Climate change awareness amongst secondary level students' in a Dar es Salaam University College of Education (DUCE) affiliated school in urban Tanzania.

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List of Acronyms

CFC	Chlorofluorocarbons
DUCE	Dar es Salaam University College of Education
IPCC	Intergovernmental Panel on Climate Change
GHG	Greenhouse Gas
NAPA	National Adaptation Programme for Action
NASAP	National Apaptation Strategy and Action Plan
NCCS	National Climate Change Strategy
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) have reported on successive occasions irrefutable evidence of increased atmospheric and ocean temperatures. (IPCC, 2007; IPCC, 2013). This rise in global temperatures is attributed largely to greenhouse gas emissions from fossil fuel consumption and it is expected that a continued and increasing rise in temperatures will occur (IPCC, 2007; IPCC, 2013). Under these conditions, capacity to deal with the consequences of climate change, or our abilities of 'adaptation' have become central to policy responses globally. An individuals or a community's capacity to adapt to these changes becomes central to mitigating and adapting to the effects of climate change. Climate change education is seen as a valuable tool to increase climate change awareness and adaptive capacity in society broadly (UNFCCC, 2012; UNFCCC, 2014b; OECD, 2009). Within this context, an ability to improve future knowledge of climate change within a society could be improved by understanding the current levels of awareness of this topic. Consequently, an understanding of how to improve climate change education and tackle any possible mis-information currently in circulation can be obtained.

Education and the general dissemination of climate change knowledge has traditionally been of low priority globally (OECD, 2009). However, more recently, adaptation has come to be considered crucial within the broader context of sustainable development and within this space there has been an increasing recognition of the need to improve climate change awareness and education to enhance the capacity of people and communities to adapt to climate change (UNFCCC, 2014b; OECD, 2009; Eriksen et al, 2009; Marshall et al, 2013). Article 6 of the United Nations Framework Convention on Climate Change (UNFCCC, 2014a) calls on countries to promote and facilitate education and public awareness of climate change. The encouragement of behavioural change through the dissemination of knowledge in education is emerging as a fundamental aspect of coping with climate change (UNFCCC, 2014b; OECD, 2009; Marshall et al, 2013).

Education development and the foundations for curricula are best designed around an understanding of students' preconceptions. Current studies with a focus on students' awareness of climate change have shown a variety of results. These results indicate considerable confusion about the concepts of 'the greenhouse effect' and 'global warming'; the causes and impacts of climate change, as well as the methods through which climate change mitigation and adaptation can occur (Dawson & Carson, 2013; Shepardson et al, 2011; Kilinc et al, 2008; Owolabi et al, 2012; Pruneau et al, 2001; Rajeev Gowda et al, 1997). Despite some research in this area, there is a strong need to gain an understanding of current climate change awareness and to update curricula to educate teachers and in turn, students.

This research is the second stage of a five-year programme on Climate Change Awareness and Education at secondary school level in Tanzania. The stage which has been completed (stage 1) involved an assessment of the current secondary school curriculum in Tanzania for its inclusion of climate change material and an evaluation of awareness of climate change among third level trainee teachers at the Dar es Salaam University College of Education (DUCE). The next stage (stage 2), which this study has undertaken, is to assess the knowledge of climate change among secondary school students at a DUCE affiliated school in Tanzania. As a result of the data retrieved from these stages and future planned stages, the objective is to develop a climate change education package to be used as part of the DUCE curriculum in Tanzania. This data can also be utilised as pre-implementation data on student

awareness which can in future be compared with post-implementation data. It is also envisaged that this research may be of relevance to other countries in Sub-Saharan Africa.

The question which this research hopes to ascertain through both qualitative and quantitative methods is:

"What is the level of awareness of climate change amongst secondary school students in a developing nation urban school?"

While also answering a number of sub questions:

- What are students' current misconceptions about climate change?
- What are students' personal views and attitudes towards climate change?
- How/ where do students' currently get information about climate change?
- Are there differences between the sexes in relation to climate change awareness?

Section 2 of this paper will identify the ethical procedures undertaken for this research. Section 3 will detail the methodology that was utilised in order to gather quantitative data used to answer the research question and sub questions. Section 4 will examine the results gathered from completion of surveys and interviews. Following this, section 5 will discuss the results while drawing comparisons with similar research in the space of climate change awareness and educate. Finally, section 6 will conclude with a number of recommendations and additional considerations for future stages of this research.

2. Ethics

As this research involves gathering information from children ages 12-18, there are a number of steps that have been taken to ensure compliance with ethics guidelines. The researchers had no direct access or interaction with children, with questionnaires being delivered and collected by secondary school teachers. In addition, to ensure confidentiality, all survey questions were anonymous and unidentifiable.F

3. Methodology

The quantitative research for this study was a survey developed upon review of a broad range of previously used and researched awareness surveys **(**Brown et al, 2012; CEED, 2011; Maponya et al, 2013; Mwalukasa, 2013; Whitmarsh, 2003**)**. In addition, attempts were made to simplify the survey instrument as much as was reasonable to allow for students of ages twelve to twenty to complete. The survey instrument developed for this stage of the research was amended from stage 1 to enable some level of comparison; however significant changes were also made to reflect a different demographic and to account for errors or improvements which were identified from stage 1.

The survey instrument was developed initially in English, the official language of instruction at secondary school in Tanzania. Upon arrival in Tanzania, the instrument was reviewed and amended further by staff within DUCE and finally submitted to a number of teachers who work directly with secondary level students at the DUCE affiliated secondary school. Language and content were assessed for their appropriateness to the survey demographic (Fink & Kosekoff, 1985). Teachers recommended changing the document to Swahili, the native language of Tanzania, and the medium of instruction in (public) National schools in Tanzania. The survey was translated to Swahili and further reviewed and amended by DUCE

staff and teachers at the secondary school before being piloted among students in Form 1 (n=25). All students in this group were subsequently excluded from further surveys. The final survey was delivered by the teachers within the DUCE affiliated secondary school. The delivery of surveys was also accompanied by an explanatory briefing for students in Swahili. Surveys took approximately 20 minutes to complete.

The final survey consisted of sixty "tick box" questions, including the use of Likert scales and split into four sections (Appendix 1):

- Participant profile (Q1-4);
- Personal views and attitudes towards climate change (Q5-20);
- Climate change knowledge (Q21-56); and
- Sources of climate change information (Q57-60).

There were approximately 450 students at the secondary school at the time of research. Students from both junior cycle (O-level) and senior cycle (A-level) were included in the survey sample. A target sample of students from form one to five was utilised. Form six students (n = 40) were excluded from the sample due to timetabling restraints that conflicted with national examinations, leaving a sample size of approximately 410 students. A sample size calculator was utilised (www.surveysystem.com) which indicated that a sample size of 254 was required to deliver results with a 99% confidence level and a confidence interval of 5.0. 296 surveys were completed between May 18th and 29th, 2015. Completed surveys were coded (Creswell, 2012, p176) and input into an excel spreadsheet. Following data screening and cleaning, 11 surveys were excluded due to 10% or more of the questions being invalid (Creswell, 2012, p182). A final sample size of 285 surveys were analysed using Statistical Package for Social Sciences (SPSS) version 20 between June and August 2015.

4. Results

Analysis of the survey dataset and interview transcriptions have resulted in an overview of the data gathered and allows for further analysis by identifying associations or trends present, which we will now review.

4.1 Survey Results

4.1.1 Demographics

The majority of surveyed students at the Secondary School are between the ages of 14 and 17 (74%) (Table 1), with an almost equal distribution of males and females (52% vs. 48% respectively) (Table 2). Students' year of study between Form 1 and Form 5 was relatively consistent (Table 3), however a considerably larger number of students in Form 4 were surveyed (33%). Five students' survey results were returned indicating that they were in Form 6, despite not specifically seeking to survey any Form 6 students.

Table 1: Student age range (n=285).

Age	n	(%)
12	1	(<1)
13	8	(3)
14	36	(13)
15	61	(21)
16	60	(21)
17	53	(19)
18	27	(9)
19	20	(7)
20	19	(7)

Table 2: Student gender breakdown (n=284).

