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Present Conditions and Future Perspectives of Technology Education in Paraguay

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Abstract

This paper reports findings of a study carried out in a number of public and private schools of Paraguay to highlight current developments and future perspectives for the field of Technology Education. Several strategies were followed to collect relevant data, among them documentary research, surveys, interviews and group meetings with practicing teachers. A historical timeline was built to guide further analyses. The study revealed a rather heterogeneous group of technology teachers dealing with extremely diverse school contents and employing traditional teaching materials and strategies. Time allocation within the school schedule was reported adequate for technology classes. Particularly emphasized were high implementation costs and the need for more in-service training. Results of this work are expected to provide pertinent directions for future related inquiries.

Keywords：Technology Education, Manual Training, Industrial Arts, Home Economics, Elementary School, Educational System.

1 . INTRODUCTION

School activities related to the field of Industrial/Manual Arts, or more recently Technology Education, were formally introduced into the Paraguayan Educational System as a result of a comprehensive Educational Reform carried out between 1922/24. As in most countries around the world, documents from this period reveal an initial desire to provide children with a more practical type of education, following ideas promoted at that time by prominent American and European thinkers and educators (Pestalozzi, Fröbel, Herbart and Dewey). Archives from this time evidence these positions: “being manual work the essential part of teaching, schools must be turned into workshops that provide the means, the environment required to transform students. Let children make, invent, construct, solve, and cultivate to obtain knowledge, theories, rules...” (Cardozo, 1991).

Rationales for practical school activities evolved over time to render three different periods with directions readily recognized in curricular guidelines. The first period subscribed to educational principles of the so-called “active school,” which conceived manual activities as instrumental to “replace the school characterized by scientificism and encyclopedic rationalism for another based on children’s’ abilities and aptitudes to learn according to their natural dispositions” (Alvarez, 1989).

The awakening of vocational interests was of major interest, favoring a more utilitarian approach in which agriculture and industrial production were recommended as vital school activities.

Despite these initial efforts, the introduction of manual work at school, could not meet expectations and a report was issued accordingly by the General Department of School Education in 1934 to announce that manual work would be gradually eliminated from schools without workshops, since “they had only made students hate work” (Quintana, 1995).

In 1949, the Course of Study for Primary School was modified to introduce Agriculture, Manual Work and Industry as official subjects. This event marked the outset of a second period in the development of Technology Education. Some years later, in 1957, a restructuring of these subjects produced a set of three disciplines: Elementary Arts, Agriculture and Home Education, which from then on would be dealing with practical activities at school. A momentous conceptual innovation can be perceived within these subjects in the association of manual work with aesthetic notions. In fact, curricular guidelines for Elementary Arts indicate at the same time an intention to educate children who will “feel and appreciate beauty and develop an aesthetic taste” and “contribute to keep and improve typical national industry” (MEC, 1959).

The next milestone in the development of Technology

Education took place in 1983, when as a result of a project on educational innovations launched in 1972 the curricular structure for primary and secondary education underwent significant modifications. A new domain of knowledge was conceived under the name of Nature, Health and Work for the first cycle of the elementary school (comprising 1st, 2nd and 3rd grades) and all activities involving manual worked were confined to this field of study. For the second cycle of the elementary education (comprising grades 4th, 5th and 6th), previous domain was broken down into three separate fields of study: Work, Health and Science with a corresponding increment in time allocation for manual work. At the Junior High School a new subject with the name "Workshops" was additionally introduced, dealing with a variety of contents such as Industrial Arts, Woodworking, Electricity, Metalworking, Ceramics, Leatherworking, Typing, Commerce, Agriculture and Home Education.

With the educational reform of 1992, Technology Education became a full fledged curricular field identified as "Work and Technology," currently implemented over a 6 year period covering grades 4 through 9. A major innovation is the combination of topics concerning the three basic economic sectors: agriculture, industry and commerce as bases for technological approach and their connections with students' household and social life. Moreover, guidelines advocate a wider notion of Technology, emphasizing higher order thinking skills to which manual work should be regarded as instrumental. The number of hours allocated per week was also increased.

