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THE PERCEPTION OF THE CLIMATE CHANGE AMONG STUDENTS IN HIGHER EDUCATION AT IBN ZOHR UNIVERSITY, MOROCCO

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ABSTRACT
The United Nations Framework Convention on Climate Change (UNFCCC), encouraged the governments to educate, inform and involve citizens in the making of policies that mitigate and adapt to the climate change. To this purpose, the role of the education system is crucial in improving the awareness and influencing the behaviour of the population toward the issue of climate change. The aim of this study is to assess the knowledge and the perception of the students attending Ibn Zohr University in Agadir, Morocco. This study involved 1017 students, attending the faculty of science. The participants were aged 22 years old, in average; among them 47% were female and 29 % were from rural areas. Our results, demonstrated a wide difference in the perception of students on the climate change. The students were well informed about the climate change. Indeed, the majority (90%) of them believed that the climate change issue is a reality. However, when asked to indicate more precisely the causes and the consequences of the climate change, they showed the limitation of their knowledge and the inaccuracy of their perception. This study revealed the limitation of the higher education system on implementing a coherent and consistent programme on the climate change topics that improve the awareness of the next generation of decision maker.
KEYWORDS: Perception, climate change, global warming, students and Higher education.

INTRODUCTION
Climate change (CC) and the global warming (GW) are global issues, that are frequently addressed by a wide range of people including, scientists, ecologists, politicians, media and educationalists. The CC is considered as the most expansive global environmental, economic and the political problem facing humanity.[1] There is a strong scientific consensus that climate is changing and that human activity is a significant contributor.[2] Human-induced climate change, is caused by greenhouse gas emissions mostly from industry, transport and agriculture. Carbon dioxide makes the largest contribution to enhanced climate change. Fossil fuels (coal, oil and gas) are the biggest source of carbon dioxide emissions in the atmosphere, but also methane, nitrous oxide, fluorinated gases including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Sulphur hexafluoride (SF6). The amount of greenhouse gases in the atmosphere reached a new record high in 2015. Its predicted that 2016 will be the first year in which the CO2 in the Launa Loa Observatory remains above 400 ppm all year and hence for many generations.[3]

Until recently, the worldwide dissemination of knowledge and education about the issue of CC was considered a low priority (Integrating Climate Change Adaptation into Development Co-operation POLICY GUIDANCE, 2009). However, there is an increasing recognition of the need to improve CC awareness and education in order to enhance the capacity of adaption of individuals and communities (The Lima Ministerial Declaration on Education and Awareness-raising).[5;6] Education programs that focuses on the environment, would encourage young generation of citizen to act in an environmentally friendly manner. Indeed, a younger generation that is aware of the global warming and climate change will be more prepared to respond to both, by taking appropriate actions and adapting to the changes already taking place. In addition, education would be an essential step to providing sufficient knowledge about the causes and impacts of the CC to the new generation of decision makers.[7;8]

Morocco is situated in a north-west corner of Africa at the European gates, with a large Mediterranean coast. Cause of its geographical position, Morocco is very

vulnerable to climate variability (according to the IPCC Fifth Assessment Report.[9]) The most expected change would be a shift of the climate towards warmer and dryer conditions, resulting in a further increase in existing water stress, especially in the South of the Atlas Mountains.[10] In addition, significant changes would be observed in the arid area of the Saharan lands. This changes might gradually affect the life of most parts of the Moroccan society. In fact, the Moroccan population rely extensively on agriculture to subside. The agriculture contributes by 19% of GDP and about 80% of direct rural employment (*Morocco climate change policy report, 2014*).[11] Economic growth in morocco is directly affected by precipitations, a rainy season will drive up the annual economic growth. The Moroccan population is about 31.89 million inhabitants (2010), with 30.1% of the population aged between 0-14 years. The population growth rate of 1.1% in 2007 (approaching the global rate).

The challenge of our education system is to educate the next generation of learners about the issue of climate change. At our knowledge, researches assessing background knowledge of climate change in Moroccan populations and studies examining high-school student's perception of global climate change or even misconceptions with regard to climate change, its mechanisms, causes and impacts are lacking. Hence this study was conducted with students in higher education in Morocco to evaluate their degree of awareness about the CC issue, its causes and consequences.

Method

The study group

This study aims to analyze the CC awareness among a population of students attending the faculty of science in at the university Ibn Zohr, south-west Morocco. The sample represent a population of students (from urban and rural origin) that cover a geographical area of almost the third of the country, known for its low rate of rain fall of dry conditions. The number of students included in the study was 1068. Their average age is comprised between 20 and 22 years. The male and female respondents represented 53 % and 47%, respectively.

