SCIENCE AWARENESS, ATTITUDES AND ASTRONOMY: CONTINUITY AND CHANGES

SOUTH AFRICAN SOCIAL ATTITUDES SURVEY 2013

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SASAS METHODOLOGY

THE SASAS 2013 SAMPLE CONSISTED OF 2 739 ADULTS OVER THE AGE OF 16. IN THIS SAMPLE, THREE EXPLICIT STRATIFICATION VARIABLES ARE USED, NAMELY PROVINCE, GEOGRAPHY TYPE AND POPULATION GROUP. THE SAMPLE WAS WEIGHTED ON THE 2011 NATIONAL CENSUS AND IS THUS REPRESENTATIVE OF THE SOUTH AFRICAN ADULT POPULATION. THE SASAS ENSURES THAT THE ITEMS ARE VALIDATED AND TRANSLATED INTO APPROPRIATE LANGUAGES. THE BROADER SURVEY INSTRUMENT INCLUDES SOCIAL, CULTURAL, ECONOMIC, DEMOGRAPHIC, AND GEOGRAPHIC DATA[1]. THE FINDINGS PRESENTED HERE ARE DISAGGREGATED BY AGE, EDUCATIONAL LEVEL AND A LIVING STANDARD MEASURE. WHERE APPROPRIATE, GENDER DIFFERENCES ARE ALSO REPORTED.

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1. INTRODUCTION

SCIENCE AND TECHNOLOGY PLAY A LARGE AND GROWING ROLE IN OUR ECONOMIC, SOCIAL, PERSONAL AND CULTURAL LIVES. MEASURING AND UNDERSTANDING THE DYNAMICS OF THIS ROLE HAS TAKEN ON INCREASING SIGNIFICANCE, AND RESEARCH RELATING TO THE PUBLIC UNDERSTANDING OF SCIENCE HAS FOCUSED ON THE VIEWS OF THE PUBLIC REGARDING SCIENCE AND SCIENTIFIC INSTITUTIONS.

There is a growing interest by policymakers in the relationship between the South African public and science. This is based on the assumption that a positive relationship between the public and science can support economic and social development, assist in consolidating democracy and citizenship, and improve the quality of life for individuals. A constructive relationship between the public and science could contribute to individual well-being, support economic and social development, allow the public to be informed about how science and technology may offer solutions to development challenges, stimulate interest and participation in science subjects and careers, encourage investment in research and development, and increase public participation in science policy formulation and adoption. The national Department of Science and Technology's Science Engagement Framework recognises the impact that science and technology have on the public and, in turn, the impact that the public has on science and technology: the 'science and society interface'[2]. The framework notes that it is important to support the public's understanding and engagement with science if South Africa is to become an innovative society. This begs the questions: "what is the current nature of the relationship between science and the public?" and "how do we measure it?"

A 2009 study for the South African Agency for Science and Technology Advancement (SAASTA) reviewed research in this area undertaken in South Africa[3]. On this basis a specialised module of 20 items (to measure the attitudes, knowledge and sources of information for science and technology) was developed for the 2010 South African Social Attitudes Survey (SASAS)[4], which was conducted by the Human Sciences Research Council. This module was extended to 40 items for SASAS 2013. This is the most recent nationally representative and internationally comparable survey to address these questions in South Africa. The key questions addressed in this report are based on a framework that views the public's relationship with science as based on behaviour, interest, knowledge and attitudes (Figure 1). The key questions are:

1. What is the public's attitude toward science?
2. What areas of science are the public interested in?
3. How well informed is the public about specialist scientific issues? *(knowledge)*
4. How does the public access science information? *(behaviour)*
5. How informed is the public about science? *(knowledge)*
6. What is the public's attitude to astronomy?
7. What is the level of knowledge about the Square Kilometre Array (SKA) telescope, and what is the public's attitude towards it?
8. What are the perceptions of science as a school subject and career choice? *(attitudes)*
9. What is the level of knowledge of, and attendance at science centres and museums? *(behaviour)*

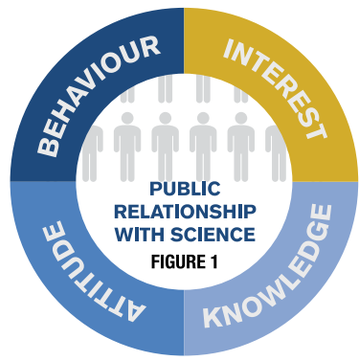


FIGURE 1

2. PUBLIC ATTITUDES TO SCIENCE

The promise-reservation index, used globally in studies of public attitudes towards science, includes four questions that measure attitudes about the potential benefits (or promise) of science, and three that measure concerns (or reservations) about science. This set of seven attitudinal items is answered on a five-point rating scale, ranging from strongly agree to strongly disagree, and was administered in SASAS 2013. Each of these items is an indicator of attitudes towards particular aspects of science. Figure 2 presents the responses to SASAS 2013, as well as responses in 2010 and 1999. This trend analysis gives an indication of attitudinal continuity and changes over time. The response to the promise-reservation index was disaggregated by age, educational attainment, and living standard measure (LSM), which measures socio-economic levels of respondents.

The findings show that, in general, South Africans have positive attitudes towards science. However, the statements that measure attitudes about the benefits or promise of science, while positive, show a general decrease over time, indicating that the public may be becoming more cautious about science and technology. The response to the statement "science and technology are making our lives healthier, easier and more comfortable" showed a decrease of 5% from 82% in 1999 to 77% in 2013, and the percentage who agreed with the statement "benefits of science are greater than any harmful effects" has decreased by 11% from 60% to 49% over this time period. The recognition of the opportunities for future generations that science and technology can provide has remained relatively constant over time, with 71% agreeing in 2013; and the role of science and technology in making work more interesting shows a decrease of 7% from 74% in 1999 to 67% in 2013.

Analysis of the reservation items revealed that the percentage of respondents who agreed that it is not important to know about science in their daily lives has remained relatively constant since 1999, ranging between 35% and 38%. There has been increased reservation since 1999 in terms of the number of people who believe that science makes their way of life change too fast, increasing by 5% from 68% to 73%. Forty two percent of the population believed that we depend too much on science and not enough on faith in 1999, and this increased in 2013 to 56%. The South African population seems to have become more cautious in terms of the level of trust they place in science, and more concerned about the impacts of science. This represents significant social change, which has important implications in terms of the public's relationship with science.

The analysis of the attitude by age showed that both the promise and reservation attitudes were highest among young people, and decreased with age. Age shows the strongest link between attitudes and demographics, which could be an indication of the inquisitive and critical nature of younger generations. As the educational level of respondents increased, the attitudes to the promise items increased. This may be due to increased knowledge and understanding of the benefits of science associated with higher educational levels. For the reservation items, the extent of reservation increased with educational attainment up to matric, and those with tertiary education exhibited slightly less reservation. A relationship between Living Standards Measure (LSM) and the promise and reservation attitudes was also observed. As LSM increased, the expression of both promise and reservation increased; while the difference between the LSM groups was more apparent for items relating to promise. Only slight differences (of 1.4% or less) in gender were found across seven of the promise and reservation items. The only notable difference was found with regard to the item: "with the application of science and new technologies, work will become more interesting", where 2.6% more males agreed with this statement.

FIGURE 2: SOUTH AFRICAN ATTITUDES TO SCIENCE (1999, 2010, 2013)

