The Public Awareness of Science and Technology Malaysia 2008

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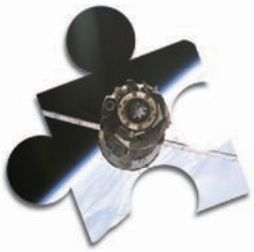
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION
MALAYSIA



The Public Awareness of Science and Technology Malaysia 2008

Publisher:
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First Printing - July 2010

ISSN: 1394 – 9209

ISSN 1394-9209
9 771394 920007

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MESSAGE BY
MINISTER OF SCIENCE, TECHNOLOGY AND INNOVATION

First and foremost, I would like to congratulate all the parties involved for their effort in making the publication of the survey on the Malaysian Public's Awareness of Science and Technology (2008) a success. This valuable input is most useful for national level sciences. This valuable input is most useful for national level science and technology planning.

We live in a highly competitive globalised world in which the most successful countries are the ones that have equipped their citizens with high-level skills in science and technology. Recognising this, our Prime Minister has called for the transformation of Malaysia, utilising science, technology and innovation. This is in line with Malaysia's aspiration to become a fully developed innovation-led economy and a developed nation by the year 2020.

Bearing that in mind, the Ministry of Science, Technology and Innovation (MOSTI) has the mission of promoting science, technology and innovation for knowledge generation, wealth creation and societal well-being. We hope to achieve this through championing scientific discovery and transforming innovation to achieve sustainable development.

The journey towards becoming an innovation-led economy driven by science and technology is a long and arduous one. We have invested a great deal of time and effort and we will continue to do so. However, we need to check periodically, as to whether we are moving in the right direction. To this end, we have conducted many studies, the most recent being a survey on the Malaysian Public's Awareness of Science and Technology (2008).

I sincerely hope that this report will be considered useful to all stakeholders in their effort to promote the mainstreaming of science and technology in the lives of Malaysians.

DATUK SERI DR. MAXIMUS JOHNITY ONGKILI, JP

SECRETARY GENERAL'S MESSAGE
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

This report, the seventh in a series of surveys on the Malaysian public's awareness and understanding of, interest in and attitude towards science and technology, addresses a number of issues related to public involvement in and commitment to science and technology. This is important in view of the fact that Malaysia is aspiring to become a developed nation, driven by an innovation-led economy by the year 2020. This requires the intensification of our efforts to promote science and technology to the public.

While the Malaysian government has invested heavily in science and technology infrastructure, research and development facilities to bring us on par with those of developed nations, the Malaysian public is apparently lagging behind the citizens of developed nations in terms of knowledge and understanding of, attitudes to and interest in science and technology. Given the highly competitive global economy, it will be virtually impossible for Malaysia to become a developed nation by 2020 without a critical mass of her citizens being involved in science and technology endeavours.

In response to this, we have initiated several programmes, in collaboration with various government agencies and other stakeholders, to sensitize the public towards science and technology. Our ultimate aim is to engage a large proportion of the Malaysian public to be interested and involved in science and technology endeavours, on par with developed nations. Thus this report shows where we are now and what is left to be done within the next 10 years.

I wish to congratulate the Malaysian Science and Technology Information Centre (MASTIC) of the Ministry of Science, Technology and Innovation (MOSTI) and all parties involved in the survey and for ably executing such a momentous task. We sincerely hope that it will be a valuable input to our national agenda on science and technology in the years to come.

DATO' MADINAH BINTI MOHAMAD

ACKNOWLEDGEMENTS

MASTIC wishes to extend our appreciation to all the individuals and organizations whose involvement and commitment have contributed towards the successful completion of the 2008 Report on The Public Awareness of Science and Technology Study. We would like, in particular, thank the Secretary – General of the Ministry of Science, Technology and Innovation for extending invaluable guidance and support.

We also wish to thank all those members in the Technical Committee for their contributions. Their assistance, advice, and suggestions were invaluable in carrying out the survey and in completing the report.

Last but not least, we would like to thank consulting firm IIUM Entrepreneurship and Consultancies Sdn. Bhd., and the research team led by Prof. Dr. Ratnawati Mohd Asraf for carrying out the 2008 Public Awareness of S&T survey, and in compiling and analysing the data as well in preparing the 2008 Report in collaboration with MASTIC.

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HIGHLIGHTS OF THE 2008 SURVEY

HIGHLIGHTS OF THE 2008 SURVEY

INTEREST IN S&T

- In general, the Malaysian public is moderately interested in the S&T issues surveyed.

- Malaysians were most interested in computer technology, inventions and new technology in Malaysia, the latest inventions in new technology, and environmental pollution.

- Throughout the years, however, there has been a gradual decline in interest in environmental pollution. Given the importance of preserving our already threatened environment, this trend is disturbing.

- Urban respondents expressed greater interest in S&T than their rural counterparts. However, the difference is marginal, and the gap between urban and rural Malaysians in terms of their perceived interest in S&T is narrowing, especially when compared to the 2004 S&T awareness Survey.

- Malaysian men and women do not differ very much in terms of their interest in S&T issues. A higher percentage of Malaysian women, however, expressed interest in the latest inventions in medicine.

PERCEIVED KNOWLEDGE IN S&T

- Comparisons across previous surveys indicate that overall, the Malaysian public perceived themselves as having a weak to average knowledge of S&T issues. However, the results of the 2008 survey show that Malaysians perceived themselves as having a weak knowledge of S&T issues.

- The S&T issues that a higher percentage of the Malaysian public reported having knowledge of are those related to: environmental pollution, the use of computer technology, and innovations in the field of telecommunications. On the other hand, the S&T issues which a smaller percentage of Malaysians reported having knowledge of include research in science and technology, the use of nuclear technology to generate power, and the latest inventions in science.

- The results of the 2008 survey also indicate that in terms of perceived knowledge, the rural-urban divide is narrowing. So is the gender divide. This suggests that the measures that have been taken towards gender equality and efforts to bridge the gap between rural and urban Malaysians are successful.

- Educational level is still an important factor that influences the level of perceived knowledge. The highest percentage of Malaysians that perceived themselves as having a good knowledge of S&T issues are those with tertiary education. With regard to age group, the trend has remained unchanged; the highest percentage of those who perceived themselves as having a good knowledge of the S&T issues are the youth.

ATTITUDES TOWARDS S&T

- The attitudes of Malaysians towards S&T have improved markedly over the years. For instance, in 2008, 73.8% of Malaysians agreed that scientific research has more positive than negative effects, compared to 69.1% who said so in 2004, 62.0% in 2002, 43.8% in 2000, and 45.3% in 1998.

- Generally, Malaysians have positive attitudes toward S&T.

- More than 70% of Malaysians feel that:
  - S&T improves the quality of our lives
  - S&T is very important for the progress of our nation
  - we need to have knowledge about science in order to manage our lives
  - daily work will be more efficient with the use of S&T

More than 2/3 of Malaysians feel that S&T has positive effects on:

- working conditions,
- public health, and
- individual enjoyment of life.

UNDERSTANDING OF S&T

- This survey reveals that Malaysians' level of understanding of several S&T issues varies according to the issues. More Malaysians answer correctly to statements such as:

- "Smoking causes lung cancer" (81.1%).
- "Plants produce the oxygen that we use for breathing" (76.4%)
- "The earth travels around the sun" (72.6%)
- "The earth takes 365 days to travel around the sun" (68.4%)
- "The centre of the earth is very hot" (66.0%)

However, Malaysians lack understanding of the following issues:

- "Antibiotics kill not only viruses but also bacteria" (7.6% answered correctly in 2008)
- "All radioactivity is man-made" (14.0%)
- "Lasers work by focusing sound waves" (15.5%)
- "Milk that is contaminated by radioactivity will be safe to drink after boiling" (28.9%)
- "Electrons are smaller than atoms" (33.0%)

- More urban than rural Malaysians, and more youth than adults and children have a correct understanding of all the various S&T issues surveyed. Males and females do not differ very much in their understanding of the S&T issues.

- On the controversial issue of human evolution, 50.8% of Malaysian adults, youth, and children considered as FALSE, the statement, "Human beings as we know them today developed from earlier species of animals". This statement, however, was not used to assess their understanding of S&T as it is not regarded as a fact.

S&T INFORMATION SOURCES AND S&T RELATED PLACES

- Television (82.4%) and newspapers (62.1%) are Malaysians' primary sources of S&T information, as well as the most trusted.

- Malaysians relied least on the Internet (24.8%)

- Malaysians prefer to visit:
  - Zoos (30.0%)
  - Museums (29.9%)
  - Parks (29.7%)

- A lower percentage of Malaysians visit the following places:
  - Aquariums (18.6%)
  - Petrosains (13.9%)
  - Science center (11.1%)
  - Planetarium (10.3%)

INTERNATIONAL COMPARISON

- In terms of interest in science and technology, Malaysia ranks slightly above India, but remains far below the US, Europe and South Korea.

- In terms of knowledge of science and technology, Malaysians are familiar with low level S&T concepts, but are acutely lacking in their knowledge of specialised S&T concepts, specifically regarding radioactivity, antibiotics, lasers, broadband, global warming and biotechnology.

- Malaysian responses to questions about evolution have remained virtually unchanged over the past 10 years. Only 17% of adult Malaysians agree with the theory of human evolution.

1 INTRODUCTION

1

INTRODUCTION

Science and technology (S&T) are increasingly influencing the way society operates. New discoveries in S&T are changing the social, ethical, political, and economic structures all over the world. Today, rich countries are not those endowed with abundant natural resources, but those which have managed to harness their human resources to produce innovations and solutions in the areas of S&T. We are living in a highly competitive world, but the nature of competition has changed from physical resources to technological and scientific know-how. Thus promoting scientific knowledge and a scientific culture among citizens is of paramount importance for any country that wants to be relevant in today's world.

In response to this situation, Malaysia in February 1991 adopted the *National Vision Policy* (Vision 2020) which expresses her aspiration to become a developed nation driven by S&T. The major goal of this initiative is for Malaysia to become one of the most developed knowledge-based economies in the world by the year 2020. As part of this vision, Malaysia is committed, among others, to becoming a "scientific and progressive society," "an economy that is ... fully able to adapt, innovate and invent, increasingly technology-intensive..." and "an economy driven by brainpower, skills and diligence, in possession of a wealth of information."

To make this vision a reality, Malaysia has to enhance her competitiveness in today's highly competitive, globalised and liberalised world. There is a need to increase value-addition in all economic sectors by developing a knowledge-based economy and optimising the brainpower of the nation. This requires enhancing the scientific knowledge and technical skills of the citizens so that they become more competent and conversant with the highly competitive and high value-added new economic endeavors.

In line with this, Malaysia launched the *Knowledge-based Economy Master Plan* in the year 2000 with the aim of ensuring "the optimal and ever-increasing application of knowledge in the production processes in all sectors of the economy," and "the vigorous development of viable knowledge empowering and enabling industries as well as profitable and high value-added knowledge intensive industries."

In the past decade, Malaysia has worked very hard to upgrade her Research & Development (R&D) and S&T infrastructure, while at the same time working on enhancing the public's knowledge of and interest in S&T. Without awareness, knowledge, and interest, all efforts towards upgrading skills in S&T, which are critically important for ensuring competitiveness and improvements in total factor productivity, will be futile.

For a nation to become advanced in S&T, a critical mass of its citizens must possess a high level of science literacy. This presupposes a good infrastructure for the creation and dissemination of scientific knowledge. To this end, a few questions are in order. How are S&T taught in the school system? To what extent are our children helped to appreciate and understand scientific innovations? In what ways are members of the public informed about the benefits, as well as the dangers, of scientific innovations? How committed are the different mass media to disseminating scientific information

to the public? To what extent are Malaysian citizens informed about and attracted to careers in S&T? Finding answers to the foregoing questions and the like can go a long way in helping the policy makers to know how close the nation is to achieving its vision of creating a knowledge-based economy and becoming a fully developed nation by the year 2020.