Sample and data collection

This study was based on primary survey using a questionnaire (Table 1) that was based on previous study on the subject.[7;12] Seven multiple choice questions and five Yes/No questions were used in this questionnaire. The Yes/No questions from 1 to 4 were designed to evaluate the general knowledge of the students about the CC and the GW; while the question 5 was designed to evaluate the student perception of the impact of CC and GW. The multiple questions 1, 2 and 5 were designed to test the general knowledge; the questions 3 and 6 were designed to evaluate the understanding of the impact and the questions 3 and 7 were designed to evaluate the student perception of the cause of CC and GW. The answers were individually collected by 36 students as a part of their end of study project. The assessors were informed not to interfere with the interviewed to guarantee that the students have relied solely with their knowledge to answer the survey.

Statistical analysis

The statistical analysis was performed using the R statistical software (The R Project for Statistical Computing).[13] To analyze the questionnaire, we used the EnQuireR package.[14] For the descriptive treatment and graphic curves we used statistical package from Excel 2016 (Microsoft Corporation).

Table 1: Questionnaire statements ([K]=Knowledge; [C]=Cause; [I]=Impact)

Yes / No questions (YNQ)	Multiple choice question (MCQ)	
1. Do you think that the climate change is a reality? [K] **2. Is there a difference between the climate change and the global warming? [K]** **3. According to you is the global warming a normal phenomenon? [K]** **4. Did the planet earth experienced a climate change in the past? [K]** **5. According to you, is there a relationship between the greenhouse effect and the climate change? [C]**	**1. Among the following problems which do you consider is the most serious for Morocco? [K]** a. Greenhouse effect b. Armed conflicts c. Nuclear weapon d. Global warming e. Climate change f. Poverty and disease g. Low growth of economy h. Hunger i. Unemployment j. terrorism **2. According to you, what define the climate? [K]** a. Temperature b. Precipitations c. Wind d. All of the above **3. According to you what causes the global warming? [C]** a. Greenhouse gas b. Anthropic activity c. others **4. According to you, what are the most visible signs of climate change? [I]** a. Rise of the temperature b. Rise of the sea level c. The frequency of Naturel disasters: Typhoons, flooding… d. Greenhouse effect e. War and diseases	f. Air pollution g. Rise of the oceans temperature h. Ice meltdown i. Irregular and rare rain and snow j. Disruption of the seasons k. Acidification of the oceans l. Deforestation **5. Among the following, indicate which are greenhouse gas? [K]** a. Oxygen (O2) b. Carbon dioxide (CO2) c. Nitrogen (N2) d. Methane (CH4) e. Others **6. Among the following human behaviours, which are involved in the climate change? [C]** a. Use of CFC b. Use of fossil energy c. Use of renewable energy d. Use of nuclear energy e. Use of pesticides f. Implantation of trees g. Volcanic activity **7. According to you, what is the impact of climate change on biodiversity? [I]** a. Extinction de certain plant species b. Extinction de certain animal species c. No effect **d.** Don't Know

RESULTS

Characteristics of the surveyed cohort

To address the perception of students on the issue of climate change, we performed a survey in a form of questionnaire (Table 1) that highlights this issue. This survey was divided into three major topics. These topics aimed to evaluate both the cognitive knowledge and the awareness related to the causes and the consequences of the issue of climate change (CC) and global warming (GW).

The students included in the survey were attending the Ibn Zohr University during the year 2015/2016. The majority of them (91.6%) were pursuing their studies in the Faculty of Sciences. A significant proportion of them were life science students (52.9%). A high percentage of the surveyed were undergraduates (97%) (**Figure 1C**), attending courses in the first, the second and the third year (29.68%, 31.92% and 35.48%, respectively). The remaining (3%) were postgraduates (Master and Doctorate).

To evaluate the geographical distribution of the students, they were asked to name the area where they originally came from. The results showed that a high proportion of the students surveyed were from urban areas (71.2%), while 28.6% of them came from rural areas (**data not shown**).

The general knowledge of the climate change and global warming issues among the higher education students

In response to the question (MCQ-1) that requested of the students to indicate among several propositions, which is the most serious for Morocco? The result showed that the greenhouse effect was considered by the 24% of the students as the most important issues that faces Morocco **(Figure 2A)**. A significant fraction of the students also mentioned the climate change (14%). However, according to students, the second most serious problem facing Morocco was the issue of unemployment (21%). The repartition of the specified answers to the question MCQ-1, did not show a significant difference between male and female (**Figure 2B**). By contrast, the repartition of the answers in relation to the level of study (**Figure 2C**), showed that the students in the third year (A3) more frequently answered that both the greenhouse (26.38%) and the unemployment (24.01%) are the most

important issues for Morocco (**Table 2**). The geographical origin (Urban or Rural) did not show any influence on the responses given by students (**Data not shown**).

Table 2: Percentage of answers to the question MCQ-1

Year/Answers	a	b	c	d	e	f	g	h	i	j	Total	%
A1	9	15	12	31	34	42	22	8	65	19	317	29.68%
A2	86	14	16	27	50	41	15	13	61	18	341	31.93%
A3	100	17	6	25	59	38	16	15	91	12	379	35.49%
M1	3	2		1	2	0	1		3	0	12	1.12%
M2	0	0	0	0	0	0	0	0	1	1	2	0.19%
PhD	2	1		2	3	1	3		4	1	17	1.59%
Percentage	24.34%	4.59%	3.18%	8.05%	13.86%	11.42%	5.34%	3.37%	21.07%	4.78%	1068	100.00%

When the participants were asked to state what define the climate (MCQ-2)? 75% of the them, replied that the climate was defined both by the temperature, the precipitation and the wind. By contrast, a small proportion answered either only temperature (17%), or precipitations (7%) or wind (1%) (**Figure 3**).