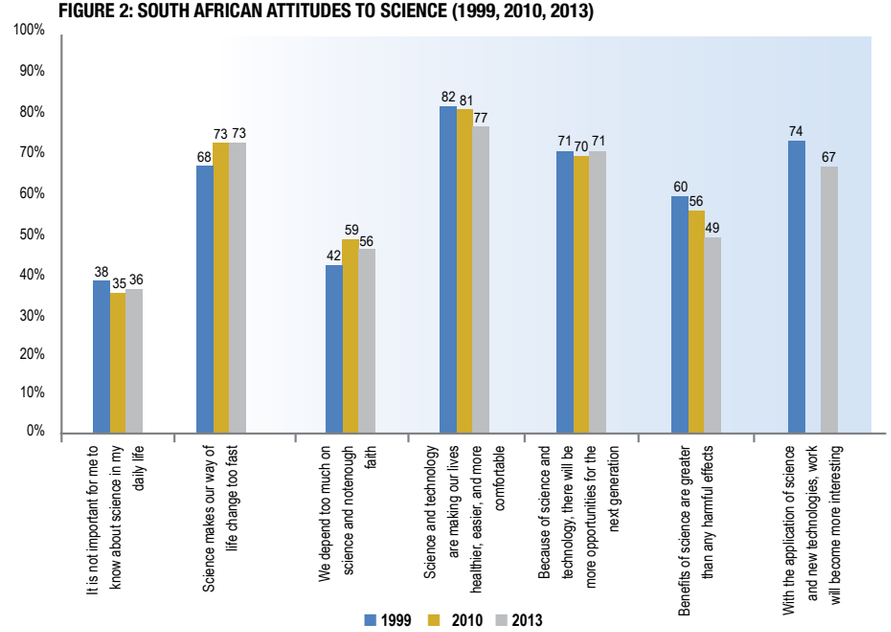


FIGURE 3: ATTITUDES TO SCIENCE BY AGE

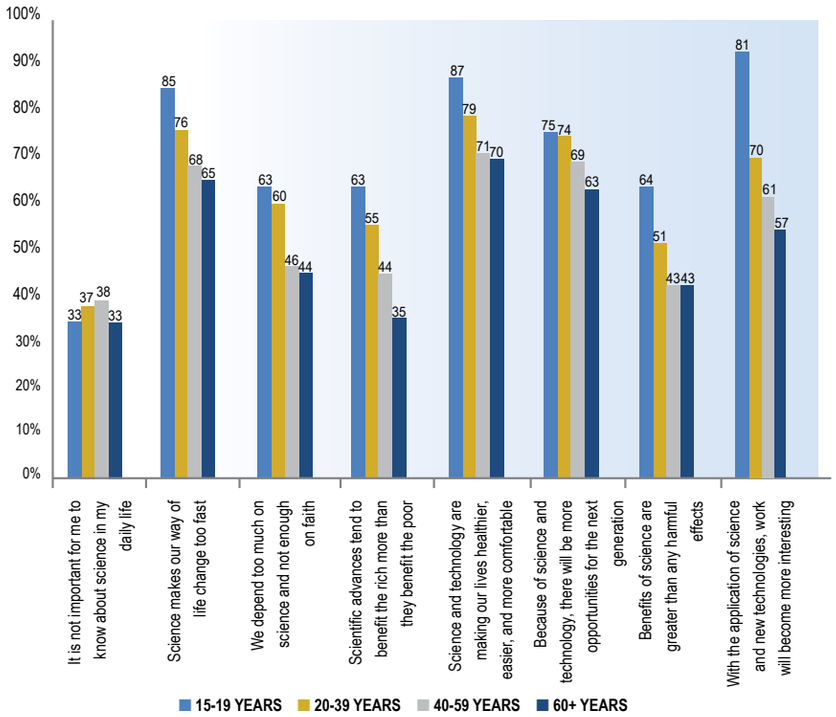


FIGURE 4: ATTITUDES TO SCIENCE BY EDUCATIONAL ATTAINMENT

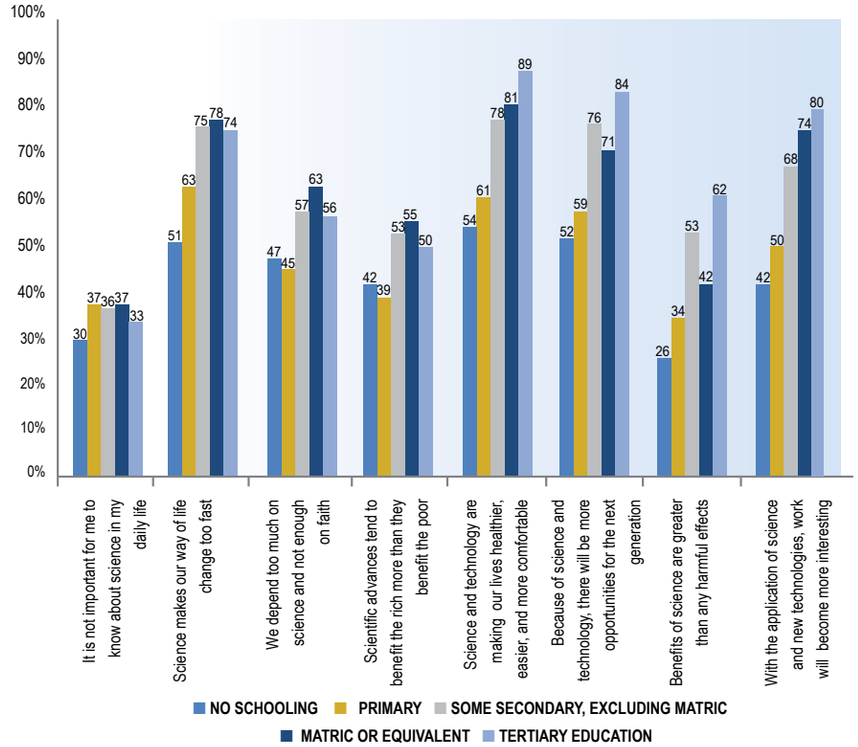
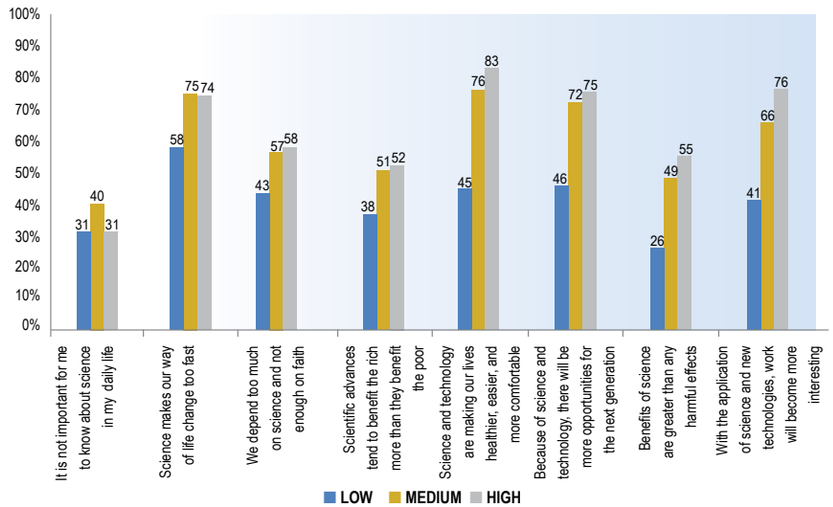
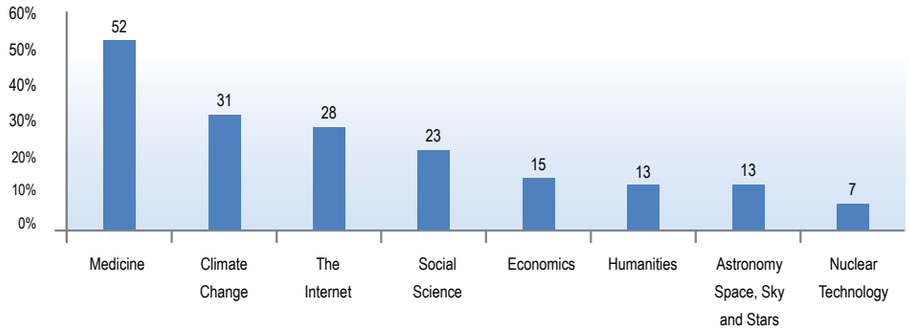


FIGURE 5: ATTITUDES TO SCIENCE BY LSM



3. INTEREST IN CONTEMPORARY SCIENCE AND TECHNOLOGY TOPICS

FIGURE 6: INTEREST IN CONTEMPORARY SCIENTIFIC TOPICS

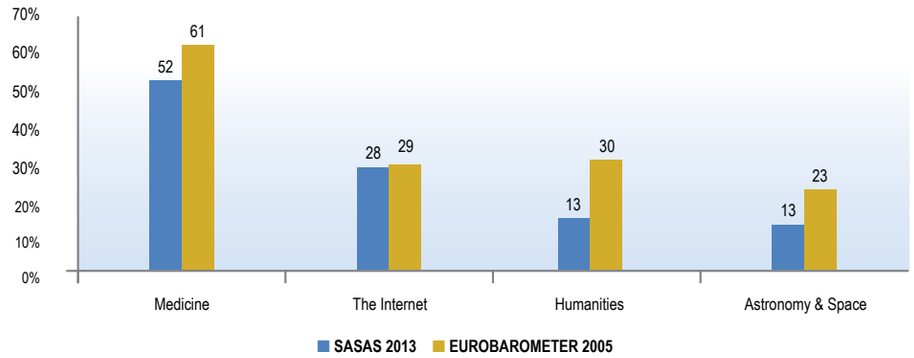


Respondents were given a list of science and technology topics in SASAS 2013, and asked which of them they were most interested in.

Medicine was the area that respondents were most interested in, with 52% indicating their interest in it. Climate change recorded the second highest level of interest, with 31% indicating an increase in the societal awareness of such environmental issues. The internet followed with 28% and social science with 23%. Fifteen percent of respondents identified economics as an area of interest to them, and humanities and astronomy both attracted an interest level of 13%. Nuclear energy was the topic that exhibited the lowest interest, with only 7% of respondents showing an interest in it.

The developments that were the most popular among the public appear to be those that are more widely publicised and have a direct impact on peoples' lives, as well as those for which the benefits or harmful effects are well-known. The benefits of medicine and the Internet are extensively promoted, and a large percentage of the population would have been directly impacted by at least one of these areas. Conversely, the negative consequences of climate change have become increasingly evident in recent years, resulting in this becoming a topic which is widely discussed. Respondents may experience the outcomes of developments in the social sciences, economics or humanities, for example through public policy; however they may be unaware of the classification of these areas. Astronomy and nuclear technology are the two topics which the public expressed the least interest in. Given South Africa's investment in the Square Kilometre Array telescope and nuclear reactors, there is a need to create further awareness among the general public of these more recent science and technology developments.

FIGURE 7: COMPARISON OF INTEREST IN SCIENTIFIC TOPICS (SASAS AND EUROBAROMETER)



The interest in scientific topics shown by the South African sample was compared to the results from the Eurobarometer 2005[5] survey. There was a high level of interest in medicine in both surveys (over 50%); and the interest in the Internet was also relatively high. When comparing the interest in humanities and astronomy, the interest shown by South Africans was lower than the interest shown by Europeans, particularly in astronomy and space, which showed a 10% difference between the two surveys.

