International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 18 (2018) pp. 13786-13793

Environmental Culture and Solid Waste Disposal at Unidades Tecnológicas de Santander student's perception, Bucaramanga, Colombia

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Abstract

Environmental culture and solid waste disposal has been considered to differentiate what students say and what they really think or do and determine their behaviour trends. A review of literature has been conducted on the topic and a quantitative market research, based on the application of 384 surveys to students of different technological y/o university courses. Data analysis has been processed through frequencies and percentiles ranges. Although courses depending on Environmental Department exist, which would suppose a high place contained of environmental information, the students showed a low level of knowledge: Their environmental culture is reflecting in the few environmental actions they are conducting. The students recognize the presence of separation's bins and ecological points, but they express that the problem lies in the limited number of those ones. A diffusion of separation and recycling culture exists in the Institution, however the actions end up by being sporadic.

Keywords: Environmental culture; waste products; education; superior institution of education.

INTRODUCTION

Different determining factors exist in Latin America and Colombia, which disadvantage the implementation of effective, efficient and sustainable environment policy (1). Like that, this author argues that although resources strategies use of environment are present in the legislation, a lack of efficiency has been demonstrated as for the managing of anti-environmental behaviours. Therefore, the author proposes to intervene in educational Institutions by means of behaviours type needed definition, and the implementation of actions as: Recycling, pro-environmental way of life, saving consumption of public services, responsible and ecological purchases, in order to give response to the determining previously raised.

For his part, Gough (2) mentions that in spite of the great interest that exists to develop programs and experiences in environmental education in Latin America, there are small works that explore efficiency in the formation of the persons in a systematic way. And in general, the studies in environmental education have favoured magisterial classes without practices, which constitute a weakness, taking into account that not only theoretical aspects are required, but also that links must be established between theoretical environmental, individual and group behaviour, with their respective consequences as analysis of behaviour keeping.

In agreement with the previous part, and to attend the raised of Tilbury (1), different experiences exist. In that regard, Gorrostieta *et al.* (3) found that in Mexico, environmental care is important for the students of Mechatronic Engineering. Thus, the students perceive that the pollution and destruction of the natural resources are the principal environmental problems, because through science and technology, cause and solutions of those ones are analysed in their respective context. In this way, and taking into account its results, the study recommends to include environmental education course in the plans of study, in order to contribute to the diverse students approaches of the sustainable, social, economic, cultural and political development, and to promote the necessary values for that those engineers, include the environmental aspect at the moment to take decisions in their professional life. Likewise, it is important to highlight that projects of research can be promoted from the academy, in order to help the society to understand environmental topics, especially in solid waste management (4).

In the same country, Sosa *et al.* (5) analysed the state of the environmental education in higher level: They took the Universidad Autonoma of Campeche as a case study. An exploratory research has been conducted, combining quantitative and qualitative methods, to diagnose the degree of student's environmental culture, and the type of environmental education that they are receiving. The result is that students possess a low level of environmental culture and that they are lacking of knowledge and necessary skills to realize favourable environmental changes in their ways of life.

Another case to stand out was given in Costa Rica, where the environmental education provided in the universities allows to the students to be aware of the need to take care of the environment, and to develop feasible projects for the benefit of the communities. The study was carried out in three universities of the country, and determined that the environmental problem of a specific zone is responding to a multivariate set, which combines political, administrative , planning, need of investment, management plans, controls, as well low coverage in solid waste recollection, absence of sites adapted for the treatment of those ones, and few formation in the area of education and environmental health, which allowed to attack problems and to improve the relations of the communities with their environmental surrounding (4).

In Colombia, Frank *et al.* (6) proposes that it is necessary to change the thought and action of the persons, with a strong approach towards environmental education in search of sustainability. Like this, environmental conscience is generating a change of behaviour, which can be promoted thanks to the environmental early education, and go fortifying in secondary and university education. Likewise, there is a big difference between setting out environmental policies and carrying out actions for its implementation. Pascagaza-Calero (7) declares that the environmental management of Bogota's official colleges has been a topic treated by the District Secretariat of Education, but although its general policy focused towards the fulfilment of procedure and follow-up projects, the work has been realized without really taking into account the environmental context. Therefore, instead of carrying out with its objective, this initiative caused administrative wears and loss of environmental conscience, which generated an effect opposite to the initially raised.