Within the preceding historical outline, this study has aimed to diagnose the ongoing progress of implemented programs at schools, centering on particular aspects such as professional profile of practicing teachers, the kind of contents are covered, the kind of teaching materials and the conditions under which they are employed, current issues faced by technology teachers and trends observed for the field in the near future. It is hoped that findings will provide practical clues as to matters that need to be addressed in order to make proper adjustments and support the consolidation of Technology Education as curricular area.

2 . METHODOLOGY

A group of 12 public schools and 8 private schools were selected as research targets.

Selection of these institutions was based on a number of criteria such as the quality of the technology education program offered, the number of practicing technology teachers and the number of enrolled students.

Research data was collected following three different procedures, as described below:

a) **Documentary Research**: a number of documents such as curricular guidelines, resolutions, decrees, reports and historical accounts were examined in order to expose underlying ideas being promoted with the establishment of manual works at school in different historical moments and the way these contexts affected and were embedded into the constitution of currently observed patterns.

b) **Survey**: a total of 70 (seventy) teachers from selected schools were surveyed to inquire into their position on the current status of Technology Education in Paraguay. A questionnaire including 25 items was designed for this purpose combining closed and semi-closed and closed questions. The questionnaire was structured combining different types of items: yes/no, graded opinion, multiple choice and open requests for information. This procedure was intended to provide flexible ways to collect more accurate data of interest for the study and facilitate proper understanding of questions included in the instrument.

c) **Interviews**: as a way to triangulate data obtained from the surveys, a group of 20 (twenty) randomly selected technology teachers were interviewed to inquire into the same set of questions provided in the questionnaire. Interviews were carried out in a relaxed and friendly atmosphere with individual teachers. There was no time limitation for the interviews and teachers were allowed to express themselves freely on the questions posed and eventually request further explanation whenever the meaning of previous questions was not fully grasped.

d) **Meetings**: each school under study was visited and meetings were organized with technology teachers on these sites to discuss about different issues regarding current implementation of Technology Education in Paraguay. These meetings were regarded as crucial opportunities to examine first-hand the diversity and collective feeling of technology teachers regarding their professional practice in the field.

Data collected through these procedures were organized following different strategies. Historical data was brought together within a framework of four different stages of conceptual development in the field of Technology Education, which were identified as major educational milestones along the History of Education in Paraguay. This structure was intended to provide the groundwork for ensuing analyses concerning the surveys.

Although quantitative data was expected from the surveys, the diagnostic nature of the study and the more qualitative tone of the questions rendered rather simple processing mechanisms, limited to a set of rates indicating different levels of priority in answering particular questions. Finally, information collected in the interviews was cross-referenced to results obtained from the questionnaire in order to round up the analysis and draw relevant conclusions.

3 . RESULTS AND DISCUSSION

3.1 General Data: a 79% of teachers in charge of technology classes at selected schools were female, while 21% were male.

This can be regarded as a significant feature in a field traditionally dominated by males.

Ages in the range of 20 to 39 years old made a 56% of the total surveyed population, while a 36% of the teachers fell into the range of 40 to 59 years old. 4% of the teachers surveyed were older than 60 years old. An 84% of the teachers surveyed are teaching in the third cycle of the elementary school (7^{th}, 8^{th} and 9^{th} Grades) and a 33% of them are teaching in the second cycle (4^{th}, 5^{th} and 6^{th} Grades). Some teachers are working at both cycles at the same time. A 64% of the teachers in the sample are employed in public schools, while another 29% worked in private schools. These numbers are not conclusive, since the interviews revealed that some teachers were working part time in both public and private schools. Based on previous data, it can be stated that the sampled population of technology teachers was composed of a majority of young women working in public schools with children at the last stage of the elementary school in Paraguay.

