

# THE AWARENESS OF THE FUNCTIONAL AND NEAR POPULATION WITH THE RELATION TO THE RESEARCH NUCLEAR REACTOR IEA-R1

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## ABSTRACT

After the natural accident that hit Japan in the beginning of March of 2011, and that ended into an accident of great proportions in the nuclear installations of Fukushima, it has now the debate over the lack of information that the population in general has over the nuclear energy. The dissemination of information, about the operation and security of the nuclear reactors, has the purpose of softening the effect that the pessimistic atmosphere has over its using. This study was reinforced by the memories of serious consequences due to other nuclear accidents that have already happened (Chernobyl, Three-Mile and Hiroshima/Nagasaki event), bringing insecurity, fear and even revenge from part of the public. Over all, people are not sufficiently informed about the positives and negatives aspects of the nuclear energy. It is necessary the adoption of a clear and aware policy with the population, about the pacific use of nuclear energy. Today, the international and national organizations of control of nuclear energy, the International Atomic Energy Agency (IAEA) and the *Comissão Nacional de Energia Nuclear* (CNEN), have respectively, published information about this subject using a more professional way and of hard access for the public in general. This work has the goal of checking the level of information that the population of workers and individuals of the close public to the research nuclear reactor IEA-RI, located in the Institute of Nuclear Research (IPEN), University City, Sao Paulo, Brazil, has over it. The way used for this study, involved questionnaires with straight questions and of simple language over the subject, to people of all different social, economic and cultural classes, from 12 to 80 years old. From the results found after this work, it was verified the necessity to elaborate a project of awareness of information and clarification about the nuclear energy, using ways of communication that exist and that are easy for the public to understand.

## 1. INTRODUCTION

The little quantity of information about the nuclear energy over itself, operation and security, encourages the wrong judgment about the matter providing an atmosphere worldwide somber. This situation has been aggravated with the occurrence of the nuclear accidents occurred in Fukushima (Japan-2011) [1], Chernobyl (Ukraine-1986) [2], Three Mile Island (USA-1979) [2], and the atomic bombardment of Hiroshima and Nagasaki [3]. The fear of the unknown brings to memory the climate of insecurity and even revolt in part of the people of all of the continents, because they do not have sufficient knowledge about the use of nuclear energy. The organs that control the pacific use of nuclear energy [4, 5, and 6],

constantly have published information about the matter, however, it brings difficult access and comprehension of the public in general.

Highlights-itself that there are not accounts of information about the nuclear energy for the populations that experienced the accidents previously described, but only after the disasters have occurred, the information are given for the survival of the population inside an atmospheric of panic anyways.

In 04/08/1988 with the inauguration of the *Centro Experimental ARAMAR* (CEA), in the town of *Iperó*, SP, it was inaugurated by the *Coordenadoria de Projetos Especiais* (COPESP) of the *Centro Tecnológico da Marinha em São Paulo* (CTMSP), an effective program of information and awareness to the public of different and varied applications of nuclear energy and of activities developed by this Center. This program was composed by lectures, expositions, informative publications and courses, regulated by the entrances of the publication by *Diário Oficial do Estado de São Paulo* (DOE) of 04/07/89 and 10/26/89 [7].

In the nuclear installations of *Angra dos Reis* (RJ), the *Eletronuclear* [5] develops a strong policy of communication where it keeps two centers of information with the goal to spread the activities of the nuclear factories and to answer the doubts of its visitors. The Center of Information of *Itaoma*, the 522 Km of the *Rio-Santos* highway provides a completely view of the nuclear complex, and also offers a permanent exposition, films and educational handbills which explain the nuclear energy. Another area offered by the *Eletronuclear* is located in the *Av. Júlio Maria*, 160, central region of *Angra dos Reis*, where it promotes educational exhibitions with electronic panels and models of the factories besides promoting cultural activities of the metropolitan region.

After the accident of March 11th of 2011 in the Fukushima facilities (Japan), was realized a research by the Global WIN (a world net of companies of research) for Brazil about the use of nuclear energy, where 57% of the Brazilians seemed to be concerned and half of them very worried about the possibility of a nuclear accident happening in the country also. The concern level is above the universal average (49%) [8].