In Bucaramanga, the Universidad Pontificia Bolivariana took the initiative to evaluate the management of solid waste, following four steps: Characterization of the solid waste destined for final disposition, quantifying of residues destined for use, evaluation of other factors associated with the management of the solid waste and statistical analysis of the information (8). The study demonstrated that two principal categories of solid waste are generated in the Institution: Food and gardening, with 44.2 % of the waste potentially usable. And although the campaigns promoted by the Environmental Management area of the university have given good results for the separation at administrative level, the same results were not obtained with students.

Now, knowledgeable about the importance of having an environmental culture and making adequately use of solid waste, this article presents an analysis of answers given by the students of the Unidades Tecnológicas de Santander (UTS), in front of those two topics of national and international importance, once consulted.

MATERIALS AND METHODS

UTS are a public Higher Education Institution that exists since 50 years, which has reached recognition in Santander's Department for the quality of its educational services and for contributing with the formation of the human talent needed for the technological development of the country. The type of research is descriptive and its objective is to know environmental culture and solid waste disposal of UTS students, and to obtain the supplies to determine the possible consequences in the future, and take the respective corrective actions. It has been considered to differentiate what students say with what they really think or do and determine their behaviour trends. A review of literature has been conducted on the topic with the objective to confirm or reject the tendencies founded. A quantitative market research (surveys) has been realized, in order to obtain extra information's to those obtained in the review of literature.

The study has been carried out during the second semester of 2016 in the Headquarter of UTS in Bucaramanga. Student's population corresponding to 17,881 persons have been taken into account. Nevertheless, the study has been worked on a finite sample of the population, with a 5% margin of error and confidence limit of 95 %, which gave a total of 391 students. Thus, and in order to reduce the margin of error, 400 surveys have been realized distributed in the whole population, taking into account a weighting in function of student's number registered in every academic program. Besides of the survey, a qualitative method has been applied (personal "face-to-face" interview), in order to allow an interaction between the pollster, the polled one and the questionnaire, permitting to obtain important characteristics of polled difficult to detect if only the survey is applied.

The surveys were analysed by means of descriptive statistics, which included comparison of answers frequencies and percentile ranges, in order to know the projections of this environmental culture and of solid waste disposal in the Institution.

RESULTS

Environmental culture

In Figure 1a, more than 86% of the students are really worried about environmental topics, whereas 13.25% are not so worried. Meanwhile, in Figure 1b, there are both principal environmental problems for which the students are worried: Water pollution (36.50 %) and global warming (32.50 %). It is important to stand out that 5.75 % of the students answered that they were worried about other environmental problems, principally for suitable managing of solid wastes.

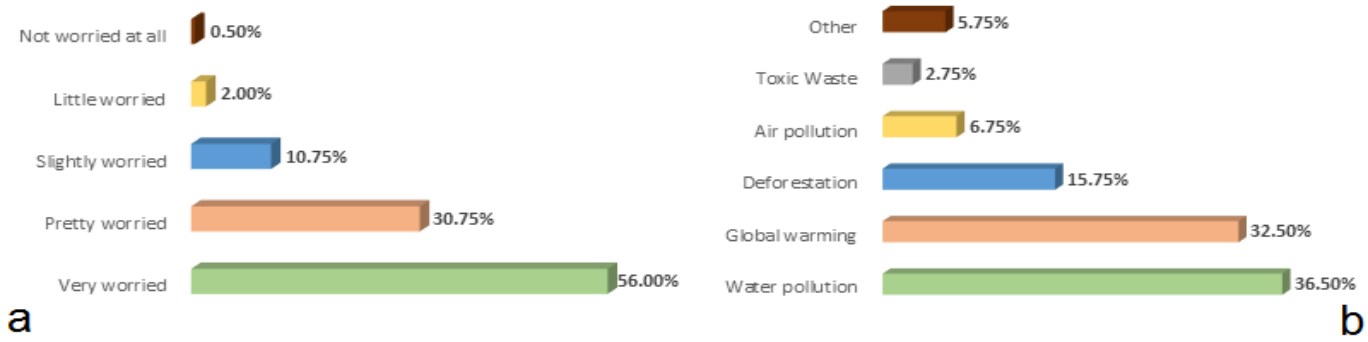

Figure 1. Results of the survey method: a) Worry about environmental topics, and b) Environmental problem most worrying today. Source: Own production.