3.2 Teachers' Profile: a 72% of teachers in the sample reported having at least 6 years of teaching experience in the field of Technology, while another 28% reported less than 5 years of work at schools. A 96% of the teachers reported having taken part in in-service trainings over the last year, and a 36% of them revealed pursuing higher academic degrees (specialization, Master, PhD, etc.). However, contents of these trainings were not related to technological topics but rather to more general teaching practice (assessment strategies, teaching methods, educational theory, etc.). Based on previous data, it can be stated that the sampled population of technology teachers can be characterized as having developed some teaching experience in the field and is constantly seeking for more opportunities to improve their academic level through different kinds of further education alternatives.

3.3 Contents covered in Technology Classes: a majority of teachers in the sample (88%) believe that contents prescribed by national guidelines for Technology classes are appropriate. At the same time, a 96% of technology teachers feel that they are given enough freedom to select educational contents for technology classes according to their own criteria and based on local conditions or needs. Several contents are covered in technology classes, such as Home Economics (71%), Business Management (71%), Information Technology and Telecommunications (68%), History of Technology (71%), Technological Design(71%), Basic Technological Concepts (89%). Contents for technology classes are selected based on several criteria, the most important of them being available resources at school (79%), students' needs and/or interests (75%) and provisions made by national guidelines (75%). Based on previous data, it can be expected that implementation of national guidelines for Technology Education in Paraguay will vary from school to school, as the great variety of contents for technology classes is not regarded prescriptive by technology teachers, but rather as a range of possibilities to choose from on the basis of resources available at school and students' interests. The variety of contents is also an indication of the wide notion of "technological behavior" underlying curricular implementation of Technology Education in Paraguay, where technology classes emphasize general skills that can be transferred to solve problems found in everyday life.

3.4 Teaching/Learning Materials: a 56% of teachers reported having enough materials, equipment, tools, etc. required for technology classes at school, while another 36% indicated that these aids are not readily available.

A 64% of teachers indicated that teaching materials used in technology classes comply with prescriptions made in the National Curriculum, while another 32% believe that the use of teaching materials is not following curricular recommendations for the field. A 64% of the teachers identified themselves as the main providers of teaching/learning materials, another 36%

indicate that these are provided by parents or guardians and a 32% indicate that teaching materials are provided by the school. Several teaching/learning materials were reported to be used in class, such as Whiteboard and Marker (93%), Newspaper/ Magazines/Pamphlets (86%), Handouts (75%), Computers and Internet (64%) and Textbooks (64%). Based on previous data, teaching materials can be expected to become a major problem for some public schools in Paraguay, where high levels of poverty have been found and parents or schools can hardly provide essential teaching/learning materials for technology classes. The predominant use of traditional teaching materials can be interpreted as a clear sign of the kind of experiences children are having in technology classes, more focused on knowledge of technological contents and less on practical manipulation or creation/design of technological objects.

3.5 Teaching/Learning Strategies: several teaching strategies were indicated as part of teachers' repertoire for technology classes, such as Lectures (93%), Projects (89%), Demonstrations (75%), Task Assignment (68%) and Exhibitions of Students' Works (64%) in that order. A 71% of teachers indicated that conditions of curricular organization at school were the most important factor on selecting teaching strategies for technology classes. These conditions have to do with issues such as class schedule, integration with other school subjects or the use of laboratories/workshops. Further relevant factors were indicated such as the overall profile of the students (68%) and the resources available at school (64%) , particularly those required for practical experiences. In 86% of the cases students are organized for individual work in technology classes. Small group work (82%) and work with peers (68%) seem to be important strategies that teachers regularly adopt for their classes. A positive sign in terms of objectives targeted in Technology Education is evidenced in the fact that most teachers are introducing the project method as part of children experiences in class. Based on previous data and observations carried out at schools, it can be stated that technology teachers in Paraguay are constrained by inadequate school facilities and a lack of resources to display a wider variety of teaching strategies in their classes. This condition can additionally be counted as an important influence on class organization patterns, usually centered on individual student's activities.