The explanation for this high percentage it's that 40% of the people do not know if the Brazilian government controls suitably the security of *Angra dos Reis'* nuclear factories. Besides, 19% of them find that there is not an adequate control. Only 41% of the people trust in the official safety measures.

Many believe that if there was an effective program of awareness of information for the public about the different uses and application of nuclear energy, relating to all economic, cultural, and social classes, then the high rating of unawareness related above certain would fall. The main reason of these high levels it's because of the weak scientific explanation of the matter, which means that, there is no knowledge that this energy is clean and safe. Besides, it is utilized, straightly or indirectly in a safe way into the lives of the population, as the use in the areas of health, research, industry and electric energy.

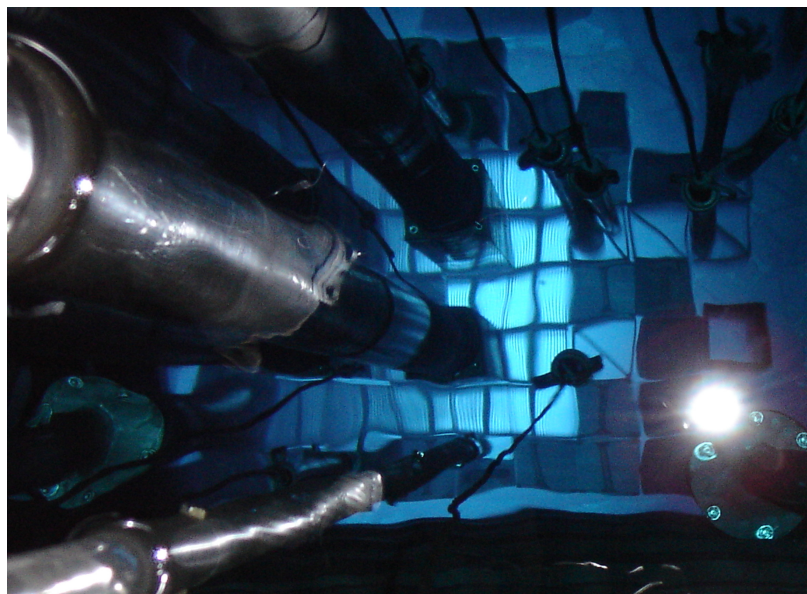
This work has the goal to verify the level of information that the population of workers and the public individuals near to the research nuclear reactor IEA-R1, located in the Institute of Nuclear Research –IPEN – University City –São Paulo- Brazil, has about it.

## 2. METHODOLOGY

The methodology utilized to develop this article consisted in: understanding better the operation of the reactor of researches IEA-R1 and elaborating and applying a questionnaire to the target public of this work. .

### 2.1 Plant description

The IEA-R1 is a 5 MW pool type research reactor. Its core is basically composed by a set of fuel elements of the type Material Test Reactor (MTR) which stays submersed in the pool and hanged by a metallic structure. The reactor is moderated and cooled with light water and its cooling is made by the passage of the water contained in the pool through the fuel elements. The primary circuit consists of the pool with the reactor's core, convection valve and two heat exchanger circuits in parallel. Each circuit contains a circulation pump, a heat exchanger, pipes, valves, and the instruments for its operational control. Its function is to provide the adequate cooling of the core, assuring that the fuel project criteria is not exceeded during any normal plant operation condition. Fig. 1 shows the overview of the IEA-R1 core [9].



**Figure 1. Overview of the IEA-R1 core.**

### 2.2 Questionnaire

The second phase of this work was the elaboration and application of a questionnaire with eleven objective questions and of simple language about the knowledge and information of the people regarding of the research nuclear reactor IEA-R1. This questionnaire was applied to a sample of 80 people divided in four groups, considering the cultural, social, economic and age group of 12 to 80 years old class. This public finds-itself near to the research nuclear reactor IEA-R1. The groups were divided in: Group1, people who live in the Community *São Remo* (inner city); Group 2, members of the staff from *São Paulo* University; Group 3,

students from *Porto União* school, registered in the elementary period and Group 4, elderly people who are part of the third age group.

