

Implementing selective waste collection: the articulation between pedagogical theory and practice in the Pollution and Ecology Class in the Environmental Control Technical Course

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Publication Date: April 13, 2009

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Abstract

This study focuses on the implementation of selective waste collection in a school located on the outskirts of the city of Rio de Janeiro. The participants consisted mainly of 64 students taking an Environmental Control technical course during 2007 and 2008. By addressing selective waste collection, the pedagogical proposal aimed at: a) enabling students to encourage practical behavioural changes and create new habits in terms of using natural resources; b) encouraging participants to reflect on our responsibility towards the planet and human survival itself, by providing the school community with elements to help create social and environmental responsibility. The transdisciplinary approach of the environmental theme and the pedagogical principals of critical theory were used as the theoretical basis for this study. The aim of this study was to emphasize the articulation between environmental education practices and a model of society that recaptures the quality of life of the individual. The qualitative research combined both qualitative and quantitative technical and methodological procedures. The results obtained indicate that the experience in question has great social relevance: pedagogically, it helps articulate the content of different subjects such as biology and chemistry; it allows for the reduction of environmental degradation in deprived regions; and it contributes to the creation of peer educators who will encourage the impoverished communities on the outskirts of Rio de Janeiro to become more aware of the importance of selective waste collection.

Key words: *Selective waste collection, environmental education, secondary school, social and environmental responsibility*

Introduction

The struggle of social movements against social exclusion has generated alternatives to neo-liberal globalisation and criticism towards capitalism in several parts of the planet. However, although social experience around the world is much broader and more varied than western scientific and philosophical tradition knows or deems important, several researchers, including sociologist Boaventura Santos (2002), have raised a warning about the waste of this social wealth. In order to fight the waste of experience and give visibility to alternative initiatives and movements, thus offering them credibility, the author states that it is essential to abandon the rationality model, known as 'lazy reason', and to adopt 'cosmopolitan reason', based on the 'sociology of the absences'.

Santos proposes giving voice to alternative political, social, economic and cultural experiences which are considered marginal and irrelevant by the centres of power. The protagonists of these experiences are excluded social groups; therefore they present a counter-hegemonic dimension, which could potentially contribute to social transformation and emancipation. The sociology of the absences, as the author explains,

aims at demonstrating that which does not exist is actively produced as non-existent, as a non-credible alternative to that which credibly exists (...). The purpose of the sociology of the absences is to transform impossible objects into possible objects, and based on these, to transform absences into presences (Santos, 2002, p. 245).

This study, which focuses on the implementation of selective waste collection in a public school in Rio de Janeiro, was inspired by Santos's ideas. The project was developed by an Environmental Control technical course teacher and her students, in conjunction with a local social group -- a co-operative which works with selective waste collection and beneficial reuse of waste in the neighbouring municipality. The above-mentioned co-operative consists mainly of women living in poverty. It was inspired by an initiative developed

by a parish in a town in the Baixada Fluminense region, in Rio de Janeiro state, which included the selection and distribution of foodstuffs. Work and income generation opportunities are offered within the premises of the co-operative, as well as non-formal educational activities related to the promotion of environmental conservation. The institution's guiding principle is to implement social inclusion strategies, thereby helping this group of women recover their citizenship.

The school project was aimed at replacing the reductionist models that inform many selective collection programmes and which deal primarily with the promotion of behavioural changes regarding waste management in our society. In other words, the objective was to go beyond this view, building, together with the students, a critical reflection of both consumerism and the cultural values that support industrial production in capitalist societies (Layrargues, 2002). The idea was to develop a project that saw selective collection not only as an environmental practice to be propagated, but mainly as a starting point for discussing political and social aspects related to waste production in our present society. The project followed the principles of Jacobi and Luzzi (2005, p.6) in that it assumed that

environmental education is aimed at pedagogical proposals that are centred upon students' awareness, changes in their behaviour, the development of competencies, their ability to evaluate and their participation. The relationship between the environment and education from the perspective of citizenship takes on a role that is more and more challenging, requiring the emergence of new knowledge in order to embrace social processes that become ever more complex and environmental risks that become ever more intense.

Therefore, through networking with the waste pickers, students were able to learn about possible alternatives for waste treatment and the actions taken by a group that is fighting for citizenship and against discrimination and prejudice.