As regards for the environmental topics, the analysis of the information based on the comparison between answers frequencies and percentiles ranges, show that a part of the students did not say really what they was thinking. The variable "pretty worried" decrease of 40.57 %, whereas all the variables that present a minimal worry increase (Table 1). The previous result is sustained, because part of the students provided a socially acceptable response for fear of being judged, telling that they are "pretty worried" for the environmental problematic, when actually, the exact opposite is happening.

Table 1. Comparison between frequencies and percentiles ranges of worry about environmental topics. Source: Own production.

Percentile	Variable	Frequency	Percentage (%)	Variation (%)
12.5	Pretty worried	123	30.75	-40.57
37.5	Slightly worried	43	10.75	+31.20
62.5	Little worried	8	2.00	+78.67
87.5	Not worried at all	2	0.50	+84.00

With regard to the most worrying environmental problems, in Table 2 the variable "Global warming" decrease of 44.44 %, whereas the variables "Air pollution" and "Others" increase of 46.00 % and 23.33 %, respectively. Those results confirm that the most spoken topics turn into principal topics of worries, as it is demonstrated in Figure 1b. On the other hand, although the variable "Deforestation" did not reach both principal categories, it is present in student's environmental worries.

Table 2. Comparison between frequencies and percentiles ranges of the environmental problem most worrying today. Source: Own production.

Percentile	Variable	Frequency	Percentage (%)	Variation (%)
10	Global warming	130	32.50	-44.44
30	Deforestation	63	15.75	10.00
50	Air pollution	27	6.75	46.00
70	Other	23	5.75	23.33
90	Toxic Waste	11	2.75	-10.00

In agreement with Figure 2a, for more than 61 % of the students the affirmation that explains better the notion of sustainable development, is the conservation of resources and ecosystems for future generations, whereas for 14.75 % of them, it is the minimal use of natural resources for production of goods and services, and for 11.00 % the equity in the access to economic and environmental resources. According to Figure 2b, more than 70 % of the students declare that they have changed a lot of behavior last year in order to benefit to the environment. Nevertheless, 28.25 % of the students admit a little change of behavior, and it means that efforts are needed to convince them with regard to a real change of attitude.

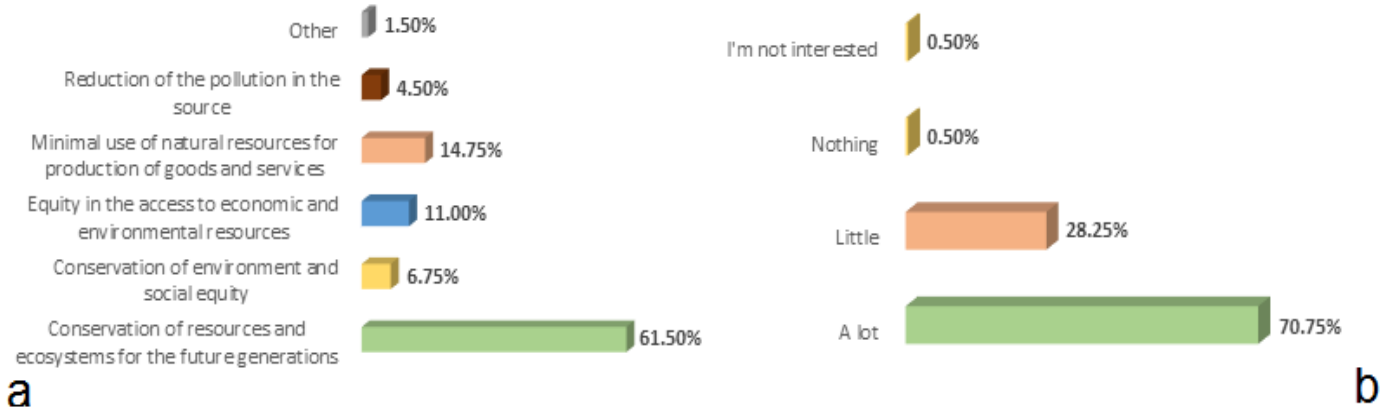

Figure 2. Results of the survey method: a) Affirmations that explain better the notion of sustainable development, and b) Change of behavior last year for the benefit of environment. Source: Own production.