FIGURE 8: INTEREST IN SCIENTIFIC TOPICS BY AGE

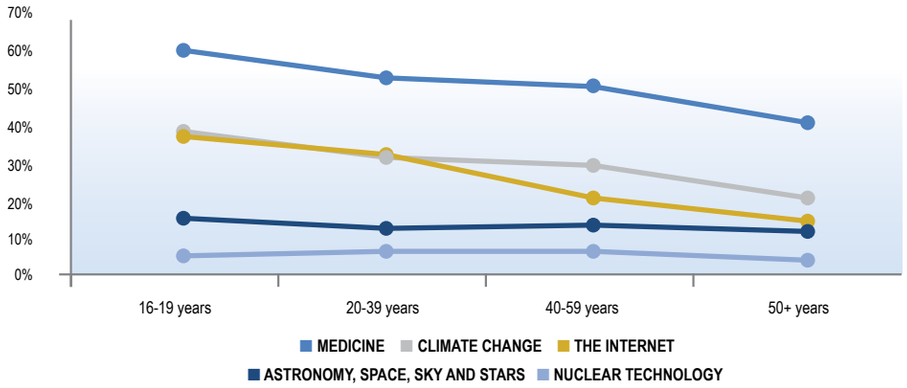


FIGURE 9: INTEREST IN SCIENTIFIC TOPICS BY EDUCATIONAL ATTAINMENT

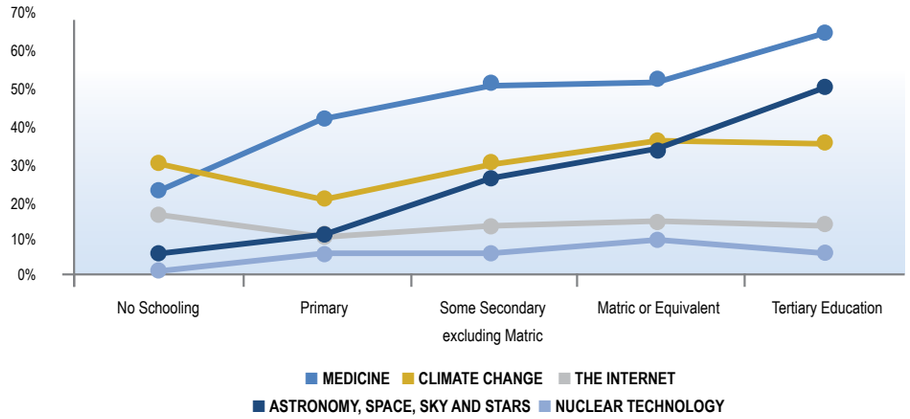
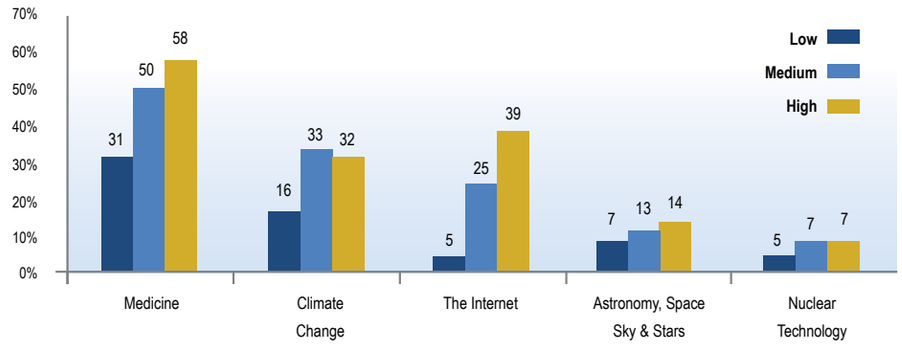


FIGURE 10: INTEREST IN SCIENTIFIC TOPICS BY LSM



Respondents in the younger age categories had a higher level of interest in all of the measured areas, with interest decreasing with age. Interest in astronomy was the highest in the 16-19-year category, at 16%. Interest in the Internet decreased substantially after 39 years, and the 20-39-year category highlighted the highest level of interest in nuclear technology, at 7%.

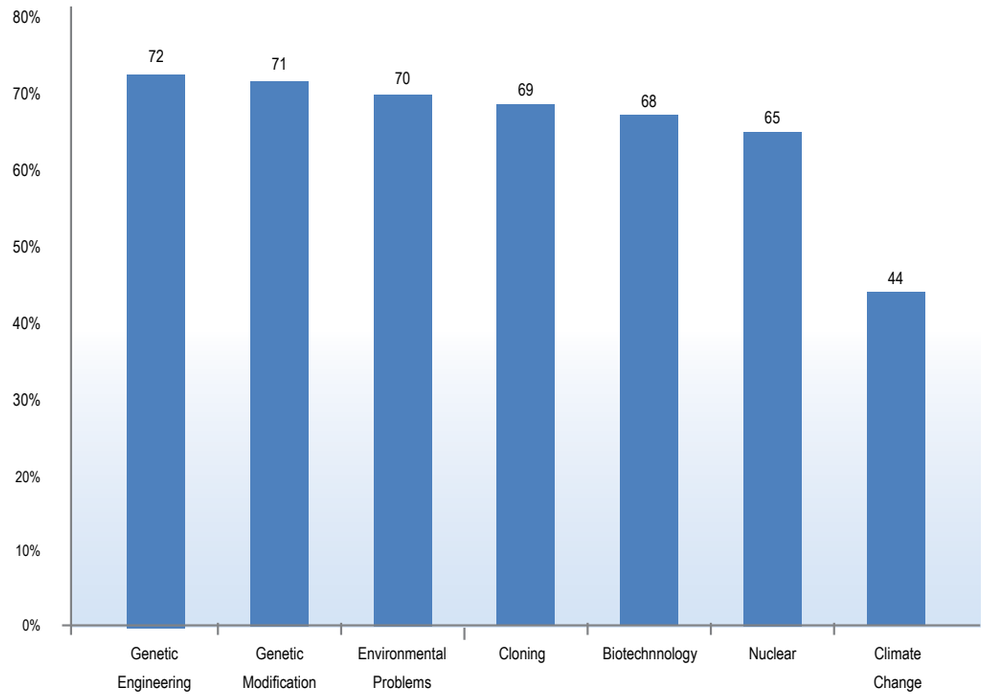
Educational attainment had an important influence on the interest shown by respondents in the various science and technology topics, and in general, the interest increased with higher educational achievements. LSM was found to be related to a person's interest in science and technology topics, as highlighted by the increase in the level of interest of respondents with higher LSM. The noteworthy finding is that even respondents with tertiary qualifications and high LSM indicated low levels of interest in topics like nuclear technology, astronomy and climate change; when it would be expected that this portion of the population would show higher levels of interest in these more complex topics.

4. KNOWLEDGE OF SPECIALISED AREAS OF SCIENCE

PREVIOUS ROUNDS OF SASAS (2004, 2007, 2010 AND 2011) HAVE INCLUDED ITEMS TO ASSESS ATTITUDES TO SPECIFIC SPECIALISED AREAS OF SCIENCE. A COMMON FINDING IN THE STUDIES HAS BEEN THE LARGE PROPORTION OF RESPONDENTS WHO COULD NOT EXPRESS THEIR ATTITUDES DUE TO HAVING VERY LITTLE TO NO KNOWLEDGE OF THE AREA OF SCIENCE.

In 2004, respondents were asked whether they thought certain technologies would improve, worsen or have no effect on our way of life in the next 20 years. Over half of the respondents felt that technologies such as solar energy (57%), computers and information technology (82%), and cell phones (87%) would improve their lives. However, a high degree of uncertainty was exhibited with regard to the impact of other technologies: biotechnology/genetic engineering, nanotechnology, space exploration and nuclear energy had a response rate of between 50% and 74% in the 'don't know' category. This suggests a lack of knowledge of the issues, which restricted respondent's ability to express an attitude.

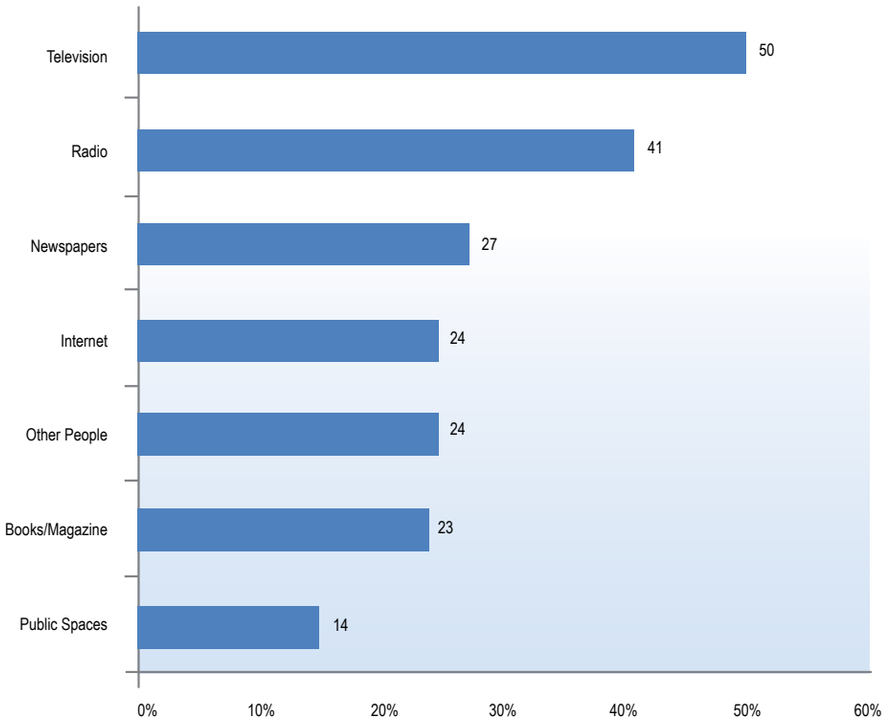
FIGURE 11: RESPONDENTS WITH LITTLE TO NO KNOWLEDGE OF A SPECIALIST AREA OF SCIENCE



5. ACCESSING SCIENTIFIC INFORMATION

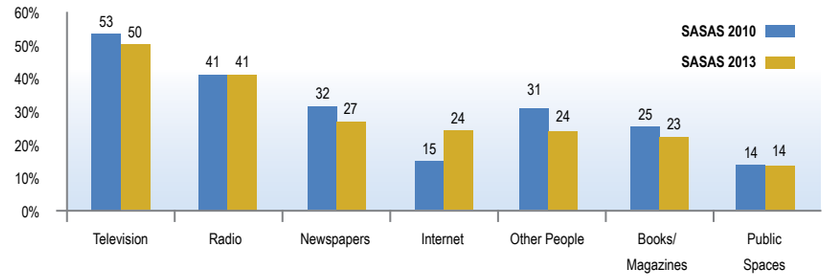
ACCESS TO INFORMATION IS A CRITICAL ISSUE TO CONSIDER AS THE NEED TO CREATE AWARENESS ABOUT SCIENTIFIC TOPICS AND DEVELOPMENTS BECOMES MORE EVIDENT. IN ORDER TO INFORM THE PUBLIC OF THESE DEVELOPMENTS, AND THEREBY PROVIDE THEM WITH AN OPPORTUNITY TO ENGAGE WITH THESE TOPICS, IT IS ESSENTIAL TO KNOW THE WAYS IN WHICH THEY ACCESS SCIENTIFIC INFORMATION SO AS TO CHOOSE THE MOST EFFICIENT COMMUNICATION OPTIONS. RESPONDENTS WERE THEREFORE ASKED WHAT SOURCES THEY GATHERED SCIENTIFIC INFORMATION FROM.

