content and face validity, and was pilot tested with Brazilian federally supported agricultural school teachers from a school not participating in the study. Overall reliability coefficient obtained from the pilot test was $\alpha = .63$. After revisions, which included addition and deletion of items, the overall reliability for the final study was $\alpha = .85$. A total of 297 usable questionnaires were returned (62% response rate).

Quantitative data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS) software for Windows, version 10.1. Descriptive and inferential statistics were used. A multinomial logistic regression model was developed to estimate the effects of the independent and moderator variables on the rate of adoption of innovations. This technique is appropriated to predict polytomous dependent variables by one or several independent variables.

Conclusions

The majority of federally supported agricultural school teachers were male (68.4%). The average age of teachers was 40.94 years with an average of 14.65 years of teaching experience. An overwhelming majority of teachers (88.9%) have some kind of graduate education, and 78.5% of teachers reported living in urban areas.

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. The multinomial logistic regression model developed in this study did not explain the non-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. The mean statement scores for Rogers' (1995) five attributes of innovations, measured in a scale

ranging from 1 to 5, were as follows: complexity=3.42; observability=3.10; relative advantage=2.74; compatibility=2.63; trialability=2.30.

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 (see Table 4-1) that such a curriculum design is more flexible than the previous one.

Lack of adequate training programs were the major limitation to the implementation of the reform as indicated by the teachers, and may have influenced their perceptions in at least four of the five attributes of innovations – compatibility,

complexity, relative advantage, and trialability. Findings from this study suggested that no systematic and continuous effort was evident in providing adequate training for teachers during the implementation of the reform; group study, group discussion, video watching, and some keynote speeches at the school level were reported, but without any systematical planning or external support. Teachers felt that they were not provided with the 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. These perceptions may be related to the lack of adequate training programs and may provide a basis for the lack of significance of trialability as a predictor for the rate of adoption. Lack of adequate training was also a major factor of inconsistency with teachers' needs and may have influenced their perceptions on the advantages and disadvantages of the reform.

Financial support from the Ministry of Education through the Technical and Vocational Education Reform Program – PROEP, which made possible improvements in school structure, was not evenly distributed among federally supported agricultural schools. No financial support from the PROEP program was provided for the development and delivery of systematic and adequate teacher and staff training programs. Financial resources were primarily used for making improvements in the school physical structure, such as new buildings, laboratories, machines, and equipments. This finding may suggest that federally supported agricultural schools have expanded and improved their physical structure but have not hired and/or trained enough personnel to operate and take full advantage of the improvements.

The manner in which the reform was implemented was an important factor of incompatibility with teachers' values and beliefs. 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).

Federally supported agricultural school teachers perceived the innovations brought about by the reform as more complex than the previous one. Competency based evaluation was the premier complexity factor. Three major aspects that emerged from the interviews may have influenced teachers' perceptions 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 an excessive individual responsibility in judging students. Teachers perceived student qualitative assessment, as required by competency based evaluation, to be especially complex.

Interdisciplinary work was not being implemented on a daily basis by federally supported agricultural school teachers. 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 in the nature of the subject matter.

The heterogeneity in the student enrollment brought about by the reform was perceived by teachers from schools located far from cities as a factor that made their job more difficult. Heterogeneity in the student enrollment started as a result of enrollment options created after the reform – concomitance in the school, concomitance in different schools, and sequential enrollment – and refers primarily to students with different quality of academic preparation enrolled in the same program. This perception of teachers from schools located far from cities 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; federally supported agricultural schools are 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. Schools in rural areas, small villages, and towns in Brazil, as in many developing countries, often suffered 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.

Closely related to the heterogeneity in the student enrollment is the finding that as of 2002, 21% of all students registered in professional education in federal agro-technical schools were enrolled in programs other than in the agricultural sciences field, particularly in information technology programs. This may suggest that the agricultural education model in place in Brazilian federally supported agricultural schools is in search of a new role. If this is true, Brazilian federally supported agricultural schools may be in

the midst of a paradigm change which brings uncertainties that may have affected teachers' perceptions about the reform of professional education.

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 this study suggested that teachers are overloaded with work due to a combination of two factors: the reform has brought 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 a 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.

Finally, all variables that were statistical significant in explaining the rate of adoption of the innovations in this study – observability, complexity, compatibility, relative advantage, and teaching experience – reflect a reality that is subject to change depending on the quality and nature of administrative, organizational, and/or educational intervention. These findings have strong implications for teachers, educational administrators, and policymakers.

Recommendations

Further research in the area is highly recommended, specifically:

1) To 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. Data from such replications would provide insights to better determine what attributes are influencing teachers' perceptions in adopting or not adopting educational innovations.

2) To 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 highly 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 find a solution for the excessive load of work the reform has brought for teachers and students. The solution 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.

Based on my experience as educational administrator in Brazil, and the knowledge I have gained through this study, I recommend to:

1) Conduct comparative research studies using mixed methods designs to evaluate the social impact of the reform on the professional mobility and educational attainment of federally supported agricultural school graduates. Graduates prior to and after the reform should be compared for their professional mobility and educational attainment.

2) Gain a better understanding of schools' structure and their role as institutions, contextualizing the impact of the reform in Brazilian agricultural schools at all levels. Data from these studies may provide a justification and support for developing an updated agricultural education model for Brazil that can better address new opportunities for students with diverse backgrounds, expectations, and perspectives.