For Malaysia to become a developed nation driven by a knowledge-based economy, a good percentage of her citizens will have to be working in S&T related fields. This presupposes that a large segment of the public realise and appreciate the importance of S&T for the betterment of society and choose to pursue careers in it. In other words, members of our society need to have positive attitudes towards S&T. We need to be concerned with the following questions: What is the attitude of the public towards S&T? How interested are they in S&T? How aware are they of issues pertaining to S&T? What do they understand of S&T? Finally, we also need to determine where we stand with regard to the public's awareness and understanding of, interest in, and attitude towards S&T compared to other developed countries before we can consider ourselves to be a fully developed nation.

In this context, the Malaysian Science and Technology Information Centre (MASTIC) set out to assess the public's awareness and understanding of, interest in, and attitude towards S&T. The first study on The Public's Awareness of S&T was conducted in 1994, and subsequently, in 1996, 1998, 2000, 2002 and 2004.

THE PURPOSE OF THE 2008 S&T SURVEY

This is the seventh survey in a series of surveys on The Public's Awareness of S&T, and was aimed at assessing the public's awareness and understanding of, interest in, and attitudes towards S&T, and their corresponding factors. It was aimed at addressing the following questions:

- How aware is the Malaysian public of S&T issues?
- What is the public's understanding of various S&T issues?
- How interested are they in S&T?
- What are their attitudes towards S&T?
- Has there been an appreciable difference in the public's awareness of, attitude towards, interest in, and understanding of S&T compared to the previous years in which similar studies were conducted?
- What are the public's expectations of and aspirations with regard to S&T?
- What S&T facilities are accessible to the public? Is the public aware of, and does it participate in government-sponsored S&T programmes?
- What improvements can be made to these programmes?
- How does the public perceive work opportunities in S&T?

It is important to ask these questions as they indicate the public's interest in and attitude towards, and how interested they are in S&T, which affect their later commitment to S&T. Knowing the answers to these questions would enable us to propose and then implement appropriate strategies that could increase the public's interest in and understanding of S&T, so that they would be more inclined to contribute to the growth of S&T in the country. Finally, it is also important to ask how Malaysians compare to their counterparts in developed countries to determine whether we are at par with these countries, and whether we can consider ourselves to be a scientifically literate and technologically advanced country.

RESEARCH METHODOLOGY

This chapter discusses the research procedures carried out in this survey. Specifically, it discusses the steps taken to ensure the validity and reliability of data, the sampling design and the statistical procedures used, and the definitions of the important terms and constructs used in this survey.

DEFINITIONS OF TERMS

The following are the definitions of the terms used in this survey.

Public

The term *public* refers to Malaysians who are in the 12-60 year-old age group.

Awareness

The term, *awareness*, as used in this survey and in the 1998 to 2004 Public Awareness surveys, refers to a person's state of knowing about an issue as a result of his or her either having heard about it, read about it, seen it, or felt its existence. This term is defined and measured by the respondents' responses to Question 10a of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire.

Perceived Interest

The term, *perceived interest*, as used in this survey and in the 1998 to 2004 Public Awareness surveys, refers to what the respondent has professed or reported to be his or her interest in S&T. This term is used in the same manner as the term *professed interest*, as used in the NSF surveys in the United States, and is defined and measured by the respondents' responses to Question 12 of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire.

Perceived Knowledge

The term, *perceived knowledge*, as used in this survey and in the 1998 to 2004 surveys, is defined as the public's perception of what they know about science and technology, and is measured by the respondents' responses to Question 12 of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire. This term is used in the same sense as the term *informedness* as used in the NSF surveys.

Understanding

The term, *understanding*, in this survey, refers to assessed or objective understanding, and is defined and assessed by the respondents' responses to questions 11 and 13 of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire. This term is used in the same sense as the terms, *understanding* and *objective understanding*, as used in the 1998 to 2004 Public Awareness surveys.

Perceived Understanding

In this survey, the public's *perceived understanding*, or their perception of their understanding of science and technology, is defined and measured by the respondents' responses to question 10b of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire. This term is used in the same sense as the term *subjective understanding* as used in the 1998 to 2004 Public Awareness surveys.

Attitude

The term, *attitude*, as used in this survey refers to a respondent's degree of like or dislike for a particular S&T issue, which is influenced by the respondent's evaluative judgment of the issue to be inherently positive or negative. This judgment is reflected in the behaviour of the respondent when he/she agrees or disagrees with a given statement about S&T. In the context of the present survey, the public's attitudes towards S&T are measured and defined by the respondents' responses to Questions 15, 16, 17, 19, 20, 21, 22, and 23 of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire.

Urban

In this survey, *urban* refers to the gazetted areas with a population of 20,000 or more persons.

Rural

In this survey, *rural* is used to refer to the gazetted areas with a population of less than 20,000 persons.

POPULATION

In this survey, the *population* is defined as all Malaysians aged between 12 to 60 years old. According to the Population Census for the year 2000, the Malaysian population was 23,274,690.

PROCEDURES

A nationwide survey was conducted on 18,447 respondents to assess the Malaysian public's awareness of science and technology. Because we are trying to generalise from our sample to the population, the adequacy of the sample as a basis for making generalisations is of paramount importance. Hence, proper attention was paid to the construction of the instrument, the sampling procedures, the methods of data collection, and the methods of data analysis, as all these factors affect the generalisability of the results. To ensure the validity and trustworthiness of the data, the following measures were undertaken:

The Use of Confidence Intervals

In order to allow us to generalise the findings of the survey to the entire Malaysian population, confidence intervals were constructed on the responses gathered from the sample. This statistical inference technique allows us to infer, from the sample, with a specified level of confidence and accuracy, and hence, within a certain margin of error, the proportion of those whom we did not survey, that is, those in the population, who feel the same way as our respondents on the issues covered in the questionnaire. Hence, confidence intervals give us estimates of the population value. This research team holds to the principle that it is good research practice to specify the sampling error, that is, the probability of error, inherent in making generalisations from sample to population. The construction of confidence intervals as used in this survey is not unlike that used by well-known and respected surveys such as the Gallup Poll, the Harris Poll, and so on.

Random Selection

The research team took great pains to ensure that the subjects were randomly selected because randomisation is a fundamental assumption underlying the use of any form of statistical inference. Randomness is also essential for the generalisability of the results, as it will ensure, within a certain known margin of error, representativeness of the samples.

Sample Size

In addition to getting a random sample, the researchers also took steps to ensure that the sample was of an adequate size to minimize the probability of error. The sample size that we sought to obtain was to allow us to justifiably construct confidence intervals with an accuracy of $\pm$ 1% and confidence of 99% (which is the probability that the calculated intervals will contain the population value).

The sample size needed to calculate confidence intervals on Population Proportion at the levels of accuracy and confidence desired by the researchers was obtained by applying the formula: *(Source : Brewer, J.K. 1988, Introductory Statistics for Researchers)*

$n = z^2e\ PQ/d^2$, where:

- n = sample size
- z^2e = standard normal deviate value associated with the confidence level
- P = population proportion
- Q = 1-P
- d = accuracy of the estimate

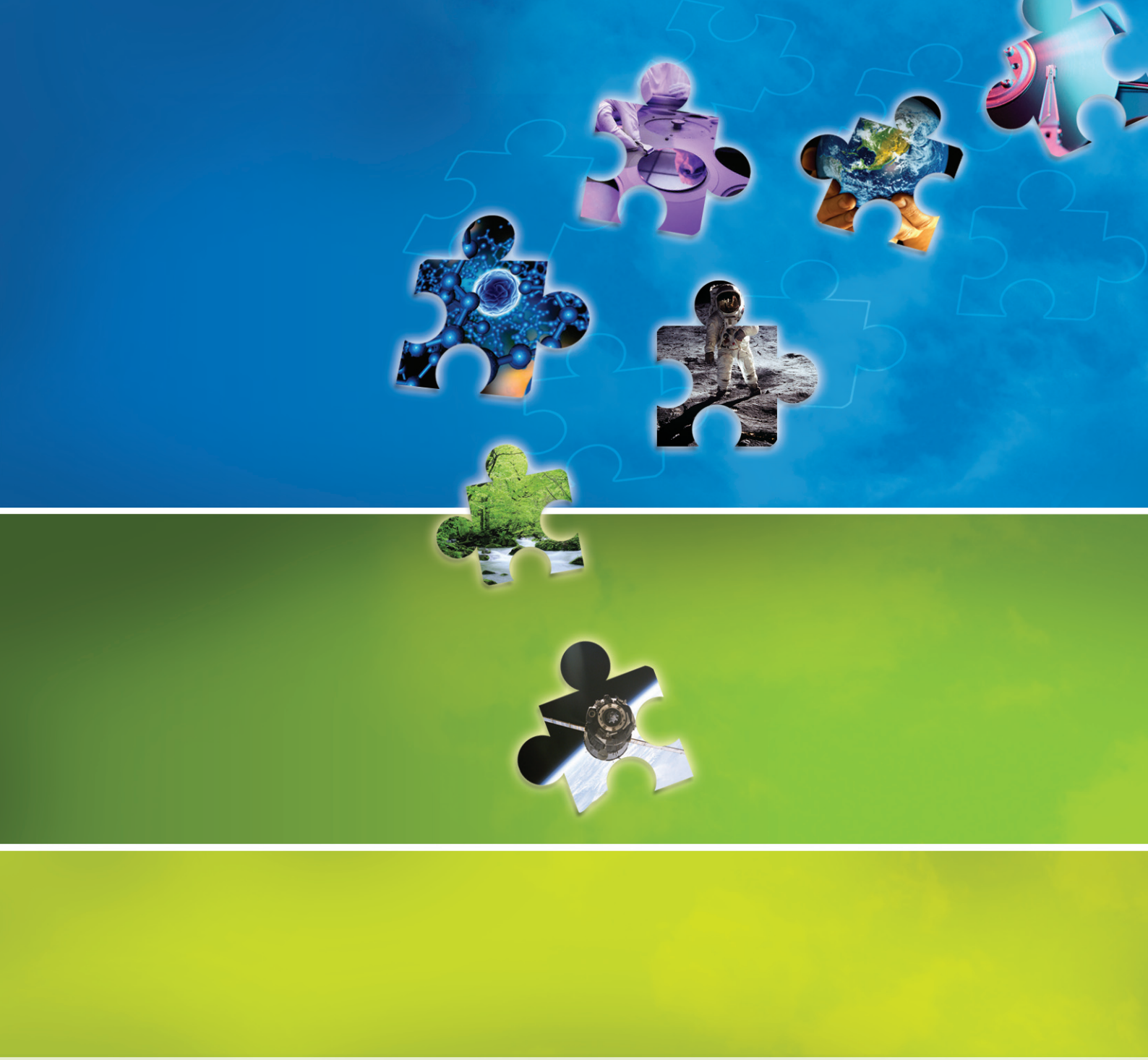
Given that the largest possible n for a fixed d (thus getting a conservatively large sample size) would be obtained when P=Q=1/2, and with confidence set at

0.99 and accuracy to be ± 1% of the true proportion, the sample size needed to calculate a confidence interval on the population who agree to the statements is $\frac{(2.57)^2\ (1/2)\ (1/2)}{(0.01)^2} = 16{,}500.$

The sample size that was proposed by the Malaysian Statistics Department was 19,312, and the sample that was actually obtained was 18,447. Hence, the sample size that was actually obtained would be more than sufficient to enable us to infer, from our sample percentages, and with 99% confidence and an accuracy of ± 1%, the proportion of those whom we did not survey, that is, the population, who feel the same way as our respondents on the issues covered in the questionnaire.

Research Instrument

The research instrument was adapted from the instruments used in previous Science and Technology Awareness Studies. However, several modifications were made to the questionnaire, such as the inclusion of new items to take into consideration new developments in S&T, the rewording of certain items for clarity, and the deletion of certain items that we felt to be no longer relevant to the issue.