To assess their perception of the relevance of the climate change issue, the students were asked a series of "Yes" or "No" questions (YNQ-1 to 4). A very important proportion of them acknowledge that the climate change is a reality (**90.2%)** (**Figure 4A**). For the question YNQ-2, on whether there is a difference between the CC and the GW, an important fraction of the participants (**65.6%)** admitted that there is a difference. By contrast, 20% of them responded "*No"* and 12% were undecided **(Figure 4B)**. To the question YNQ-3, on whether the global warming was a normal phenomenon, **64.8%** responded "*No"* and only 19% responded "*Yes"*. The remaining 16% were undecided (**Figure 4C**). By contrast, when asked whether the planet earth was exposed to a global warming in the past (YNQ-4), only **46.2%** of the surveyed responded by the affirmative, while 32% responded "No" and the remaining 22% were undecided (**Figure 4D**).

The final question that addressed the general knowledge about CC asked the participants to indicate which of the gases listed were greenhouse gases (MCQ-5). The participants cited Carbone dioxide as the principal greenhouse gases (47%), followed respectively by Methane (32%), Nitrogen (16%), others (3%) and Oxygen (2%) (**Figure 5**).

The perception of the causes of climate change

In order to evaluate their degree of awareness about the causes of the CC and the GW the students were asked three questions. The first (YNQ-5) was a Yes/No question, assessing the understanding of the participants on the causal relationship between the greenhouse gases and the climate change. The student acknowledges the relationship between greenhouse gases emissions and the CC by 86.7%, against 4.5% that responded "*No"* and 9% that were undecided (**Figure 6A**). The second question (MCQ-3) was an open question addressing what causes the CC. Three propositions were given, either greenhouse gas or human activity or another choice to be specified. A significant fraction of the participants replied either only human activity (29.8%), or only greenhouse gas (28.7%) (**Figure 6B**). The participants that replied both represented 58.4% of the total.

The third question (MCQ-6) was an open question that ask to specify which human behavior might be accountable for CC. The participants had to choose from seven propositions of human behaviours, which might be directly responsible of CC. The participants responded in order of importance (**Table 3**), nuclear energy (61.1%), fossil energy (49.2%), CFC (Chlorofluorocarbons) (29.6%), pesticides (29.3%), trees plantation (7.4%), volcanic activity and renewable energy (5.8%). However, a very important fraction of them admitted that they did not know the meaning of volcanic activity (58.7%), CFC (50.1%), plantation (45.4%), renewable energy (42.9%), fossil energy (18.9%), pesticides (17%) nuclear energy (16.9%), respectively.

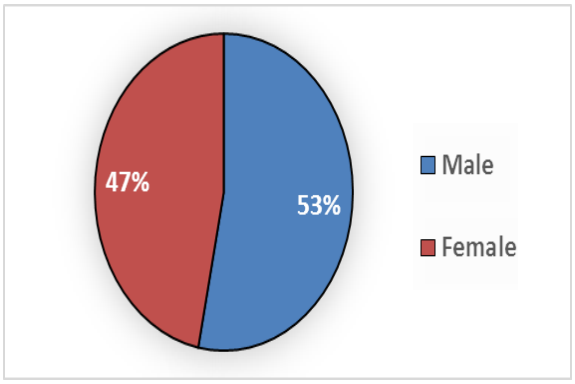
Table 3: Human activities responsible of CC according to the participants

MCQ-6	CFC	Fossil energy	Renewable energy	Nuclear energy	Pesticides	Plantation	Volcanic activity
Don't know	50.1%	18.9%	42.9%	16.9%	17.0%	45.4%	58.7%
Low effect	2.5%	3.9%	23.5%	4.3%	14.0%	18.1%	13.8%
Medium effect	14.3%	25.3%	9.0%	14.6%	34.1%	8.8%	12.3%
High effect	29.6%	49.2%	5.8%	61.1%	29.3%	7.4%	6.9%
Undecided	3.5%	2.7%	18.8%	3.0%	2.5%	20.3%	8.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The Consequences and impact of the climate change

To evaluate the perception of the students on the consequences of the CC, we asked them to answer two open multi-choice questions, MCQ-4 and MCQ-6, respectively. The MCQ-4 asked the participants to indicate, from given propositions, what were the most visible signs of CC. Some 820 answers were scored **(Figure 7A)**, the results showed that 72.4% of the

participants mentioned the rise of the temperature on the surface of the planet as a consequence of the CC. More than half of them cited the disruption of the seasons (52%), the ice meltdown (51.7%), greenhouse gas (51.2%), the frequency of natural catastrophes (51%); followed by the irregular rain and snow falls (46.8%), the rise of sea level (38%) and the air pollution (37.9%). Less than third of the participants mentioned the rise of oceans temperature (28.3%), the deforestation (21%) and the acidification of the oceans (17.9%). A relatively small fraction cited the war and disease (9.6%). When asked directly on the effect of CC on the biodiversity, a very high proportion of participants believed that both plants and animal biodiversity were at risk, 89.6% and 80%, respectively (**Figure 7B**).