3) Conduct a systematic needs assessment at the school level, involving school personnel, students, and communities, to identify gaps, priorities, and possible solutions related to the implementation of the reform. The findings of this study, have provided insights for examining some variables that showed significance in explaining the rate of adoption of the innovations. Needs assessment should help develop systematic training programs for teachers. Such training programs should take into consideration social, historical, economic, educational, emotional, political, and personal factors, to promote positive reactions, effective learning, and the desired behavioral change on teachers.

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APPENDIX A

Human Subjects Documents – Phase One

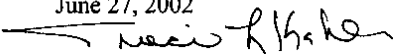
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Office for Regulatory Compliance

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Date: June 27, 2002
 From: 
 Tracie L. Kahler, IRB Administrator
 To: Francisco C. Leite
 Subject: Proposal for Use of Human Subjects in Research - Exemption (IRB #14629)

Approval Expiration Date: June 27, 2003

“Factors Influencing the Adoption of New Curriculum in Brazil's Federally Supported Agricultural Schools”

Your proposal for use of human subjects in your research has been reviewed and **approved for a one-year period**. Subjects in your research are at minimal risk.

Attached are confidential labels you can use to seal the envelopes that contain the original, signed informed consent forms obtained from the subjects of your study. These envelopes are then to be mailed to the address listed above. Contact this office if you need more labels.

Subjects must receive a copy of the informed consent form and the written explanation of your study that was submitted to this office for review.

By accepting this decision you agree to notify this office of (1) any additions or changes in procedures for your study that modify the subjects' risks in any way and (2) any events that affect the safety or well being of subjects.

The University appreciates your efforts to conduct research in compliance with the federal regulations that have been established to ensure the protection of human subjects.

TLK/mbc

Attachments

cc: Rama B. Radhakrishna
 Connie D. Baggett ✓
 Department Head, Agricultural and Extension Education
 Research Dean, College of Agricultural Sciences

Title: Factors Influencing the Adoption of New Curriculum in Brazil's Federally Supported Agricultural Schools

Researcher: **Francisco Carlos Leite**, Ph.D. Candidate
Department of Agricultural and Extension Education
e-mail: fleite@psu.edu

Advisor: **Connie D. Bagett**, Associate Professor
Department of Agricultural and Extension Education
e-mail: bbc@psu.edu

Co-Advisor: **Rama B. Radhakrishna**, Associate Professor
Department of Agricultural and Extension Education
e-mail: brr100@psu.edu

Interview Protocol

Opening Remarks

- Greetings:
 - Researcher will introduce himself with name and as a Ph.D. student from Penn State.
 - Researcher will describe his previous background as agricultural education teacher and agricultural school principal in Brazil (Mato Grosso do Sul and Tocantins states) during 18 years.
 - Researcher will give quick explanation about the objectives of the research: to provide information on how federally supported agricultural school teachers have reacted to two innovations brought about by the reform of professional education: 1) the separation between general and professional education and 2) the competence-based curriculum.
 - Researcher will assure the confidentiality of the data, explaining that the interview will be recorded, however the name of the interviewee will not be recorded on the tape.
- Ask interviewee to introduce him or herself (focus on professional and educational background):
 - Give his or her professional background in terms of experience in teaching.
 - Give his or her educational background in terms of what kind of college degree he or she holds as well as graduate education.

Introductory/Transitional Questions

- About the previous agricultural education curricula, under the Law 5692:
 - What were the main strengths and weaknesses?

- The 1997 reform of professional education:
 - What are the main points that have affected your job?

 - How did the reform affect the school identity/structure (if so)?

Key Questions

1. Related to Relative Advantage

- Primary question: Do you think the changes brought about by the reform (the separation between academic and professional education, and the modular competency based curriculum) makes the current situation better, worse, or about the same as compared to the situation before the reform? Why? Can you list some advantages and disadvantages of both situations?
-
- Probing questions:
 1. Do you think the separation between academic and professional education and the modular competency based curriculum: Makes your job easier? Promotes savings in time and effort? – Why/How?

 2. Do you think the separation between academic and professional education and the modular competency based curriculum: Has brought more flexibility to the curriculum? Promotes or diminishes the vocational-academic dichotomy? Creates new career opportunities for students? – Why/How?

 - Closing questions: Do you think the separation between academic and professional education and the modular competency based curriculum have being beneficial to agricultural education? In general, did it bring more advantages or disadvantages? – Explain.
-

2. Related to Compatibility:

- Primary question: Are the changes brought about by the reform (separation between academic and professional education and the modular competency based curriculum) compatible with your educational values and past experiences? Are they compatible with your needs, with the needs of your students and the school community?

- Probing questions:
 1. Do you think the independence between general-professional education and the modular competence-based curriculum will give students new perspectives and opportunities? Will the new curriculum organization give students better opportunities in the world of work?

 2. What are the similarities and differences between this reform and the one promoted by the Law 5692?

 3. Did you have an opportunity to participate in training programs to implement the reform? How often did you participate? Do you think the training program was enough?

 4. Did the implementation of the independence between general-professional education and the modular competence-based curriculum influence/precipitate a need for new teaching materials, equipments, laboratories, and so on? If so, are there financial resources to cope with the new requirements? Do you think lack of money can be a source of constraint to the success of the reform?