3.6 Current Issues in Technology Education: the survey revealed a 50% of teachers feeling that the time assigned for Technology Education classes within the school schedule is enough for the kind of activities organized in this subject. On the other hand, a 39% of teachers disagreed with this position. A high rate of teachers (54%) see students rather motivated to join technology classes, although for another group (39%), there is low motivation for these kinds of learning experiences. A slight majority of teachers (61%) agree that contents prescribed by national guidelines for technology classes are extremely diverse and poses one of the major obstacles for successful learning outcomes in this subject.

On the other hand, a 39% mostly disagree with this position and expressed on the interviews that is usually up to the teacher to perform what is locally know as "curricular adaptation," namely the reinterpretation of national prescriptions according to local needs and realities. A 79% of teachers agree that school managers have difficult time trying to cope with the costs generated by installing and maintaining workshops used in technology classes and a high rate of teachers (85%) think that they are in much need of further training regarding new concepts and paradigms in Technology Education. Viewpoints regarding the role played by school authorities in the promotion of Technology Education programs were almost balanced between a group of teachers who feel supported (50%) and another who feel neglected (43%). Teachers also indicated a number of further issues that needed to be addressed in the short term, as described below:

- Little support from the Ministry of Education, school and community.
- Limited financial resources.
- Limited availability of teaching materials.
- Lack of workshops for Electricity, Woodworking and Metalworking.
- Some contents such as Urbanity and Biotechnology should be included.
- More teachers' training is needed in areas such as Business Management, Accounting and Micro-enterprises are needed.
- More infrastructures for Home Economics are needed.

- Contents for the field need to be more properly arranged in terms of sequence and connected in significant ways with other curricular subjects.
- Little parent involvement into class related activities.
- Large groups of students.
- Costly materials

Based on previous data, it can be stated that among the common issues in the field of Technology Education explored in this study; content diversity, implementation costs and in-service teacher training are regarded by technology teachers in Paraguay as the ones in need of urgent attention.

3.7 Future Trends: a 54% of teachers in the sample believe that students' motivation towards the field of Technology Education will grow in the near future, while another 46% is not sure or think that this is unlikely. A 65% of the teachers in the sample predict that support from educational authorities should not be expected to increase in the near future. A 64% of the teachers in the sample believe that the field of Technology Education will consolidate in the near future, while another 33% are less optimistic on this regard. Finally, several actions were indicated by teachers as needing urgent attention in the near future, such as the need for more research work in the field of Technology Education (82%), the need to improve quality and quantity of In-Service training for Technology Teachers (71%) and the need to improve school infrastructure (64%) in order to provide quality Technology Education programs. Based on previous data and on-site interviews, it can be stated that the field of Technology Education is expected to consolidate in the near future in Paraguay, supported by decisive efforts of a committed group of technology teachers.

4 . CONCLUSIONS

Findings from this study revealed several aspects that are crucial to understand current developments of Technology Education in Paraguay.

Although focused on a limited number of schools and teachers, they provide valuable insights into the wider implementation of curricular guidelines across the country. As for the sampled population in the survey, a first arresting realization was the amount of females present among technology teachers. Undoubtedly a positive sign from a gender equity perspective, a note of caution should nevertheless be sounded as to the set of contents this group of teachers is proficient at, as most of them were originally trained to teach a variety of subjects (Manual Arts, Plastic Arts, Technical Drawing, Homemaking, etc.) that were merged into a new one(Work and Technology) after the last educational reform. It is therefore essential that appropriate retraining measures be carried out in order to provide a more adequate technological direction to class experiences. On the other hand, technology teachers seem to have a rather positive attitude towards further education and there is an apparent thirst for more opportunities on this regard. As a majority of teachers in the sample were found responsible for class activities with students in the third cycle of elementary school, further exploration should be encouraged to target a more relevant proportion of teachers appointed in the second cycle of the elementary education.