2 THE FINDINGS

2

THE FINDINGS

THE PUBLIC'S PERCEIVED INTEREST IN S&T ISSUES

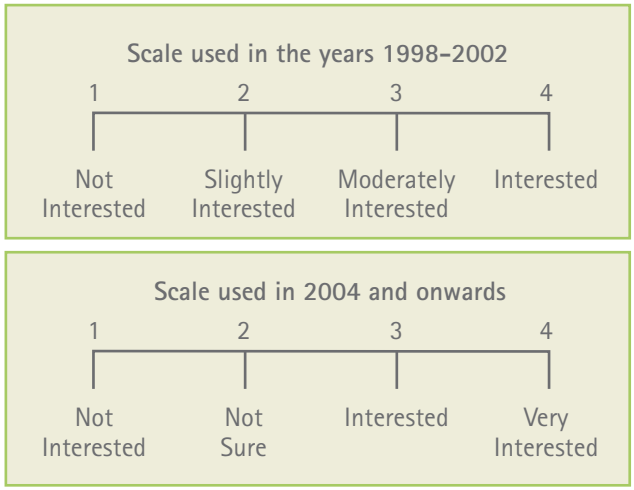
Interest in S&T is an important indicator for planning programmes aimed at developing the science literacy of citizens. In this survey, *"perceived interest"* as opposed to *"real interest"* is reported, where it is taken to refer to what the respondent has reported to be his or her interest in S&T. This conceptualization of *"perceived interest"* is similar to the one used in previous surveys and in the NSF surveys in the United States. *Perceived interest* is defined and measured by the respondents' responses to the 11 items in Question 12 of The Public's Awareness of Science and Technology Malaysia 2008 questionnaire.

An analysis of the trends from 1998 to 2008 shows that the interest of the Malaysian public towards S&T has remained relatively constant. Throughout the years, Malaysians have been between slightly to moderately interested in S&T as indicated by the overall mean of 2.42 for 2000, 2.41 for 2002, 2.40 for 2004 and 2.39 for 2008.

It is important to note at this juncture that the scale used in this year's study – as in the 2004 survey – differs from the one used in the surveys conducted from 1998 to 2002 **(Figure 1)**. Nevertheless, this difference in orientation does not affect the interpretation of 2.40 as denoting "moderately interested".

Between 1998 to 2008, the respondents reported that they were moderately interested in issues related to *space exploration* (2.18 to 2.54), *latest inventions in science* (2.29 to 2.66), *inventions and new technology*

Figure 1: Scales Used in the Different Years



in Malaysia (2.48 to 2.83), *economy & commerce* (2.25 to 2.90), and *innovations in telecommunications technology* (2.49 to 2.56) **(Appendix 1)**. *The use of nuclear technology to generate power*, on the other hand, generated lower levels of interest (1.97 to 2.35). The S&T issue that registered the highest level of interest is *environmental pollution* (2.48 to 3.06) and *the use of computer technology* (2.54 to 2.95).

The level of public interest in most of these issues is varied across the years surveyed, with the exception of the interest in *environmental pollution*, which displayed a gradual decline. Given the importance of preserving our already threatened environment, this trend is disturbing. On the other hand, an increase in perceived interest is seen in three issues related to *space exploration, the use of nuclear power to generate power,* and *economy & commerce*. It is highly likely that the increased interest in *space exploration* was stimulated by Malaysia's "National Angkasawan

Programme," which was given broad coverage by the Malaysian media throughout the nation's involvement in the project between 2007 and 2008. The public's interest in the other two issues could have been stimulated by the sudden oil crisis that took the world by surprise at the time the survey was conducted.

For the 2008 survey, the issue that the highest percentage of respondents expressed interest in (based on the categories of "interested" and "very interested") is *computer technology* (56.9%), while issues related to *research in S&T* (34.2%) and *use of nuclear technology to generate power* (38.1%) **(Appendix 2)** charted lower percentages of respondents' expressing interest in. More than 50.0% of the respondents surveyed indicated interest in the following S&T issues: *the use of computer technology, inventions and new technology in Malaysia, latest inventions in new technology, innovations in telecommunications technology, environmental pollution, and latest inventions in the field of medicine.*

The results of the survey also indicate that there is no real gender divide **(Appendix 3)**. Interest in S&T issues remains close for men and women, with men recording a slightly higher percentage. The only issue where more women expressed interest in is *the latest inventions in medicine*. An analysis by locality also indicates a marginal difference between urban and rural Malaysians in terms of their perceived interest in S&T **(Appendix 4)**.

Interest in S&T issues by age group mirrors the 2004 survey results, but with one exception. A higher percentage of children professed interest in *space exploration* compared to youth. This could be due to the considerable coverage given by the media to Malaysia's space programme. In most of the other issues, more youth expressed an interest compared to children and adults. As in previous years, more adults than youth or children express an interest in *economy and commerce*, a trend which is understandable and reflective of the respondents' age group **(Appendix 5)**.

An analysis of perceived interest by education level yields no surprises. Level of education is correlated with interest in S&T issues. With regard to ethnicity, there is a change in the trends observed in some ethnic groups. A higher percentage of respondents in the 'Other' category expressed interest in most of the S&T issues surveyed, compared to the Chinese, Malays, Indians and Other Bumiputera Groups. This is especially so in issues related to *telecommunications* and *computer technology*. As regards *economy and commerce*, more Chinese expressed interest, similar to the findings of the previous surveys. Given their extensive involvement in Malaysia's economy, this is to be expected **(Appendix 6)**.

One important point that requires immediate attention is the continued decline in interest in environmental issues. This is alarming given the environmental situation the world is in. Therefore greater efforts must be undertaken to increase the awareness and interest of the Malaysian public on this issue.

THE PUBLIC'S PERCEIVED KNOWLEDGE OF S&T ISSUES

Similar to previous surveys, perceived knowledge is defined as the public's perceptions of what they know about science and technology. It is measured by the respondents' responses to the 11 items in Question 12 of "*The Public's Awareness of Science and Technology Malaysia 2008*", in which they were asked to rate their knowledge of the 11 items as being "good", "average", "weak" or "none at all". This term is used in the same sense as the term, *informedness*, as used in the National Science Foundation (NSF) surveys.

An analysis of the trends from 1998 to 2008 indicates that Malaysians perceived themselves as having between a *poor* and *average* knowledge of S&T as indicated by an overall mean of 2.28 for 1998, 2.22 for 2000, 2.32 for 2002, 2.22 for 2004, and 2.05 for 2008 **(Appendix 7)**. However, this year's overall mean of

2.05 points towards Malaysians' perceiving themselves as having a weak knowledge, rather than an average knowledge of S&T.

It is important to note that the scale used in 2004 and 2008 was different from that used in 1998 to 2002. While the 1998-2002 scale used 1 to denote "no knowledge", 2 to denote "poor knowledge", 3 to denote "average knowledge" and 4 to denote "excellent knowledge", the 2004-2008 scale used 1 to denote "no knowledge", 2 to denote "weak knowledge", 3 to denote "average knowledge" and 4 to denote "good knowledge". The change, however, does not affect the interpretation of 2.1 as denoting "weak knowledge".

The respondents generally perceived themselves as having a weak knowledge in all the issues surveyed **(Figure 2)**, with *the latest inventions in medicine* having the highest percentage of respondents (41.6%) professing themselves as having *none* and *weak* knowledge of **(Figure 2)**. Other S&T issues where a high percentage of respondents had expressed having weak knowledge of are: *the use of nuclear technology to generate power* (39.1%), *the latest inventions in science* (40.1%), *research in science and technology* (34.7%), and *space exploration* (39.5%). The respondents perceived themselves as being knowledgeable about are *environmental pollution* (37.3%), followed by *the use of computer technology* (35.2%), and *innovations in telecommunications technology* (36.4%).

With regard to rural – urban comparisons, more urban respondents reported themselves as being knowledgeable about all the S&T issues surveyed. Nonetheless, the rural-urban gap has narrowed quite remarkably. In 2004, the gap was 9.8 percentage points, but in this year's survey, the gap is only 4.2 percentage points, a difference of about 5.6 points. It is possible that recent developments in technology and infrastructure have created greater awareness of and provided better information access to S&T issues **(Appendix 8)**.

Gender comparisons, on the other hand, indicate similar results to the 2004 survey. The gap in terms of perceived knowledge between males and females is marginal. Comparisons across age groups also show congruence with the previous survey. A higher percentage of youth reported having knowledge of the S&T issues surveyed compared to adults and children. This similarity is again seen in the comparisons by educational background, where a higher percentage of respondents with tertiary education compared to those with secondary, primary and no formal education professed to having knowledge of S&T issues **(Appendix 9)**.

Comparisons across ethnic groups show a change from the results of the previous survey. In this year's survey, a higher percentage of respondents belonging to the 'Other' category reported having knowledge of the S&T issues compared to respondents from the other ethnic groups. In the 2004 survey, a higher percentage of Malays reported having knowledge of the S&T issues. In this year's survey, overall, Malays are ranked third, after Indians in terms of perceived knowledge. The Chinese, consistent with previous surveys, ranked first in their perceived knowledge of economy and commerce-related issues **(Appendix 10)**.

PUBLIC ATTITUDES TOWARDS S&T

In the context of the present study, the public's attitudes towards science and technology are measured and defined by the respondents' responses to Questions 15, 16, 17, 19, 20, 21, 22, and 23 of *The Public's Awareness of Science and Technology Malaysia 2008* questionnaire.

In general, the attitudes of Malaysians towards S&T have improved over the years. For instance, in 2008, 73.8% of Malaysians agreed that scientific research brings more positive than negative effects, compared to 69.1% who said so in 2004, 62.0% in 2002, 43.8% in 2000, and 45.3% in 1998 **(Figure 3).**