Analyzing the results of the transport mean most used by the students (Figure 3), more than 26.00 % uses motorcycles. Other 26.00 % uses massive transport system called Metrolínea, for being friendlier with the environment. 25.50 % uses classic bus, being the most polluting transport with motorcycles and cars (13.00 %). Those results are in contradiction with the change of attitude (Figure 2b). It is important to stand out that it seems that the polled ones confuse intentions with actions. And indeed, only 9.00 % of the student's uses transport means not motorized (4.25 %), including there the option "Walk".

According to Figure 4a, more than 95.00 % of the students admit using low energy consumption light bulbs at home, in order to save electricity (53.00 %), and because in the same time, it's friendly with the environment (43.86 %). In this way, the last response was given by students with a little bit more environmental conscience (Figure 4b). With regard to 4.25 % of the sample that admitted not using low energy consumption light bulbs, it was possible to verify that the causes were the high price of those ones, and the lack of conscience of their utility.

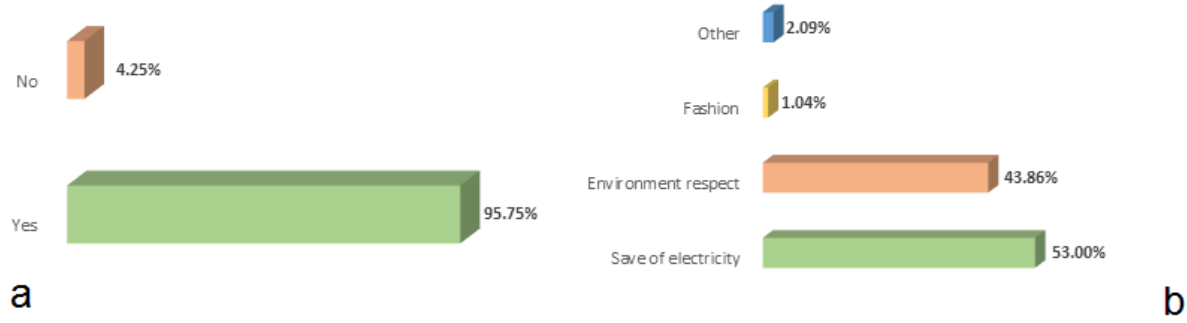

Figure 4. Results of the survey method: a) Use of low energy consumption light bulbs at home, and b) Justification of low energy consumption light bulbs use at home. Source: Own production.

As it is demonstrated in Figure 5a, both activities most carried out, in order to help to protect environment are the use of less water (33.50 %) and the recycling (32.50 %). Likewise, in Figure 5b, it is possible to observe that more than 74 % of the polled students is discouraged by government and industry lack of measures. Therefore, student's answers demonstrate a gap between the repetitive alerts from the scientific community concerning the damages caused to the environment, politician's inaction, and industries lack of interest. Those ones continue producing without taking into account the threat for the environment (7.75% of responses). Another activity generated as a consequence of rationing threats, because of rainfalls decrease in the beginning of 2016, is linked with the use of less energy (23.50 %). In the same way, 9 % of the sampled population answered "Other one". In this regard, half of those considered the micro reforestation (of stables or neighborhoods), and the collection of water generated by the rain, as management strategies to protect water sources.