Innovative notions underlying current implementation of Technology Education in Paraguay are reflected in the new curricular guidelines and account for the vast diversity of contents suggested for class work. Although teachers regard official guidelines provided by the Ministry of Education as adequate, the possibility to contextualize issues addressed in technology classes suggests that more emphasis needs to be placed on current pre-service and in-service training concerning the selection of proper class topics. In fact, content diversity and flexible selection may become serious obstacles to realize educational aspirations of Technology Education programs, as unskilled teachers may eventually be led to overemphasize conceptual and historical aspects of Technology, thus reducing opportunities for practical experiences with different kinds of technological processes and products.

Long-established and traditional teaching materials are still predominant in technology classes. If this is founded on legitimate lack of resources at school, a precarious skill of teachers to use available teaching aids or an inability to get hold of them is still a matter of future inquiries. The high rate of teachers identifying themselves as main providers for teaching/learning materials is indicative of a widespread financial crisis currently affecting the country, and it's undoubtedly a problem beyond school's accountability. Nevertheless, technology teachers and school authorities are called upon to get together and devise creative strategies to make implementation of technology classes sustainable. Consistent with previous facts, teaching strategies emerged rather conservative, with teachers more prone to give lectures or demonstrations and students working individually or in small groups. The need to intensify a more practical orientation of the field is thus evident and despite possible links of this problem with

organizational flaws within the school curriculum, a more exhaustive exploration would be advisable to identify additional factors that could lead teachers to neglect certain strategies (e.g. experiments, case study, contents, study trips) that are particularly suited to technology classes.
Although the amount of allocated hours may be seen as a unique opportunity for continued growth of the field, technology teachers still need to find proper ways to take better advantage of this opportunity and show more solid outcomes to justify lasting support from educational authorities and relevant social agents.

Students' apparent motivation to join technology classes should be capitalized on and to improve educational outcomes expected from the field; however, it is of paramount importance that the educational value of practical activities organized in these classes be clearly understood in order to sustain this motivation along the technological production process.

Current concerns highlighted by technology teachers in this study, such as the diversity in class contents, costs involved in technology education and the need for more and better quality of in-service training in the field demand serious attention within the short term. These are complex issues unlikely to be successfully addressed without a strategic alliance of different sectors. including primarily technology teachers, technology specialists, educational authorities and parents. Final decisions may be prerogatives of national authorities, there is nevertheless an undisputed benefit when analyses of this nature are carried out by as large number of stakeholders as possible.

The future looks at the same time promising and challenging for the development of Technology Education in Paraguay. Teachers are convinced that consolidation of the field will involve extraordinary efforts, but are aware at the same time that much of what can be accomplished will rely on their own commitment to mobilize colleagues, school authorities, and parents in this endeavor. The study revealed a group of professionals highly qualified in a rich variety of technological fields, which have matured over the years implementing the new curriculum and acquired through these experiences a strong sense of identify with the field. At the same time, one of the main threats for eventual undertakings in the development of Technology Education was found to be the lack of a formally organized body of technology teachers to facilitate collective efforts.

As a final note, it is worth mentioning that the completion of this research work, constituted an invaluable opportunity for a systematic excursion into school realities concerning the field of Technology Education in Paraguay. Its findings provide at the same time a first account of progress since the last Educational Reform and are thus expected to suggest relevant directions for inquiries to come.

REFERENCES

Alvarez Caceres, J. (1989). *El Pensamiento y la acción pedagógica de Ramón Indalecio Cardozo*. Biblioteca de Estudios Paraguayos. Volumen 26. Universidad Católica: Paraguay.

Cardozo, R. I. (1991). *Mi Vida de Ciudadano y Maestro. Memorias de Ramón Indalecio Cardozo.* Editorial El Lector. Paraguay.

MEC(1959). Programas para las Escuelas Primarias del Paraguay. Grados Inferiores (1°, 2°y 3°). Ministerio de Educación y Culto. Paraguay.

Quintana, C.(1995). *Educación Escolar en el Paraguay. Apuntes para una Historia.* Serie Educación: Paraguay.

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