FIGURE 12: SOURCES OF SCIENTIFIC INFORMATION



The most common sources of scientific information that respondents were exposed to were television, with 50%, followed by the radio, with 41%. Newspapers, the Internet, other people, and books and magazines received similar proportions of responses (one-quarter). Respondents indicated that they received the least amount of scientific information from public spaces (such as museums and zoos), with only 14% of respondents getting information from these sources.

FIGURE 13: COMPARISON OF SOURCES OF SCIENTIFIC INFORMATION (2010, 2013)



When the sources of information in SASAS 2013 were compared with the results from the 2010 SASAS, it was found that the information sources for scientific developments remained relatively consistent over this period. The use of newspapers, however, decreased by 5% from 2010, and other people as an information source decreased by 7%, while the use of the Internet increased from 15% to 24% in 2013. This highlights the growing use of modern technologies in the search for scientific information.

FIGURE 14: INTERNATIONAL COMPARISON OF SOURCES OF SCIENTIFIC INFORMATION

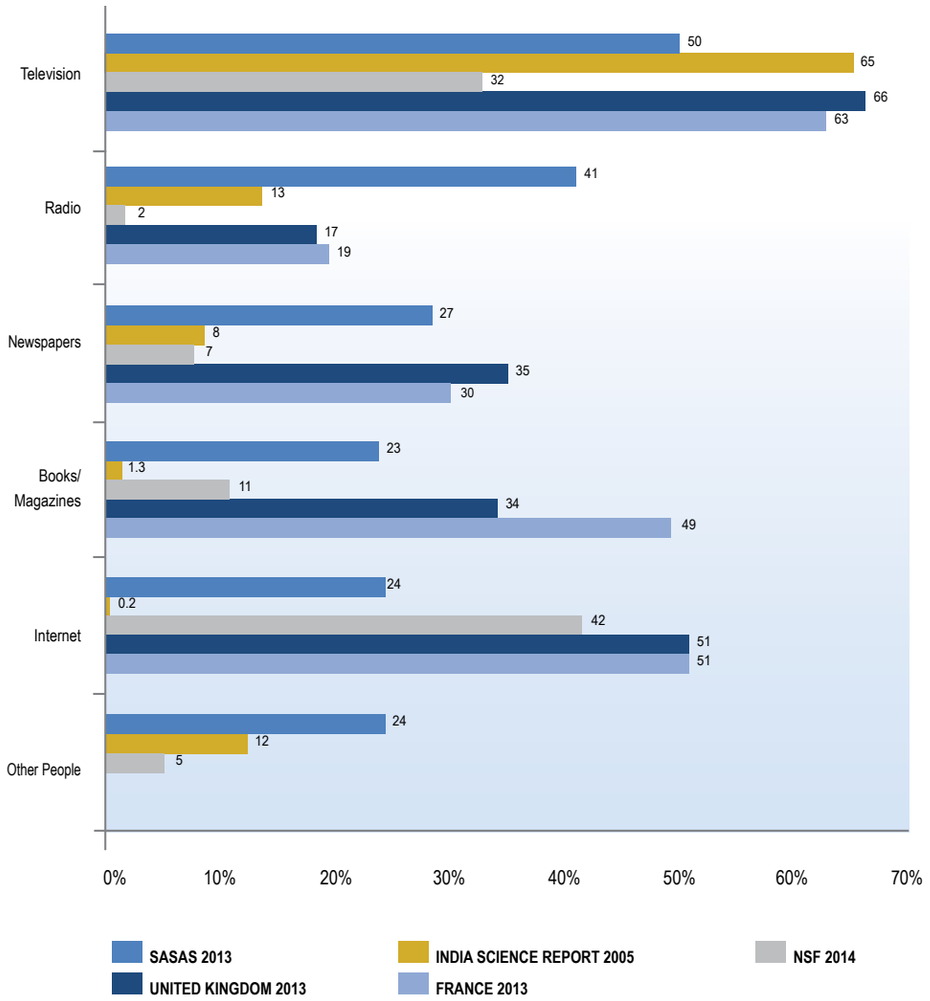


Figure 14 shows a comparison of five countries regarding the sources of information for scientific research and developments[6]. Television was the most widely used source of information in most countries, however SASAS exhibited a lower percentage than most of the other surveys at 50% (82% of SASAS respondents reported owning a TV). The use of radio in South Africa was much higher than its use in the other countries (41%), and other people (24%) as a source of information was also significantly more popular in this country. In the Western countries (US, UK, France), between 40-50% of people used the Internet to access scientific information compared to 24% in South Africa, and a very small percentage (less than 1%) in India.

Most information sources were used more widely by those in the 16-19 age group, and exhibited a general decrease in their use by age. The interesting exception is that radio was used almost equally by all age groups. The use of newspapers, books and magazines, and public spaces increased slightly for respondents after the age of 60.

FIGURE 15: SOURCES OF SCIENTIFIC INFORMATION BY AGE

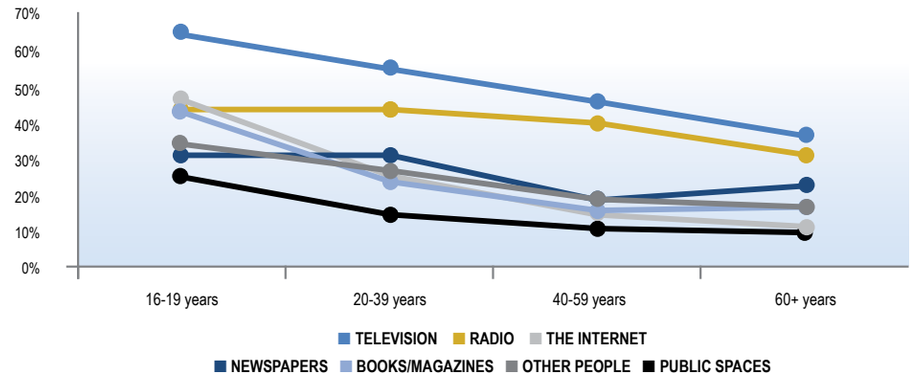
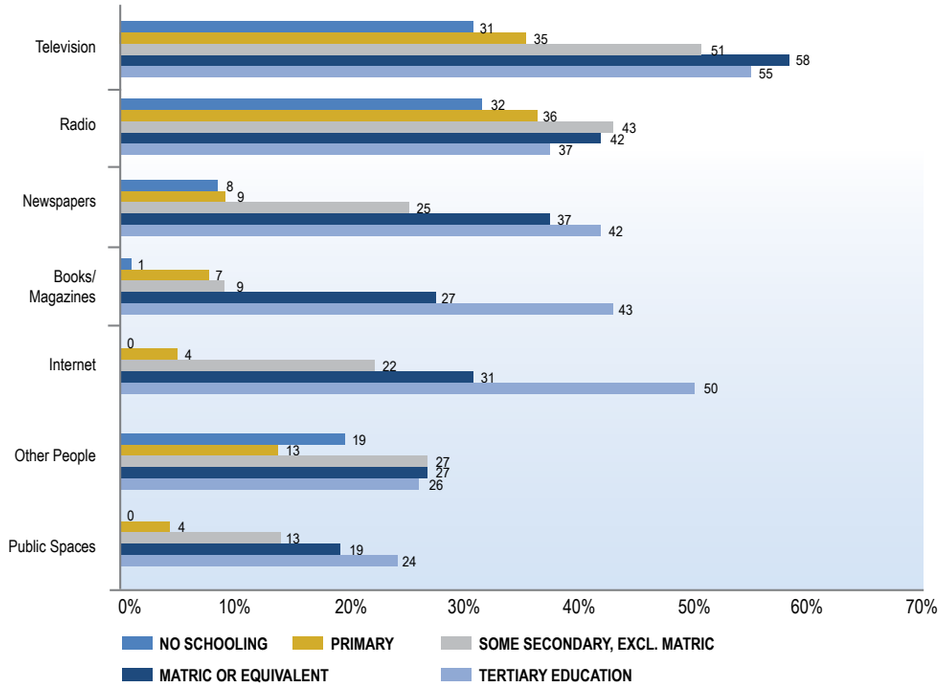
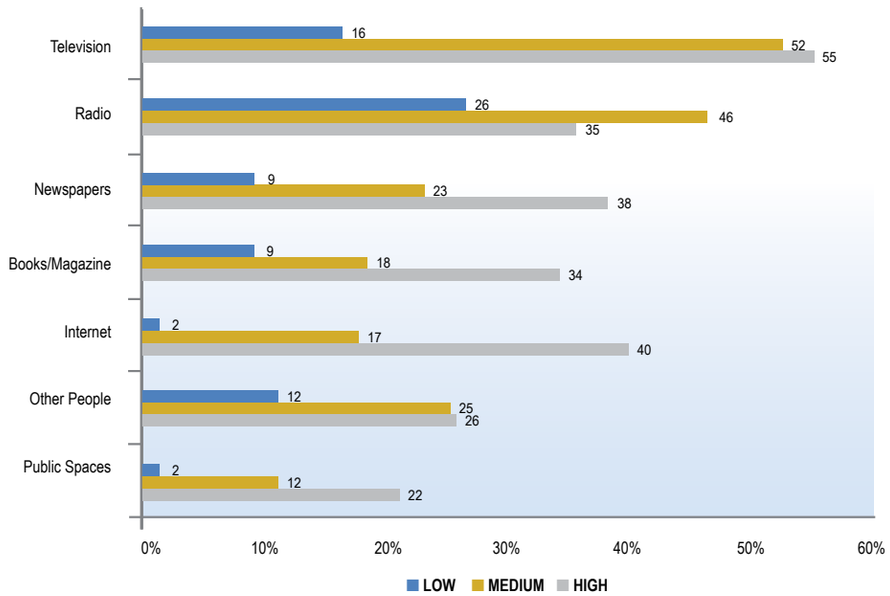