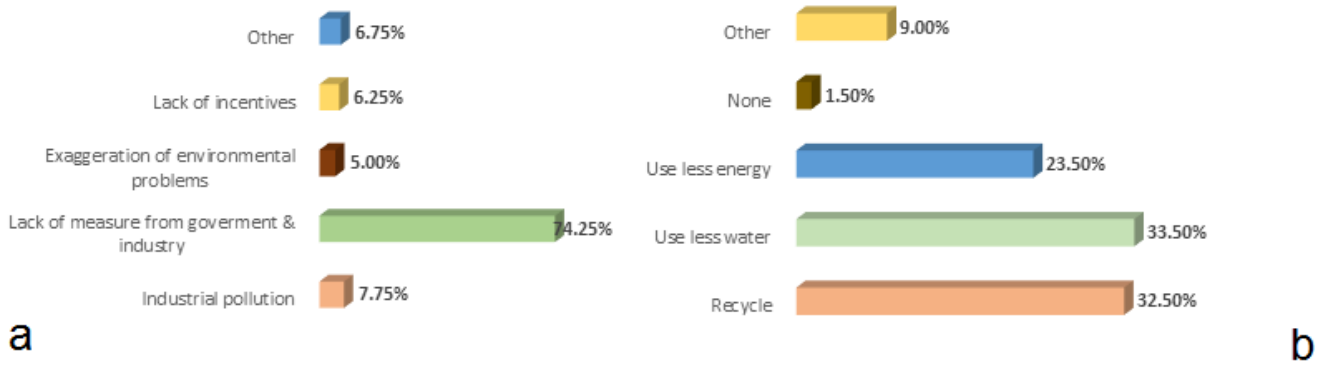

Figure 5. Results of the survey method: a) Activities executed to help environment protection, and b) Disincentive factor to worry about environment. Source: Own production.

According to Table 3, it's possible to demonstrate that the variables "Recycle" and "Use less energy" decrease respectively of 48.57 % and 50.40 %, whereas the variable "None" increase of 52.00 %. Although those results don't mean that all the students did not say what they were thinking, they allow to qualify the trend demonstrated in Figure 5a, and to say that some of the polled ones were impeded to admit that they were not doing any action to protect the environment, and that they provided the socially more acceptable response.

Table 3. Comparison between frequencies and percentiles ranges of the activities executed to help environment protection. Source: Own production.

Percentile	Variable	Frequency	Percentage (%)	Variation (%)
12.5	Recycle	130	32.50	-48.57
37.5	Use less water	94	23.50	-50.40
62.5	Other	36	9.00	4.00
87.5	None	6	1.50	52.00

Even if there are courses depending of Environmental

Department in the Institution, which supposes a high content of environmental information, the students showed a low level of environmental knowledge and culture.

Solid wastes

In Figure 6a, it is possible to observe that the residues produced on regular basis in the UTS are paper (81.50 %), food waste (52 %), and carton (39.00 %). Those results coincide with common wastes, and in general the managerial or institutional campaigns focus in their reduction or reutilization. Nevertheless, in case of educational institutions, it would be interesting to know the difference of paper and carton recycling between dependences and students. Likewise, in Figure 6b, 64.75 % of the students observed practices of paper recovery and recycling, whereas 46.75 % declared that this initiative was carried out only with carton. On the other hand, 21.50 % of the students expressed that they did not observe any action.