- Closing questions: How compatible is the new curriculum organization/structure with your own educational philosophy? Do you think students perceive the reform as beneficial to their needs and expectations? – Explain.

3. Related to Complexity

- Primary question: Do you think the separation between academic and professional education, and the modular competency based curriculum is more complex, less complex, or have the same degree of complexity as the situation previous the reform? Can you indicate the major points of complexity, according to your perception?

- Probing questions:
 1. Do you think the concepts of competence-based curriculum are easy to understand and apply in the teaching, planning and practice?

 2. Is it easy to work with other interdisciplinary teachers as a team?

 3. Is it easier for students to make connections across disciplines under the new modular competence-based curriculum?

- Closing questions: What do you think are the more or less complex points for teachers and students in teaching the modular competence-based curriculum?

4. Related to Trialability:

- Primary question: Do you think the legal period granted as trial period (April 1997 – December 2001) was enough to experiment the changes brought about by the reform? Please, explain your answer.

- Probing questions:
 1. Did you have enough opportunity to experience the modular competence-based curriculum model during the trial period? Have you interacted enough with your colleagues to discuss experiences during the trial period?

 2. Do you think the trial period was important in giving you tools to apply the innovations? Was the time length enough? – Why? Explain.

- Closing questions: From your perspective, what are the positive and negative aspects you have experienced during this trial period? What aspects do you think might be handled differently? – Explain.

5. Related to Observability:

- Primary question: What are the results you perceive from the reform? Can you list some of these results, if any?

- Probing questions:

1. What are some reactions of your colleagues to the innovations brought about by the reform?

2. Do you think the reform has impacted students' drop-out rates? How/Why?

- Closing questions: Are there any other outcome(s) (to yourself, to students, to school) you have observed as a result of the adoption of the modular competence-based curriculum? Please, describe.
-

Voluntariness of use

Imagine if the adoption of the reform was a voluntary decision. Would you have adopted the separation between academic and professional education? How about the modular competency based curriculum?

Closing Remarks

- Are there some other important (positive or negative) aspects that may influence your perception of the independence between general-professional education and the modular competence-based curriculum that we did not cover today? If so, please explain.
-
- If the adoption of the modular competence-based curriculum was voluntary, would you have adopted it? Why, or why not?
-
- Thanks for the participation.
 - The researcher will reassure that all responses he or she has given during the interview will be handled strictly confidential. No names were recorded and no individual data will be released under any circumstance.
 - The researcher will ask for any other questions or comments from the interviewee.

APPENDIX B

Human Subjects Documents – Phase Two

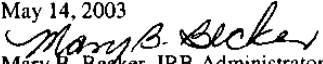
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Date: May 14, 2003
From: 
Mary B. Becker, IRB Administrator
To: Francisco C. Leite
Subject: Results of Review of Proposal - Exemption (**IRB #15894**)

Approval Expiration Date: May 13, 2004

"Factors Influencing the Adoption of New Curriculum in Brazil's Federally Supported Agricultural Schools"

The Social Science Committee of the Institutional Review Board has reviewed and approved your proposal for use of human participants in your research. **This approval has been granted for a one-year period.**

COMMENT: Enclosed is the dated, IRB-approved informed consent to be used when recruiting participants for this research.

Approval for use of human participants in this research is given for a period covering one year from today. **If your study extends beyond this approval period, you must contact this office to request an annual review of this research.**

Subjects must receive a **copy** of any informed consent documentation that was submitted to the Office for Research Protections for review.

By accepting this decision you agree to notify the Office for Research Protections of (1) any additions or procedural changes that modify the participants' risks in any way and (2) any unanticipated subject events that are encountered during the conduct of this research. Prior approval must be obtained for any planned changes to the approved protocol. Unanticipated participant events must be reported in a timely fashion.

On behalf of the committee and the University, I thank you for your efforts to conduct your research in compliance with the federal regulations that have been established for the protection of human participants.

MBB/mbc

Enclosure

cc: Connie D. Baggett
Department Head, Agricultural and Extension Education
Research Dean, College of Agricultural Sciences

PENNSTATE



Department of Agricultural and Extension Education

(814) 865-1688

Fax: (814) 863-4753

College of Agricultural Sciences
The Pennsylvania State University
323 Agricultural Administration Building
University Park, PA 16802-2601

April 17, 2003.

Dear Agricultural Teacher:

The reform in the Brazilian educational system and particularly the reform in the vocational education initiated with the Presidential Decree 2.208 of 1997, has remarkable implications to agricultural education. The separation between general and vocational education and the inception of the modular competency based curriculum are among the biggest changes impacting agricultural schools.

In an effort to help better understand the impact of such changes in federally supported agricultural schools, we are conducting this study with federally supported agricultural school teachers. Specifically, our study addresses the factors that influence the way teachers perceive two aspects (we named innovations) of the reform: the separation between academic and vocational education, and the modular competency based curriculum. We are inviting you to complete and return the attached questionnaire which may take about 15-20 minutes. Your responses are very important to the study we are conducting.

Findings from this study will potentially benefit teachers, administrators, legislators, policymakers, and students. In addition these, findings may also provide data for the advancement of public policies and training programs in the agricultural education field. Finally, findings will have the potential to provide data to evaluate the impact the reform has bringing to schools, students, and communities.