Figure 2: The Public's Perceived Knowledge of S&T Issues 2008

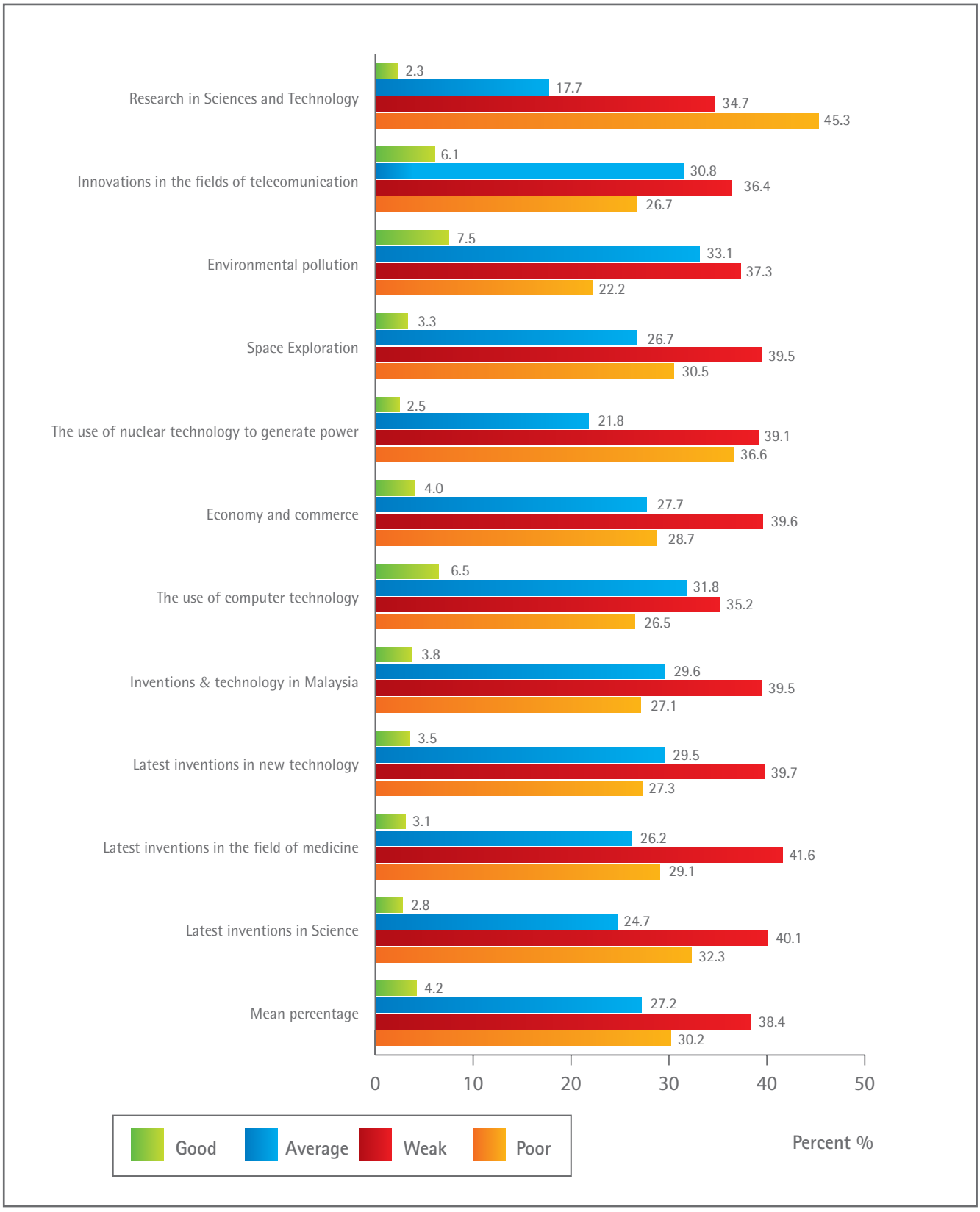
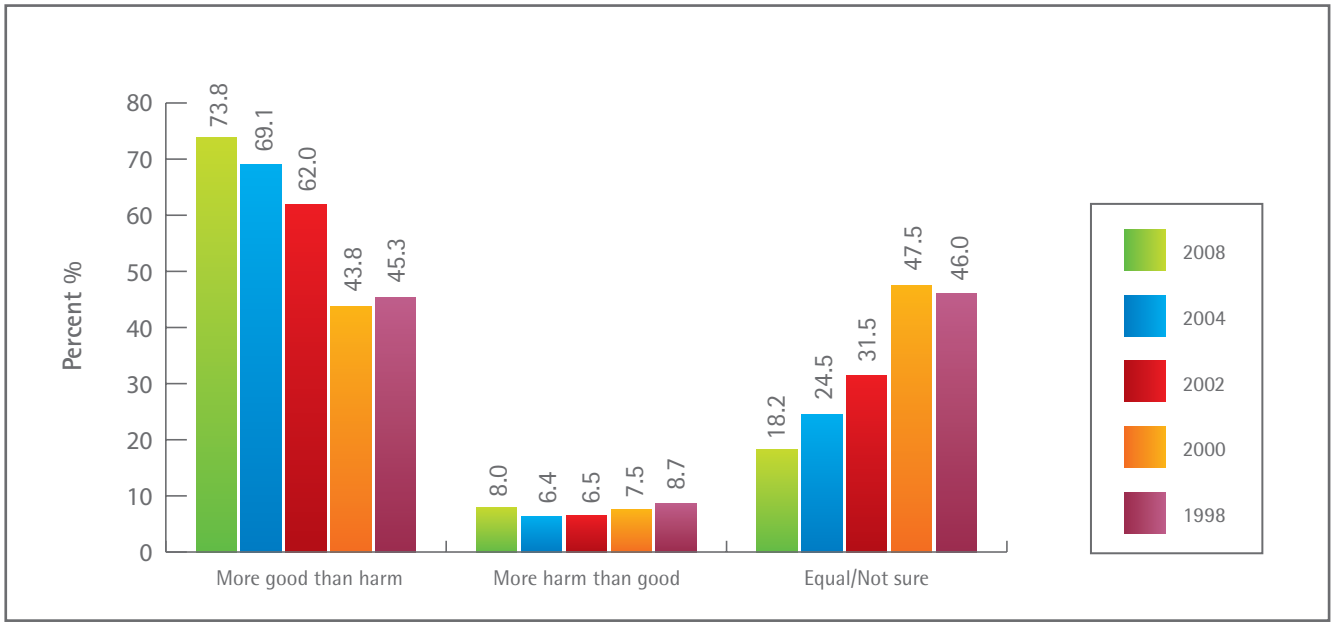


Figure 3: Public Opinions on the Effects of S&T (1998-2008)



When asked to react to the statement on the effects of S&T on selected issues, 77.6% of Malaysians in this survey felt that S&T has positive effects on the *standard of living, public health* (71.1%), and c*ost of living* (56.0%) *(***Appendix 11***)*. 67.3% agreed that S&T has positive effects on *working conditions, individual enjoyment of life* (59.9%), and *the environment* (54.1%). However, less than half of Malaysians (44.6%) perceived S&T to have a positive effect on *world peace*.

The same pattern of findings can be seen in the previous Public Awareness of S&T studies. From 1998 to 2004, the majority of Malaysians (more than 60.0%) felt that S&T has positive effects on *public health, individual enjoyment of life, standard of living,* and *working conditions.*

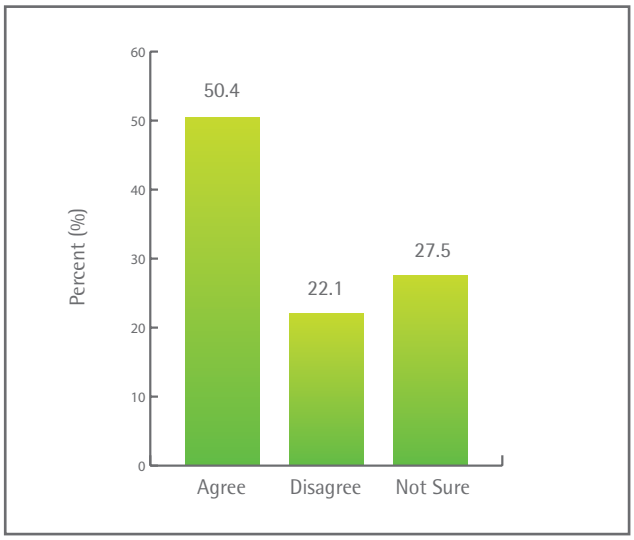
Another discernible pattern is that Malaysians have consistently been positive towards various S&T issues, where 84.3% agreed that *S&T improves the quality of our lives* and 79.8% agreed that *S&T is very important for the progress of our nation* **(Appendix 12)**. In response to the statement regarding the use of animals in research, 50.4% of the Malaysians agreed that *although research on animals may cause suffering, it has to be done for the sake of mankind*, while another 22.1% disagreed. This is a positive finding as it suggests that half of Malaysians support scientific research. 27.5% of the Malaysians, however, were unsure of how they felt about the issue **(Figure 4)**.

Malaysians appear to be somewhat divided on the issue that involves the interplay of science and religion. 39.2% agreed that *we depend too much on science and not enough on faith*, 33.4% disagreed with the statement, while 27.4% **(Figure 5)** were unsure.

OPINIONS ON JOB OPPORTUNITIES IN S&T

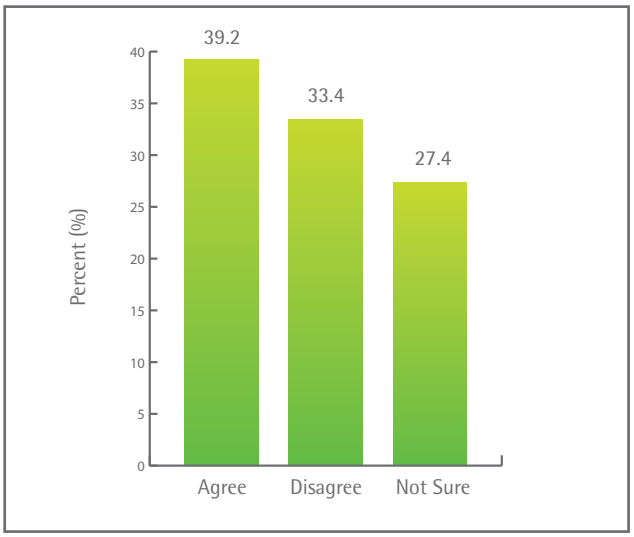
The opinions of the Malaysian public were also sought on issues related to job opportunities in S&T. Some of the noteworthy findings are that only 39.4% of Malaysians thought that *science subjects are difficult*, and that 12.5% perceive that *the approach in teaching S&T subjects is too academic*. This suggests that special attention should be given to how science subjects should be taught in schools. In addition, 37.2% thought that the *Malaysian public lacks awareness of S&T*. On the other hand, 5.7% of the respondents felt that *there are*

Figure 4: Public Attitudes towards the Use of Animals in Research 2008



Note: The graph shows the Malaysian public's response to the statement, "Although research on animals may cause suffering, it has to be done for the sake of mankind"

Figure 5: Public Attitudes towards S&T and Religion 2008



Note: The graph shows the Malaysian public's response to the statement, "We depend too much on science and not enough on faith".

limited job opportunities in S&T, and 8.2% think that *not all jobs require knowledge of S&T* **(Appendix 13)**. Finally, only 5.6% thought that *the income level in the field of S&T is not attractive.*

PUBLIC ATTITUDES TOWARDS GENETIC ENGINEERING

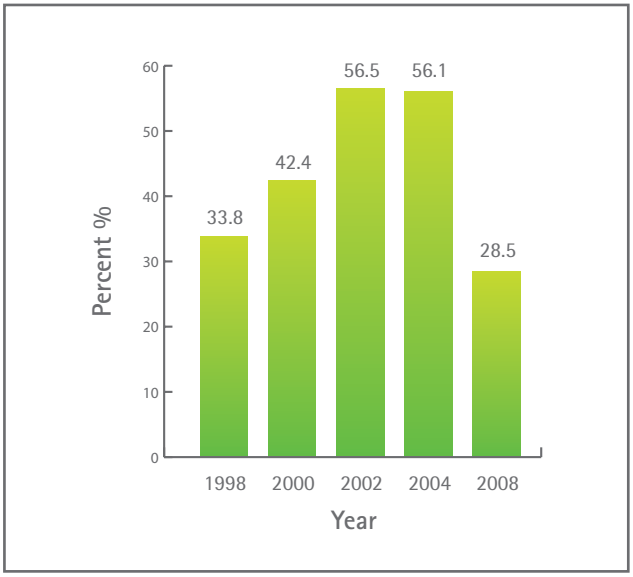
Over the years, the percentage of Malaysians who have heard of *genetic engineering* or *cloning* has steadily increased, except for 2008 where the percentage dropped to 28.5% from 56.1% **(Figure 6)**. This could be due to the fact that in the 2008 survey, the respondents were asked whether they had heard of *genetic engineering*, not *cloning*, as was the case in the previous surveys. This suggests that Malaysians may be more familiar with the term *cloning*, which was much discussed, several years ago, through "*Dolly*" and other examples. This may also be due to a shift in emphasis on the part of the mass media from *cloning* to other issues such as *space exploration*.

When asked whether *genetic engineering* should be practiced, 34.5% in the 2008 survey expressed their agreement, an increase of 15.8% from the percentage of those who said so in 2004 **(Figure 7)**. This suggests that the Malaysian public is now becoming more receptive to changes brought about by genetic technology.

Among the reasons given by those who disagreed with the practice of *genetic engineering*, 24.8% cited religion as the reason for not agreeing with the practice **(Appendix 14)** while 8.4% cited that genetic engineering disrupts the balance of the ecosystem.

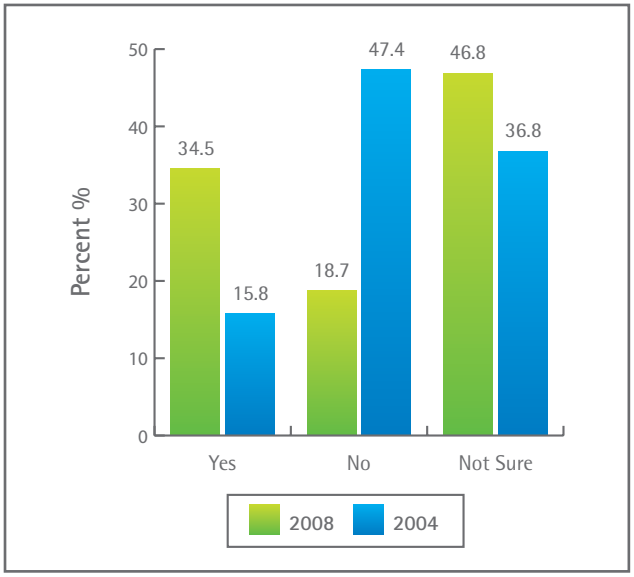
On the other hand, of those who agreed that *genetic engineering should be practiced*, 23.0% felt that it would improve the quality of life, 13.8% felt that it helps improve the genotype of plants and livestock, 11.8% felt it to be beneficial for the nation's development, and 8.2% felt that it helps improve agriculture and livestock products. Only 5.2% felt that it is important for the advancement of knowledge, while 2.7% felt that it should be practiced for medical purposes **(Appendix 15)**.