Waste Collection

Waste production is directly related to consumption habits learned and maintained by the industrial society, whose problems regarding solid waste vary according to the type of waste, the amount produced and the method of disposal. Nowadays, we are constantly looking for a solution for the environmental liability caused by waste production in different communities, which has forced us to evaluate and rethink the use of material we no longer need.

Selective collection is an environmentally correct alternative that reduces the amount of solid waste that would normally be disposed of in sanitary landfills and open dumps (Ribeiro & Lima, 2000). It also reduces the proliferation of disease transmitters, saves energy, generates jobs and reduces the exploitation of natural resources, which lowers the cost of the final product for consumers. Data from a study conducted by an institution working with recycling shows a 38% growth in selective collection between 2004 and 2006. This growth, however, is restricted to some municipalities in the south and southeast regions of Brazil (CEMPRE, 2006). The study, named *Ciclossoft*, which was developed by Brazilian Business Commitment for Recycling (CEMPRE), informs that, of the 327 municipalities involved in the process, 43.5% work directly with co-operatives of waste pickers, a result that shows not only an environmental, but also a social concern.

However, how can an interest in obtaining information about selective collection mechanisms in their municipality be raised among the population? How can a selective collection programme be initiated? These questions are part of the population's everyday life, and schools are one of the references for initiatives related to environmental issues. According to Marin et al (2006, p.1), who conducted a multidisciplinary environmental monitoring project at the Federal Centre for Technological Education (CEFET) in the state of Santa Catarina, education is one of the ways to obtain behaviour change, as

Education has always been a fundamental aspect of the quality of life of society itself.

Therefore, it is important for schools to have projects available which are related to the

everyday life of the society students are part of and which seek to awaken a critical, scientific and innovative awareness within them.

In 2007, based on these assumptions and wondering how she could encourage students to reflect upon social and environmental issues, a teacher from a federal technical school, who taught an Environmental Control Technical course which had been integrated into the secondary school syllabus, drew relationships between these topics and the curricular content that would be taught during the semester. Considering the amount of waste generated on a daily basis in the school, the introduction of this selective collection project aimed at both raising awareness in students and employees and giving them the tools they needed to put selective collection systems into practice in their own homes and on the streets. In light of the institution's concern about environmental issues, the implementation of selective collection may serve as a model for surrounding schools and industries. It is a pioneering practice in the region that contributes to fostering more credibility in society and in public agencies with regard to the importance of taking action.

Another socially relevant aspect is the fact that all the waste produced and separated is sent to a co-operative in the region. This co-operative is a member of the Supportive Selective Collection Project (CSS), which is supported by the Municipality of Mesquita. The solid waste is separated at the co-operative, and the money obtained from selling this material is then shared among the members. In this way, the institution referred to in this study, is encouraging both an increased awareness of environmental issues, as well as a concern for social responsibility.

The objective of working with selective waste collection from the transdisciplinary perspective¹ of environmental education is to enable students to promote practical changes in behaviour and to form new habits with regard to the use of natural resources. The adoption of this view has fostered a reflection on our responsibility towards the planet and human survival itself, providing both students and employees with a tool

to help create social and environmental responsibility. Moreover, the federal technical school is in accordance with the new legislation, Decree n. 5 940 of October 25, 2006, which institutes selective collection as a mandatory activity in federal institutions, meeting one of the objectives of the Chamber of Deputies when it

observes the laws and regulations applicable to the environment and implements and maintains procedures and best environmental practices in its different administrative segments, including new environmental standards in their different activities (Câmara dos Deputados, 2006, appendix IV).

The implementation of this project together with the Pollution and Ecology students aims mainly at encouraging them to rethink both their actions in relation to their patterns of consumption and in relation to the environmental, political and economic issues involved in the recycling process. This is in accordance with what Layrargues (2002, p. 1) proposes when he states that

many environmental education programmes in schools are implemented in a reductionist manner, as due to recycling, they only develop Selective Waste Collection, thereby failing to provide a critical and comprehensive reflection on the cultural values of the consumerist society, consumerism, industrialism, the capitalist mode of production and the political and economic aspects of the waste issue.

Therefore, this transdisciplinarity of the environmental theme seeks to broaden the discourse and the reflection proposed to the students taking the course in question, thus providing another opportunity to develop citizens who are conscious of their rights and duties.