### 3. RESULTS

The results were evaluated through graphics and individually for each one of the questions of the questionnaire; where in a first phase of the work was observed the rank of knowledge and information of each group. The figures presented below are relative to each one of the questions that they are showed in the figures 2 until 12, aiming at the four groups of people described previously. Through the figure number 2 until the number 12 it is able to observe the level of information that each one of the communities has over the nuclear energy.

The union of the results was done during the second phase of this work, where it can be observed by two graphics, utilizing two kinds of criteria: the Fig. 13 has all the questions from 1 until 7 and 11, where the questioning is focused over the knowledge the people have about the nuclear energy, and the Fig. 14 holds the questions 8, 9 and 10, having the goal to verify what the interest of each one of the groups about the matter proposed is.

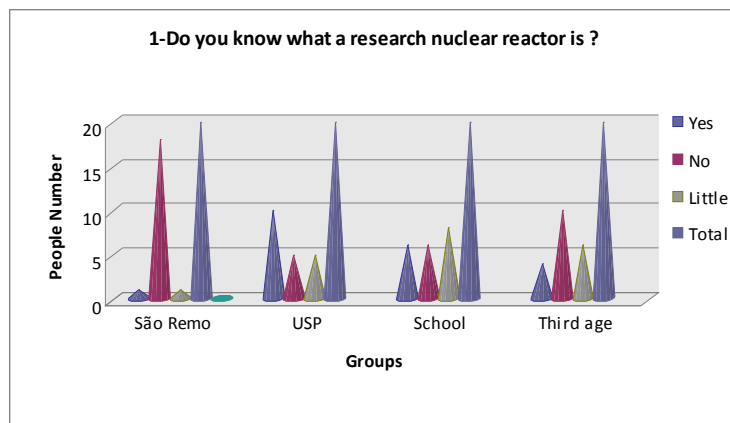


Figure 2. Question number 1.

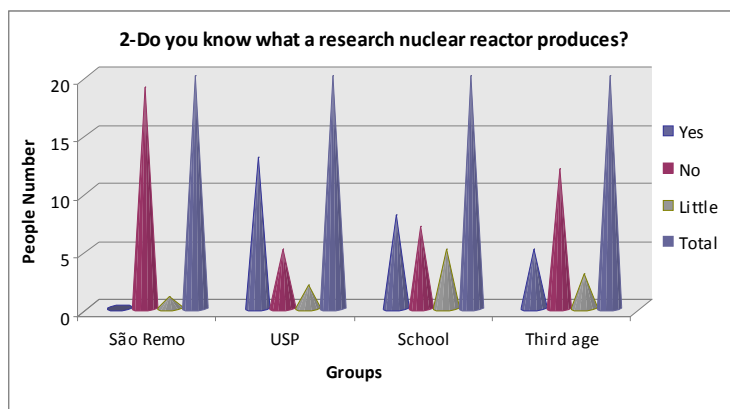
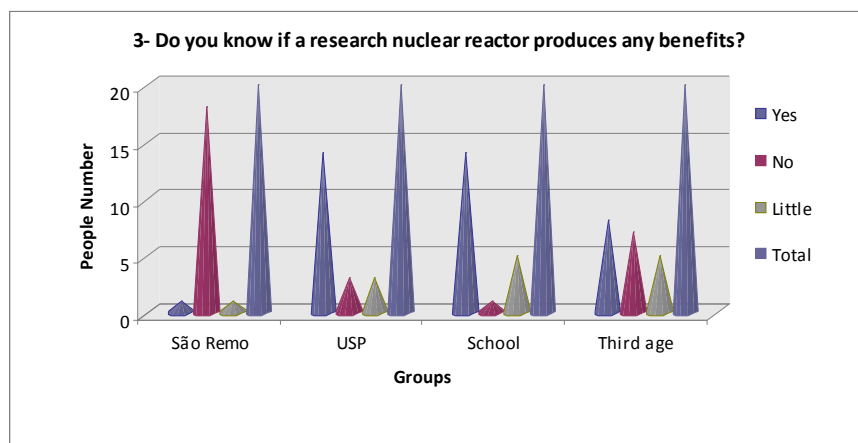
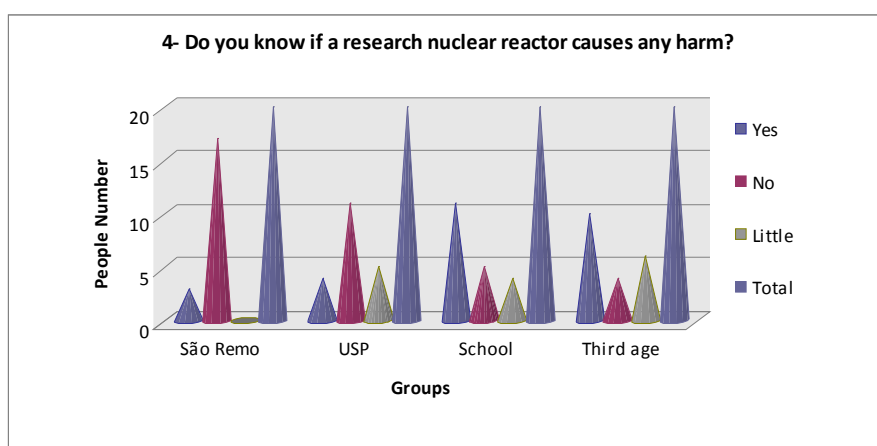