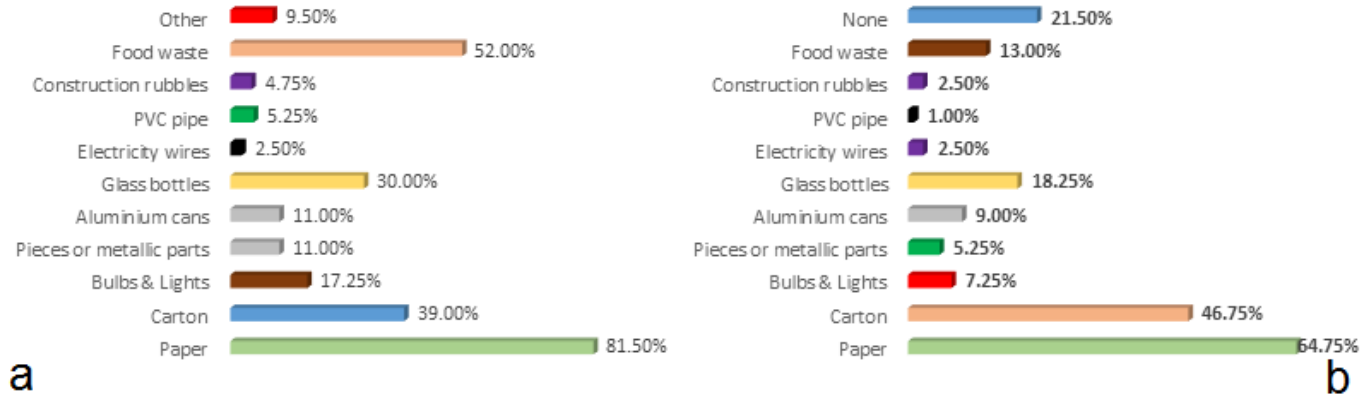

Figure 6. Results of the survey method: a) Residues produced regularly in the place of work or study, and b) Residues for which the application of recovery and recycling practices is observed in the place of work or study. Source: Own production.

Asking about the frequency of recycling bins use, 83 % of the students uses them always and mostly, whereas 15 % uses them sometimes (Figure 7a). Then, the UTS must do more efforts in the promotion of recycling bins use. In the same way, and in order to know if the final disposition of carton wastes is done in an adapted way by the students, in Figure 7b, 56.25 % of the polled sample provided the right response to the question, whereas 43.75 % was wrong. Thus, it is possible to deduce that there is a contradiction between the results registered in Figure 7b and Figure 7a, where 83 % of the students admitted using recycling bins always or mostly.

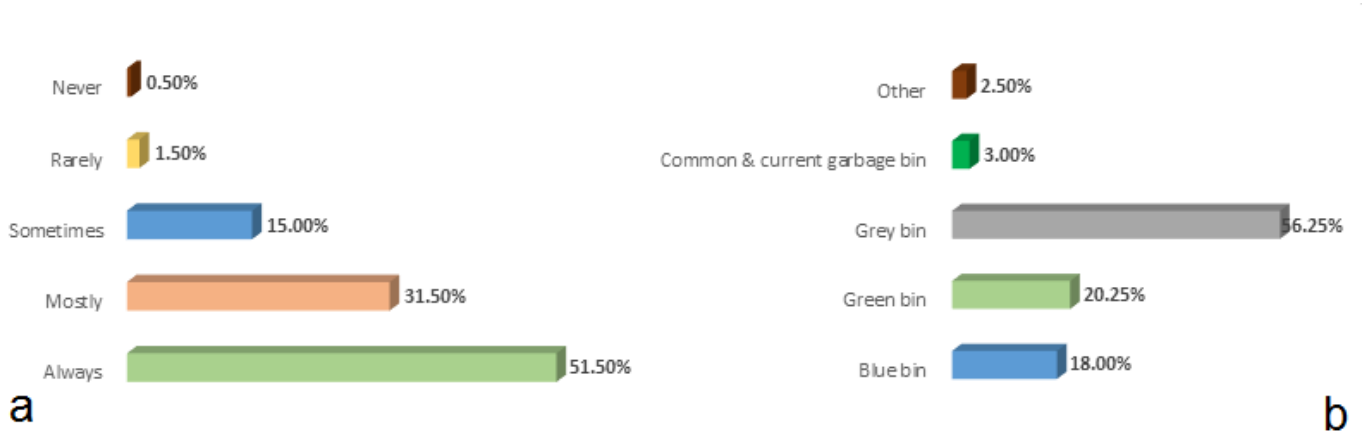

Figure 7. Results of the survey method: a) Use frequency of recycling bins, and b) Knowledge of the bin where paper and carton must be bounced. Source: Own production.

To corroborate the results of Figure 7a, Table 4, shows that the variable “Mostly” decrease of 44.00 %, whereas variables as “Rarely” and “Never” increase of 84 %. It means that a part of the students did not really say really what they were thinking, and indeed, they are using recycling bins less than they say. Further, the phenomenon of socially acceptable answer can be observed.

Table 4. Comparison between frequencies and percentiles ranges of recycling bins use frequency. Source: Own production.