Figure 6: Percentage Distribution of the Malaysian Public Who Have Heard of Genetic Engineering (1998-2008)



Note: The graph shows the percentage of Malaysians who agree to the above issues

Figure 7: Public Attitudes towards the Implementation of Genetic Engineering or Cloning (2004-2008)



Note: The graph shows the Malaysian public's response to the question "Do you agree that genetic engineering should be practiced?"

Comparisons of attitudes towards S&T by age group and educational level indicate that the youth and the respondents with tertiary education have a greater tendency to agree with the positive statements made about S&T, compared to adults and children. On the question of whether it is ethical to use animals in research, the percentage of youth, adults, and children who agreed are 53.3%, 51.0% and 41.2% respectively; while, 42.7% of the youth, 39.2% of the adults and 33.6% of the children agreed with the statement, "*We depend too much on science and not enough on faith.*" Nevertheless, there is, in general, a positive outlook on S&T among Malaysians from all educational backgrounds **(Appendix 16 & 17)**.

Analyses by locality indicate that more respondents from the urban areas agreed with the statements made regarding the positive impact of S&T on life compared to their rural counterparts. However, the mean difference in the percentage by locality is small (5.5%), indicating the gap in the attitudes towards S&T between urban and rural Malaysians is diminishing. Similar to the results obtained in the 2004 survey, analyses by gender consistently indicate that both Malaysian men and women do not differ markedly in their attitudes toward S&T issues **(Appendix 18)**. Comparisons across ethnic groups also indicate that, in general, the Malays, Chinese, and Indians do not differ very much on the issues of research that causes animal suffering and the dependence on science and religion, although there is an appreciably lower percentage of Other Bumiputera Groups who felt the same way towards the two aforementioned issues **(Appendix 19)**.

PUBLIC UNDERSTANDING OF S&T ISSUES

Malaysians were asked to judge whether the science and technology-related statements given to them (as presented in Questions 13 and 14 of the questionnaire) were "TRUE" or "FALSE" or whether they were "NOT SURE" about the statements. A correct answer to a

given statement indicates that they understand that particular S&T issue, and an incorrect answer indicates that they do not. In addition to the "TRUE" or "FALSE" response scales, Malaysians, in this survey, were given the option to respond, "NOT SURE" to statements they were unsure about.

This survey reveals that Malaysians' level of understanding of S&T varies according to the issues. This has been the trend in the last twelve years in which the Public Awareness studies were conducted **(Appendix 20)**. In 2008, more Malaysians answered correctly to statements such, as "*The earth travels around the sun*" (72.6%), "*Plants produce the oxygen that we use for breathing* (76.4%)", "*Light travels faster than sound*" (58.9%), and "*The centre of the earth is very hot*" (66.0%). These issues, which Malaysians seem to have understood the most, are basic S&T issues that Malaysians have been exposed to in school. This explains the relatively high percentage of correct answers obtained. Malaysians show the highest level of understanding to the statement, "S*moking causes lung cancer*", where 84.5% answered correctly in 2002 and 2004 and 81.1% in 2008. The high percentage of Malaysians answering correctly on this issue, therefore, suggests that the campaign on smoking has been very successful in raising the public's understanding of the issue.

On the other hand, this survey also shows that Malaysians lack understanding of the following issues, as measured by the percentage of those who correctly responded to the following items: *"Antibiotics kill viruses as well as bacteria"*, where 15.5% scored correctly in 2004 and only 7.6% in 2008; *"Milk contaminated by radioactivity is safe to drink after it is boiled"* which 28.9% of the respondents answered correctly in 2008, while 15.1% did so in 2004, 34.7% in 2002, and 63.8% in 2000; *"All radioactivity is man-made"*, which was answered correctly by 14.0% of the respondents, compared to 13.4% in 2004; *"Lasers work by focusing sound waves"* which was answered correctly by 15.5% of the respondents in 2008, and *"Electrons are smaller than atoms"* which was answered correctly by 33.0% of the respondents compared to 26.4% in 2004.

The fact that the Malaysian public did not do very well on the above issues may be explained by the fact that these issues are more specialized, and hence, obtaining correct answers on them would reflect a higher and more sophisticated understanding of S&T, which is more likely to be found among those who are truly interested in S&T and who have acquired these concepts through formal education. Nevertheless, the results show that the Malaysian public's understanding of most of these issues has improved slightly compared to the 2004 survey. The overall mean percentage of correct answers in the 2008 survey is 45.1%, compared to 43.8% in 2004. There is a marked improvement in the Malaysian public's responses to all the items with only three exceptions: "*The first men lived at the same time as dinosaurs*" for which the percentage of correct responses declined from 32.9% in 2004 to 25.4% in 2008; "*Antibiotics kill viruses as well as bacteria*", which declined from 15.5% in 2004 to only 7.6% in 2008; and "*Lasers work by focusing sound waves*", which fell from 19.2% in 2004 to 15.5% in 2008.

The fact that the percentage of correct responses to the specialized questions is still quite low shows that a lot more needs to be done to improve the public's understanding of S&T such that they would be considered scientifically literate. We need to look into the quality of science teaching, the appropriateness of the science curriculum, and the content of non-formal programmes, as these factors may have affected the public's interest in, and understanding of science.

THEORIES OF EVOLUTION AND BIG BANG

Because the statements, "*The universe began with a huge explosion*" and "*Human beings as we know them today developed from earlier species of animals*" are

expressions of beliefs and philosophies rather than scientific facts, they were not included in computing the level of the Malaysian public's understanding of S&T issues. Hence, the theory of evolution and the Big Bang theory are discussed to know their beliefs regarding these issues.

In 2008, 31.4% of the public correctly answered that the statement, *"The universe began with a huge explosion"* was FALSE (25.1% did so in 2004, 28.6% in 2002 and an average of about 41.3% in 1996, 1998, and 2000). It should also be pointed out that 61.4% were unsure about this statement in 2004 while only 44.8% of the respondents were unsure about it in 2008. On the statement, "*Human beings as we know them today developed from earlier species of animals*", around 50.8% of Malaysians correctly answered that it was FALSE, while 46.1% did so in 2004, 41.7% in 2002, and an average of about 59.7% in 1998 and 2000. 31.7% of the respondents were unsure of this statement in 2008, compared to 32.8% in 2004 **(Appendices 21 & 22)**.

It should be noted that the public's responses to the evolution and *Big Bang theories* do not indicate familiarity with or ignorance of scientific concepts and issues. Instead, they are statements of a person's beliefs or philosophical stand more than his or her knowledge of the concepts. In the USA, positive responses to these statements dramatically increased when the additional phrases "according to the theory of evolution," and "according to astronomers," were added to the statements about the evolution and big bang theories respectively. This led the NSF to conclude that "these differences probably indicate that many Americans hold religious beliefs that cause them to be skeptical of scientific ideas, even when they have basic familiarity with those ideas" (NSF, 2008, 7-19). In another Muslim country, Turkey, only 27.0% of the respondents considered the statement "Man, as we know him today, originated from an earlier animal species" to be true, while 51.0% considered it false (Eurobarometer 224, p. 40). In this survey and its predecessors, Malaysian scientists have regarded the two statements as FALSE, although the reverse is true in the NSF and Eurobarometer surveys. Hence, the public's responses to these two statements should not be used as one of the indicators of their understanding of S&T.

AWARENESS OF S&T CONCEPTS

The term, *awareness*, as used in this survey and in the 1998 to 2004 Public Awareness surveys is defined and measured by the respondents' responses to Questions 10a to 10l of ***The Public's Awareness of Science and Technology Malaysia 2008 questionnaire.***

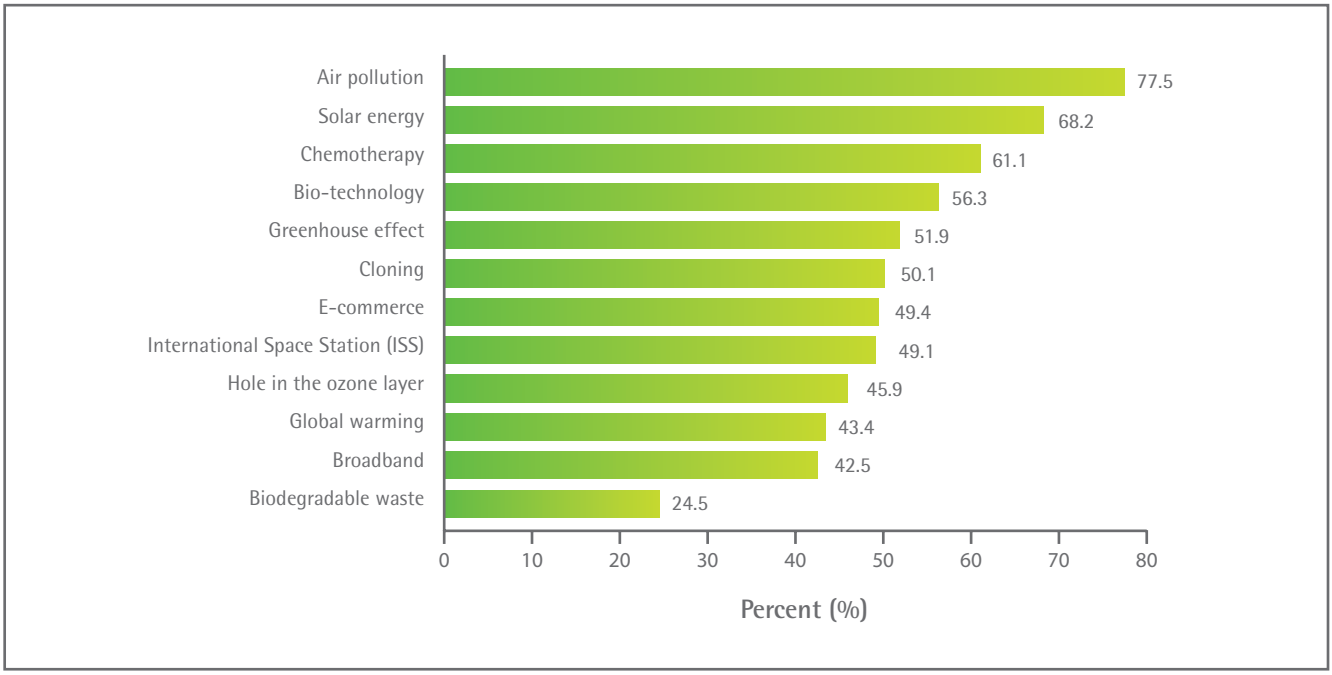
Descriptive analyses show varying patterns of responses on the twelve S&T-related issues. Results indicate that more respondents have heard or read about *air pollution, solar energy, chemotherapy, biotechnology, the hole in the ozone layer* and *cloning*. In contrast, fewer respondents have heard or read about *biodegradable waste, broadband* and *global warming*. Almost half of the respondents reported being aware of the *International Space Station (ISS), cloning, the greenhouse effect,* and *e-commerce* **(Figure 8)**. With the exception of air pollution and cloning, the public's awareness of S&T issues in the 2008 survey was higher than that in the 2004 survey.

SUBJECTIVE UNDERSTANDING OF S&T CONCEPTS

The Malaysian public's *subjective understanding*, or their self-assessed understanding, of S&T concepts was measured by their responses to the same 12 items shown in Figure 8.

In the 2008 survey, 2 new items, *International Space Station (ISS)* and *biodegradable waste* were added to

Figure 8: The Public Awareness of S&T Concepts 2008



the original 10 items asked in the 2004 survey. The percentages for the items are computed by collapsing the public's responses in the "good" and "average" categories.

Interestingly, on all 12 items, more than half of the respondents reported having between an average and good understanding of the S&T concepts. The issue that the highest most number of respondents reported having *good* and *average* understanding of was *air pollution* (67.0%), *followed by solar energy* (63.7%), *global warming* (63.3%), *hole in the ozone layer* (62.3%) and *greenhouse effect* (62.1%). Just slightly over half of the respondents surveyed (50.8%) claimed they understood *International Space Station* (ISS), while 51.5% reported understanding *biodegradable waste* **(Appendix 23)**.