Sex	n	(%)
Male	148	(52)
Female	136	(48)

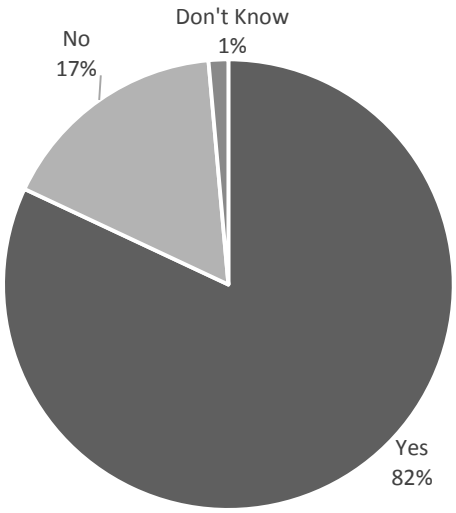
Table 3: Student year of study (n=284).

Year	n	(%)
Form 1	47	(17)
Form 2	53	(19)
Form 3	53	(19)
Form 4	93	(33)
Form 5	33	(12)
Form 6	5	(2)

4.1.2 Climate Change Knowledge

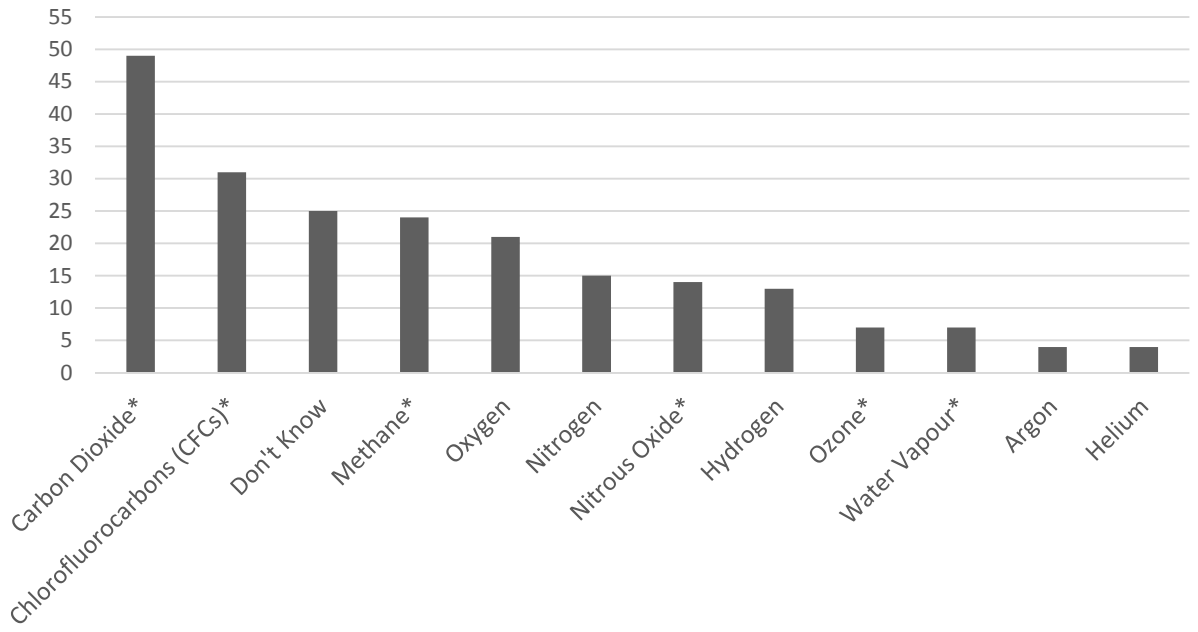
The majority of students (82%) indicated that they had learnt about climate change in Secondary School (Figure 1), while 17% indicated they had not.

Figure 1: Percentage of students who self-identify as having learnt about Climate Change in Secondary School (n = 283)



Students were presented with a list of both greenhouse gases (GHGs) and non-GHGs and asked to correctly identify all GHGs. None of the greenhouse gases (GHGs) were correctly identified by more than 50% of respondents (Figure 2). 49% of students identified carbon dioxide as a GHG while the other principal greenhouse gas, methane, was only correctly identified by 24% of students. A further 31% of students correctly identified Chlorofluorocarbons (CFCs) as a GHG, while nitrous oxide, ozone and water vapour were correctly identified by much smaller numbers (14%, 7% and 7% respectively). Oxygen was the most frequently identified non GHG (21%), followed by nitrogen (15%), hydrogen (13%), argon (4%) and helium (4%). Significantly, 25% of respondents indicated that they did not know any of the GHGs.

Figure 2: Students' identification of Greenhouse Gases (%) (GHGs) (n=271)



*Note: Greenhouse gases are identified by an asterisk **
Note: Students were asked to choose as many options as they wished

Students were given a list of 32 questions related to climate change, and were asked to answer "True", "False" or "Don't Know" to each. The statements were a mixture of true and false statements and were designed to test students' knowledge in the following areas:

- 7 statements related to an understanding of weather and climate. (Q1-7)
- 7 statement related to the causes of climate change. (Q8-14)
- 8 statements related to the effects of climate change. (Q15-22)
- 7 statements related to methods of mitigation and adaptation to climate change. (Q23-29)
- 3 statements related to an understanding of basic ocean science. (Q30-32)

The results from this series of questions can be seen in the following tables (tables 4-8) and have been disaggregated to account separately for results from males and females. A small number of questions produced results which had differences which were statistically significant between males and females, most notably on questions about the earth's temperature over the past 100 years (Q7, Table 4) (34 male v. 24% female correct answers) and ocean science (Q31, table 8) (48% male v. 63% female correct answers). Table 4 illustrates the results of questions one to seven which relate to the basic concepts and definitions of climate and weather. Only three of the questions were answered correctly by more than 50% of students, while only 30% of students know that "climate means average weather" and 29% know that "the earth's average temperature has risen in the last 100 years". This question also delivered the highest number of "don't know" choices in this section, with 42% of students choosing this option. Collectively for these 7 questions, 48% of the students

chose the correct answer, 33% of students chose the incorrect answer while 19% of students did not know the answer.

Table 4: Students Knowledge of Weather and Climate

		Correct n (%)	Incorrect n (%)	Don't Know n (%)	Total n	P*
1. Weather often changes from year to year	Male	71 (48)	70 (48)	6 (4)	282	NS
	Female	80 (59)	51 (38)	4 (3)		
	Total	151 (54)	121 (43)	10 (4)		
2. Climate means average weather	Male	47 (32)	77 (52)	23 (16)	281	NS
	Female	38 (28)	74 (55)	22 (16)		
	Total	85 (30)	151 (54)	45 (16)		
3. Climate often changes from year to year	Male	68 (47)	67 (46)	11 (8)	278	NS
	Female	57 (44)	62 (47)	13 (10)		
	Total	125 (45)	129 (46)	24 (9)		
4. Weather means average climate	Male	73 (50)	45 (31)	27 (18)	277	NS
	Female	66 (50)	43 (33)	23 (17)		
	Total	139 (50)	88 (32)	50 (18)		
5. Climate means the same thing as weather	Male	95 (64)	32 (22)	20 (14)	282	NS
	Female	93 (70)	21 (16)	20 (15)		
	Total	188 (67)	53 (19)	40 (14)		
6. The Climate hasn't changed for millions of years	Male	97 (67)	9 (6)	39 (27)	278	NS
	Female	72 (54)	17 (13)	44 (33)		
	Total	169 (61)	26 (9)	83 (30)		
7. The earth's average temperature has risen in the last 100 years	Male	49 (34)	46 (32)	51 (35)	281	.029
	Female	32 (24)	35 (26)	68 (50)		
	Total	81 (29)	81 (29)	119 (42)		

*Pearson Chi-Square – Non-significant <0.05

Questions eight to fourteen tested the students' knowledge of the causes of climate change (table 5). This section produced the highest number of correct choices for an individual statement in the entire knowledge section, with 90% of student's correctly identifying that "cutting down trees causes climate change" (Q9). A similar level of correct choices were chosen which identifies that students have a good knowledge of the effects of volcanic activity (Q11) and industry (Q14) on climate change. However, these high figures are balanced by similar extremes in incorrect answers. 90% of students believe that damage to the ozone layer causes climate change, 67% of students believe that acid rain is a cause and 66% that increased waste is a cause of climate change. Significantly, only 45% of students identified the combustion of fossil fuels as a cause of climate change. On average 46% of students answered these seven questions correctly, 42% incorrectly and 12% "didn't know" the answer.