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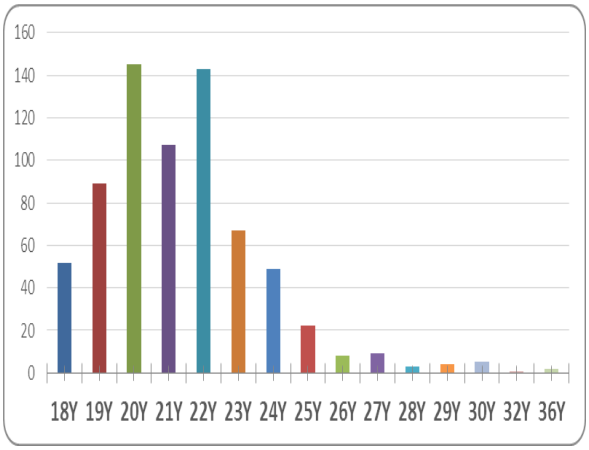
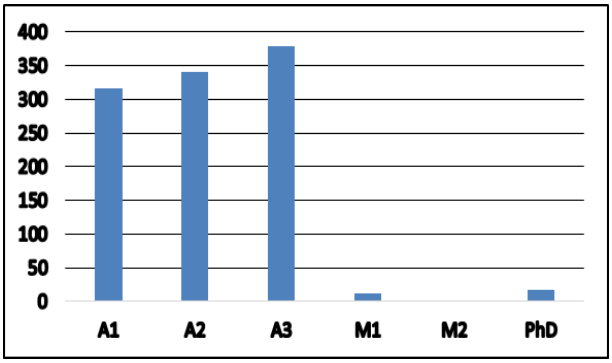


Figure 1B



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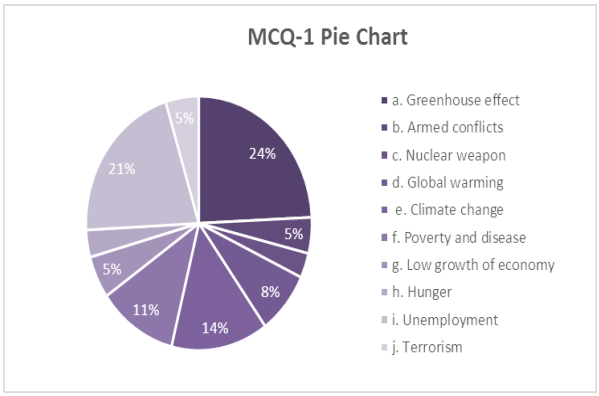

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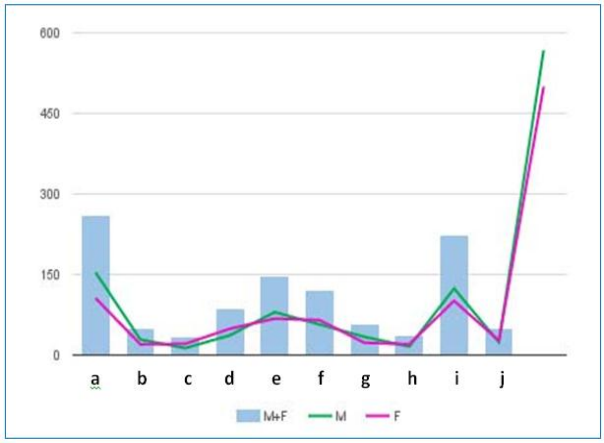

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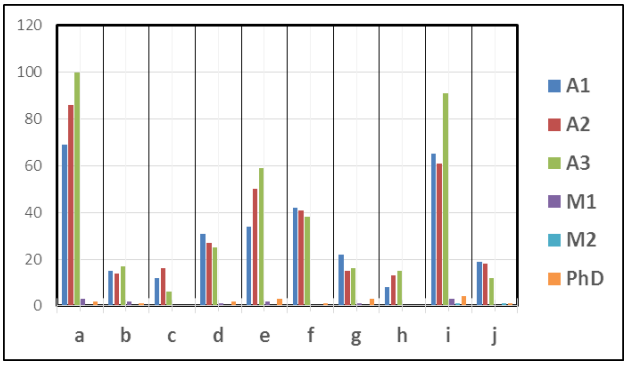