OBJECTIVE UNDERSTANDING OF S&T CONCEPTS

Malaysians' *objective* understanding of S&T issues, as opposed to their *subjective* understanding which was *self-assessed* or *self-reported*, was measured using 12 items posed in Question 11. The respondents were asked to indicate whether the items represented true or false scientific information. A third option, *Not Sure*, was also given to cater to the respondents who were in doubt of the truth or falsity of the statements **(Appendix 24)**. The figures obtained in the current survey indicate that the Malaysian public is acutely lacking an understanding in three particular S&T concepts: *biotechnology, global warming* and *broadband*. Only 10.2% understand *biotechnology*, 16.1% understand *global warming*, and 17.6% *broadband*. The vast majority of Malaysians are either ignorant or unsure about the concepts. Specifically, 59.3% expressed uncertainty regarding *broadband*, 43.6% regarding *biotechnology*, and 53.5% regarding *global warming*. Other concepts that record high percentages of uncertainty are *biodegradable waste* (64.1%), and *the greenhouse effect* (53.3%). This shows that Malaysians need to be further educated about these issues, as they affect the environment and their quality of life.

In the current survey, quite a large segment of the Malaysian population appears to be well-informed

about *solar energy* (74.8%) and *chemotherapy* (64.2%). Also, close to 60.0% correctly identified the function of the *International Space Station*, a trend that is not surprising taking into account the extensive media coverage on Malaysia's First National Astronaut Project *(Projek Angkasawan Negara)* in 2007 and 2008.

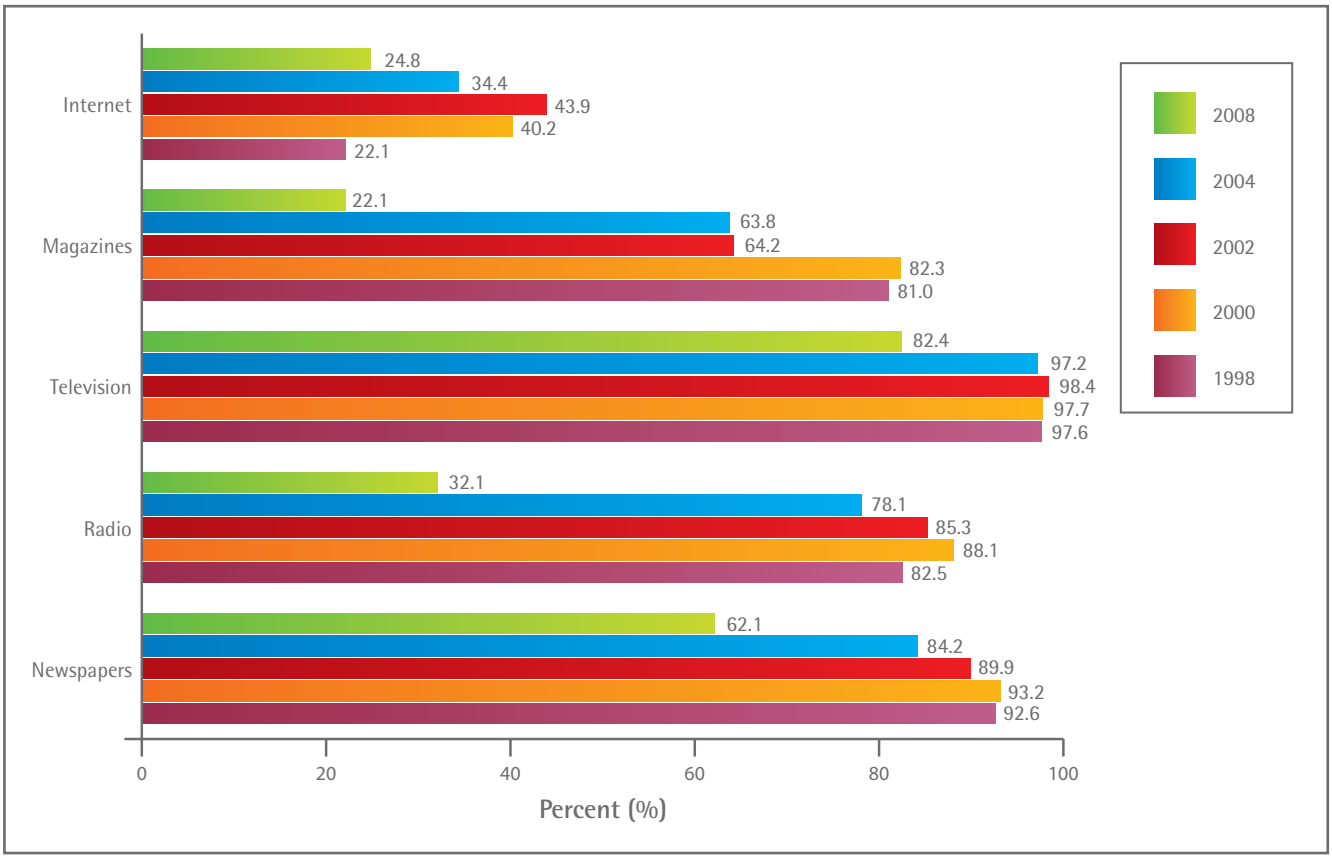
GENERAL SOURCES OF INFORMATION ON S&T

In general, Malaysians still choose the *television* (82.4%) and *newspapers* (62.1%) for their main sources of S&T news and information over other means. The radio is cited as a source by only 32.1%. Magazines (22.1%) and the Internet (24.8%) are the least preferred sources **(Figure 9).**

The most discernible trend in 2008 is that all the media listed in the questionnaire – the *television, radio, newspaper, Internet* and *magazines* – record a decline in the percentage of Malaysians citing them as a source of information and news for S&T. This may be explained by the inclusion of two new items in the 2008 survey – the *school* and *books*. 16.1% relied on the school and 19.3% on books as a source of S&T information.

The results also shows that, despite the current age of advanced telecommunications, relatively few Malaysians rely on the Internet for S&T information. In fact, the percentage is even smaller this year (24.8%) compared to the previous years, i.e. 40.2% in 2000, 43.9% in 2002 and 34.4% in 2004. The trend suggests that the Malaysian public does not capitalize on the potential

Figure 9: Public Sources of Information on S&T (1998-2008)



of the Internet as a source of S&T information. One possible explanation for this is that there may still be a substantial proportion of Malaysian families who do not own computers or who may not have access to the Internet, especially those in the rural areas. In fact, in 2008, 51.2% of the respondents came from rural areas. It may also be due to the fact that a substantial number of Malaysians (45.0%) are wary of the Internet as being a source of reliable S&T information **(Appendix 25)**.

AWARENESS OF S&T PROGRAMMES

In general, the findings show that about 50.0% of the 18,447 respondents are aware of the S&T programmes. Youth show the highest mean percentage (57.4%) of awareness of the S&T programmes compared to children (53.7%) and adults (37.8%). The programmes that registered high percentages for youth are: *science camps* (66.3%), *science and technology seminars* (61.1%), *science and technology exposure* (60.3%), *science and technology quizzes* (58.6%), and the *National Angkasawan Programme* (58.3%) **(Appendix 26)**.

Adults, on the other hand, are less aware of the programmes for youth and children, with the level of awareness falling below 50%. Their awareness of *commercializing research products, financial incentives for S&T activities, science technology congress, S&T invention awards, science exhibitions, inventions and research,* and *science seminars* falls in the range of 27.7% to 39.6%. The programme that the highest percentage of adults (43.9%) were aware of was the *National Angkasawan Programme*.

VISITS TO S&T RELATED PLACES

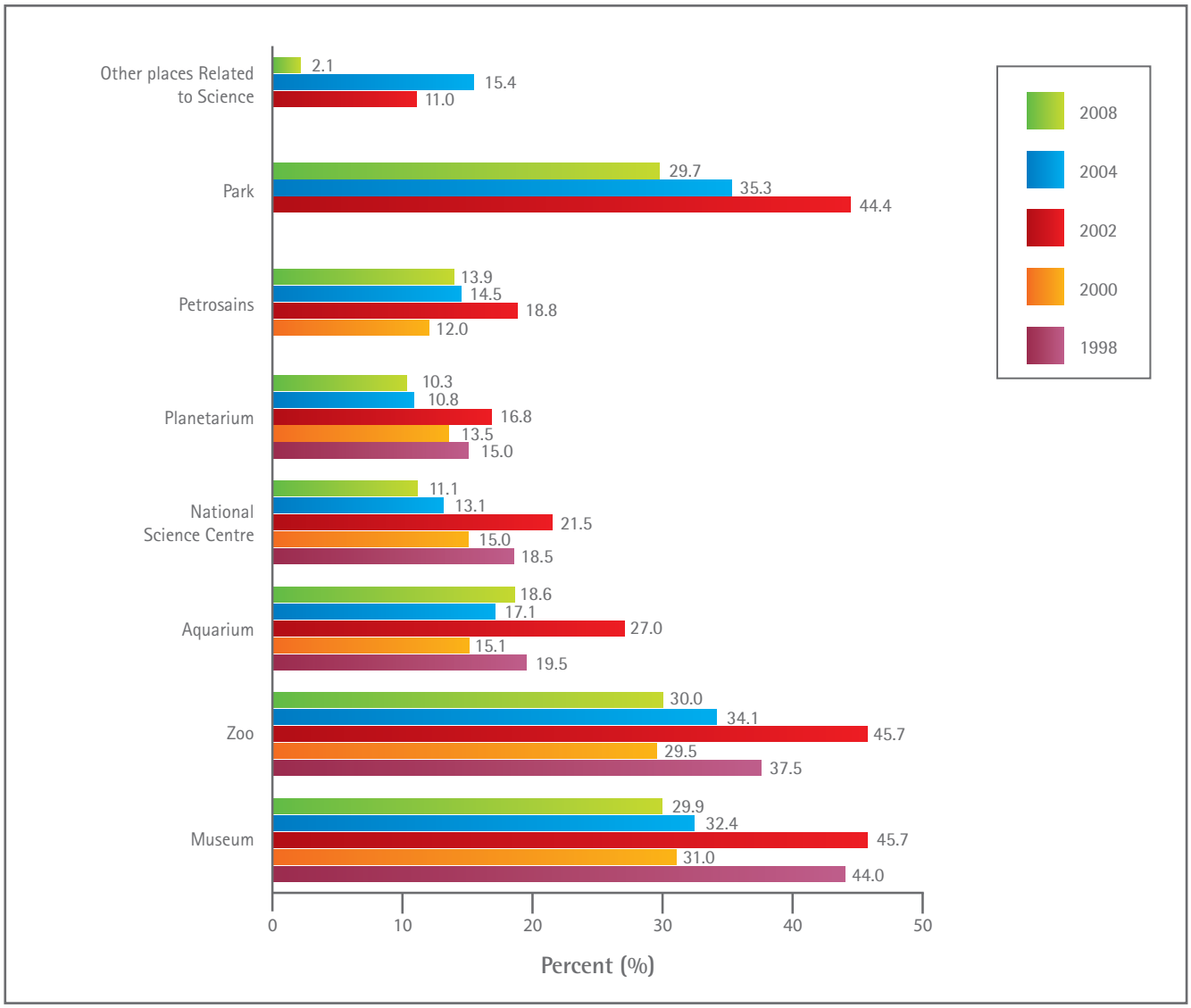
In 2008, the places most frequently visited by Malaysians were the *Museum* (29.9%), *Zoo* (30.0%) and the *parks* (29.7%). 18.6% visited the *aquarium*, 11.9% the *National Science Centre*, 10.3% the *Planetarium*, and 13.9% *PETROSAINS* **(Figure 10)**. The findings show that geographical distance from a science centre is a factor affecting the number of visits made by the Malaysian public **(Appendix 27)**.

ACCESSIBILITY OF S&T FACILITIES

More than half of the Malaysian public reported that they have access to the *library* (54.3%) and the *Internet* (53.0%). In 2008, the number of respondents reporting to have access to *computers* (PC) was only 42.4%, whereas in 2004, it was recorded at 55.0% **(Appendix 28)**.