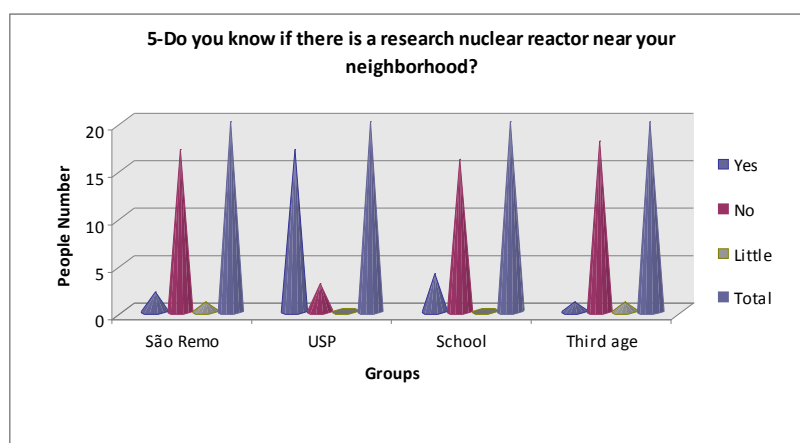
Figure 3. Question number 2.



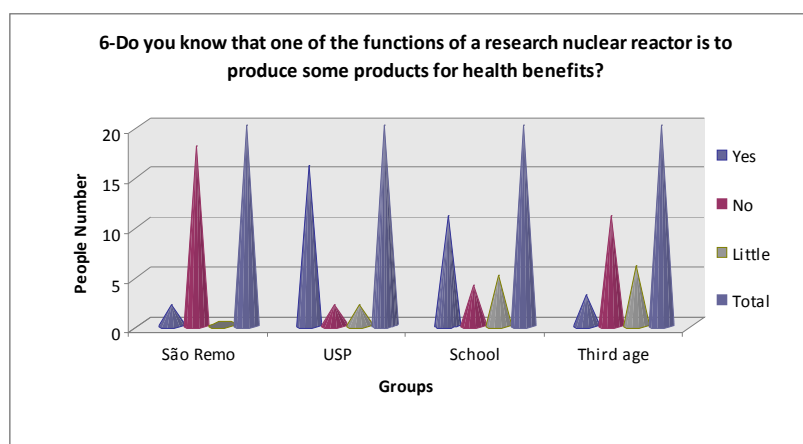
**Figure 4. Question number 3.**



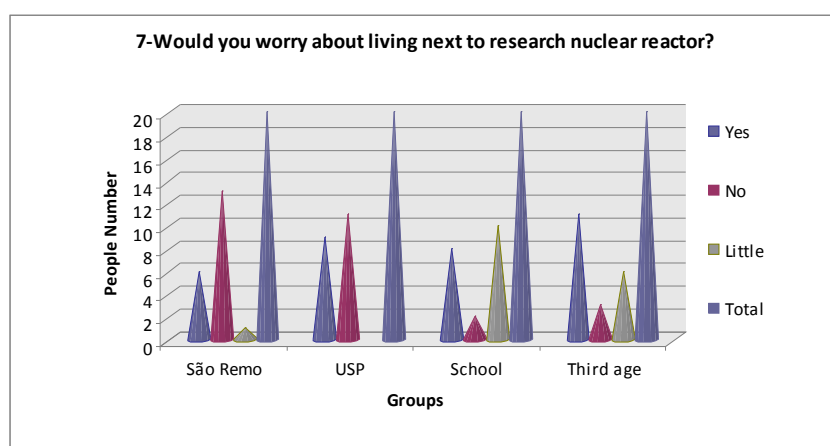
**Figure 5. Question number 4.**



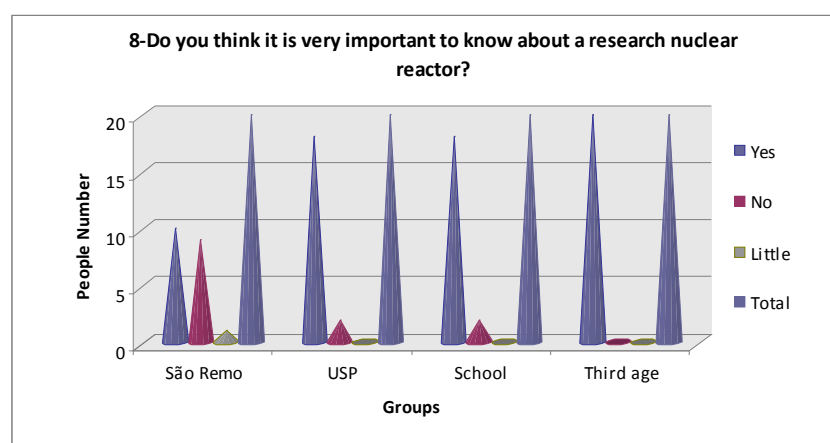
**Figure 6. Question number 5.**



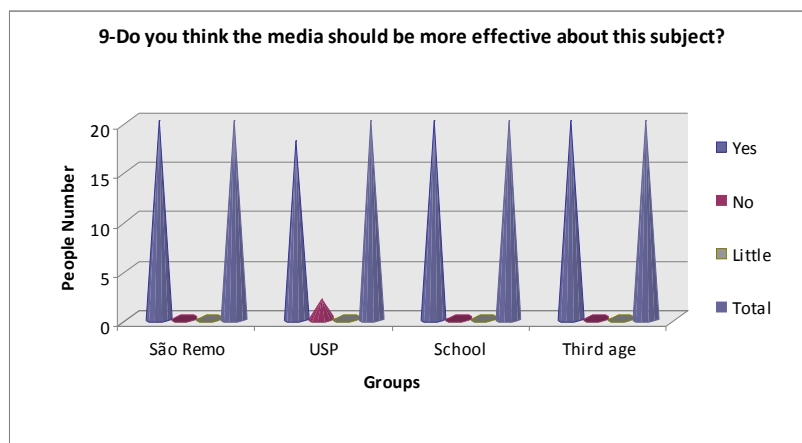
**Figure 7. Question number 6.**



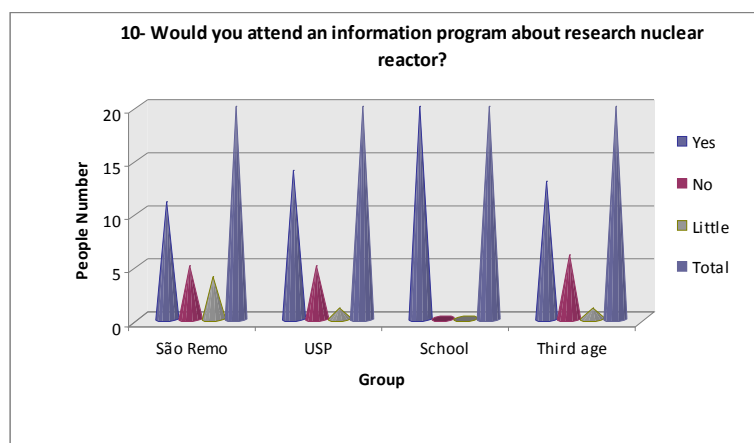
**Figure 8. Question number 7.**



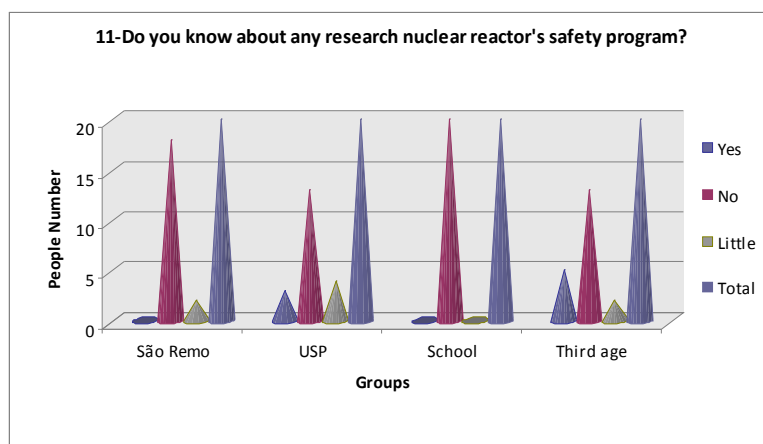
**Figure 9. Question number 8.**



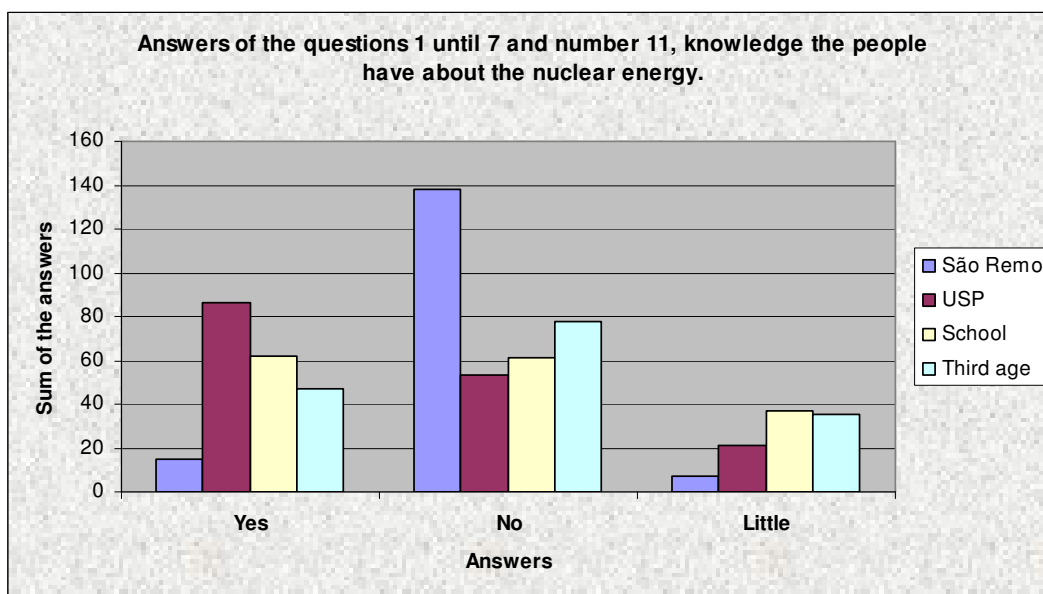
**Figure 10. Question number 9.**



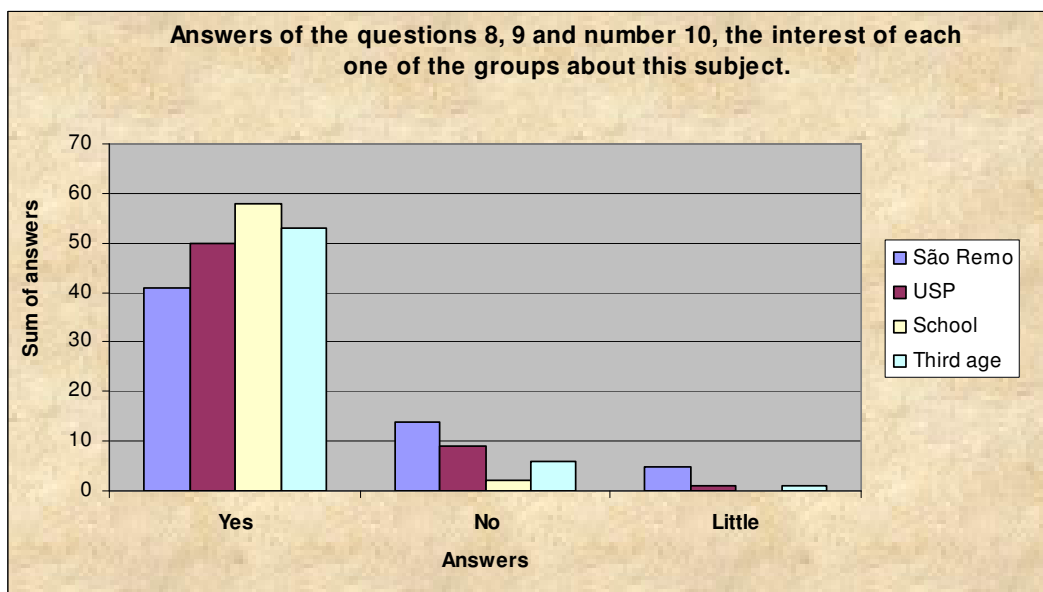
**Figure 11. Question number 10.**



**Figure 12. Question number 11.**



**Figure 13. Questions numbers 1 to 7 and 11.**



**Figure 14. Questions numbers 8, 9 and 10.