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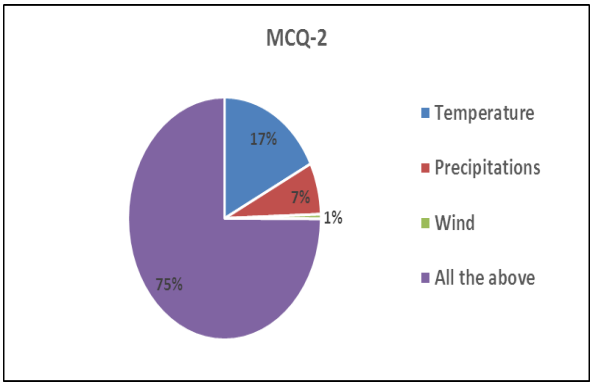
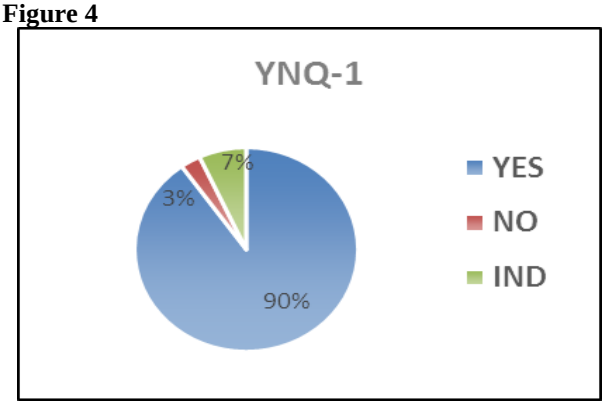


Figure 3

Figure 4



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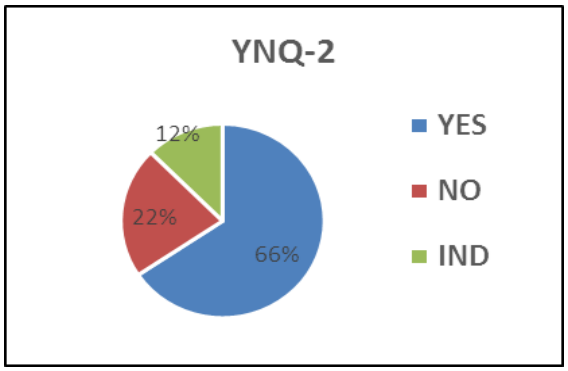

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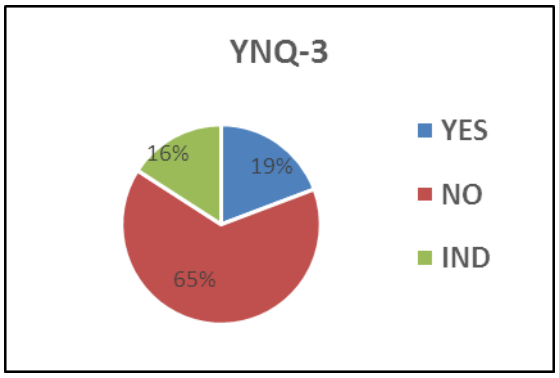

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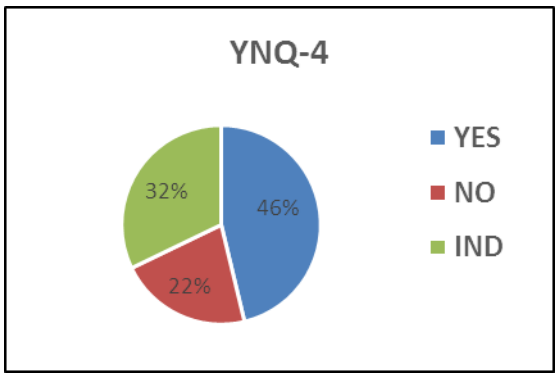

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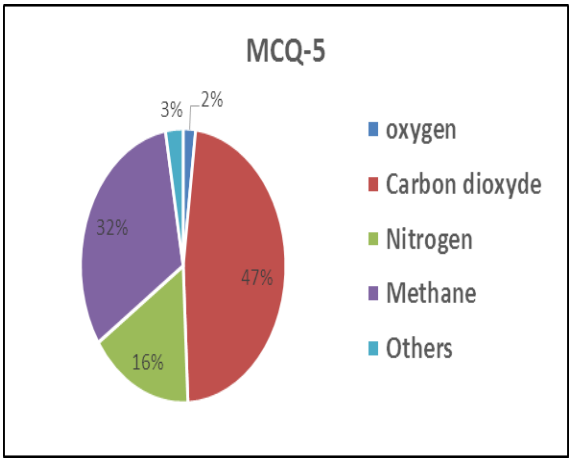