Your responses will remain completely confidential. Your name is not identified in any form, which protects you through anonymity. The name of your school will never be identified in the study and under no circumstances will any individual data be released. All data will be reported in summary form only. When you finish answering the questionnaire, put it in the provided envelope, seal the envelope and return it to the drop box located in the place indicated by the person who gave you the questionnaire. Please, do not write your name or any other form of personal identification in the questionnaire or on the envelope – this is critical to ensure the confidentiality of your answers.

Your participation in this study is voluntary. The informed consent form attached to this letter contains detailed information about your participation. Please read it carefully before completing the questionnaire and, if you have any questions, feel free to contact us through e-mail (fleite@psu.edu) or telephone (00-xx-1-814-863-7877).

Your cooperation and support for this study is deeply appreciated.

Sincerely,

Francisco Carlos Leite
Ph.D. Candidate, Agricultural and Extension Education
Researcher

Connie D. Baggett
Associate Professor
Academic Advisor

PENNSTATE



Department of Agricultural and Extension Education

(814) 865-1688

Fax: (814) 863-4753

College of Agricultural Sciences
The Pennsylvania State University
323 Agricultural Administration Building
University Park, PA 16802-2601

17 de Abril de 2003.

Prezado(a) Professor(a):

A reforma do sistema educacional brasileiro, particularmente a reforma da educação profissional iniciada com o Decreto 2.208 em 1997, tem provocado uma série de impactos no ensino agrícola. Em especial a separação entre ensino médio e a educação profissional, e a implantação do currículo modular por competência são pontos estruturais de maior impacto nas escolas agrícolas/agrotécnicas.

Num esforço para melhor entender o impacto dessas mudanças nas escolas agrícolas federais (agrotécnicas e agrícolas vinculadas a universidades), estamos conduzindo um estudo com os(as) professores(as) dessas escolas, tanto do ensino médio quanto da educação profissional. Especificamente, nosso estudo procura clarificar os fatores que influenciam a forma como os(as) professores(as) percebem os dois principais aspectos (que chamamos inovações) da reforma: a separação entre o ensino médio e a educação profissional, e o currículo modular por competências. Através desta, estamos convidando V. Sa. a completar e devolver o questionário anexo, o que irá tomar não mais de 15-20 minutos do seu tempo. Suas respostas são muito importantes para o sucesso do estudo.

Os resultados deste estudo beneficiarão potencialmente professores, administradores, legisladores, órgãos educacionais, estudantes, e comunidades em geral. Além disso, tais resultados fornecerão dados que podem subsidiar a melhoria das políticas públicas e dos programas de capacitação na área do ensino agrícola, bem como balizar um programa de avaliação da implantação da reforma.

Asseguramos que suas respostas permanecerão completamente confidenciais. Seu nome está protegido pelo anonimato, uma vez que você não irá se identificar ao responder o questionário. O nome de sua escola, não será identificado durante o estudo e em nenhuma hipótese será divulgado qualquer dado individual. Após responder o questionário, coloque-o no envelope apropriado, cole o envelope, e deposite-o no local indicado pela pessoa que lhe forneceu o questionário. Não escreva seu nome em nenhum lugar no questionário ou no envelope – isso é essencial para assegurar a confidencialidade de suas respostas.

Sua participação no estudo é voluntária. Se você tiver alguma dúvida ou sugestão, sinta-se à vontade para contactar-nos por e-mail (fleite@psu.edu) ou por telefone (00-xx-1-814-863-7877).

Sua cooperação e apoio para este estudo é profundamente apreciada.

Atenciosamente,

Francisco Carlos Leite
Ph.D. Candidate in Agricultural and Extension Education
Pesquisador

Connie D. Baggett, Ph.D.
Associate Professor
Orientador

Anexos: Questionário
Formulário de consentimento

INFORMED CONSENT FORM FOR BEHAVIORAL AND SOCIAL SCIENCE RESEARCH
The Pennsylvania State University

Title of Project: ***Factors Influencing the Adoption of Educational Innovations in Brazil's Federally Supported Agricultural Schools***

Principal Investigator: Francisco Carlos Leite

1. Purpose of the Study: The purpose of this study is to gather information on how federally supported agricultural school teachers have reacted to two innovations brought about by the reform of professional education: 1) the separation between general and professional education and 2) the competence-based curriculum.
2. Procedures to be followed: You will be asked to answer a questionnaire.
3. Discomforts and Risks: There are no risks or discomforts by participating in this research.
4. Benefits: Assessing and understanding the existence of the gap between what is being proposed in terms of educational policy and what is being implemented in the schools can be highly valuable to foresee the outcomes and take corrective actions to ensure achievement of the best possible results.
5. Duration/Time: Answering the questionnaire will take about 15-20 minutes.
6. Statement of Confidentiality: Only the researcher and the thesis advisor and co-advisor will have access to the questionnaires. Your response is protected by anonymity. No individual answers will be reported.
7. Right to Ask Questions: You can ask questions about the interview and about the study. The researcher will answer your questions. You can contact the researcher after the interview at fleite@psu.edu or at 00-xx-1-814-863-7877. You can also contact the thesis advisor, Dr. Connie Baggett at bbc@psu.edu or at 00-xx-1-814-863-7415.
8. Voluntary Participation: Participation is voluntary. Participation or non-participation will not affect participants' employment status. Subjects can withdraw from the study at any time by notifying the researcher. Subjects can decline to answer specific questions.

You must be 18 years of age or older to consent to participate in this research study. If you agree to participate in this research study according to the terms above, please answer the attached questionnaire.