Table 5: Students knowledge of the causes of climate change

		Correct n (%)	Incorrect n (%)	Don't Know n (%)	Total n	P*
8. Burning fossil fuels causes climate change	Male	67 (46)	42 (29)	37 (25)	280	NS
	Female	60 (45)	39 (29)	35 (26)		
	Total	127 (45)	81 (29)	72 (26)		
9. Cutting down trees causes climate change	Male	129 (89)	11 (8)	5 (3)	278	NS
	Female	120 (90)	9 (7)	4 (3)		
	Total	249 (90)	20 (7)	9 (3)		
10. Damage to the ozone layer causes climate change	Male	9 (6)	132 (89)	7 (5)	280	NS
	Female	8 (6)	119 (90)	5 (4)		
	Total	17 (6)	251 (90)	12 (4)		
11. Erupting volcanoes can cause climate change	Male	103 (70)	30 (20)	14 (10)	280	.042
	Female	103 (77)	13 (10)	17 (13)		
	Total	206 (74)	43 (15)	31 (11)		
12. Acid rain causes climate change	Male	27 (18)	90 (60)	31 (21)	280	NS
	Female	18 (14)	97 (73)	17 (13)		
	Total	45 (16)	187 (67)	48 (17)		
13. More garbage/ waste causes climate change	Male	31 (21)	95 (65)	21 (14)	279	NS
	Female	26 (20)	90 (68)	16 (12)		
	Total	57 (20)	185 (66)	37 (13)		
14. More industry helps to stop climate change	Male	103 (70)	26 (18)	19 (13)	282	NS
	Female	95 (71)	28 (21)	11 (8)		
	Total	198 (70)	54 (19)	30 (11)		

*Pearson Chi-Square – Non-significant <0.05

A test of students' knowledge of the effects of climate change constituted the next 8 questions (table 6). This section accounted for the largest collective number of correct choices with the statement "Climate change can cause sea levels to rise" being the only one which had correct responses below 50%. Very high percentage of students identified correctly the effects of climate change on weather (85%), flooding and droughts (73%) and the spread of disease (74%). There was significant misunderstanding or lack of knowledge however on the effects of climate change on biodiversity (combined 46% incorrect or "don't know" responses) and melting polar ice-caps (combined 50% incorrect or "don't know" responses). The total percentages when averaged indicate that 63% of students chose the correct answers, 20% chose incorrectly and 16% indicated they "didn't know" the answer.

Table 6: Students knowledge of the effects of climate change

		Correct n (%)	Incorrect n (%)	Don't Know n (%)	Total n	P*
15. Climate change can lead to an increase in the amount of food available	Male	103 (70)	26 (18)	18 (12)	276	NS
	Female	97 (75)	13 (10)	16 (12)		
	Total	200 (72)	39 (14)	34 (12)		
16. Climate change can cause a change in weather	Male	125 (85)	14 (10)	9 (6)	283	NS
	Female	116 (86)	15 (11)	4 (3)		
	Total	241 (85)	29 (10)	13 (5)		
17. Climate change can cause sea levels to rise	Male	58 (39)	60 (41)	30 (20)	282	NS
	Female	39 (29)	59 (44)	36 (27)		
	Total	97 (34)	119 (42)	66 (23)		
18. Climate change can lead to more plant and animal species	Male	80 (54)	36 (24)	32 (22)	277	NS
	Female	70 (54)	33 (26)	25 (20)		
	Total	150 (54)	69 (25)	57 (21)		
19. Climate change can cause more flooding and droughts	Male	106 (72)	26 (18)	16 (11)	282	NS
	Female	99 (74)	26 (19)	9 (7)		
	Total	205 (73)	52 (18)	25 (9)		
20. Climate change can help to stop diseases	Male	104 (71)	17 (12)	26 (18)	283	NS
	Female	105 (77)	18 (13)	13 (10)		
	Total	209 (74)	35 (12)	39 (14)		
21. Climate change can cause polar ice caps and glaciers to melt	Male	79 (55)	38 (26)	28 (19)	277	NS
	Female	58 (44)	38 (29)	36 (27)		
	Total	137 (50)	76 (27)	64 (23)		
22. Climate change can cause deserts to get smaller	Male	92 (63)	25 (17)	28 (19)	280	NS
	Female	78 (58)	17 (13)	40 (30)		
	Total	170 (61)	42 (15)	68 (24)		

*Pearson Chi-Square – Non-significant <0.05

Students' knowledge of climate change mitigation and adaptation was also tested (table 7). Large percentages of students correctly recognised public transport (Q24) and planting trees (Q28) as climate change mitigation measures (both 78% correct choice). Similarly, the use of renewable energy and reducing electricity use was identified correctly by more than 50% of students as a way to adapt to/ mitigate climate change. A larger percentage of students answered incorrectly when asked about the ability to mitigate/ adapt to climate change by consuming more organic produce while 41% incorrectly believe that using more land to grow food can help "stop" climate change. Taken together and averaged, 54% answered the questions in this section correctly, 33% answered incorrectly and 13% "didn't know" the answer.

Table 7: Students knowledge of methods of mitigation and adaptation to climate change

		Correct n (%)	Incorrect n (%)	Don't Know n (%)	Total n	P*
23. People can help stop climate change by using more land to grow food.	Male	66 (45)	61 (41)	21 (14)	283	NS
	Female	62 (46)	55 (41)	18 (13)		
	Total	128 (45)	116 (41)	39 (14)		
24. People can help stop climate change by using cars instead of public transport	Male	115 (79)	19 (13)	12 (8)	281	NS
	Female	103 (76)	14 (10)	18 (13)		
	Total	218 (78)	33 (12)	30 (11)		
25. People can help stop climate change by using more renewable sources of energy	Male	90 (63)	31 (22)	22 (15)	278	.049
	Female	69 (51)	47 (34)	19 (14)		
	Total	159 (57)	78 (28)	41 (15)		
26. People can help stop climate change by growing more organic fruit and vegetables	Male	58 (41)	58 (41)	27 (19)	278	NS
	Female	53 (39)	68 (50)	14 (10)		
	Total	111 (40)	126 (45)	41 (15)		
27. People can help stop climate change by using more electricity	Male	80 (54)	41 (28)	26 (18)	282	NS
	Female	79 (59)	36 (27)	20 (15)		
	Total	159 (56)	77 (27)	46 (16)		
28. People can help stop climate change by planting more trees	Male	115 (78)	16 (11)	16 (11)	282	.047
	Female	105 (78)	24 (18)	6 (4)		
	Total	220 (78)	40 (14)	22 (8)		
29. People can help stop climate change by buying more local goods.	Male	41 (28)	82 (55)	25 (17)	282	NS
	Female	28 (21)	90 (67)	16 (12)		
	Total	69 (26)	172 (61)	41 (15)		

*Pearson Chi-Square – Non-significant <0.05

In the final knowledge questions, students were asked more specific questions related to ocean science (table 8). Despite 62% of students correctly recognising that melting polar ice-caps can lead to higher sea level, the other two questions produced results which indicated a relatively large amount of confusion. When incorrect and "don't know" answers are combined, 55% of students chose the wrong answer when asked about the effect of lower sea temperatures on sea level and 45% chose the wrong answer when questioned about the effect of ocean acidification on sea level. An average of 52% of students answered these three questions correctly, 21% incorrectly and 27% "didn't know" the answer. When averages are accounted for in all 32 knowledge questions, 52% of students answered the questions correctly, 30% incorrectly while 17% "didn't know" the answer.

Table 8: Students knowledge of ocean science

		Correct n (%)	Incorrect n (%)	Don't Know n (%)	Total n	P*
30. Lower sea temperatures cause sea levels to rise	Male	55 (38)	40 (27)	51 (35)	279	NS
	Female	56 (42)	30 (23)	47 (35)		
	Total	111 (40)	70 (25)	98 (35)		
31. More acid in the ocean can cause sea levels to rise	Male	71 (48)	31 (21)	45 (31)	282	.029
	Female	85 (63)	16 (12)	34 (25)		
	Total	156 (55)	47 (17)	79 (28)		
32. Melting ice caps and glaciers can cause sea level to rise	Male	87 (59)	32 (22)	29 (20)	281	NS
	Female	86 (65)	29 (22)	18 (14)		
	Total	173 (62)	61 (22)	47 (17)		

*Pearson Chi-Square – Non-significant <0.05

4.1.3 Personal Opinions and attitudes on Climate Change

In order to gain a better understanding of students personal views on climate change, students were presented with a series of twelve statements, to which they were asked if they "agreed", "disagreed" or were "neutral" towards the statement. The results of this Likert scale are presented in table 9 and have been presented in order to analyse responses of males and females separately. Overall there were very few differences between the sexes, with larger differences only evident in a small number of responses. Both sexes agree in large percentiles that humans have a considerable effect on climate change (87% male v. 86% female), that all countries should help each other to stop climate change (92% male v. 87% female) and that the Tanzanian government should play a more active role in tackling climate change (92% male v. 89% female). The only significant difference that exists in opinions between the sexes was in question 11, where 10% more female students (82 % male v. 92% female) desired to learn more about climate change in school. 74% of total respondents indicated that "climate change is a big problem for Tanzania", however 72% of total students believe that it is not already "too late" to tackle climate change. The questions which produced the most even numbers of choices across the Likert scale were questions 1 and 3, which both reflect on a more scientific understanding of the causes of climate change, further supporting results obtained in the previous knowledge section..