Figure 5

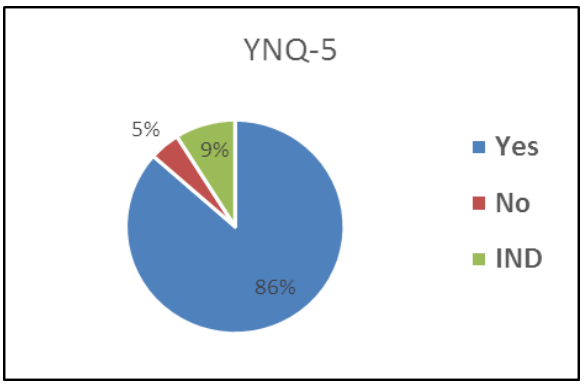

Figure 6A

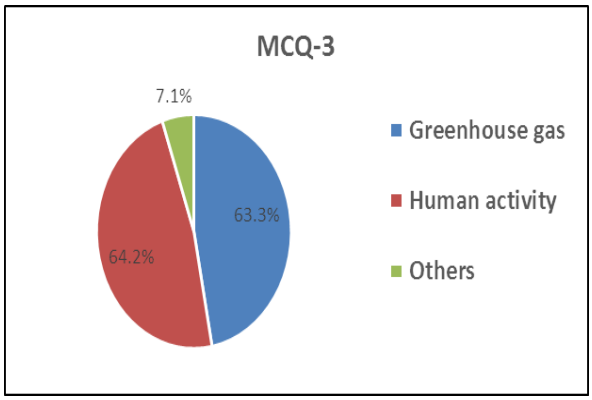

Figure 6B

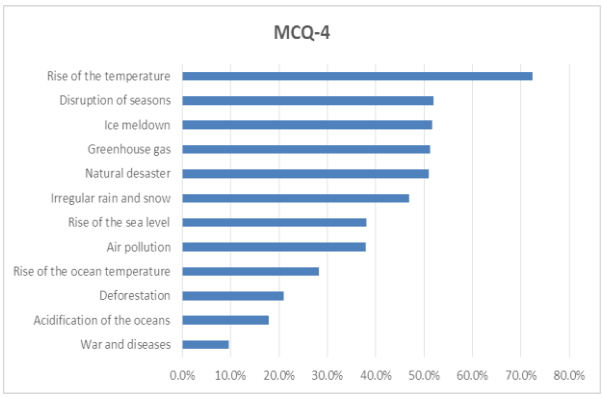

Figure 7A

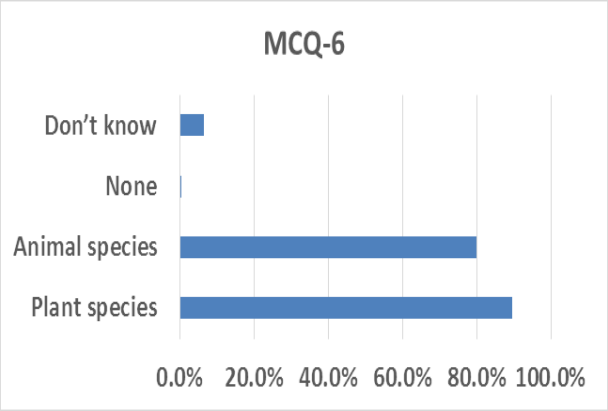

Figure 7B

FIGURE LEGEND

FIGURE 1: Surveyed students according to their sex (A); the repartition of the surveyed students according to their age (B); the repartition of the students surveyed according to their level of study (C).

FIGURE 2: The students' perception of the most serious issues that faces Morocco (A); correlation between the responses and the sex of the students surveyed (B); correlation between the answers and the level of studies (C). MCQ-1 is a multi-choice question with open propositions answers.

FIGURE 3: Definition of the climate change, according to the students surveyed (MCQ-2: multi-choice question with 4 propositions and a unique answer).

FIGURE 4: General knowledge about the climate change among the student surveyed, based on series of a *Yes* or *No* question (YNQ1-4).

FIGURE 5: The most important greenhouse gas according to the students surveyed based on a multi-choice question with five propositions and one possible answer.

FIGURE 6: The relationship between the greenhouse gas effect and the climate change according to the students, based on a Yes or No question (A); the cause of climate change according to the students, based on an open multi-choice question with three propositions.

FIGURE 7: The impact of the climate change according to the students surveyed, based on an open multi-choice question with twelve propositions (A); the effect of the climate change on the biodiversity of plants and animals, based on an open multi-choice question with four propositions (B).

DISCUSSION

This study was the first of its kind that took place in Morocco while the country was hosting the Conference of the Parties (COP22) to the United Nations Framework Convention on Climate Change (UNFCCC) in Marrakech. The aim was to assess the perception of high education students on the issue of climate change. The underlined question was to determine whether the education programs delivered in higher education enhanced the awareness of the students toward the issue of climate change. This study was based on a questionnaire that was previously validated (*Boyes et al. 1993; Liarakou et al 2011).* It was divided on three major topics that assess both the general knowledge about the issue of climate change, its causes and its impact. The participants to the study were male and female students with a sex ratio calculated to 0.94:1.06. The average age of the students surveyed was comprised between 20 and 22 (Figure 1B). The age of the participants corresponded to the age of higher education students that spend 2 to 4 year at the university. The students that participated to the questionnaire were in their majority undergraduates, distributed between the first, the second and the third year. Most the participants were pursuing their studies in life science curricula (data not shown).