Percentile	Variable	Frequency	Percentage (%)	Variation (%)
12.5	Mostly	126	31.50%	-44.00%
37.5	Sometimes	60	15.00%	4.00%
62.5	Rarely	6	1.50%	84.00%
87.5	Never	2	0.50%	84.00%

The previous analysis of Figure 7 and Table 4, provides a doubt about answers veracity. According to Figure 8a, it was possible to establish that for 73.75 % of the students, the UTS do not handle the separation of solid waste on a suitable form, whereas 26.25 % thinks the opposite. Thus, in Figure 8b, 32.54 % of the students think that there is a lack of separation and recycling implementation and that the Institution does not fulfill with its role of environmental education. Equally, for 26.44 % of the sample, there is not clarity in separation and recycling that allow demonstrating a suitable management of solid waste. Nevertheless, 82.86 % of the students recognize the presence of separation bins and ecological points, but they demonstrate that the problem lies in the limited number of those ones (not showed figure). In the same way, the remaining percentage thinks that there is a diffusion of separation and recycling culture provided by the Institution. But in relation with the results of the previous analysis, those actions end up by being sporadic, and it is necessary to have a more intense and effective diffusion.

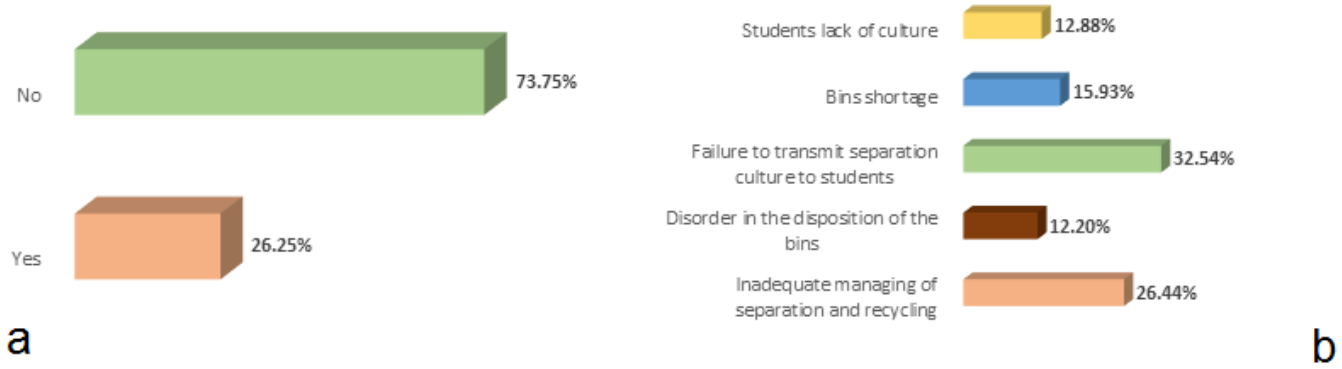

Figure 8. Results of the survey method: a) Proper managing of solid waste separation, and b) Reasons of the inadequate managing of solid waste in the UTS. Source: Own production.

DISCUSSION

Starting from the obtained results, it can be interpreted that the students of the Institution recognize the danger represented by environmental problems at global, regional y local level: That is a good basis to involve them in actions of environmental preservation (2,6). In that way, water pollution and global warming are topics most treated by mass Medias, as Happer and Philo (9) recognize it. But it does not mean that other topics are not worrying. In fact, those authors mention that communication Medias help to improve collective and individual behavior for different issues of interest, like climate change.

More than 61% of the students consider that sustainable development begins with resources and ecosystem conservation for future generations. They are worried about planet future that can be consolidated in equity and equality, which must exist between countries in order to take common actions for the benefice of humanity. As regards to the change of behavior last year for the benefit of environment, it is also a topic very diffused in mass communication means with the objective to change humanity behavior. It is important to focus on the work done by some teachers of the Institution that are trying to raise awareness students on topics as: Solid waste separation and intelligent use of paper through electronic Medias works. Likewise, González and Malagónlez (10) and Stromquist (11) express that when it is time to think about new professionals teaching quality and qualify the contribution to human resources in humanity, the training of university teachers is a fundamental topic. Therefore, in the UTS, this commitment is assumed with responsibility.