FIGURE 16: SOURCES OF SCIENTIFIC INFORMATION BY EDUCATIONAL ATTAINMENT



Most of the information sources were increasingly used by respondents with higher educational levels, and the use of books and magazines (43%) and the internet (50%) was substantially higher for those respondents with a tertiary education. Television was used more by respondents with matric or equivalent, and radio and other people were more widely used as information sources by those with some secondary education, and matric or equivalent. Those who did not attend school used television, radio and other people as their main sources of scientific information.

FIGURE 17: SOURCES OF SCIENTIFIC INFORMATION BY LSM



The use of all the sources of scientific information increased with LSM, except radio, where respondents with medium LSM were the most frequent users. Radio is the medium of choice for the low income, disadvantaged majority of the South African population, and therefore has a crucial role to play in science communication efforts. Respondents with low LSM hardly used public space and the Internet as sources of scientific information. The use of the Internet was sharply affected by LSM, with usage by respondents increasing from 2% (low) to 17% (medium), and subsequently to 40% (high). In terms of gender, males consistently reported higher frequencies of sourcing scientific information from newspapers (9% difference), the Internet (6%), television (5%), books and magazines (5%), public spaces (2%) and radio (0.4%).

6. SCIENTIFIC INFORMEDNESS

The sample of the South African population surveyed indicated that they did not feel adequately informed about science, and scientific research and developments. One third of respondents felt that they were informed about these developments, while two thirds felt that they were not very well informed or not at all informed. Comparing these findings to the Eurobarometer (Europe and France) and Ipsos (United Kingdom) surveys, we see that the level of informedness is slightly higher in these countries than in South Africa. Given the contexts, it is likely that people in France and the UK have greater exposure to scientific information and more access to sources of such information, resulting in the public feeling more informed about science and scientific research and developments than South Africans.

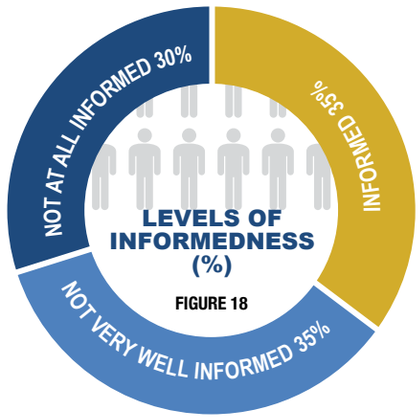
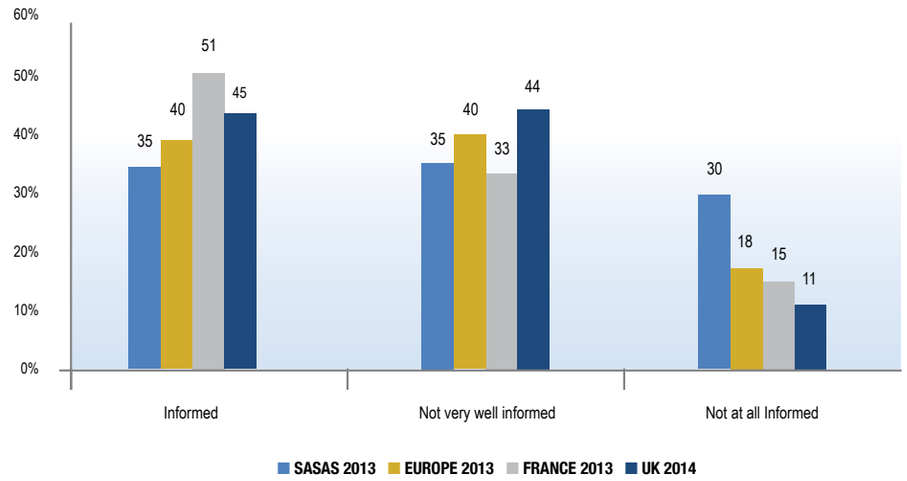


FIGURE 18

FIGURE 19: INTERNATIONAL COMPARISON OF PUBLIC INFORMEDNESS



7. ATTITUDES TO ASTRONOMY

ASTRONOMY EMBODIES A UNIQUE COMBINATION OF SCIENCE, TECHNOLOGY AND CULTURE, AND HAS INFLUENCED DEVELOPMENTS IN A RANGE OF AREAS OF TECHNOLOGY. IT ALSO HAS THE POTENTIAL TO PLAY AN IMPORTANT ROLE IN STIMULATING DEVELOPMENT AT ALL LEVELS OF EDUCATION, AND PROMOTING THE PUBLIC UNDERSTANDING OF SCIENCE[7].

SASAS 2013 included a number of statements that measured the attitude of the South African public towards astronomy.

Just over 40% of the public thought that astronomy is interesting (44%), and indicated that they like to look at the sky at night (42%). However, only 21% of respondents felt that astronomy concepts are easy to understand, and only about a quarter (27%) acknowledged the relevance of astronomy to their lives. Despite the interest in astronomy, less than 20% of respondents felt that astronomy benefits local communities and only 29% agreed that South Africa and other developing countries should spend money on astronomy.

In the age category, there is a general, small decrease in the percentage of positive responses with age for all of the statements. Attitudes towards astronomy are influenced positively by education levels and LSM, as is evident by the increase in the percentage of respondents who agreed with each statement with higher educational attainment and LSM. The largest increase with education occurs between matric or equivalent and tertiary for all statements.