Methodology

¹ 'Applying methodologies from one science to another scientific field' (Leff, 2006, p. 37). The actual subject of *Pollution and Ecology* allows for this approach via the integrated articulation of nature and society, discussing cultural, social, and other perspectives.

The idea of introducing selective collection in that particular educational institution was inspired by projects carried out by four groups of Secondary School students in their Pollution and Ecology class which was part of the Environmental Control Technical course. During 2007 and 2008, 64 students involved in the three consecutive semesters, aged 15-19, took part in the project. After hearing the proposal made by the course, the students were invited to choose the project they would develop throughout the semester. Most of them chose to implement selective collection, and a joint plan was developed by both teachers and students. The rationale for their choice was that it was adequate for a technical course in environmental control. A statement made by one of the students highlights this concern and indignation:

'Oh, teacher! It doesn't look good now, does it...? We learn a lot about environmental control but we keep throwing out garbage so carelessly... It has to start somewhere.'

To prepare students for the development of the activities, the teacher discussed the social, political, economic and ecological issues related to solid waste and environmental pollution during the lessons. She also arranged for a technical visit to their partner co-operative in order to inform students about their work and to sensitize them to it.

The students' enthusiasm was the starting point, and due to the size of the school, the guidelines provided by the co-operative were followed. The project was divided into three phases. During the first semester, the class was responsible for mapping out all the offices used by the school's administrative sectors; at this point, initiatives to raise awareness were initiated in these sectors. The class was subdivided into groups, and each group was responsible for a group of offices. At the end of the first semester, in 2007, this class proposed holding an event to promote the work done and to reach a larger audience. During the Environment Week in June, they invited the president of the co-operative to give a talk and present a video made by its members about the importance of selective collection for the environment and for their lives. Moreover, the theatre group, called *Coleta em Cena*, which accompanies the co-operative, presented a light-hearted play illustrating the different steps of selective collection, from people's homes to the final waste destination. The entire

community that attended the school's morning shift was invited, and questionnaires were handed out to the participants. The purpose of the questionnaire was to obtain information needed to guide the following steps of the implementation process; thus, they investigated how the selective collection project was influencing the awareness, learning and change of behaviour within the school community in that which concerned the issue of waste, and if those changes were being expanded beyond the school environment. The questionnaires consisted of closed questions, and the frequency with which the answers were given was calculated, and open questions, following the instructions of Bardin (1997); for the latter, the answers were categorized according to the analysis of the contents and afterwards the frequency of each category was calculated. The intention behind using the questionnaires was to interpret the meaning of the respondents' texts and to highlight the most recurrent content in the answers by categorising them.

In the second semester of 2007, two classes (in both the morning and afternoon shifts) were responsible for implementing the second phase of the project, which involved following up on the administrative sectors and also included the classrooms. All of the rooms in the school -- 20 classrooms, 33 administrative offices and 12 laboratories -- were mapped and the groups were responsible for distributing waste bins and starting the awareness raising process. As the school has three shifts a day, they organized it in such a way that each classroom would be visited at least twice in the four weeks during each of the daily shifts. Following the example of the class from the first semester of 2007, the students chose to promote their work in a more comprehensive way, by using the Technology Week (SEMATEC), held during the first week of November, for this purpose.

Both classes prepared waste bins which were suitably identified with the labels 'organic waste' and 'recyclable waste' and distributed them in the school's offices, classrooms and common spaces so that the waste could be separated and disposed of in the correct bin according to each category. Another informative resource, used to raise people's awareness, was produced during the actual lessons given in that course: posters were made to promote the selective collection project and encourage people's support. Armed with an

official document provided by the management of the unit informing about the legislation that instituted selective collection in federal public departments, the students proceeded to install the bins in all the sectors of the school. Besides the labelled bins placed inside the rooms, bins for recyclable waste were also placed in the common grounds of the school.

The president of the co-operative went to the institution to give talks targeted exclusively at the outsourced cleaners, telling them about the specific care they needed to take in separating the waste collected, i.e. putting it into plastic bags to be stored in the school until it could be collected by the co-operative.

The objective of all of these procedures was to qualify students and employees so that the implementation process could occur in the most natural and uncomplicated manner, in accordance with the propositions of Barreto (1996, apud Tavares & Freire, 2003, p.125), when he states that

here information is qualified as a modifier of people's awareness and of their social group's awareness; it maintains a relationship with knowledge, which in turn, only happens when information is perceived and accepted as such.