Keep this consent form for your records. You do not need to mail it back with the questionnaire.

**FORMULÁRIO DE INFORMAÇÕES PARA CONSENTIMENTO DE
PARTICIPAÇÃO EM PESQUISAS DE CIÊNCIAS SOCIAIS E COMOPORTAMENTAIS
The Pennsylvania State University**

Título do Projeto: *Fatores que Influenciam a Adoção de Inovações Educacionais nas Escolas Agrícolas Federais Brasileiras.*

Pesquisador Principal: Francisco Carlos Leite

1. Propósito do Estudo: O propósito desta pesquisa é identificar os fatores que influenciam a forma como os professores e administradores das escolas agrícolas federais reagem a duas inovações trazidas pela reforma da educação profissional: 1) a separação entre o ensino médio e a educação profissional, e 2) a implantação do currículo modular por competências.
2. Procedimentos a serem seguidos: Responder a um questionário objetivo.
3. Disconforto e Riscos: Não existem riscos ou desconfortos envolvidos com a participação nesta pesquisa.
4. Benefícios: Compreender e avaliar a existência de diferenças entre o que está sendo proposto em termos de legislação educacional e o que está sendo implementado no interior das escolas pode ser altamente valioso para antever os resultados e adotar medidas corretivas que assegurem a obtenção dos melhores resultados possíveis.
5. Duração: Responder ao questionário irá consumir não mais que 15-20 minutos.
6. Declaração de Confidencialidade: Somente o pesquisador, o orientador e o co-orientador terão acesso aos questionários. Suas respostas estarão protegidas pelo anonimato, uma vez que seu nome não será identificado no questionário. Nenhum dado individual ou mesmo por escola será divulgado.
7. Direito a questões: Você tem direito a formular perguntas sobre a entrevista e sobre o estudo. O pesquisador irá responder suas questões. Você pode contactar o pesquisador por e-mail – fleite@psu.edu – ou por telefone – 00-xx-1-814-863-7877. Você pode contactar também o orientador do estudo, Dr. Connie D. Baggett, por e-mail – bbc@psu.edu – ou por telefone – 00-xx-1-814-863-7415.
8. Participação voluntária: Sua participação neste estudo é voluntária. Participar ou não do estudo não implicará qualquer consequência profissional para o participante. O participante poderá abandonar o estudo a qualquer tempo informando o pesquisador. Você pode também deixar de responder a qualquer questão específica.

Todo participante precisa ter 18 anos ou mais para participar do presente estudo. Se você está de acordo em participar deste estudo segundo os termos acima, por favor responda o questionário anexo.

Mantenha este formulário de consentimento com você. Não o devolva com o questionário.



FACTORS INFLUENCING THE ADOPTION OF EDUCATIONAL INNOVATIONS IN BRAZIL'S FEDERALLY SUPPORTED AGRICULTURAL SCHOOLS

Note: The word "reform," as used in this instrument, refers to the set of changes introduced through the LDB Law, Presidential Decree No. 2208 and subsequent ministerial regulations that affect both general and vocational education.

I. Relative Advantage

Please, rate your degree of agreement with the following statements:

	Strongly Disagree	Disagree	Not sure	Agree	Strongly agree
1. The physical structure of the school became better because of the reform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The number of students that have taken or are taking academic education in a different school makes the teachers' job more difficult.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The reform:					
a) has brought salary advantages for teachers,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) has strengthened the ties with the world of work,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) has weakened the ties with the world of work,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) has lowered the load of activities for the teachers,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) has brought an overload of activities to the teachers,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) has lowered the load of course work for students,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) has brought an overload of course work for students,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) makes students' preparation more practical than theoretical,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) makes students' preparation more theoretical than practical,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) allows teachers to spend more time with practical/lab activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The segmentation in certification brought by the reform:					
a) makes it easier for graduates to find a job,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) prepares technicians that better fit the families' agricultural needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The reform's advantages outweighs its disadvantages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Worse	Same	Better
1	2 3 4 5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Easier	Same	More Difficult
1	2 3 4 5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please, indicate the impact of the following situations on the teacher's job:

8. The separation between academic and vocational education makes the teacher's job _____

9. The modular competency based curriculum makes the teacher's job _____

3. In my daily practice (choose only one):
- I have adopted the innovations brought about by the reform.
 - I have not adopted the innovations brought about by the reform.
 - I have only partially adopted the innovations brought about by the reform.

Below describe the main reason that influenced you to adopt or not adopt the innovations brought about by the reform.

VII. Demographic data:

- 1. Gender: Male Female
- 2. Age: _____ years
- 3. Highest degree earned:
 - Secondary education Bachelor Specialization Masters Doctoral
- 4. Teaching Area:
 - General education Vocational education Both
- 5. Teaching experience: _____ years.
- 6. Your current location:
 - Rural Urban

Thanks for participating in this study. To ensure the confidentiality of data, put the questionnaire in the provided envelope, and seal it. We will send to your school a summary result of this research when completed.

Instruction: To answer the next set of questions, consider "implementation period" as the length of time between April 1997 (Presidential Decree 2208) and December 2001.