**

The results clearly show that the neighborhoods around of the research nuclear reactor IEA-R1 do not possess the necessary knowledge about the matter and not even know if there is any kind of information of dissemination program offered by IPEN.



#### 4. CONCLUSIONS

From the results obtained, it is concluded that the population that has a bigger level of knowledge regarding the nuclear reactors of research is the Group 2, constituted of members from the staff of Sao Paulo University, by the fact of this group having a better intellectual level of seeking information and explanation over the matter. However, the others groups even not having the same intellectual level, they all have the interest of obtaining information about the reactor of research IEA-R1.

It is concluded that: from the elaboration of an information dissemination program about the pacific use of nuclear energy, utilizing the adequate ways of communication to the understanding of the population, it believes that the public in general will have the minimum of knowledge, in order to have an opinion about the matter. Besides, the population will receive subsidy from this program, to deal with possible adverse situations.

#### ACKNOWLEDGMENTS

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#### REFERENCES

1. Revista ISTOE, artigo nº 2.158 “*Ameaça Nuclear Assusta o Mundo*”, março (2011).
2. M. P. S. MARTINS, “*Estudo de Fatores Humanos, e observação dos seus aspectos básicos, focados em operadores do reator de pesquisa IEA-R1 objetivando a prevenção de acidentes ocasionados por falhas humanas*”. Dissertação de Mestrado – Instituto de Pesquisas Energéticas e Nucleares – IPEN-CNEN/SP, USP, São Paulo, SP, Brasil, (2008).
3. Portal São Francisco <http://www.portalsãofrancisco.com.br> Acesso em abril (2011).
4. INTERNATIONAL ATOMIC ENERGY AGENCY, Disponível no módulo Centro de Notícias em <http://www.iaea.org> Acesso em abril (2011)
5. Eletronuclear Disponível no modulo Imprensa em <http://www.eletronuclear.gov.br>. Acesso em abril (2011).
6. Comissão Nacional de Energia Nuclear, Disponível no módulo Portal Nuclear <http://www.portalnuclear.cnem.gov.br>, Acesso em abril (2011).
7. Publicação no D.O.E Diário Oficial do Estado de 07/04/89 e 26/10/89.
8. Cidadania & Meio Ambiente. Disponível em: <http://www.codebate.com.br>. Acesso em abril (2011).
9. INSTITUTO DE PESQUISAS ENERGÉTICAS E NUCLEARES, “*Relatório Final de Análise de Segurança*”, (1998).