In other words, it was crucial for everyone to receive adequate guidance and have an adequate level of understanding for the project to be implemented successfully. This was especially relevant with regard to the cleaning staff, as they were responsible for removing the waste appropriately, and preventing it from getting mixed up with the organic waste while removing the solid waste from the offices and classrooms.

After the summer break, the process was continued by a new environmental control class, made up of students from the first semester of 2008. They went to the Gramacho sanitary landfill in Duque de Caxias for a technical visit, in order to accompany the arrival of the solid waste at its final destination. In addition, they noticed that during the school break, several waste bins had been removed from the classrooms, and they felt that there had been a decrease in the school community's participation in the selective waste collection. They therefore proposed conducting a survey to evaluate how informed and compliant students, teachers and school

employees were. The data was collected through questionnaires containing both open and closed questions and the analysis followed the same procedures as those used for the first questionnaire applied at the end of the first semester of 2007.

Results and Discussion

During the talks and technical visits, the students learned that solid waste disposal was in fact quite easy, simply demanding that the recyclable waste (paper, cardboard, aluminium cans, plastic, glass and so on) be placed in the designated, labelled waste bins provided in the classrooms and offices or in the containers located at specific points throughout the school. The process was that simple because the co-operative only had one lorry for waste collection and all of the recyclable waste had to be placed in the lorry's skip. Therefore, as instructed by the co-operative, there was no need to separate metal, plastic, glass and paper; this separation was carried out at the co-operative's shed, following technical specifications for each category of material.

A preliminary profile was created based on the questionnaires handed out at the end of the first semester in 2007, which outlined the school community's knowledge of environmental issues, particularly those related to solid waste and selective collection. Of the 100 questionnaires handed out to the school's Secondary School (SS) and undergraduate (U) students, employees and teachers/professors (T/P), 64 were returned. Among those who participated in the survey, approximately 70.3% consisted of up to 17 year olds and a smaller number, approximately 4.7%, consisted of over 40 year olds (figure 1). Concerning their connection to the institution, most participants were students (table 1), of which 54.7% were Secondary School students taking the Environmental Control Technical course, followed by 15.7% taking the Cultural Production Technologist course and only 6.2% was made up of teachers/professors and employees.

[insert figure 1 about here]

[insert table 1 about here]

Legend: Secondary school students (SS), undergraduate students (U) and teachers/professors (T/P).

When asked if they usually took part in environmental education activities (EE), 64% of the participants in the survey said that they usually participated in events promoted by the school, while 36% said they did not have this habit. Regarding those who usually have contact with EE at the school, 54.7% said that this contact was normally made via the teachers/professors, who deal with the topic in the classes they give during the school semester. The participants in the survey also mentioned other ways through which they became aware of the importance of environmental issues: a) through friends, family and contact with other institutions in 16% of the cases; b) via service providers (12%); c) via professional associations (9.3%); and d) 8% of the interviewees did not answer the question. This data not only serves to emphasize the role environmental education developed in related activities within the formal learning environment plays, but most importantly, it highlights the importance of qualifying peer educators, who will then act in different educational spaces by promoting a debate, an evaluation and a reflection on the environmental issues, thus inspiring more actions that promote environmental and social improvement (Carvalho, 2006). To sum up, the integration between a formal space -- the federal technical school -- and a non-formal educational space -- the co-operative -- as practised in the study described herein, shows the potential of this exchange regarding the construction of a new political culture among individuals (Gohn, 2001).

The visit to the co-operative and to the Dona Eugênia River -- which runs through several municipalities in the Baixada Fluminense region -- sensitized students to the different destinations given to solid waste. By observing the environmental pollution of the river and comparing it to the waste after it goes through the co-operative, teachers were able to perceive the impact caused by consumption and urban chaos. The waste in the rivers causes diseases, overflows, floods, and other environmental, public health, economic and social problems. The co-operative's waste generates income, promotes the inclusion of people who previously lived on the margins of society and reduces environmental impacts.