Table 9: Student attitudes and perceptions towards climate change

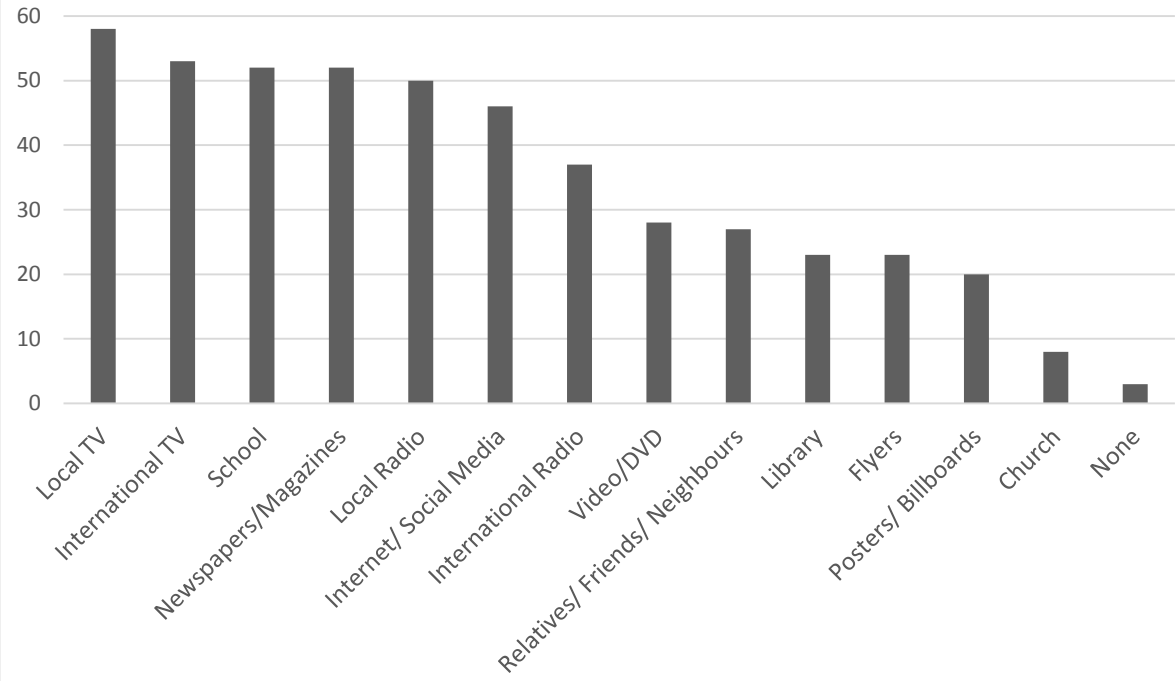
		Agree n (%)	Neutral n (%)	Disagree n (%)	Total n	P*
1. Climate Change is mostly something that happens naturally	Male	40 (28)	31 (21)	75 (51)	277	NS
	Female	30 (23)	40 (31)	61 (47)		
	Total	70 (25)	71 (26)	136 (49)		
2. Humans have a big effect on climate change	Male	129 (87)	12 (8)	7 (5)	283	NS
	Female	116 (86)	11 (8)	8 (6)		
	Total	245 (87)	23 (8)	15 (5)		
3. Things other than humans have an effect on climate change	Male	60 (41)	37 (25)	50 (34)	278	NS
	Female	53 (41)	36 (28)	42 (32)		
	Total	113 (41)	73 (26)	92 (33)		
4. It is already too late to do anything about climate change.	Male	16 (11)	30 (21)	98 (68)	274	NS
	Female	9 (7)	21 (16)	100 (77)		
	Total	25 (9)	51 (19)	198 (72)		
5. All countries should do something to stop climate change.	Male	124 (84)	16 (11)	8 (5)	281	NS
	Female	110 (83)	15 (11)	8 (6)		
	Total	234 (83)	31 (11)	16 (6)		
6. All countries should help each other to stop climate change	Male	131 (92)	7 (5)	5 (4)	276	NS
	Female	116 (87)	12 (9)	5 (4)		
	Total	247 (90)	19 (7)	10 (4)		
7. Europe and America are causing most climate change, so they should take the blame for it.	Male	44 (30)	45 (30)	59 (40)	282	NS
	Female	27 (20)	42 (31)	65 (49)		
	Total	71 (25)	87 (31)	124 (44)		
8. Rich countries should fix climate change in poor countries.	Male	113 (77)	18 (12)	17 (12)	283	NS
	Female	99 (74)	21 (16)	15 (11)		
	Total	212 (75)	39 (14)	32 (11)		
9. The Tanzanian government should do more to stop climate change.	Male	135 (92)	6 (4)	6 (4)	283	NS
	Female	121 (89)	10 (8)	5 (4)		
	Total	256 (91)	16 (6)	11 (4)		
10. Climate change is a big problem for Tanzania	Male	108 (73)	26 (18)	14 (10)	284	NS
	Female	102 (75)	21 (15)	13 (10)		
	Total	210 (74)	47 (17)	27 (10)		
11. I want to learn more about climate change at school.	Male	121 (82)	23 (16)	4 (3)	284	.042
	Female	125 (92)	9 (7)	2 (2)		
	Total	246 (87)	32 (11)	6 (2)		
12. I am worried about climate change	Male	93 (63)	39 (27)	15 (10)	283	NS
	Female	78 (57)	43 (32)	15 (11)		
	Total	171 (60)	82 (29)	30 (11)		

*Pearson Chi-Square – Non-significant <0.05

4.1.4 Sources of Climate Change Information

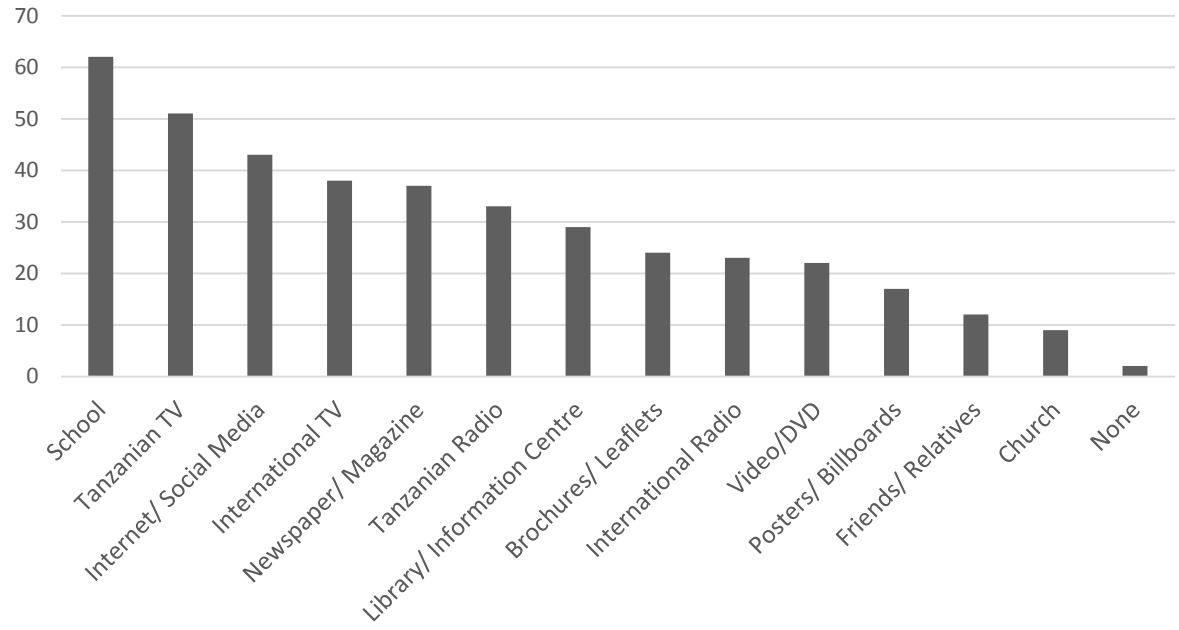
The final section of the survey asked students a series of questions which sought to gather information about the sources through which students get information about climate change. The results are presented in Figure 3 and Figure 4. The first question in this section asked students to choose from a list of media sources/ vehicles of information and to identify all the ways in which they get information about climate change (figure 3). Both local and national TV are identified as the most prominent sources of information on climate change with 58% and 53% of students identifying these sources respectively. The next most popular avenue to gather information is school, with more than half (52%) of the students identifying this as a source of information. Both local and national radio also feature heavily in respect to information sources, with 50% recognising local radio and 37% identifying international radio as sources. The more contemporary media of internet/ social media was identified as a source of information on climate change by 46% of students.