IV. Triability
Please, indicate your degree of agreement with the following statements:

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1. During the implementation period: a) I had a great deal of opportunity to try the innovations brought about by the reform. b) teachers frequently exchange experiences among them. c) I was supplied with the tools to effectively test the innovations.	↖	↖	↖	↖	↖
2. The implementation period would have been more valuable if I had more support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The implementation period helped dispel uncertainties I had about the reform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I know where I can go to get information on the implementation of the reform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

V. Observability
Please, indicate your degree of agreement with the following statements:

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1. After the reform, students who attend the school have a different profile than the ones who attend prior to the reform.	↖	↖	↖	↖	↖
2. As a result of the reform, the schools' drop-out rate has increased.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. After the reform, students' preparation is more practically oriented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The reform brought an increase in the number of students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. In my school, I see many people adopting the reform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. In my school, the reform has made worse the teacher shortage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The reform brought a shortage in staff personnel to run the school farm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I would have no difficult in telling others about the results of the reform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I can communicate to others the consequences of the reform.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

III. Compatibility
Please, rate your degree of agreement with the following statements:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. The separation between academic and vocational education is consistent with my educational philosophy.	↖	↖	↖	↖	↖
2. The modular competency based curriculum model is consistent with my beliefs because they restrict opportunities for educational attainment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The innovations brought about by the reform are not consistent with my beliefs because they restrict opportunities for professional mobility.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The preparation of specialist technicians is the best option for the student's professional future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The preparation of generalist technicians is the best option for the student's professional future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. The training programs offered during the implementation of the reform were adequate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The Ministry of Education's support was adequate during the implementation process.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. The innovations brought about by the reform fit in well in agricultural schools.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

III. Complexity
Please, indicate the degree of complexity for each of the following statements.

	Not complex	1	2	3	4	5	Very complex
1. Teaching courses under the modular competency based curriculum is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Conducting competency based evaluation is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Conducting assessment on an individual qualitative basis is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Interdisciplinary work is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Establishing connections between general education subjects and professional competencies is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Understanding the reform is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Keeping the curriculum updated on the latest technologies is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. How do you classify the reform? <input type="checkbox"/> More complex than the previous system. <input type="checkbox"/> Less complex than the previous system. <input type="checkbox"/> There is no difference in complexity as related to the previous system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

VI. Voluntariness of Adoption
If the reform was voluntary:

- Would you choose to separate academic and vocational education?
 Yes No
- Would you choose to implement the modular competency based curriculum?
 Yes No



FATORES INFLUENCIANDO A ADOÇÃO DE INOVAÇÕES EDUCACIONAIS
NAS ESCOLAS AGRÍCOLAS FEDERAIS BRASILEIRAS

Nota: O termo "reforma", quando utilizado neste instrumento, refere ao conjunto de alterações introduzidas pela LDB, pelo Decreto No. 2.208 e subsequentemente por outras legislações ministeriais que afetam tanto o ensino médio quanto a educação profissional.

3. Em minha prática diária (marque apenas uma alternativa):
 Eu adotei plenamente as inovações trazidas pela reforma.
 Eu não adotei as inovações trazidas pela reforma.
 Eu adotei apenas parcialmente as inovações trazidas pela reforma.

Descreva abaixo o principal motivo que o(a) levou a adotar ou não (ou a adotar parcialmente) as inovações trazidas pela reforma:

VII. Dados demográficos:

1. Sexo: Masculino Feminino
2. Idade: _____ anos
3. Escolaridade (indique apenas o seu mais alto grau de escolaridade):
 Ensino Médio Curso Superior Especialização Mestrado Doutorado
4. Área de atuação:
 Ensino Médio Educação Profissional Ambos
5. Experiência docente: _____ anos.
6. Sua residência:
 Zona urbana Zona Rural

Obrigado por sua participação neste estudo. Para assegurar a confidencialidade de suas respostas, coloque este questionário no envelope fornecido, e lacre o envelope. Nós enviaremos à sua escola o um sumário com os resultados do estudo tão logo ele esteja concluído.

Concordo plenamente

Concordo plenamente	Concordo				
	1	2	3	4	5
I. Vantagens Relativas Por favor, indique o seu grau de concordância com as afirmações abaixo:					
1. A estrutura física da escola melhorou por causa da reforma.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Os alunos que frequentam o ensino médio em outra escola tomam o trabalho do professor mais difícil.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. A reforma:					
a) melhorou o salário do professor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) fortaleceu os laços da escola com o mercado de trabalho.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) enfraqueceu os laços da escola com o mercado de trabalho.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) diminuiu a carga de trabalho do professor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) aumentou a carga de trabalho do professor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) diminuiu a carga de atividades escolares dos alunos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) aumentou a carga de atividades escolares dos alunos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) está formando alunos mais práticos que teóricos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) está formando alunos mais teóricos que práticos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) permite ao professor oferecer mais práticas de campo/laboratório aos alunos.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. A pulverização de certificações trazida pela reforma:					
a) facilita aos alunos conseguir emprego.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) forma pessoas mais aptas às necessidades da agricultura familiar.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. A reforma trouxe mais vantagens que desvantagens.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Na sua opinião, as duas situações abaixo são piores, iguais, ou melhores, quando comparadas com a situação anterior à reforma?