Through interviews with members of the co-operative, the students learned that many of the women did not 'exist for society' until they had to register at the co-operative and hence needed to obtain documents such as IDs, individual taxpayer registration numbers (CPF) and voter IDs. One of the students even mentioned that *'many women have children, but had never even been born themselves'*; referring to the fact that some of the women only obtained their birth certificate after they joined the co-operative. Going back to the contributions of Santos (2002), the 'absentees' became visible. The networking between the school and the co-operative provided an exchange of knowledge between the 'excluded' and the educated. From this perspective, the environmental education was used as:

a possible strategy for facing the double sided -- cultural and social -- civilization crisis. Its critical and liberating perspective aims at triggering processes in which both individual and collective searches for cultural and social changes are dialectically undissociated (Sorrentino et al, 2005, p.1).

When asked about the changes in their personal behaviour after the implementation of selective collection at school, 72.3% of the students and employees who answered the survey said that they had changed their personal behaviour and 23% said they hadn't or that they had already been concerned about this issue before the school addressed it; 4.7% of the participants did not answer the question. The percentage of participants who said that they intended to change their personal behaviour in the future after having participated in the event was significant (77.7%).

Compliance with the selective collection project was mainly achieved because a social and environmental awareness was raised among students and employees (table 2), who, during 2007, came to understand the importance of discussing the diverse problems that affect our society and effectively taking action. They also stated that the posters distributed by the students participating in the classes involved in the project and the talks held were the main mechanisms for providing information and incentive, and consequently, for fostering compliance with the selective collection process.

[insert table 2 about here]

Although the different actors in the school community were interested in the implementation of the project and in participating in it in general, the students taking part in the second phase of the project discovered that the waste bins placed in several administrative offices were being used incorrectly and that the different types of waste were being mixed. The teachers who took part in the study also noticed that it was necessary to continuously communicate information about the work that was being developed, as they often saw people throwing organic waste into the bins for recyclables.

It can be seen therefore, that in spite of all the activities developed throughout 2007 and even with the ostensive presence of environmental topics in the media, environmental education initiatives which promote reflection and possibly change of behaviour must occur intensely and continually, using varied resources to draw the attention of the population. We want to add that the results of the study show that secondary school teachers need to be more involved in terms of meeting the legal guidelines that value the environmental theme as a cross-sectional topic which is present in different subjects and which calls for an interaction between the different knowledge areas. This aspect indicates that changes need to be made regarding the professional qualification of teachers, as pointed out by renowned scholars of the subject.

The second questionnaire, applied at the end of the first semester of 2008, revealed data considered to be intriguing by the environmental control students. This time, 147 questionnaires were answered and the sample was made up of 48.3% students, 15% administrative employees, 30% teachers, 6% outsourced employees and 0.7% people who had another connection to the school (in this case, a trainee). Even after two semesters of ostensive work and the 77.7% of the first survey respondents who said they intended to change their personal behaviour in future opportunities, it was noticed that the school break caused an interruption in this process of action and reflection in that which concerned the solid waste produced in the school: only 53.7% said they knew about the selective collection project. However, 95.2% said that this initiative was important for the

school and for the environment, and there was no variation between the data collected in June 2007 and in June 2008 regarding the reasons that led them to comply with the project (table 2).

It was also noticed that the posters spread out around the school (45%) and the students' visits to the classrooms (27.6%) were the main communication mechanisms, thus corroborating the data obtained from the first questionnaire. Approximately 60.6% of the interviewees said that the implementation of selective collection changed their personal behaviour towards waste – a reduction of 16% in relation to the survey conducted in the same period of the previous year. Another fact that drew students' attention was that only 35.4% said that the school community accepted and complied with the selective collection process. A factor that certainly influenced this change in the data was the fact that the waste bins were initially removed from some of the classrooms and then from the main circulation routes of the school, so the result obtained was 'hidden'. After a while, with the posters still in place but with no waste bins in sight, the volume of collection was reduced, and this led to the co-operative interrupting the process at the beginning of the second semester in 2008. This result may be reinforced when we analyse the question which asks about the final destination of the solid waste generated by the different players in the school: it can be seen that because there were waste bins in the classrooms and offices as well as in the public spaces, these were used, respectively, by 37.5% and 47.2% of the interviewees. The development of the work was dramatically affected by their removal. Unfortunately, it was not possible to identify who was accountable for those decisions. What students and teachers were most 'astonished' about was that 14.7% of the interviewees said that they did not use any waste bins at all. At this point, it can be seen that the waste issue must be addressed continuously in school units with the purpose of providing moments of reflection and action as regards caring for assets, respecting one's neighbours and environmental conservation, among other elements discussed during the Pollution and Ecology lessons.