Figure 3: Sources of information on Climate Change (%) (n=226).



Students were also asked about their preferences in relation to gathering information in the future about climate change (figure 4). Encouragingly, 62% of students had a preference for learning more about climate change at school, despite this being much lower down the list of current sources of information on climate change in figure 3. Again, national and international TV stations feature prominently (51% and 38% respectively), while internet and social media is the third preference as a desired source of information (43% preference), while it is identified only in 6th position as a current source of information (figure 3). Only 2% of students indicated that they do not wish to get further information about climate change from any of the identified sources.

Figure 4: Students' preferences for how they would like to learn more about Climate Change (%) (n=276).



5. Discussion

From the results presented in the student surveys it is clear that students at the secondary school have some knowledge and awareness of climate change, but that significant gaps in knowledge exist. Perhaps more importantly, students harbour considerable misunderstandings about climate change. Knowledge about GHGs is limited, which is largely consistent with other surveys which tested for awareness of this topic (Jean-Baptiste et al, 2007; Boyes & Stanisstreet, 1993). Also the very low level of knowledge of ozone and water vapour as GHGs can be noted in similar surveys (Fisher, 1998; Boyes & Stanisstreet, 1993). Studies by Prunea et al (2001) and Boyes & Stanisstreet (1997) have also returned results similar to the surprising result from this study that <50% of students know that carbon dioxide is a GHG. Perhaps most significantly, 25% of students identified that they did not know any of the GHGs, indicating that there is a significant gap in relation to teaching of this core scientific element, an essential building block in understanding global warming and climate change.

In the core section of this survey which attempted to ascertain students' knowledge of climate change, it is clear that some elements of climate change are better understood than others. In a further indication of the lack of basic scientific knowledge, students struggled significantly with an understanding of the basic concepts of climate and weather, and to a lesser extent ocean science. In a stark indication of the confusion surrounding these concepts, less than a third of students correctly identified that climate is a term used to describe average weather over a prolonged period of time. When combining the elements which reflect on climate/ weather and ocean science, only 50% of students answered this combination of questions correctly. These misunderstandings can also be observed in an American survey on high school students by Rajeev Gowda et. al (1997).

In respect to knowledge of perhaps less scientific elements of climate change which relate to causes of climate change, students generally had a better understanding, but exceptions are common. In questioning students about the causes of climate change, students again return a high number of incorrect or "don't know" choices to questions which could be deemed more scientific such as those relating to acid rain, fossil fuels and the ozone layer. Alarmingly, less than half of the surveyed students identified the combustion of fossil fuels as a contributor to climate change. The large numbers of students to exhibit confusion in respect to these elements of climate change knowledge are well documented in a number of similar studies (Boyes & Stanisstreet, 1993; Rajeev Gowda et al, 2013). It could be argued that the strong links between GHG emissions, acid rain and ozone layer depletion are to blame for these misunderstandings. It would appear that more direct human interferences with our atmosphere such as the effects of cutting down trees and industry on climate change are better understood among the secondary school population sampled.

Results for sections which tested students on their knowledge of climate change effects and climate change mitigation/ adaptation were more favourable. Students showed a relatively strong understanding of the main effects of climate change, with extreme weather and the spread of disease featuring heavily in correct responses. A study by Olayinka et al. (2013), which was conducted in an urban environment among adults in Nigeria presents an interesting developing world contrast. Similarly, extreme weather, droughts and flooding were the most popularly chosen effects of climate change in the Nigerian study. However significantly higher numbers of students recognised an increase in the spread of disease as a consequence of climate change in the study presented here, while a rise in sea level was accurately identified by more respondents in the comparative study than in this sample. Echoing earlier observations, the most commonly cited effects in the Tanzanian research can be seen as very direct human impacts, whereas questions relating to more in depth understandings of climate change related to melting ice caps, rising sea level and the effects of climate change on biodiversity produced mixed results. Despite this, the section on climate change effects produced the most correct answers. Finally, students understanding of climate change mitigation and adaptation were mixed. Understanding of the positive effects of re-forestation and the use of public transport were answered strongly. From a developed country perspective, the US study by Jean-Baptiste et al. (2007) also had a large percentage of students relate planting trees and reducing the use of cars as a way of mitigating climate change.

From the survey results on students' opinions and attitudes on climate change, we can observe that students readily recognise the negative contribution that humans play in anthropogenic climate change, believe that all countries including their own should play their part in tackling climate change and are assured that it is not too late for nations, or themselves, to do so. Interestingly, this positive outlook and sense of agency in combating climate change is in contrast to the study by Pruneau et al. (2001), which reports that many survey respondents (students in Canada) felt that there was little that people could do and also that people are unwilling to make lifestyle changes in order to mitigate the effects of climate change.

From the analysis presented in this survey, it does not appear that there are significant differences in awareness among males and females. In addition, there is little evidence that there is significance between the sexes in relation to their personal attitudes and opinions towards climate change. This is in contrast to a number of similar awareness studies conducted in South Africa which found significant differences between the sexes in relation

to climate change awareness (Lambrou & Nelson, 2010; Maponya & Mpandeli, 2012). However it is important to note that both of these studies were based on adult respondents in rural settings. In addition, further analysis is required to better understand any possible nuances within the data presented which may point to differences in climate change awareness and opinions on the topic.

Students' in the secondary school gather awareness and knowledge of climate change from a broad range of sources, both inside and outside the classroom. The data presented in this study identifies that more traditional media such as TV, radio and newspapers/ magazines remain the most common ways to gather information on climate change. However the role of the education system is still a dominant player in a heavily mediated environment, and indeed students identify school as their preferred method of gathering information about climate change, while more recent media such as the internet and social media have an important role to play, with perhaps an increasingly important role in the students future as a source of information. The results presented here broadly reflect a study on climate change awareness in an urban environment in Nigeria, where broadcast media, print media and electronic media (e.g. internet) are the most dominant ways of receiving information on climate change (Olayinka et al., 2013).

6. Limitations

The research has a number of restraints which must be acknowledged. The terms of reference dictated at the outset of the five year programme provided the structure. Within this, there are limitations in respect to the research subjects being constrained to within DUCE and its affiliated schools. In addition, the outcomes of the research were prescribed by the in-country institution. There is a strong recognition upon completion of this stage (stage 2) of the research that a much broader scope is necessary in order to better contextualise the study. An increased focus must be sought on the specific geo-political, economic and social structures at play at DUCE, their affiliate schools, Dar es Salaam and indeed in Tanzania as a whole.

It is essential that further research attempts to capture the unique knowledge and skills which research subjects do have, in order to better design and implement any future education package. It is crucial that the eventual educational package account for the realities of local lives, their diverse engagements with climate change information and their unique needs in respect to adapting to and mitigating climate change. It is important that there is a level of reciprocal knowledge sharing, and that the research does not adopt an overly prescriptive approach to curriculum design and instead incorporates local knowledge and expertise while accounting for indigenous needs.

7. Conclusions and recommendations

The preliminary analysis of the data collated in this research identifies that students' knowledge of climate change is rife with misunderstandings, inaccuracies and in some cases a general lack of knowledge. However it is also true that students are enthused by the topic of climate change, they are eager to learn more about the various aspects of the topic, and see the prospect of being positive agents in tackling climate change and in adapting to/ mitigating its effects in the future. There does not appear to be any pattern in differences between the sexes in knowledge of climate change or on personal attitudes and opinions towards the topic. However, a range of further analyses can be undertaken to assess potential differences between students of varying ages or grades, as well as those who self-identified as having learnt about climate change in school or not. Through additional analysis a more robust

understand of the dynamics of a secondary school classroom can be better understood, and so a future curriculum package can be more effectively designed and implemented.