FIGURE 20: ATTITUDES TO ASTRONOMY

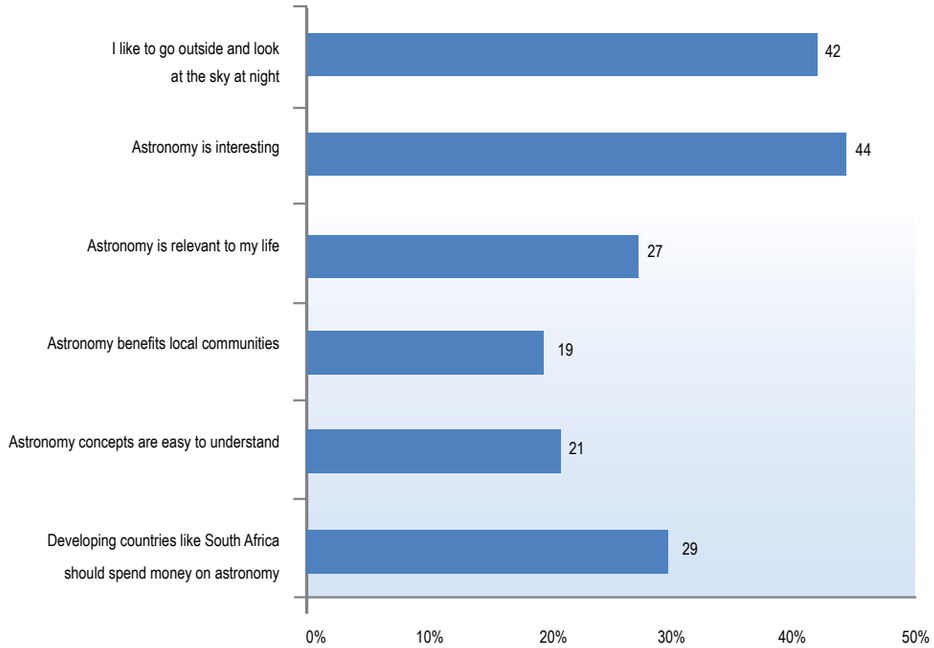


FIGURE 21: ATTITUDES TO ASTRONOMY BY AGE

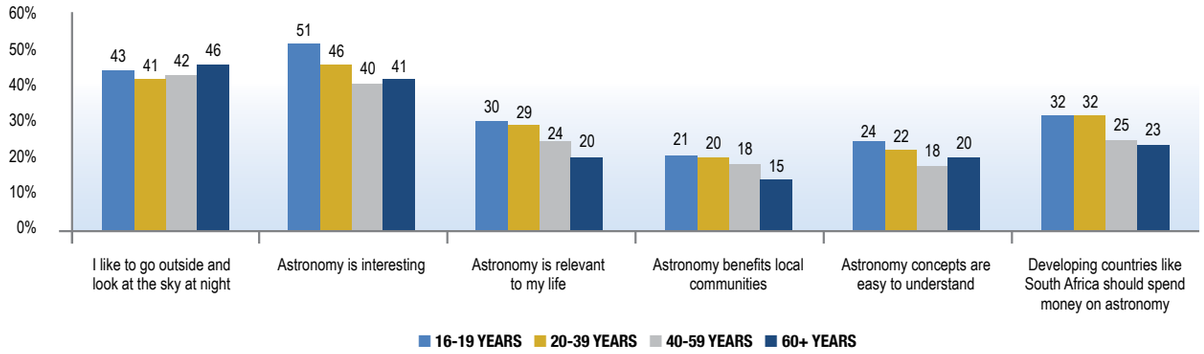


FIGURE 22: ATTITUDES TO ASTRONOMY BY EDUCATIONAL ATTAINMENT

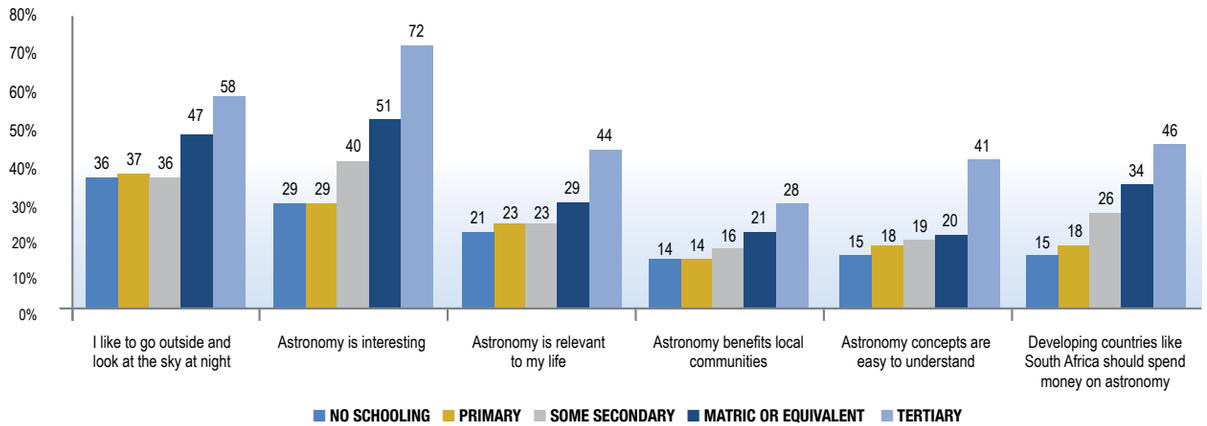
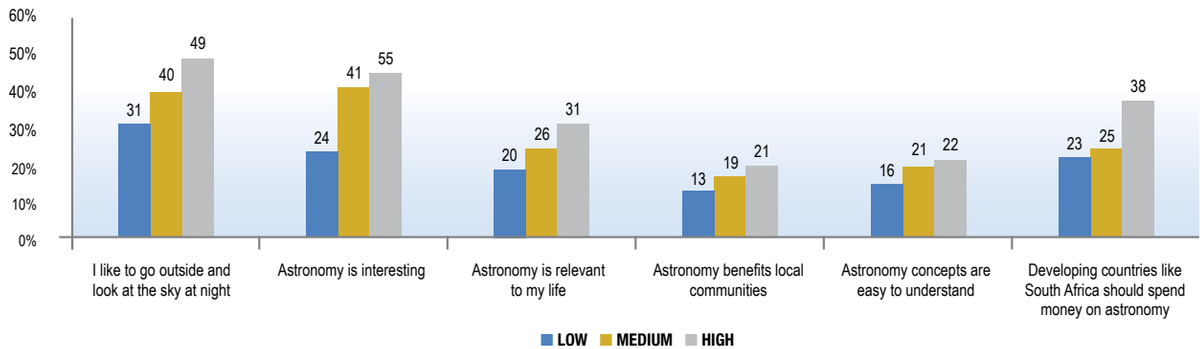


FIGURE 23: ATTITUDES TO ASTRONOMY BY LSM



8. KNOWLEDGE & VIEWS ABOUT THE SQUARE KILOMETRE ARRAY TELESCOPE

THE PROMOTION OF PUBLIC UNDERSTANDING OF ASTRONOMY IS ESPECIALLY IMPORTANT IN SOUTH AFRICA, WHICH WAS SUCCESSFUL IN THE BID TO HOST THE SQUARE KILOMETRE ARRAY (SKA) TELESCOPE: A GLOBAL SCIENCE AND ENGINEERING PROJECT TO BUILD THE WORLD'S LARGEST RADIO TELESCOPE, SET TO BE FULLY OPERATIONAL IN 2024. THE SKA PROJECT IS BEING UNDERTAKEN THROUGH COLLABORATION BETWEEN INSTITUTIONS IN 20 COUNTRIES AROUND THE WORLD, AND WILL BE HOSTED BY SOUTH AFRICA (KAROO REGION IN THE NORTHERN CAPE) AND AUSTRALIA. THE SKA TELESCOPE WILL PLAY AN IMPORTANT ROLE IN ASTRONOMICAL OBSERVATION, AS WELL AS DRIVING DEVELOPMENT IN INFORMATION AND COMMUNICATION TECHNOLOGY[8].

When asked how much they had heard about the SKA telescope, 83% of respondents said that they had heard very little or nothing at all, or did not know about the SKA telescope; while only 17% of respondents reported having heard something about it.

With reference to the location of the SKA telescope, only 19% of respondents were correct in their knowledge that it will be located in the Northern Cape. The majority of respondents (68%), however, replied that they did not know the location of the main site of the project.

Although LSM had a slightly positive influence on the percentage of respondents who had heard about the SKA telescope and those who were aware of its location, the majority of respondents were unaware of the SKA telescope and where it is being built. This is a cause for concern, particularly as the DST is trying to promote the relationship between the public and science. This illustrates a further impetus for creating further science awareness around scientific topics and developments.

The respondents were then given basic information about the SKA telescope in order to assess their attitudes towards it[9]. A minority (between 30% and 40%) of respondents agreed with the items. These data could inform outreach and communication strategies regarding the SKA telescope. Across the items, males exhibited more positive attitudes towards the SKA telescope than females. However these differences did not exceed 5%.

FIGURE 24: HOW MUCH HAVE YOU HEARD ABOUT THE SQUARE KILOMETRE ARRAY (SKA) TELESCOPE?

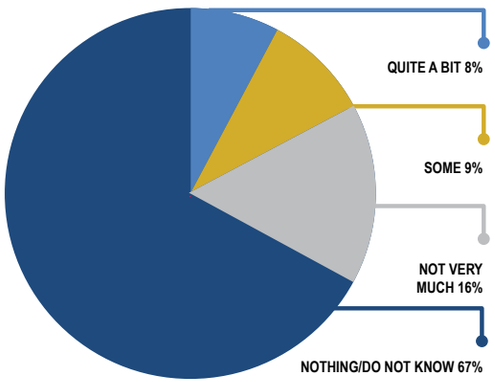


FIGURE 25: THE MAIN SITE OF THE SKA TELESCOPE IS IN WHICH OF THE FOLLOWING PROVINCES?

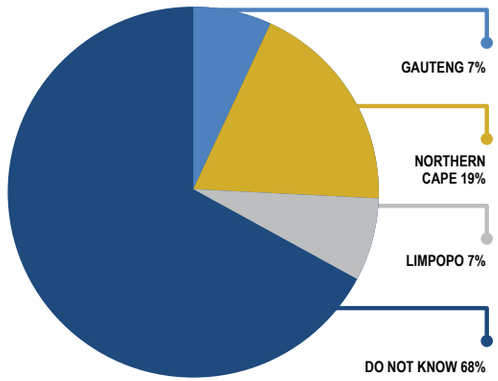
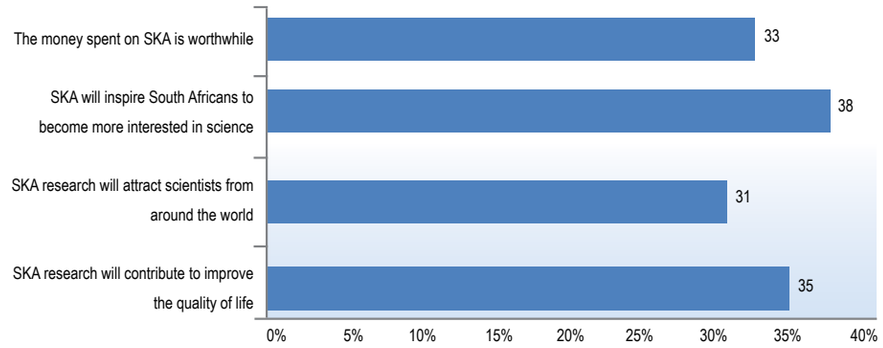


FIGURE 26: ATTITUDES TOWARDS THE SKA TELESCOPE



9. PERCEPTIONS OF SCIENCE AS A SCHOOL SUBJECT AND CAREER CHOICE

IT IS IMPORTANT TO UNDERSTAND THE PUBLIC'S VIEWS REGARDING THE VALUE OF THE SCIENCE THAT IS LEARNT AT SCHOOL, AS WELL AS THEIR ATTITUDES TOWARDS SCIENCE AS A CAREER CHOICE. A SET OF QUESTIONS THEREFORE SOUGHT TO DETERMINE HOW RESPONDENTS PERCEIVED THE VALUE AND USEFULNESS OF THE SCIENCE THAT THEY LEARNT AT SCHOOL, AND HOW THEY FELT ABOUT SCIENCE AS A CAREER.