On the other hand, only about 17.0% of Malaysians reported having access to the *National Science Centre* and *PETROSAINS*. The main reason cited for the lack of accessibility to these two facilities is their location **(Appendix 28)**.

Figure 10: Visit to S&T Related Places (1998-2008)



3 INTERNATIONAL COMPARISON

3

INTERNATIONAL COMPARISON

In this chapter, an attempt is made to compare Malaysia with other nations on several pertinent variables regarding science and technology: the public's perceived interest, perceived knowledge, actual understanding, attitude and main sources of information. The comparisons are drawn only in as much as the international data would allow. In some cases, the comparisons involve only two issues shared commonly by Malaysia and one or two other nations.

To illustrate, Malaysia is compared to two Western nations, the USA and the European Union, with respect to perceived interest and perceived knowledge of S&T. On these variables, no comparison could be made with Asian countries because although some, such as Japan, China and South Korea, have reportedly conducted similar Public Awareness and Understanding of S&T surveys their data could not be found or retrieved from the Web sites accessed. Therefore, the international comparison made regarding the public's perceived interest in and perceived knowledge of S&T is somewhat constricted in terms of the number of issues covered and the countries involved.

The international data used for the comparisons were obtained from several sources. The USA data, for example, were obtained from the Science and Engineering Indicators 2006 and 2008, as well as from the 2004 VCU (Virginia Commonwealth University) Life Sciences Survey. The European data were obtained from the Special Eurobarometer November 2005 Issue, the Double Eurobarometer Survey of Citizens, Science and Technology, European Commission. The Indian data were drawn from the India Science Report 2005. It should be stated at the outset that the comparison with the international data on public understanding of S&T involves only adults. Children and youth have not been included in the analysis.

PERCEIVED INTEREST IN S&T

In this section, Malaysia is compared to the USA and Europe with respect to perceived public interest in S&T. Malaysia is directly comparable to the USA on three issues that concern the latest inventions or new discoveries in science, medicine and new technology **(Table 1)**. These three issues were represented by similar items that appeared in both the Malaysian and American S&T surveys, to which the respondents were asked to express whether they were "interested" or "very interested" in the issues.

In the comparison involving the European public, two extra items – *environmental pollution* and *space exploration* – were added, making Malaysia directly comparable to Europe on five S&T issues.

For the Malaysian and USA data, the response categories were identical, where the public's interest in S&T was captured using the categories of "interested" and "very interested." The European data were slightly different. The coding to reflect public interest in S&T had used "moderately interested" rather than just "interested", while very high levels of public interest were recorded using "very interested".

To allow for a meaningful comparison, the public's responses at the moderate and high interest levels were collapsed. The percentages of interested citizens

Table 1: Perceived Interest in S&T among the Malaysian, American and European Public (Percent)

S&T Issues	Malaysia 2008			USA 2006			Europe 2005		
	Interested	Very Interested	Not Interested	Interested	Very Interested	Not Interested	Moderately Interested	Very Interested	Not at all Interested
Latest inventions or new discoveries in science	40.9	4.0	37.1	40.0	47.0	10.0	48.0	30.0	20.0
Latest inventions or new discoveries in medicine	45.4	5.9	34.2	53.0	24.0	7.0	50.0	33.0	16.0
Latest inventions in new technology	49.0	6.9	29.7	48.0	15.0	*	48.0	30.0	21.0
Environmental pollution	47.3	7.1	31.7	*	*	*	49.0	38.0	12.0
Space exploration	43.1	6.6	34.7	*	*	*	23.0	*	*
Mean percentage	**45.1**	**6.1**	**33.5**	**44.7**	**34.3**	**8.5**	**43.6**	**32.8**	**17.3**

Sources: Science and Engineering Indicators 2006; Eurobarometer 2005
**Data not recorded in the sources retrieved*

for each S&T item and the mean percentages for all three nations – across three issues for the USA and across five for Europe – are presented in **Table 1**.

The findings are not very encouraging. Malaysia consistently registers lower numbers of interested citizens than the USA in all the three S&T issues compared, and Europe in four of the five issues compared. Malaysia surpasses Europe in only one issue, which is *space exploration*.

Not very many Malaysians are interested in new science inventions or discoveries (44.9%). In contrast, far more Americans (87.0%) and Europeans (78.0%) expressed an interest in this issue, exceeding Malaysians by 42.1% and 33.1% respectively. The same is true for medicine, where Malaysia is below the US by 25.8% and Europe by 31.8%. The percentage points registered for the latest inventions or discoveries in new technology are not as bad, however, when compared to the USA. On this topic, Malaysia is still below the USA, but only by 7.1%.

Likewise, a far smaller number of Malaysians are concerned about the environment compared to Europeans. Only 54.4% of Malaysians expressed an interest in *environmental pollution*, 32.6 percentage points lower than the number of Europeans who reported being concerned about this issue. Indeed, more Malaysians should be interested in and express concern about environmental issues and the environment in which they live.

The only S&T issue that sees Malaysia surpassing Europe in public interest is *space exploration.* Quite interestingly, Malaysia registers a 49.7% of interested citizens on the issue, 26.7 percentage points greater than what Europe registered, which was only 23.0%. It should be noted that the wordings of the item on *space exploration* in the Malaysian S&T survey and Eurobarometer 2005 are not exactly the same – the item was worded as *space exploration* in the Malaysian survey and as *astronomy and space* in the Eurobarometer, but they may be used, with a certain degree of caution, to provide an approximation of the Malaysian and European public's interest in space matters. On the issue of space exploration, the *Science and Engineering Indicators 2008* reports that "interest in space exploration has consistently ranked low both in the United States and around the world. Surveys in Europe, Russia, China, and Japan document this general pattern". In the USA 2002 survey, 73.0% of Americans reported being interested in space exploration, which is technically not a low percentage, but between 2002 and 2008, this interest has reportedly declined among Americans. In India, only 15.0% were reported to be attentive to and interested in the subject.

While much of the world exhibits a lack of or a declining interest in space matters, Malaysia seems to experience a new surge of interest in this issue. The fact that almost half of Malaysian survey respondents reported being interested in space exploration, recording a percentage which more than doubles the European percentage, is a phenomenon perhaps attributable to the recent 2007 *Angkasawan Negara Project (National Astronaut Project).* The extensive news and media coverage on the project has probably boosted the public's interest in space exploration. This speaks volumes about the power of the Malaysian broadcast and print media in informing and influencing the public regarding a particular issue.

It is quite evident that very few Malaysians as shown by have high levels of interest in S&T, evidenced in the mean percentages of respondents saying they are *very interested* in the various S&T issues. Further, quite a large segment of the Malaysian population, more than one-third, clearly expressed a lack of interest. On most of the S&T issues, the percentages recorded for non-interest exceed the 30.0% mark. These statistics make quite a compelling case that the Malaysian government needs to do more to reach out to those Malaysians who appear to be indifferent to or uninterested in S&T. More specifically, the government needs to devise more creative and effective strategies to address the concern of getting a larger proportion of Malaysians to be interested in S&T, based on the premise that interest in the subjects will pave the way for the acquisition of greater S&T knowledge, and greater S&T knowledge will substantially determine the survival of Malaysia in the scientifically and technologically challenging 21st century.

PERCEIVED KNOWLEDGE OF S&T

Altogether, 11 items were used to assess the Malaysian public's perceived knowledge of various S&T issues, but only four items are used for the international comparison with the USA and Europe. Of these four items, Malaysia is directly comparable to the USA on only two, *latest inventions or new discoveries in science* and *medicine.* **Table 2** shows the statistics for the perceived S&T knowledge of Malaysians, Americans and Europeans. It should be noted that there is a slight difference in the wording of the response categories, where the Malaysian survey had used *level of knowledge* consisting of *good, average* and *weak*, while the US and European surveys had used *level of informedness.*

Table 2: Perceived Knowledge of S&T among Malaysians, Americans and Europeans (Percent)

S&T Issues	Malaysia 2008			USA 2004			Europe 2005		
	Good	Average	Weak	Very Informed	Some What Informed	Not Very Informed	Very Well Informed	Well Informed	Poorly Informed
Latest inventions or new discoveries in science	2.8	24.7	40.1	10.0	64.0	22.0	10.0	51.0	37.0
Latest inventions or new discoveries in medicine	3.1	26.2	41.6	9.0	67.0	19.0	11.0	59.0	28.0
Latest inventions in new technology	3.5	29.5	39.7	*	*	*	11.0	53.0	35.0
Environmental pollution	7.5	33.1	37.3	*	*	*	15.0	61.0	23.0
Mean percentage	**4.2**	**28.4**	**39.7**	**9.5**	**65.5**	**20.5**	**11.8**	**56.0**	**30.8**

Sources: 2004 Virginia Commonwealth University Life Sciences Survey; Eurobarometer 2005

The trends in the three nations appear to be somewhat similar. In general, most Malaysians, like most Americans and Europeans, do not rate themselves very highly on S&T knowledge. Less than 5.0% of Malaysians felt they have good knowledge of S&T. Similarly, not quite 10.0% of the Americans and 12.0% of the Europeans felt that they are very well-informed about S&T issues.

Among the four S&T issues compared, Malaysians and Europeans similarly felt least knowledgeable about scientific discoveries, and most knowledgeable about environmental pollution.

ACTUAL KNOWLEDGE AND UNDERSTANDING OF S&T ISSUES

In the current survey, 16 items were used to assess the Malaysian public's actual knowledge and understanding of S&T, or science literacy. However, only nine of the items were similar or identical to those used in international surveys, such as the National Science Foundation surveys in the USA and the Eurobarometer in Europe. Hence, these nine items are now used for comparison involving Malaysia and other countries **(Table 3).**

The mean percentage of correct answers to all nine statements achieved by Malaysian adults in the present survey is only 38.8%, placing Malaysia well below the USA (by 23.6%), Europe (by 24.1%) and South Korea (by 20.8%) in terms of science literacy. However, Malaysia

Table 3: Malaysia's Science Literacy in Selected S&T Issues Compared to That of Other Countries

Test Items		Malaysia (2008)	USA (2006)	Europe (2005)	S. Korea (2004)	India (2004)
1.	The earth travels around the sun (True)	70.3	56.0	65.0	88.5	68.5
2.	The earth takes 365 days to complete its rotation around the sun (True)	65.6	55.0	*	*	41.0
3.	The center of the earth is very hot (True)	63.8	80.0	87.0	87.0	56.5
4.	The continents have been moving their location for millions of years and will continue to move (True)	44.6	80.0	88.5	88.7	31.5
5.	It is the father's gene that determines the gender of the baby (True)	38.7	63.5	62.0	59.0	38.0
6.	Electrons are smaller than atoms (True)	30.8	54.5	46.0	46.0	30.0
7.	Lasers work by focusing sound waves (False)	14.5	47.0	49.5	30.0	*
8.	All radioactivity is manmade (False)	13.3	70.5	59.0	48.0	*
9.	Antibiotics kill viruses as well as bacteria (False)	7.2	55.5	46.0	29.5	8.0
Mean percentage		**38.8**	**62.4**	**62.9**	**59.6**	**39.1**

Sources: Science and Engineering Indicators 2006; Eurobarometer 2005

is above India, leading by 6.8% (based on the mean percentages computed for seven items, which comes up to 45.9% for Malaysia and 39.1% for India).

The findings also show that for 2008, Malaysians score lower on almost all S&T concepts than Americans and Europeans, except for two items: *"The earth travels around the sun"* and *"The earth takes 365 days to complete its rotation around the sun."* To the first item, 70.3% the Malaysians responded correctly, surpassing Americans (56.0%), Europeans (65.0%) and Indians (68.5%), and are outperformed only by South Koreans (88.5%).

On the second item, Malaysia can only be compared to the USA and India, as the data regarding the performance of other nations on this item are not available. The figures show Malaysians outperforming the Americans by 10.5% and the Indians by 24.6% in their understanding of the earth's rotation around the sun. Interestingly, Malaysia registered higher scores than India on five of the six items compared, but on the item, *"Antibiotics kill viruses as well as bacteria"*, India outperformed Malaysia by a slight 0.8%.