	Pior					Igual	Melhor						
	1	2	3	4	5		1	2	3	4	5		
6. A separação entre o ensino médio e a educação profissional.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. O currículo modular por competências.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Por favor, indique abaixo o impacto de cada uma das situações no trabalho do professor:

	Mais Fácil					Igual	Mais Difícil						
	1	2	3	4	5		1	2	3	4	5		
8. A separação entre o ensino médio e a educação profissional torna o trabalho do professor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. O currículo modular por competências torna o trabalho do professor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX C

**Frequencies, Percentages, Means and Standard Deviations on
Rogers' (1995) Five Attributes of Innovations**

I. Relative Advantage

Statement	Perception ^a	f	%	Mean	S.D.
1. The physical structure of the school became better because of the reform.				2.57	1.25
	Disagree	166	55.9		
	Not Sure	36	12.1		
	Agree	95	32.0		
2. The number of students that have taken or are taking academic education in a different school makes the teachers' job more difficult.				3.24	1.26
	Disagree	109	36.7		
	Not Sure	36	12.1		
	Agree	151	50.8		
3. The reform: a) has strengthened the ties with the world of work,				2.73	1.15
	Disagree	137	46.4		
	Not Sure	61	20.7		
	Agree	97	32.9		
b) has weakened the ties with the world of work,				2.55	1.00
	Disagree	161	54.4		
	Not Sure	79	26.7		
	Agree	56	18.9		
c) has lowered the load of activities for the teachers,				1.89	0.97
	Disagree	250	84.7		
	Not Sure	12	4.1		
	Agree	33	11.2		
d) has lowered the load of course work for students,				2.69	1.28
	Disagree	173	58.7		
	Not Sure	24	8.1		
	Agree	98	33.2		
e) has brought an overload of course work for students,				3.08	1.25
	Disagree	120	40.5		
	Not Sure	28	9.5		
	Agree	148	50.0		
f) makes students' preparation more practical than theoretical,				2.98	1.21
	Disagree	122	41.1		
	Not Sure	49	16.6		
	Agree	124	42.1		
g) make students' preparation more theoretical than practical,				2.87	1.23
	Disagree	141	47.6		
	Not Sure	45	15.2		
	Agree	110	37.2		

I. Relative Advantage – continued

Statement	Perception ^a	f	%	Mean	S.D.
h) allows teachers to spend more time with practical/lab activities.				2.96	1.25
	Disagree	128	43.4		
	Not Sure	31	10.5		
	Agree	136	46.1		
4. The segmentation in certification brought by the reform: a) makes it easier for graduates to find a job,				2.73	1.12
	Disagree	138	46.6		
	Not Sure	68	23.0		
	Agree	90	30.5		
b) prepares technicians that better fit the families' agricultural needs.				3.03	1.18
	Disagree	116	39.0		
	Not Sure	43	14.5		
	Agree	138	46.5		
5. The reform's advantages outweighs its disadvantages.				2.96	1.14
	Disagree	115	38.8		
	Not Sure	71	24.0		
	Agree	110	37.1		
The following situations compared to before the reform:					
6. The separation between academic and professional education.				2.92	1.56
	Worse	124	42.2		
	Same	51	17.3		
	Better	119	40.5		
7. The modular competency based curriculum.				3.27	1.47
	Worse	98	33.1		
	Same	54	18.2		
	Better	144	48.7		
The impact on teacher's job:					
8. The separation between academic and professional education.				3.43	1.27
	Easier	59	20.1		
	Same	103	34.9		
	More difficult	133	45.1		
9. The modular competency based curriculum.				3.51	1.36
	Easier	69	23.2		
	Same	65	21.9		
	More difficult	163	54.9		

^a 1 and 2=disagree; 3=not sure; 4 and 5=agree.

1 and 2=worse; 3=same; 4 and 5=better.

1 and 2=easier; 3=same; 4 and 5=more difficult.

II. Compatibility

Statement	Perception ^a	f	%	Mean	S.D.
1. The separation between academic and vocational education is consistent with my educational philosophy.				2.94	1.21
	Disagree	131	44.3		
	Not Sure	39	13.2		
	Agree	126	42.5		
2. The modular competency based curriculum model is consistent with my educational philosophy.				3.14	1.13
	Disagree	108	36.4		
	Not Sure	39	13.1		
	Agree	150	50.5		
3. The innovations brought by the reform are not consistent with my beliefs because they restrict opportunities for educational attainment.				2.71	1.12
	Disagree	164	55.4		
	Not Sure	46	15.5		
	Agree	86	29.1		
4. The innovations brought by the reform are not consistent with my beliefs because they restrict opportunities for professional mobility.				2.80	1.15
	Disagree	157	53.3		
	Not Sure	44	14.9		
	Agree	94	31.9		
5. The preparation of specialist technicians is the best option for the student's professional future.				2.97	1.16
	Disagree	128	43.3		
	Not Sure	47	15.9		
	Agree	121	40.9		
6. The preparation of generalist technicians is the best option for the student's professional future.				3.10	1.10
	Disagree	116	39.2		
	Not Sure	48	16.2		
	Agree	132	44.6		
7. The reform's implementation has been done in a participatory way.				2.38	1.12
	Disagree	194	65.4		
	Not Sure	32	10.8		
	Agree	71	23.9		
8. The training programs offered during the implementation of the reform were adequate.				1.96	0.99
	Disagree	237	80.1		
	Not Sure	25	8.4		
	Agree	34	11.5		

II. Compatibility – continued

Statement	Perception ^a	f	%	Mean	S.D.
9. The Ministry of Education's support was adequate during the implementation process.				2.11	0.99
	Disagree	221	74.7		
	Not Sure	38	12.8		
10. The innovations brought about by the reform fit in well in agricultural schools.	Agree	37	12.5		
				2.26	1.07
	Disagree	206	69.3		
	Not Sure	35	11.8		
	Agree	56	18.9		

^a 1 and 2=disagree; 3=not sure; 4 and 5=agree.