FIGURE 27: PERCEPTIONS OF SCIENCE BY AGE

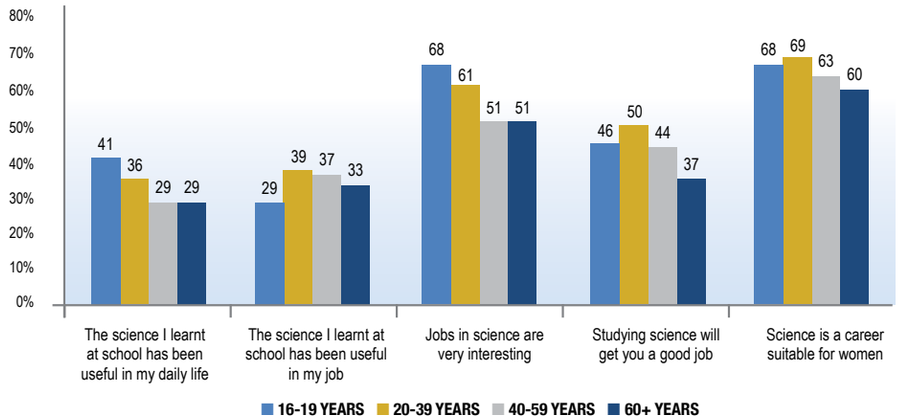
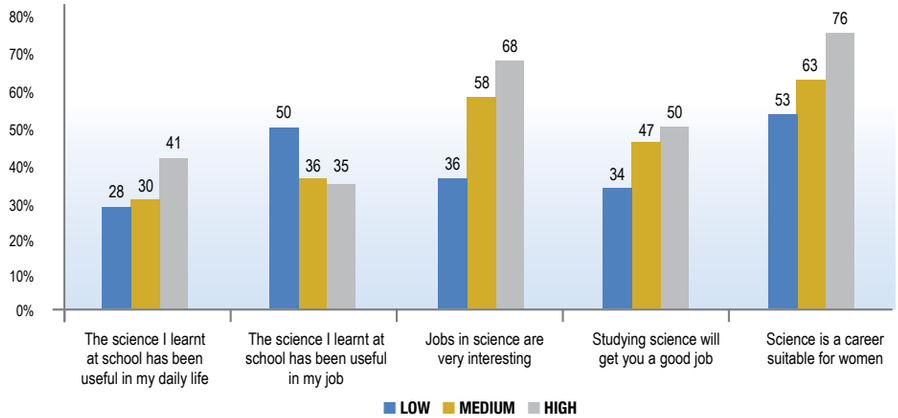
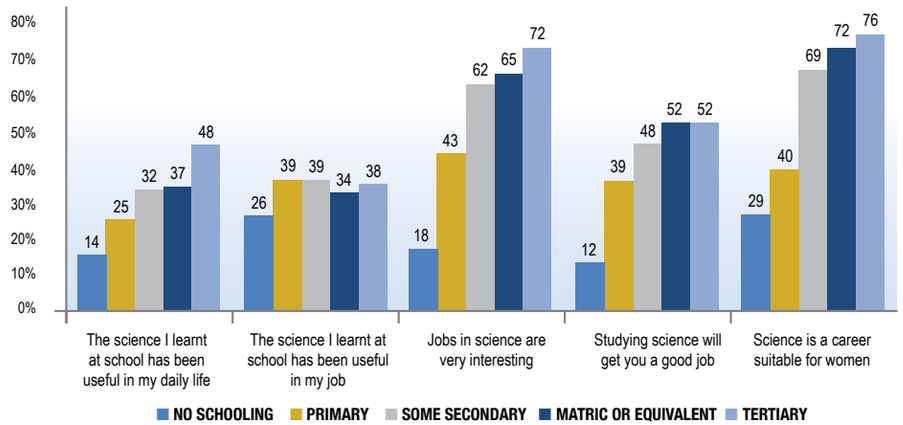


FIGURE 29: PERCEPTIONS OF SCIENCE BY LSM



The usefulness of the science that was learnt at school in an individual's daily life was recognised by 33% of respondents, while 36% acknowledged its value in their jobs and 47% will get you a good job. Despite only a third of respondents agreeing with these statements, nearly half of them agreed that studying science will get people a good job, and more than half said that jobs in science are very interesting. Two thirds (66%) of the respondents also stated that science is a career suitable for women, emphasising the entrenchment of a progressive mindset.

FIGURE 28: PERCEPTIONS OF SCIENCE BY EDUCATIONAL ATTAINMENT



School science experiences have an important influence in shaping peoples' attitudes towards both school science and science in general. It is therefore crucial to ensure that positive school science experiences are provided in order to promote a public that has positive attitudes towards science.

10. KNOWLEDGE OF SCIENCE CENTRES

The DST is responsible for promoting science and technology awareness among the public. One way in which such awareness can be measured is by examining the knowledge that the public has regarding the existence of science centres in their areas. Science centres are an important space for science and technology promotion. Respondents were asked if they knew of a science centre in their area or closest town, city or village. Only 11% of respondents (national average) stated that they knew of a local science centre, while 89% did not know of the existence of one.

FIGURE 30: AGE

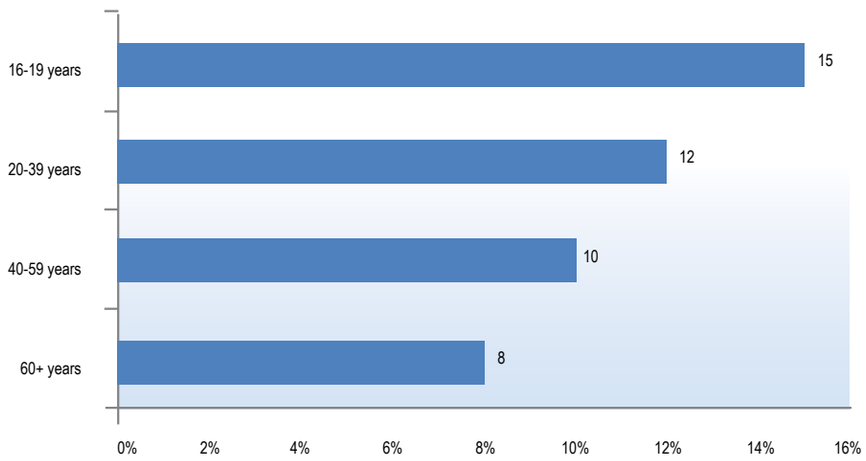
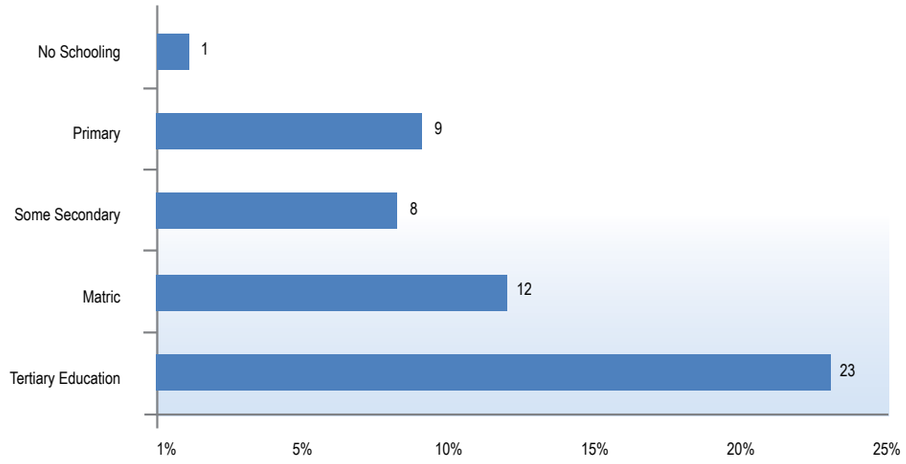
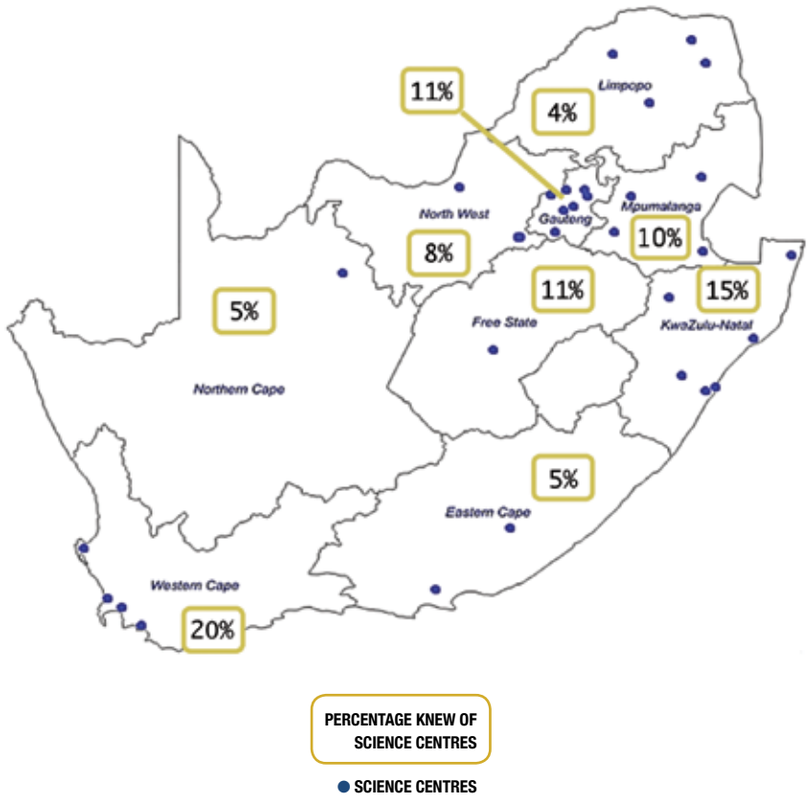


FIGURE 31: EDUCATIONAL ATTAINMENT



The lack of awareness about the existence of the 34 science centres in the country was evident across age, education levels and provinces. The awareness of a science centre in close proximity to respondents decreased with age, and increased with educational attainment. The highest awareness existed in the 16-19 age group (15%), and among those with a tertiary education qualification (23%).