Mata-Segreda (12) express that cultural transformation must be searched, starting from interventions in beliefs, knowledge and values that are dominating social groups. This transformation only can be verified by the observation of environmental behavior. In that way, the analysis of this one permits the understanding of the different cultural precepts over time, with regard to the environment. According to Cohen-Katz *et al.* (13) it is necessary to boost emotional intelligence of the person in order to transform behaviors', which must be in consensus with a global approach focused in Century XXI education as proposed by Eira de Aquino *et al.* (14). On the other hand, Gutberlet (15) express that it is necessary, in order to transform communities, to reform between others aspects: Environmental policies, but above all, education through mechanisms permitting to balance solid waste quantity produced in a given time. For example, in the Universidad de Cienfuegos (Cuba), the relationship between company and university has been analysed with the support of

researches focused on the implementation of cleaner production activities. With this action, the results were an improvement of air and water quality in the whole city (16).

Sosa et al. (5) stand out that institutional context operate as a factor inhibitory for environmental education, because environmental training is not considered as a priority and therefore, spaces, infrastructure and necessary supports for its study, teaching and promotion do not exist. A radical change is required in teachers training, in order to overcome the type of teaching practiced, focused on the providing of information without a deep understanding of complexity and interdependence between natural and socioeconomically systems. However, in case of the UTS, the work carried out is the initial phase of a long term project in which environmental values and integrated managing of solid waste training are priorities (17). For example, Canul-Bacab *et al.* (18) are talking about a work carried out in the Instituto Tecnológico Superior Motul (Mexico), depending on ethic commitment that Superior Education Institutions have with the Society and specifically with the management of solid waste. It has been concluded that, in order to facilitate solid waste management and storage, it is fundamental to separate and classify those ones. In that way, environmental education was one of the used strategies to achieve the objective, above all because in this case, solid waste compositions vary according to the time of the year.

In the UTS, the polled students admitted using always o mostly recycle bin but in fact, they use them less than they say. In the same time, the UTS do not handle the separation of solid waste on a suitable form. For their part, Trejo-Alba *et al.* (19), found in a study carried out in the Universidad Autónoma de Baja California (Mexico), that the majority of the sample is rating recycling process as an important activity (98% of the sample of 529 polled ones). Likewise, this same study is mentioning that 57% of the polled ones are agree to participate in a recycling program, but it's important to highlight that almost the half (43%) answered that they would not like to participate in it; inclusive, 0.4% didn't want to answer. Like this, it is necessary to promote ecological values in the academic unit in order to create more conscience about the importance of recycling. An opposite case to the previously raised has been reported by Ramírez-Lara *et al.* (20): In a work carried out in chemistry sciences Faculty of the Universidad Autónoma de Nuevo León (Mexico), they found that students and academic community accepted and adopted quickly classification and separation of solid waste.

CONCLUSIONS

In the Institution, courses depending on Environmental Department exist, which would suppose a high environmental commitment. However the students showed a low level of environmental knowledge and culture. In that way, the polled students are worried about environmental problematic, especially about water pollution and global warming, which are topics very defunded by the scientific community and mass Media means. Besides, the majority of the sample admits an important change of behavior thanks to the campaigns dedicated to environmental care. For them, the most popular measures for environment protection are: Less water use and recycling. In this order of ideas, more than 80% of the sample use recycle bin always or mostly. This is in contradiction with more than 40% of the sample that went wrong at the moment to mention the bin where paper and carton has to be deposited. In the same time, the phenomenon of answer socially acceptable has been observed.

With regard to the observation of solid wastes benefiting of recuperation and recycling processes in the place of work or study, good practices of paper and carton recycling and re-use has been demonstrated. But more than 20% of the sample does not observe any action related with recuperation and recycling. Likewise, for more than 70% of the sample, the UTS do not manage properly solid waste separation. Besides, this policy is not clear, to the point that a part of the polled ones does not know if the Institution is carrying out those actions. However, in regard to the transport mean used, 65% of the sample use pollutant transport means, whereas the rest use less o nothing contaminating transport means. This last result goes in contrary with an environmental culture in the Institution.

ACKNOWLEDGEMENTS

The execution of this work has been possible thanks to the research process developed by Marketing Research Group (GIMA), specifically by Marketing Students Seedbed (SEI+MARK) of the UTS.

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