It is vital that research into climate change awareness and education looks at the broader spectrum of learning and awareness raising and seeks to understand the advantages, pitfalls and opportunities that a media and resource intensive Dar es Salaam can present. It is also important to note that this study does not exist in a vacuum, but instead is placed in the context of a broader Tanzanian education system. This reality can present both opportunities and barriers, but only in recognising these can future stages of this programme be implemented effectively and efficiently.

In 2015, this study finds itself in a time on the cusp of major changes in the context of both climate change action and development more broadly, with both the Sustainable Development Goals being adopted and the Paris Climate Conference aiming to achieve a legally binding and universal agreement on climate change. It is hoped that research such as this, which seeks to more effectively disseminate knowledge of climate change as its overall goal can bring about positive change which can assist with the goals of these global agreements.

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9. References

Boyes, E., & Stanisstreet, M. (1993). The greenhouse effect – Children's perception of causes, consequences and cures. International Journal of science education, 15(5): 531-552.

Boyes, E., & Stanisstreet, M. (1997). Children's models of understanding of two major global environmental issues (ozone layer and greenhouse effect). Research in Science & Technological Education, 15(1): 19-28.

Brown, C., Christensen, D., Leene, E., Putman, D. and Whited, B. (2012). Comparing Survey Results to Assess Climate Change/Global Warming Awareness, Perceptions and Beliefs of College Students in the United States and China. Department of Economics, University of Wisconsin-Eau Claire. Watershed Institute for Collaborative Environmental Studies, United States of America.

CEED (2011) Knowledge, Attitudes and Practices Survey on Children and Climate Change. UNDP and UNICEF. Available at: http://www.unicef.org/montenegro/KAP_Survey_on_children_and_climate_change.pdf

Creswell, J., W. (2012). Educational Research – planning, conducting, and evaluating quantitative and qualitative research. New York: Pearson

Dawson, V., Carson, K., (2013) Australian secondary school students understanding of Climate Change. Teaching Science, 59 (3), 9-14

Eriksen, S. E. H., Klein, R. J. T., Hammill, A., Naess, L. O., Tanner, T. M., Robledo, C., O'Brien, K. L. (2007) Portfolio screening to support the mainstreaming of adaptation to climate change into development assistance.

Fink, A., & Kosekoff, J. (1985). How to conduct surveys: A step-by-step guide. Newbury Park, CA: Sage.

Fisher, B. (1998). Australian students' appreciation of the greenhouse effect and the ozone hole. Australian Science Journal, 44(33): 46-55.

IPCC (2007) Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K. and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

IPCC (2013). Working Group I Contribution to the IPCC Fifth Assessment Report – Summary for Policymakers. Climate Change 2013: The Physical Science Basis.

Jean-Baptiste, M., Lambert, J., Lester, B.T., Lee, O., Ma, L. (2007) Conceptions of the Greenhouse Effect and Global Warming among Elementary Students from Diverse Languages and Cultures. Journal of Geoscience Education, 55(2): 117-125

Kilinc A, Stanisstreet M, Boyes E. (2008) Turkish students' ideas about global warming, International Journal of Environmental & Science Education. 3(2):89-98.

Lambrou, Y., & Nelson, S. (2010). Farmers in a Changing Climate: Does Gender Matter? – Food Security in Andhra Pradesh, India. Food and Agricultural Organisation (FAO): Rome.

Maponya, P., Mpandeli, S., & Oduniyi, S. (2013). Climate change awareness in Mpumalanga Province, South Africa. Journal of Agricultural Science, 5(10), 273. doi:10.5539/jas.v5n10p273

Maponya, P., & Mpandeli, S. (2012). Climate Change and Agricultural Production in South Africa: Impacts and Adaptation options. Journal of Agricultural Science, 4(10), 48-60. http://dx.doi.org/10.5539/jas.v4n10p48

Marshall, N. A., Park, S., Howden, S.M., Dowd, A.B., Jakku, E.S. (2013) Climate change awareness is associated with enhanced adaptive capacity. Agricultural Systems, 117, 30-34.

Mwalukasa, N. (2013). Agricultural information sources used for climate change adaptation in Tanzania. Library Review, 62 (4/5): 266 - 292

OECD (2009). Integrating Climate Change Adaptation into Development Co-Operation. OECD Publishing: Paris. Accessed online 15/3/15: www.sourceoecd.org/development/9789264054769

Olayinka C. O., Kolawole C. I., Ayodeji O. O., Lekan M. A., Patience F. T. (2013). Improving Urban Residents' Awareness of the Impact of Household Activities on Climate Change in Lagos State, Nigeria. Journal of Sustainable Development; 6(4) doi:10.5539/jsd.v6n4p56 URL: http://dx.doi.org/10.5539/jsd.v6n4p56

Owolabi, H.O., Gyimah, E.K. and Amponsah, M.O. (2012) Assessment of junior high school students' awareness of climate change and sustainable development in central region, Ghana. Educational Research Journal, 2, 309-317.

Pruneau, D., Moncton, U., Liboiron, L. and Vrain, E. (2001). People's idea about climate change: a source of inspiration for the creation of educational programs. Canadian Journal of Environmental Education, 6, 121-138.

Rajeev Gowda, M. V., Fox, J. C., Magelky, R. D. (1997) Students Understanding of Climate Change: Insights for Scientists and Educators. Educational Affairs, 78 (10), 2232-2240

Shepardson, D.P., Niyogi, D., Choi, S. and Charusombat, U. (2011) Students' conceptions about the greenhouse effect, global warming, and climate change. Climatic Change, 104, 481-507.

United Republic of Tanzania (2004) Environmental Management Act. Government of Tanzania, Vice President's office.

United Republic of Tanzania (2007) National Adaptation Programme of Action (NAPA) Government of Tanzania, UNEP, GEF.

United Republic of Tanzania (2009) National Adaptation Strategy and Action Plan. Government of Tanzania, Vice President's office.

United Republic of Tanzania (2012a) National Climate Change Communication Strategy (2012-2017) Government of Tanzania, Vice President's office.

United Republic of Tanzania (2012b) National Climate Change Srategy. Vice President's office – Division of Environment.

UNFCCC (2014a). Article 6 - Education Training and Public Awareness. United Nations Framework Convention on Climate Change.

UNFCCC (2014b). The Lima Ministerial Declaration on Education and Awareness-raising. United Nations Framework Convention on Climate Change.

UNFCCC (2012). Doha work programme on article 6 of the convention. United Nations Framework Convention on Climate Change.

Whitmarsh, L. (2003). Survey Questionnaire ('Climate change' version). Survey of Environmental Concerns. University of Bath, United Kingdom

10.Appendix

Appendix 1: Student Survey (English)

Thank you for taking the time to complete this survey. Please answer every question.

Section 1: Personal Profile

1. Your sex?

☐ male ☐ female

2. Where are you from originally?

☐ a village ☐ a town ☐ a city

3. What age are you?

☐12 ☐13 ☐14 ☐15 ☐16 ☐17 ☐18 ☐19 ☐20

4. In which class are you?

☐ Form 1 ☐ Form 2 ☐ Form 3 ☐ Form 4 ☐ Form 5 ☐ Form 6

Section 2: Personal Views on Climate Change

5. What are the biggest problems in Tanzania today? Tick two boxes.

☐ Poor infrastructure ☐ Poverty ☐ Climate Change
☐ Disease ☐ Unemployment ☐ Corruption

6. When do you think people began/will begin to feel the effects of climate change in Tanzania?

☐ 50 years ago ☐ 25 years ago
☐ 10 years ago ☐ Within 10 years
☐ In this past year ☐ Within 50 years
☐ Never ☐ Don't know

7. Does climate change affect you?

☐ Yes ☐ No ☐ Don't know

8. How do you feel about climate change? Tick three boxes.

☐ Fearful/afraid ☐ Happy
☐ Excited ☐ Confused ☐ Angry
☐ Optimistic ☐ Powerless ☐ Hopeful
☐ Sad ☐ Enthusiastic ☐ Nothing

Section 3: Attitudes and Perceptions

Please tick the appropriate box to indicate your level of agreement.