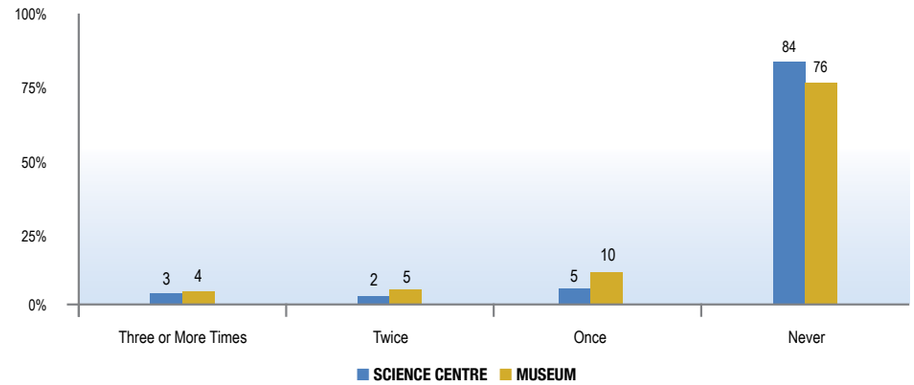
FIGURE 32: MAP - DISTRIBUTION OF SOUTH AFRICAN SCIENCE CENTRES AND AWARENESS OF NEARBY SCIENCE CENTRES



Those in the Western Cape (20%) and KwaZulu-Natal (15%) showed the highest levels of awareness of a nearby science centre, while 5% or less of the respondents from the Eastern Cape, Northern Cape and Limpopo knew of a science centre near them.

Respondents were then asked how many times they had visited a science centre or museum in the year prior to completing the survey. Less than 5% said they had visited a science centre or museum three or more times in the last year, while 2% and 5% respectively had visited a science centre or museum twice, and 5% and 10% had visited a science centre or museum only once in the preceding year. Eighty-four percent of respondents indicated that they had not visited a science centre, and 76% had not visited a museum in the last year.

FIGURE 33: INSTANCES OF VISITING A SCIENCE CENTRE OR MUSEUM IN THE PRECEDING YEAR



This echoes the previous findings, as people are not aware of the existence of science centres and therefore will not be visiting them. These science centres and museums have the potential to play a significant role in educating the public about science and technology, and creating science awareness. It is therefore essential that they are promoted further so that they can fulfil this role to a greater extent.

11. FINDINGS AND RECOMMENDATIONS

11.1. FINDINGS

THE PUBLIC'S ATTITUDES TO SCIENCE, AND TRENDS FROM 1999 TO 2013

The promise-reservation index consists of a set of seven items that have been included in the 1999, 2010 and 2013 surveys.

- The South African public expressed views that science and technology make their lives easier, healthier, and more comfortable; will make work more interesting; and will create more opportunities for the next generation.
- On the other hand, the public are also concerned that science makes their way of life change too fast, and that we depend too much on science and not enough on faith.
- The overall assessment of the role of science in society is finely balanced, with around half the public feeling that the benefits of science are greater than the harmful effects.
- The trend evident from 1999 to 2013 is that the extent of promise attitudes is decreasing, and reservation attitudes are increasing. This could be due to the increased educational levels of the population, and the public being more circumspect in their assessment of science and technology.
- The views and attitudes expressed are complex and multi-dimensional. They are shaped by age, educational attainment and socio-economic status (LSM). South Africans who are younger, with higher levels of education and higher living standards, tend to appreciate both the value and risks of science and technology developments.
- The analysis by gender revealed no exceptional differences in attitudes expressed by the respondents.
- The knowledge of, interest in and attitudes of the public towards contemporary scientific and technology developments, are varied. The public tends to be more knowledgeable about, and interested in, topics that they have direct experience with (medicine, internet); and topics that have been debated in the public domain over a sustained period (climate change). More recent science and technology developments (SKA telescope, nuclear technology) exhibited the lowest levels of knowledge and interest.

THE PUBLIC'S ATTITUDES TO ASTRONOMY AND THE SKA TELESCOPE

We have direct experience of astronomy through our observation and interest in the sky, stars and space.

- Thirteen percent of the 2013 South African public were interested in astronomy and space (compared to 23% in the Eurobarometer 2005). However, 42% of SASAS 2013 respondents agreed with the statement 'I like to go outside and look at the sky at night', and 44% indicated that 'astronomy is interesting'. The extent of the attitude was related to age, educational level and living standard measure.
- Knowledge about the SKA telescope was limited. Only one in six South Africans were aware of the project, and one in 10 people knew the location of the SKA telescope.

HOW THE PUBLIC ACCESSES SCIENTIFIC INFORMATION

Information about science and technology developments is key to shaping a view or attitude.

- One third of the public felt informed about scientific developments.
- The most popular sources of scientific information were TV and radio (close to half of the public use these sources); a quarter of the public accessed scientific information through print media, the Internet and other people; and 14% accessed information through public spaces.
- The use of print media has decreased over time, and the use of the Internet has increased as it has become more widely accessible.
- The usage pattern of TV, the Internet, books and magazines, and other people as sources of information decreased with age.
- The use of radio to access scientific information was consistent across age groups.
- Gender patterns of access to scientific information show that males were more exposed to the various sources of science information.

THE PUBLIC'S PERCEPTIONS OF SCHOOL SCIENCE AND SCIENCE AS A CAREER

Exposure to science at school influences current and future interest in, and attitudes towards, science and scientific issues.

- One third of the public thought that the science they learnt in school had been 'useful' in their daily lives or in their jobs. A higher proportion of the public thought that 'jobs in science are interesting' (60%), and that 'studying science will get you a good job' (47%).
- It is pleasing that two-thirds (66%) of the public thought that science-related careers are suitable for women.
- In general, there was a stronger relationship between positive perceptions of school science and careers, and higher educational and LSM levels.

THE PUBLIC'S KNOWLEDGE OF SCIENCE CENTRES

Science centres are one of the key institutions for the promotion of science and technology awareness.

- There was limited knowledge of science centres, with only one in 10 respondents being aware of a science centre located in close proximity to them. Awareness was higher among young people (16-19 years), and those with a tertiary education qualification.
- There was higher awareness in the Western Cape and KwaZulu-Natal provinces. There are six science centres in KwaZulu-Natal and five in the Western Cape.

11.2. RECOMMENDATIONS

RECOMMENDATIONS FOR POLICYMAKERS AND SCIENCE COMMUNICATORS

Awareness of, interest in and attitudes towards science are amenable to change, and are dependent on knowledge of science and technology debates and developments. Communication strategies are key to changing perceptions of science, and science and technology developments. From this study, the following are recommended:

- The focus on improving educational levels in the country must be supported, as increased science and technology awareness and knowledge is linked to higher levels of education.
- Changing awareness, interest and attitudes takes time and requires sustained communication efforts, and the communication of specialised science domains requires a sustained public education and outreach campaign. This sustained involvement should be built into any science communication plan.
- The science engagement strategy must include the school sector, and use the school curriculum as an instrument to communicate specialised contemporary science and technology topics and developments, as this would afford an opportunity to engage with 12 million young people.
- Radio and television should be used to communicate science and technology information in order to reach the majority of the population.
- There should be more science spaces across the country where the public can engage with science.

RECOMMENDATIONS REGARDING METHODOLOGIES

Understanding attitudes is a complex endeavour that will require utilising a range of innovative methodologies, such as the use of social media. Mixed-method techniques that incorporate qualitative studies will aid in the understanding of the nature of attitudes against a contextual landscape.

It is important that periodic surveys are conducted, as the trend analysis will provide information about the continuity and changes of awareness, interest and attitudes over time. This is especially important as educational levels, living standards and access to information are changing. These could be contributory factors in the changing attitudes to science. This will require ongoing detailed analysis of new and existing data sets over time.

A research challenge in exploring the public relationship with science is how to tap into the public's awareness, understanding, interest and knowledge without using an expert register. Preliminary qualitative studies must be conducted to establish how the non-expert public understands the issues, and this understanding must be used to construct an appropriate survey instrument.

RECOMMENDATIONS FOR FUTURE RESEARCH

This report presents the first level of analysis of the data on the South African public's relationship with science. The findings have pointed to further areas of research, including:

- A shift from the descriptive to explanatory analyses. Since age is the most powerful demographic variable to have an effect on attitudes towards science, what is it about the 'younger generations' that causes this substantial social trend? Why are their attitudes towards science, both in terms of promise and reservation, more intense? What does this mean for policy?
- Policy analysis in relation to the promotion of a scientific culture, and integration into public policies for Science, Technology and Innovation;
- How sources of information, including the media and popular culture, shape attitudes towards science. The growth of the Internet is a key issue for communication and will become increasingly important;
- Analysis of science in the media;
- How attitudes relate to behaviour and behavioural change.

NOTES

1 See Roberts, B, Kivilu, M & Davids, Y (eds). (2010). South African Social Attitudes: The 2nd Report Reflections on the Age of Hope. Cape town: HSRC Press

2 Department of Science and Technology (2014). Science Engagement Framework: Science and society engaging to enrich and improve our lives.

3 Reddy, V., Juan, A., Gastrow, M. & Bantwini, B. (2009). Science and the publics: a review of public understanding of science studies. (Commissioned by the South African Agency for Science and Technology Advancement)

4 Reddy V, Gastrow M, Juan A, Roberts B (2013). Public attitudes to science in South Africa. South African Journal of Science. Vol 109(1/2)

5 More recent Eurobarometer surveys have used more broad categories to explore the public's interest in science, and this is therefore the survey that is most comparable with the 2013 SASAS question.

6 The India Science Report is focused on research in India and The National Science Foundation's (NSF) Science and Engineering Indicators provide the results for the United States of America (USA). The Eurobarometer survey results were used to extract information for the United Kingdom and France.

7 International Astronomical Union, 2012; www.iau.org.

8 The Square Kilometre Array Telescope: www.skatelescope.org

9 The following was read to respondents to provide them with background of the SKA telescope: "The Square Kilometre Array (SKA) is the world's biggest telescope being developed in Australia and South Africa and will let scientists look at the sky in more detail than before to answer questions about the universe".

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