Final Considerations

After evaluating the questionnaires and reports produced by the students, the importance of developing a more integrated project and seeking new partnerships both within the school environment and in the surrounding community could be observed. It also served to highlight the need for this work to be continuous, involving all institutional sectors and using special audiovisual resources for the purpose of reaching the public in the most varied ways possible, drawing their attention and encouraging them to think about the matter. In any case, the following items can be highlighted as benefits gained by carrying out the project:

1. Pedagogical: the selective waste collection functioned as a transdisciplinary pedagogical instrument, which allowed the students who were involved in the process to think about the different aspects of the environmental and social issues, initiating an articulation between the content of different subjects such as biology, chemistry and others;
2. Environmental: as a result of the project, hundreds of kilos of waste did not end up in landfills, but were recycled, contributing to the improvement of the quality of urban life.
3. Peer education: the community gained in that the students who took the Pollution and Ecology course became peer educators, introducing selective waste collection in their homes, and by extension, in their parents' workplaces, as reported by some students.

However, the negative aspects cannot be overlooked, and the operational aspects that need to be improved should be evaluated, seeing as the intention is to continue with the project. The reduced volume of waste which was noticed by the co-operative after the summer break (2007/2008) was caused by the arrival of new students, the removal of the waste bins from the classrooms, and mainly, by the high turnover of the outsourced cleaners, who mixed the waste in the bins without paying attention to their labels. The necessity for these workers to be trained, not only by the teachers and students involved in the project, but also and essentially by the outsourced company that hires them, was also perceived. A meeting was held with the management of the unit, in which these findings were discussed. Management promised that this item would

be included in the requirements stipulated in their next tender document for hiring a new cleaning company. New teachers are currently showing an interest in the project, and they are trying to find mechanisms that are more efficient in terms of solid waste collection. They are also currently involved in the process of establishing a partnership with the Municipality in order to install standardized waste bins, and are arranging for the Municipality to collect the waste and forward the recyclable material to the registered co-operatives. Therefore, after this initiative, more people are expected to value the environmental education practices, integrating the network of selective collection implemented in the federal technical school, and giving continuity to the project in the following years. They are also expected to implement other projects with the purpose of helping individuals internalize values that are compatible with those of a socially and environmentally responsible person.

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Figure 1: Age group distribution of participants in the survey conducted at the event held during the first implementation phase of the selective collection project during the Environmental Week.

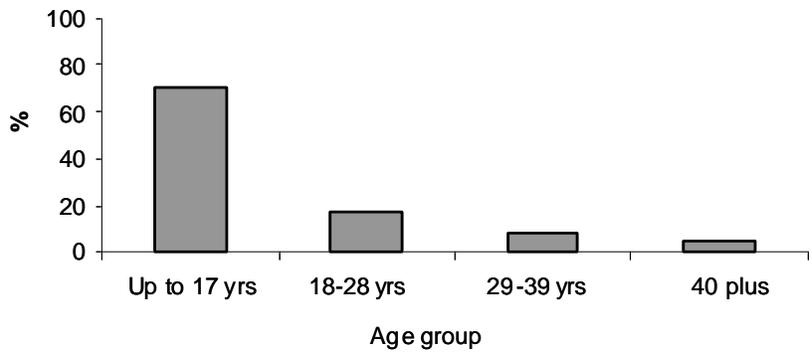


Table 1: Background of the audience with regard to the course taken and their connection to the federal technical school.

Course/Connection	%
Environmental Control (SS)	54.7
Chemistry (SS)	4.7
Cultural Production (U)	15.7
Natural Products (U)	6.2
Environmental Control, Natural Products and Cultural Production (T/P)	3.0
Employee	3.2
Did not answer	12.5

Legend: Secondary school students (SS), undergraduate students (U) and teachers/professors (T/P).

Table 2: Factors that encouraged participation in the selective waste collection project implemented in the federal technical school, as pointed out by those who participated in the survey at two different stages of the implementation of the project (June 2007 and June 2008).

Motivation	2007 (%)	2008 (%)
Environmental conservation	40.0	43.2
Social concern	32.1	30.7
Personal satisfaction	16.5	16.8
Educational advantage	7.8	9.0
Other	3.6	0.3