III. Complexity

Statement ^b		f	%	Mean	S.D.
1. Teaching courses under the modular competency based curriculum				2.94	1.32
2. Conducting competency based evaluation				3.69	1.27
3. Conducting assessment on an individual qualitative basis				3.66	1.30
4. Interdisciplinary work				3.17	1.34
5. Establishing connections between general education subjects and professional competencies				3.41	1.25
6. Understanding the reform				3.53	1.26
7. Keeping the curriculum updated on the latest technologies				3.55	1.19
8. How do you classify the reform?					
	More complex	209	70.4		
	Less complex	34	11.4		
	No difference	54	18.2		

^b Statements 1 to 7 measured on a continuous scale ranging from 1=not complex to 5=very complex.

IV. Trialability

Statement	Perception ^a	f	%	Mean	S.D.
1. During the implementation period: a) I had a great deal of opportunity to try the innovations brought about by the reform,				2.11	1.11
	Disagree	220	74.1		
	Not Sure	30	10.1		
	Agree	47	15.9		

IV. Trialability – continued

Statement	Perception ^a	f	%	Mean	S.D.
b) teachers frequently exchange experiences among them,				2.46	1.11
	Disagree	166	62.7		
	Not Sure	30	11.3		
c) I was supplied with the tools to effectively test the innovations.	Agree	69	26.1		
				2.14	1.03
	Disagree	217	73.8		
2. The implementation period helped dispel uncertainties I had about the reform.	Not Sure	34	11.6		
	Agree	43	14.6		
				2.52	1.10
3. I know where I can go to get information on the implementation of the reform.	Disagree	179	60.4		
	Not Sure	47	15.9		
	Agree	70	23.7		
				2.62	1.09
	Disagree	155	52.3		
	Not Sure	56	18.9		
	Agree	85	28.8		

^a 1 and 2=disagree; 3=not sure; 4 and 5=agree.

V. Observability

Statement	Perception ^a	f	%	Mean	S.D.
1. After the reform, students who attend the school have a different profile than the ones who attend prior to the reform.				3.14	1.14
	Disagree	98	33.0		
	Not Sure	51	17.2		
2. The reform brought an increase in the number of students.	Agree	148	49.8		
				3.27	1.07
	Disagree	80	27.0		
3. In my school, I see many people adopting the reform.	Not Sure	63	21.3		
	Agree	153	51.7		
				2.94	0.98
	Disagree	109	36.7		
	Not Sure	92	31.0		
	Agree	96	32.3		

V. Observability - continued

Statement	Perception ^a	f	%	Mean	S.D.
4. I would have no difficult in telling others about the results of the reform.	Disagree	117	39.4	2.99	1.12
	Not Sure	67	22.6		
	Agree	113	38.0		
5. I can communicate to others the consequences of the reform.	Disagree	80	26.9	3.14	1.05
	Not Sure	85	28.6		
	Agree	132	44.5		

^a 1 and 2=disagree; 3=not sure; 4 and 5=agree.

APPENDIX D
Classification Tables

Classification Table 1: Rogers' (1995) Five Attributes of Innovations

Observed	Predicted			Percent Correct
	Have Adopted	Have Not Adopted	Have Partially Adopted	
Have adopted	10	0	37	21.3
Have not adopted	2	0	17	0.0
Have partially adopted	6	0	170	96.6
Overall percentage (%)	7.4	0.0	92.6	74.4

Classification Table 2: Rogers' (1995) Five Attributes of Innovations and Voluntariness of Use

Observed	Predicted			Percent Correct
	Have Adopted	Have Not Adopted	Have Partially Adopted	
Have adopted	10	0	37	21.3
Have not adopted	2	0	17	0.0
Have partially adopted	5	0	171	97.2
Overall percentage (%)	7.0	0.0	93.0	74.8

Classification Table 3: Rogers' (1995) Five Attributes of Innovations and Teaching Experience

Observed	Predicted			Percent Correct
	Have Adopted	Have Not Adopted	Have Partially Adopted	
Have adopted	13	0	33	28.3
Have not adopted	0	1	17	5.6
Have partially adopted	6	0	169	96.6
Overall percentage (%)	7.9	0.4	91.6	76.6

FRANCISCO C. LEITE

EDUCATION

Ph.D. The Pennsylvania State University - USA
2003 Major: Agricultural and Extension Education

Specialist São Luiz College of Education - Brazil
1999 Major: Didactics

B.S. State University of Maringá – Brazil
1981 Major: Agricultural Engeneering

PROFESSIONAL EXPERIENCE

2001-2003 Graduate Assistant
The Pennsylvania State University – University Park, PA

1998-1999 The Secretary of Education
Aquidauana, MS - Brazil

1994-1997 Agricultural School Principal (High school)
CERA Agricultural School – Aquidauana, MS - Brazil

1986-1993 Agricultural School Principal (K-12)
Bradesco Foundation, Bodoquena and Canuanã Schools - Brazil

1983-1985 Extension educator
Mato Grosso do Sul, Brazil

PERSONAL INFORMATION

Brazilian citizen

Married, two daughters