	Agree	Neutral	Disagree
1. Climate change is mostly something that happens naturally.			
2. Humans have a big effect on climate change			

3. Things other than humans have an effect on climate change			
4. It is already too late to do anything about climate change.			
5. All countries should do something to stop climate change, because it is a global problem.			
6. All countries should help each other to stop climate change			
7. Europe and America are causing most climate change, so they should take the blame for it.			
8. Rich countries should fix climate change in poor countries.			
9. The Tanzanian government should do more to stop climate change.			
10. Climate change is a big problem for Tanzania			
11. I want to learn more about climate change at school.			
12. I am worried about climate change			

Section 4: Climate Change Knowledge

9. Have you learnt about climate change in secondary school?

☐ Yes ☐ No ☐ Don't Know

10. How much do you know about climate change?

☐ I have never heard of climate change
☐ I know a little bit about climate change
☐ I know a lot about climate change

11. What is the biggest influence on climate change? Tick <u>one</u> box.

☐ Human activity ☐ Nature
☐ Both human activity and nature ☐ None

12. Are any of the following Greenhouse Gases (GHGs)? Tick <u>all</u> boxes that you think are correct

☐ Carbon dioxide ☐ Methane ☐ Oxygen
☐ Argon ☐ Water vapour ☐ Nitrous oxide
☐ Hydrogen ☐ Nitrogen ☐ Ozone
☐ Chlorofluorocarbons (CFCs) ☐ Helium ☐ Don't know

Please select if you think these statements are true, false or you don't know the answer

	True	False	Don't Know
1. Weather often changes from year to year			
2. Climate means average weather			
3. Climate often changes from year to year			
4. Weather means average climate			
5. Climate means the same thing as weather			
6. The Climate hasn't changed for millions of years			
7. The earth's average temperature has risen in the last 100 years			
8. Burning fossil fuels causes climate change			
9. Cutting down trees causes climate change			
10. Damage to the ozone layer causes climate change			
11. Erupting volcanoes can cause climate change			
12. Acid rain causes climate change			
13. More garbage/ waste causes climate change			
14. Climate change can lead to an increase in the amount of food available			
15. Climate change can cause a change in weather			
16. Climate change can cause sea levels to rise			
17. Climate change can lead to more plant and animal species			
18. Climate change can cause more flooding and droughts			

19. Climate change can help to stop diseases			
20. Climate change can cause polar ice caps and glaciers to melt			
21. Climate change can cause deserts to get smaller			
22. People can help stop climate change by using more land to grow food.			
23. People can help stop climate change by using cars instead of public transport			
24. People can help stop climate change by using more renewable sources of energy (for example: wind, solar energy)			
25. People can help stop climate change by growing more organic fruit and vegetables			
26. People can help stop climate change by using more electricity			
27. People can help stop climate change by planting more trees			
28. People can help stop climate change by buying more local goods.			
29. More industry helps to stop climate change			
30. Lower sea temperatures cause sea levels to rise			
31. More acid in the ocean can cause sea levels to rise			
32. Melting ice caps and glaciers can cause sea level to rise			

Section 5: Sources of Climate Change Information

13. Where have you heard/ watched/ read about climate change? Tick all boxes that apply

☐ Tanzanian radio station ☐ International radio

☐ Tanzanian TV channels
☐ Video/DVD
☐ School
☐ Church
☐ Relatives, friends and neighbours
☐ Flyers
☐ Other, please specify _____

☐ International TV channels
☐ Internet/Social media (e.g. Facebook, Twitter etc.)
☐ Library and information centre
☐ Newspapers/Magazines
☐ Posters/ Billboards
☐ None

14. Where have you heard/ watched/ read <u>THE MOST</u> about climate change? Tick <u>two</u> boxes

☐ Tanzanian radio station
☐ Tanzanian TV channels
☐ Video/DVD
☐ School
☐ Church
☐ Relatives, friends and neighbours
☐ Flyers

☐ International radio
☐ International TV channels
☐ Internet/Social media (e.g. Facebook, Twitter etc.)
☐ Library and information centre
☐ Newspapers/Magazines
☐ Posters/ Billboards

15. Would you like to hear/read/watch more information about climate change?

☐ Yes ☐ No ☐ Don't know

16. How would you like to learn <u>MORE</u> about climate change? Tick <u>all</u> boxes that apply

☐ Tanzanian radio
☐ Tanzanian TV channels
☐ Video/DVD
☐ School
☐ Church
☐ Relatives, friends and neighbours
☐ Brochures/ Leaflets
☐ Other, please specify _____

☐ International radio
☐ International TV channels
☐ Internet/Social media (e.g. Facebook, Twitter etc.)
☐ Library and information centre
☐ Newspapers/Magazines
☐ Posters/ Billboards
☐ None

Appendix 2: Student Survey (Swahili version)

Asante kwa kushiriki kwenye utafiti huu. Tafadhali jibu maswali yote. Maneno yaliyowekewa alama * yameandikwa kwa lugha ya kiingereza. Tafadhali omba msaada kwa mwalimu endapo hutaelewa maana ya maneno hayo.

mabadiliko ya tabia nchi = *Climate Change**

Kipengele cha kwanza: Taarifa binafsi.

17. Jinsia yako
☐ Me ☐ Ke

18. Je, umekulia wapi?
☐ Kijijini ☐ Mjini ☐ Jijini

19. Je, una umri gani?
☐12 ☐13 ☐14 ☐15 ☐16 ☐17 ☐18 ☐19 ☐20

20. Je, unasoma kidato gani?
☐ cha kwanza ☐ cha pili ☐ cha tatu ☐ cha nne ☐ cha tano ☐ cha sita

Kipengele cha pili: Mitazamo binafsi juu ya mabadiliko ya tabia nchi.

21. Je, unadhani kwa hivi sasa nchi ya Tanzania inakabiliwa na changamoto kuu zipi? Tafadhali weka alama ya tiki katika sehemu mbili tu.
☐ Miundo mbinu mibovu ☐ Umaskini ☐ Mabadiliko ya tabia nchi
☐ Ugonjwa ☐ Ukosaji wa ajira ☐ Rushwa

22. Kwa maoni yako, je unadhani ni wakati gani wananchi wa Tanzania walianza kupata athari za mabadiliko ya tabia nchi? Tafadhali weka alama ya tiki katika sehemu <u>moja</u> tu.
☐ Miaka hamsini iliyopita ☐ Miaka ishirini na tano iliyopita
☐ Miaka kumi iliyopita ☐ Ndani miaka kumi ijayo
☐ Ndani ya mwaka huu ☐ Ndani ya miaka hamsini ijayo
☐ Hawajaathirika na hawataathirika kabisa ☐ Sijui

23. Je, mabadiliko ya tabia nchi yanakuathiri wewe binafsi?
☐ Ndio ☐ Hapana ☐ Sijui

24. Je, unapata hisia gani juu ya suala la mabadiliko ya tabia nchi? Tafadhali weka tiki katika sehemu <u>tatu</u> tu.
☐ Ninapata uoga ☐ Ninafurahishwa
☐ Ninasisimshwa ☐ Ninachanganyikiwa ☐ Ninasikitishwa
☐ Ninapata matumaini ☐ Ninasononeshwa ☐ Ninafarijika
☐ Ninahuzunishwa ☐ Ninachangamshwa ☐ Sihisi chochote

Kipengele cha tatu: mawazo na mitazamo kuhusu mabadiliko ya tabia nchi

Tafadhali weka tiki katika sehemu husika endapo utakubaliana/uko katikati/haukubaliani na taarifa zifuatazo:

	Ninakubali	Niko katikati	Sikubaliani
1. Mabadiliko ya tabia nchi yanatokea kwa sababu za kiasilia.			
2. Binadamu wana mchango mkubwa katika mabadiliko ya tabia nchi.			
3. Mabadiliko ya tabia nchi yanasababishwa na mambo mengine, yasiyohusiana na binadamu.			
4. Kwa hali ilivyo sasa, hatuwezi kufanya chochote kukabiliana na mabadiliko ya tabia nchi.			
5. Mataifa yote duniani yanawajibu wa kuchukua hatua dhidi ya mabadiliko ya tabia nchi, hii ni kwasababu yana athiri ulimwengu wote.			
6. Mataifa yote yanapaswa kusaidiana ili yaweze kuchukua hatua dhidi ya mabadiliko ya tabia nchi.			
7. Mataifa ya bara la Ulaya na Amerika ya kaskazini yanachangia kwa zaidi kusababisha mabadiliko ya tabia nchi. Hivyo basi, yanapaswa kubeba lawama kwa ajili hiyo.			
8. Mataifa yalioendelea yanatakiwa kutoa msaada kwa mataifa yanayoendelea ili yaweze kukabiliana na mabadiliko ya tabia nchi.			
9. Serikali ya Jamhuri ya Muungano wa Tanzania ina jukumu la kuchukua hatua za ziada kwa ajili ya kukabiliana na mabadiliko ya tabia nchi.			
10. Mabadiliko ya tabia nchi ni janga kubwa katika taifa la Tanzania.			
11. Ninataka nijifunze zaidi shuleni juu ya mabadiliko ya tabia nchi.			
12. Nikifikiria juu ya mabadiliko ya tabia nchi ninapata hofu na wasiwasi.			