When asked which are the most serious problems that faces Morocco, the students answered in the order of importance, the greenhouse gas (24%), the unemployment (21%) and the climate change (14%). The importance of the issue of unemployment was specified as the second most important issue. This was due to the importance of finding a job that faces most of the graduates leaving university. Nevertheless, the results indicated that the climate change and the greenhouse gas issue both scored about 38% of the answers. The answers of the participants were independent of their sex, their age and the geographical area where they came from (Figure 2A, B). However, we noted a positive correlation between the answers and the level of studies. The answers given by the students in a higher level of education were more relevant (Figure 2B). Taken together, these results showed that even if students (to be graduated) were mostly preoccupied by finding a job, they still believed that the issue related to the global warming (Climate change and greenhouse gas) were equally important. This suggested that the students at the University of Agadir were aware that any change in the geographical area where they live might also affect their future and wellbeing.

The assessment of the general knowledge of the participants showed that they were clearly able to indicate what define the climate (Figure 3). They also admitted that the climate change is a reality, that it was a normal phenomenon and that the planet earth experienced it in the past (Figure 4). In addition, most of the students questioned (79%) indicated that both the carbon dioxide and the methane were among the most important greenhouse gases. Taken together, these results indicated that the participants built a good knowledge about the issue of the climate change.

However, we couldn't relate whether the source of their information is academic or from their own initiative through the world-wide web, television, news magazines and the social media.

The understanding of what causes the climate change was assessed through three questions. The results showed that 86% of the participants acknowledge a relationship between the greenhouse emissions and the climate change (Figure 6A). In addition, the participants indicated clearly that the human activity was also, in part, responsible of the climate change (Figure 6B). However, when asked to indicate more specifically which of the human activity that was the most responsible of the climate change, the answers were unpredictable (Table 3). The participants responded that both the use of the nuclear (61.1%), the use of renewable energy (42.9) and the use of pesticide (29.3%) highly affect the climate change, compare to the fossil energy (49.2%), and CFC (29.6%). In the same time, an important fraction of them were unable to situate the effect of the volcanic activity (58.7%), the use CFC (50.1%) or planting trees (45.4%), simply because they did not know their meaning (Table 3). Taken together these results suggest that the students were mostly aware of the causes of the climate change. However, they were unable to indicate more specifically (from known propositions) what exactly causes the climate change. Probably the language used in the questionnaire (French) was to blame for these unpredictable answers. However, the French is the teaching language in the Moroccan faculties of Science, which suggest that the source that their source of information was probably not always related to the university curricula.

To assess the perception of the students on the impact of the climate change, the participants were asked to choose among twelve propositions which were the visible signs of the climate change. In their majority, the participants indicated, in an appropriate order, the most important signs they relate to the climate change (Figure 7A). Their answers also clearly indicated that they mostly think that climate change will affect the biodiversity of the flora as well as the biodiversity of fauna (Figure 7B). These results were consistent with the results, related to the general knowledge, previously shown.

At the end of the questionnaire the students were asked to score themselves from 0 to 10 in relation to the relevance of the answers they gave. Most of them scored themselves slightly over the average of 5/10 (data not shown). This suggests that they were aware of the limitations of their knowledge of the climate change issue.

Our study showed that the students hold more correct perceptions on the basic concepts and causes of climate change but they lack accurate perception on its effects, mitigations, and adaptations. This is consistent with previous reports that compared between the perception of the students from Chinese and American universities.[15] In many developed countries, specific environmental programs were introduced in the education system.[16] This is not the case in Morocco, where most students relay on the world-wide web, televisions, newspaper, magazines and social media as a source of information on the issue of climate change. Such sources are not always reliable and can spread a misconception of the awareness on the climate change issue. It was shown that there is a correlation between behaviour and awareness toward the environment.[17] Consistent with our study, other reports showed a significant difference in the correct and alternative perception between the first and second year students, on the basic concepts of climate change.[18] Over three quarters of the students attending Haramaya University were aware of the consequences of climate change on health, with slightly higher rates in females compare to males, and a range from 60.7% (pharmacy students) to 100% (environmental health and post-graduate public health students).[19] A wide difference in the attitudes and behaviours toward the environment was established between the undergraduate students enrolled in environmental sciences course and others who did not study the course yet. This demonstrate the importance of environmental education in university.[21] Indeed, the knowledge about climate change science significantly affects opinions about climate change. Students with a higher number of correct answers are more likely to have the opinion that humans are causing climate change and that both individuals and governments are responsible for addressing climate change.[22]

By contrast to our study, a significant difference was found on the correct perception of male and female students on climate change mitigations. The quality of schools and grade, major and merit position of students were also shown to affect the perception of the students; in addition to their religion, gender, parental education, occupation and income.[1] Across all years, many findings revealed that students tend to assign responsibility for the environment to the government and consumers rather than accepting personal responsibility.[23]

CONCLUSION

The environmental education is an important step toward providing sufficient knowledge and information about the climate change, its causes, and impacts. We demonstrated here an urgent need for improving climate change science in higher education. We believe that more adapted lectures that focused on the climate change issue, its causes and consequences will improve the perception and the awareness of the young generation of Moroccan decision makers.