<u>Kipengele cha nne: Elimu juu ya mabadiliko ya tabia nchi.</u>

25. Je, katika elimu yako ya sekondari, umewahi kufundishwa kuhusu mabadiliko ya tabia nchi?

☐ Ndio ☐ Hapana ☐ Sijui

26. Je, una kiwango gani cha uelewa juu ya suala la mabadiliko ya tabia nchi? Tafadhali weka alama ya tiki katika jibu <u>moja</u> tu.

☐ Sijui kabisa kuhusu suala la mabadiliko ya tabia nchi
☐ Ninafahamu kiasi kuhusu suala la mabadiliko ya tabia nchi
☐ Ninao uelewa wa kutosha kabisa kuhusu suala la mabadiliko ya tabia nchi

27. Je, kwa uelewa wako, ni kitu gani kinacho sababisha mabadiliko ya tabia nchi? Tafadhali weka alama ya tiki katika jibu <u>moja</u> tu.

☐ Ni shughuli za binadamu ☐ Ni madiliko ya kawaida ya dunia
☐ Ni shughuli za binadamu pamoja na mabadiliko ya kawaida ya dunia ☐ Hakuna

28. Zipi kati ya zifuatazo ni *Greenhouse Gases (GHGs)? Tafadhali weka alama ya tiki katika majibu (jibu zaidi ya moja linaruhusiwa).**

☐ Carbon dioxide*	☐ Methane*	☐ Oxygen*
☐ Argon*	☐ Water vapour*	☐ Nitrous oxide*
☐ Hydrogen*	☐ Nitrogen*	☐ Ozone*
☐ Chlorofluorocarbons (CFCs)*	☐ Helium*	☐ Sijui

Tafadhali tuambie kama taarifa zifuatazo ni za kweli,si za kweli au haujui. Weka alama ya tiki kwenye jibu ulilochagua.

	Kweli	Si kweli	Sijui
1. Kwa kawaida hali ya hewa *(weather*)* hubadilika mwaka hadi mwaka.			
2. Tabia nchi (*climate*)* ni sawa hali ya hewa *(weather*)* ya wastani.			
3. Kwa kawaida, tabia nchi *(climate*)* hubadilika mwaka hadi mwaka.			
4. Hali ya hewa *(weather*)* ni sawa na tabia nchi *(climate*)* ya wastani.			
5. Tabia nchi *(climate*)* **ina maana** sawa na hali ya hewa *(weather*)*.			
6. Tabia nchi *(climate*)* ya dunia haijabadilika ndani ya miaka millioni na zaidi.			
7. Wastani wa kiwango cha joto la dunia umeongezeka ndani ya miaka mia moja.			
8. Matumizi ya mafutahusababisha mabadiliko ya tabia nchi.			
9. Ukataji wa miti husababisha mabadiliko ya tabia nchi.			
10. Uharibifu wa *ozone layer** husababisha mabadiliko ya tabia nchi.			
11. Ulipukaji wa volkano husababisha mabadiliko ya tabia nchi.			
12. Mvua zenye kemikali husababisha mabadiliko ya tabia nchi.			
13. Uongezekaji wa takataka husababisha mabadiliko ya tabia nchi.			
14. Mabadiliko ya tabia nchi huongeza uzalishaji wa chakula.			
	Kweli	Si	Sijui

		kweli	
15. Mabadiliko ya tabia nchi duniani huchangia kuwa na hali ya hewa tofauti inayobadilika mara kwa mara.			
16. Mabadiliko ya tabia nchi husababisha kiwango cha maji ya bahari kuongezeka.			
17. Mabadiliko ya tabia nchi husababisha uongezekaji wa viumbe hai vya wanyama na mimea.			
18. Mabadiliko ya tabia nchi husababisha mafuriko na ukame.			
19. Mabadiliko ya tabia nchi husaidia kupunguza magonjwa.			
20. Mabadiliko ya tabia nchi husababisha maeneo yenye barafu duniani kuyeyuka.			
21. Mabadiliko ya tabia nchi husababisha majangwa ya dunia kupungua ukubwa			
22. Jamii inaweza kusaidia kutatua tatizo la ubadilikaji wa hali ya hewa kwa kutumia sana ardhi na kupanda mazao mengi zaidi ya chakula.			
23. Jamii inaweza kusaidia kutatua tatizo la mabadiliko ya tabia nchi kwa kutumia usafiri wa magari binafsi badala yausafiri wa umma.			
24. Jamii inaweza kusaidia kutatua tatizo la mabadiliko ya tabia nchi kwa kutumia vyanzo vya kuzalisha nishati kutoka kwenye upepo na mionzi ya jua.			
25. Jamii inaweza kusaidia kutatua tatizo la mabadiliko ya tabia nchi kwa kupanda matunda na mbogamboga kwakutumia teknolojia ya kilimo asilia na si cha kisasa.			
26. Jamii inaweza kusaidia kutatua tatizo la mabadiliko ya tabia nchi a kwa kuongeza matumizi yao ya nishati ya umeme.			
27. Jamii inaweza kusaidia kutatua tatizo la mabadiliko ya tabia nchi kwa kuongeza upandaji wa miti.			
28. Jamii inaweza kusaidia kutatua tatizo la mabadiliko ya tabia nchi kwa kununua bidhaa zinazotengenezwa ndani ya nchi.			
29. Uongezekaji wa viwanda husaidia kutatua tatizo la mabadiliko ya tabia nchi.			
30. Upunguaji wa joto la bahari husababisha kiwango cha maji ya bahari kuongezeka.			
31. Uongezekaji wa kemikali katika maji ya bahari husababisha kiwango cha bahari kuongezeka.			
32. Uyeyukaji wa maeneo yenye barafu unaweza kusababisha kuongezeka kwa kiwango cha maji ya bahari.			

Kipengele cha tano: Vyanzo vya taarifa kuhusu mabadiliko ya tabia nchi

29. Je, ni kutoka kwenye vyanzo vipi vya habari, umewahi kusikia/kuona/kusoma taarifa kuhusu mabadiliko ya tabia nchi? Tafadhali weka alama ya tiki kwenye jibu/majibu uliyoyachagua.

☐ Stesheni ya redio ya Tanzania
☐ Stesheni ya radio ya kimataifa
☐ Stesheni ya runinga ya Tanzania
☐ Stesheni ya runinga ya kimataifa
☐ Video/DVD
☐ Intaneti/Mtandao wa kijamii (kwa mfano, Facebook,Twitter n.k.)
☐ Shuleni
☐ Maktaba au vituo vya habari
☐ Kanisani
☐ Magazeti/Jarida
☐ Ndugu, Jamaa, Majirani au Marafiki
☐ Mabango ya matangazo
☐ Vipeperushi
☐ Hakuna
☐ Nyingine, tafadhali toa maelezo _____

30. Je, ni katika vyanzo vipi vya habari ulisikia/uliona/ulisoma taarifa za kutosha kabisa kuhusu mabadiliko ya tabia nchi? Tafadhali weka alama ya tiki katika sehemu mbili tu.

☐ Stesheni ya redio ya Tanzania
☐ Stesheni ya radio ya kimataifa
☐ Stesheni ya runinga ya Tanzania
☐ Stesheni ya runinga ya kimataifa
☐ Video/DVD
☐ Intaneti/Mtandao wa kijamii (kwa mfano, Facebook,Twitter n.k.)
☐ Shuleni
☐ Maktaba au vituo vya habari
☐ Kanisani
☐ Magazeti/Jarida
☐ Ndugu, Jamaa, Majirani au Marafiki
☐ Mabango ya matangazo
☐ Vipeperushi

31. Je, ungependa kupata kusikia/kuona/kusoma taarifa zaidi kuhusu mabadiliko ya tabia nchi?

☐ Ndio ☐ Hapana ☐ Sijui

32. Je, ni kwa njia gani ungependelea <u>zaidi</u> kujifunza kuhusu mabadiliko ya tabia nchi? Tafadhali weka alama ya tiki kwenye jibu/majibu uliyoyachagua.

☐ Stesheni ya redio ya Tanzania
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☐ Stesheni ya runinga ya Tanzania
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☐ Ndugu, Jamaa, Majirani au Marafiki
☐ Mabango ya matangazo
☐ Vipeperushi
☐ Hakuna
☐ Nyingine, tafadhali toa maelezo _____