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REFERENCES

1. Rahman SMA, Tasmin S, Uddin MK, Islam MT, Sujauddin M. Climate Change Awareness among the High School Students: Case Study from a Climate Vulnerable Country. *Int J Built Environ Sustain*. 2014; (1). doi:10.11113/ijbes.v1.n1.4.
2. Anderegg WRL, Prall JW, Harold J, Schneider SH. Expert credibility in climate change. *Proc Natl Acad Sci U S A*. 2010; 107(27): 12107-12109. doi:10.1073/pnas.1003187107.
3. Betts RA, Jones CD, Knight JR, Keeling RF, Kennedy JJ. El Niño and a record CO2 rise. *Nat Clim Chang*. 2016; 6(9): 806-810. doi:10.1038/nclimate3063.
4. Integrating Climate Change Adaptation into Development Co-operation POLICY GUIDANCE. 2009. www.sourceoecd.org/development/9789264054769.
5. The Lima Ministerial Declaration on Education and Awareness-raising.
6. Marshall NA, Park S, Howden SM, Dowd AB, Jakku ES. Climate change awareness is associated with enhanced adaptive capacity. *Agric Syst*. 2013; 117: 30-34. doi:10.1016/j.agsy.2013.01.003.
7. Boyes E, Chuckran D, Stanisstreet M. How do high school students perceive global climatic change: What are its manifestations? What are its origins? What corrective action can be taken? *J Sci Educ Technol*. 1993; 2(4): 541-557. doi:10.1007/BF00695323.
8. Carr P. Climate change awareness amongst secondary level students and teachers in a Dar es Salaam University College of Education (DUCE) affiliated school in urban Tanzania.
9. IPCC Fifth Assessment Report. https://www.ipcc.ch/report/ar5/. Accessed February 12, 2017.
10. Born K, Christoph M, Fink AH, Knippertz P, Paeth H, Speth P. Moroccan Climate in the Present and Future: Combined View from Observational Data and Regional Climate Scenarios. In: *Climatic Changes and Water Resources in the Middle East and North Africa*. Berlin, Heidelberg: Springer Berlin Heidelberg; 2008; 29-45. doi:10.1007/978-3-540-85047-2_4.
11. Towards a Low-Carbon Climate-Resilient Development MOROCCAN CLIMATE CHANGE POLICY.
12. Liarakou G, Athanasiadis I, Gavrilakis C. What Greek secondary school students believe about climate change? *Int J Environ Sci Educ*. 3(3).
13. R: The R Project for Statistical Computing. https://www.r-project.org/. Accessed March 12, 2017.
14. Le S, Bouche J, Fournier O, Le Poder F. Display the results of a chi-square test. 2009. https://cran.r-project.org/web/packages/EnQuireR/EnQuireR.pdf. Accessed March 12, 2017.
15. Jamelske E, Barrett J, Boulter J. Comparing climate change awareness, perceptions and beliefs of college students in the United States and China. *J Environ Stud Sci*. 2013. doi:10.1007/s13412-013-0144-x.
16. Hassan A, Ismail MZ. The infusion of Environmental Education (EE) in chemistry teaching and students' awareness and attitudes towards environment in Malaysia. *Procedia - Soc Behav Sci*. 2011; 15: 3404-3409. doi:10.1016/j.sbspro.2011.04.309.
17. Fang S-C, Yu T-Y, Yu T-Y, Yu T-Y. A RISK PERCEPTION MODEL OF CLIMATE CHANGE FOR UNIVERSITY STUDENTS. *J Balt Sci Educ*. 2015; 14(3).
18. Pitpitunge AD. STUDENTS' PERCEPTIONS ABOUT CLIMATE CHANGE. *Asian J Biol Educ*. 2013; 7.
19. Nigatu AS, Asamoah BO, Kloos H. Knowledge and perceptions about the health impact of climate change among health sciences students in Ethiopia: a cross-sectional study. *BMC Public Health*. 2014; 14(1): 587. doi:10.1186/1471-2458-14-587.
20. Peyari Tarannum Dana G, Roy S, Rabuil Haque M. Adolescents Perception on Environmental Change and Health Risk in Two Divisions of Bangladesh. *Open J Soc Sci*. 2015; 3(3): 71-79. doi:10.4236/jss.2015.312008.
21. Raman RA. Attitudes and Behavior of Ajman University of Science and Technology Students Towards the Environment. *IAFOR J Educ*. 2016; 4(1).
22. Harker-Schuch I, Bugge-Henriksen C. Opinions and knowledge about climate change science in high school students. *Ambio*. 2013; 42(6): 755-766. doi:10.1007/s13280-013-0388-4.
23. Wray-Lake L, Flanagan CA, Osgood DW. Examining Trends in Adolescent Environmental Attitudes, Beliefs and Behaviors Across Three Decades. *Environ Behav*. 2010; 42(1): 61-85. doi:10.1177/0013916509335163.