Malaysians scored *most poorly* on three items: *"Antibiotics kill viruses as well as bacteria,"* (to which

only 7.6% of the Malaysian respondents responded correctly compared to 46.0% of the European respondents and 55.5% of the American respondents), "*All radioactivity is manmade*", (only 14.0% answered this item correctly compared to 59.0% of Europeans and 70.5% of Americans), and "*Lasers work by focusing sound waves,*" where only 14.5% of Malaysians chose the correct answer compared to 47.0% of Americans, close to 50.0% of Europeans and 30.0% of South Koreans. Malaysians' low scores on these items suggest that they are acutely lacking in highly specialized science knowledge.

Malaysians did not perform very well on the items, "*Electrons are smaller than atoms*" (30.8% Malaysians answered this item correctly compared to 46.0% of Europeans and 54.5% of Americans); "*It is the father's gene that determines the gender of the baby*", (38.7% of the Malaysian respondents answered correctly compared to 62.0% of the European and 63.5% of the American respondents); and "*The continents have been moving their location for millions of years and will continue to move*" (44.6% of the Malaysians answered correctly compared to the Europeans (88.5%), the Americans (80.0%), the South Koreans (88.7%) and the Indians (31.5%).

The items that Malaysians performed quite well on are, "*The earth travels around the sun*", "*The earth takes 365 days to complete its rotation around the sun,*" and "*The center of the earth is very hot*". On these items, more than 60.0% of the Malaysians demonstrate the correct understanding of the science concepts. Overall, Malaysians outperformed Indians on eight of the nine items of comparison, Americans on the first two, and Europeans on only the first item.

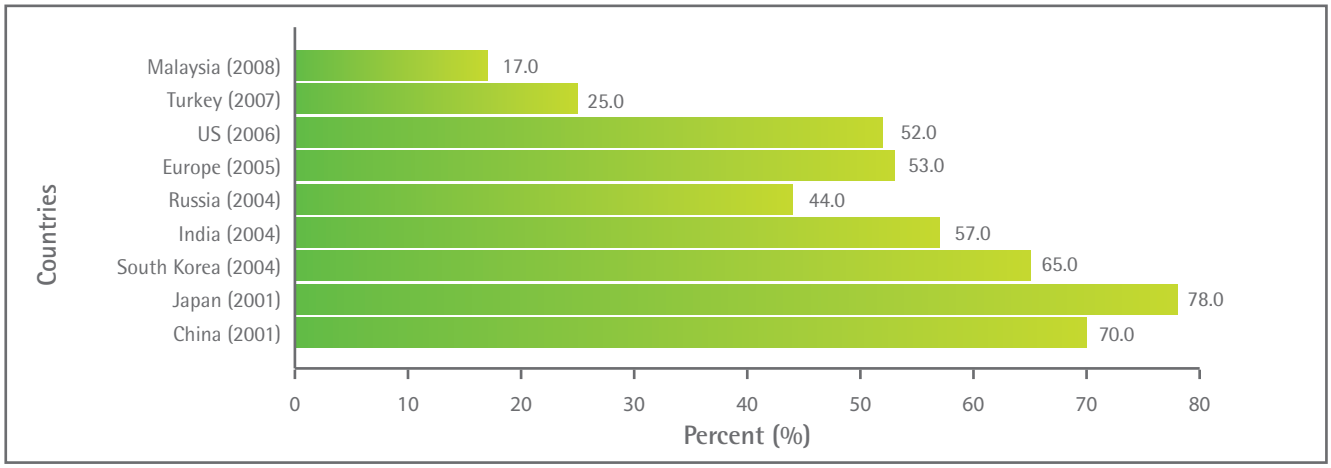
THE MALAYSIAN PUBLIC'S RESPONSES TO THE THEORIES OF EVOLUTION AND BIG BANG

Two items, "*The universe began with a huge explosion*", and "*Human beings as we know them today developed from earlier species of animals*", which consistently appear in *Public Understanding of S&T* surveys conducted worldwide, have not been included in the assessment of the public's *understanding* of S&T. This is because the two statements represent scientific theories on which scientists have differing views. In addition, the item, "*Human beings as we know them today developed from earlier species of animals,*" does not reflect science literacy, but rather, one's religious beliefs or philosophical orientation. However, the items have been included in a separate section in the present survey to enable some comparison to be drawn between the Malaysian and international public with respect to epistemological beliefs in science.

With regard to the statement, "*The universe began with a huge explosion*" not a very high percentage of the Malaysian (27.0%), American (32.0%), Russian (35.0%), or Indian (35.0%) adult public agreed with the statement. An even lower percentage of agreement (17.0%) was found among the Chinese public. The highest percentage of agreement was recorded among the South Koreans (67.0%) and Japanese (60.3%).

Concerning the statement "*Human beings as we know them today developed from earlier species of animals,*" only 17.0% of Malaysians agreed it is TRUE **(Figure 11).** The majority of Malaysians (51.3%) marked this item as FALSE, which means they reject the notion that man originates from apes. In contrast, 52.0% of the Americans, 53.0% of the Europeans, 44.0% of the Russians and 57.0% of the Indians accept this notion as representing a scientific truth. Even greater acceptance of the notion is evident among oriental societies in China (70.0%), Japan (78.0%) and South Korea (65.0%). However, in Turkey where the respondents are predominantly Muslim, those who agree with human evolution constitute 25.0% **(Figure 11).** Elsewhere in

Figure 11: International Comparison of Public Agreement with the Idea "*Human Beings as We Know Them Today Developed from Earlier Species of Animals*"

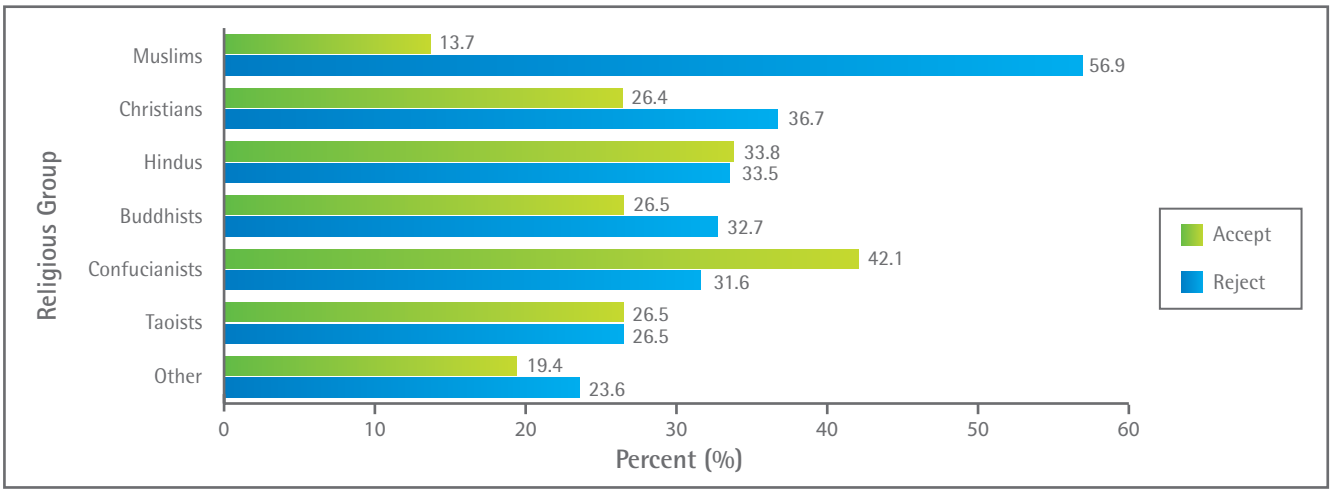


Sources: Science and Engineering Indicators 2006; Eurobarometer 2005; India Science Report 2005

countries where there are large Muslim populations, those who think that Darwin's evolution theory is true make up only small percentages: 8.0% in Egypt, 14.0% in Pakistan, and 16.0% in Indonesia, while those who outrightly reject the theory constitute more than 65.0% (source: *http://helios.hampshire.edu/~sahCS/Hameed-Science-Creationism.pdf)*

Hence, the inclination to agree with Darwin's evolution theory is noticeably less among Muslims than among the respondents of other faiths. In the current Malaysian survey, only 13.7% of the Muslims support the theory, as opposed to 26.5% of the Buddhists, 33.8% of the Hindus, 26.4% of the Christians, 42.1% of the Confucians, 26.5% of the Taoists and 19.4% of the other believers **(Figure 12)**, while those who reject the theory as false are greater in number among Muslims (56.9%) than among Buddhists (32.7%), Hindus (33.5%), Christians (36.7%), Confucians (31.6%), Taoists (26.5%) and other believers (23.6%) **(Figure 12).**

Figure 12: Malaysian Public's Acceptance and Rejection of the Idea "*Human Beings as We Know Them Today Developed from Earlier Species of Animals*" by Religious Group



Source: The Public's Awareness of Science & Technology 2008

ATTITUDES TOWARDS S&T

The attitudes of the Malaysian public towards S&T are also compared to those of the American and European public. An Index of Scientific Promise and an Index of Scientific Reservation were first developed by the USA National Science Foundation to track trends in public attitudes towards S&T. The two indices were based on the premise that most individuals hold two primary views toward science and technology.

The first view, as cited in The Public's Awareness of Science and Technology Malaysia 2000 report, represents the belief in the promise that science and technology would provide positive assessment of the likelihood of future benefits.

This view is represented by specific statements. For the purpose of comparison, the Index of Scientific Promise is represented by statements A and B for Malaysia, the USA, Europe and India **(Table 4)**. The second view represents personal reservations held about science and technology, which may conflict with a person's values and beliefs. This view is represented by statements D and I calculated for Malaysia, the USA, Europe and India **(Table 5)**. In this study, and in The Public's Awareness of Science and Technology Malaysia 2000 and 2004 studies, the two indices were calculated by taking the average percentage of adult respondents who agreed to the four items.

The Index of Scientific Promise among Malaysians is 68.8%. While this seems to indicate that Malaysia ranks lowest in terms of positive attitudes towards S&T when compared to these countries, the results should be taken with caution, as the index is based on the average of the percentage of agreement to only two items. It should be emphasized that more than 70% of the Malaysian public feel that "*S&T improves the quality of our lives*"; "*S&T is important for the progress of our nation*"; *"We need to have knowledge about science in order to manage our lives"*; and that *"Daily work will be more efficient with the use of S&T"*. In addition, more than 2/3 of Malaysians feel that S&T gas positive effects on working conditions, public health, and individual enjoyment of life (See Highlights of the 2008 Survey).

Based on the indices of four countries shown in **Table 6**, India seems to express the most reservation towards S&T. The Index of Scientific Reservation for Malaysia is almost the same as that of Europe, while the USA seems to have the least reservation towards S&T.

A sizeable portion of the Indian population (74.0%) feels that their society depends too much on science. The percentage agreement to this statement is much lower in Malaysia (39.2%). Malaysia and Europe are almost the same in their response toward this item. This suggests that most Malaysians, as most Europeans, do not see science and religion as being in conflict. This

Table 4: Index of Scientific Promise

Issues		Malaysia (2008)	USA (2004)	Europe (2005)	India (2004)
A	S&T makes us healthier & our lives more comfortable	66.1	91.0	78.0	77.0
B	Our daily work will be more interesting with the use of S&T	71.4	78.5	70.0	61.0
Mean Percentage		**68.8**	**84.8**	**74.0**	**69.0**

Sources: Science and Engineering Indicators 2006; India Science Report 2005

Table 5: Index of Scientific Reservation

Issues		Malaysia (2008)	USA (2004)	Europe (2005)	India (2004)
A	We depend too much on science and not enough on faith	39.2	56.0	40.0	74.0
B	Science causes our lifestyles to change too rapidly or Science makes our lives change too fast	66.1	31.0	60.0	75.0
Mean Percentage		**52.7**	**43.5**	**50.0**	**74.5**

Source: Science and Engineering Indicators 2006

response is encouraging, as it indicates that Malaysians have quite a positive attitude towards S&T.

On the other hand, quite a large percentage of the Malaysian, Indian & European public also feel that science changes their lives too fast. This sentiment is shared by only 31.0% of the Americans.

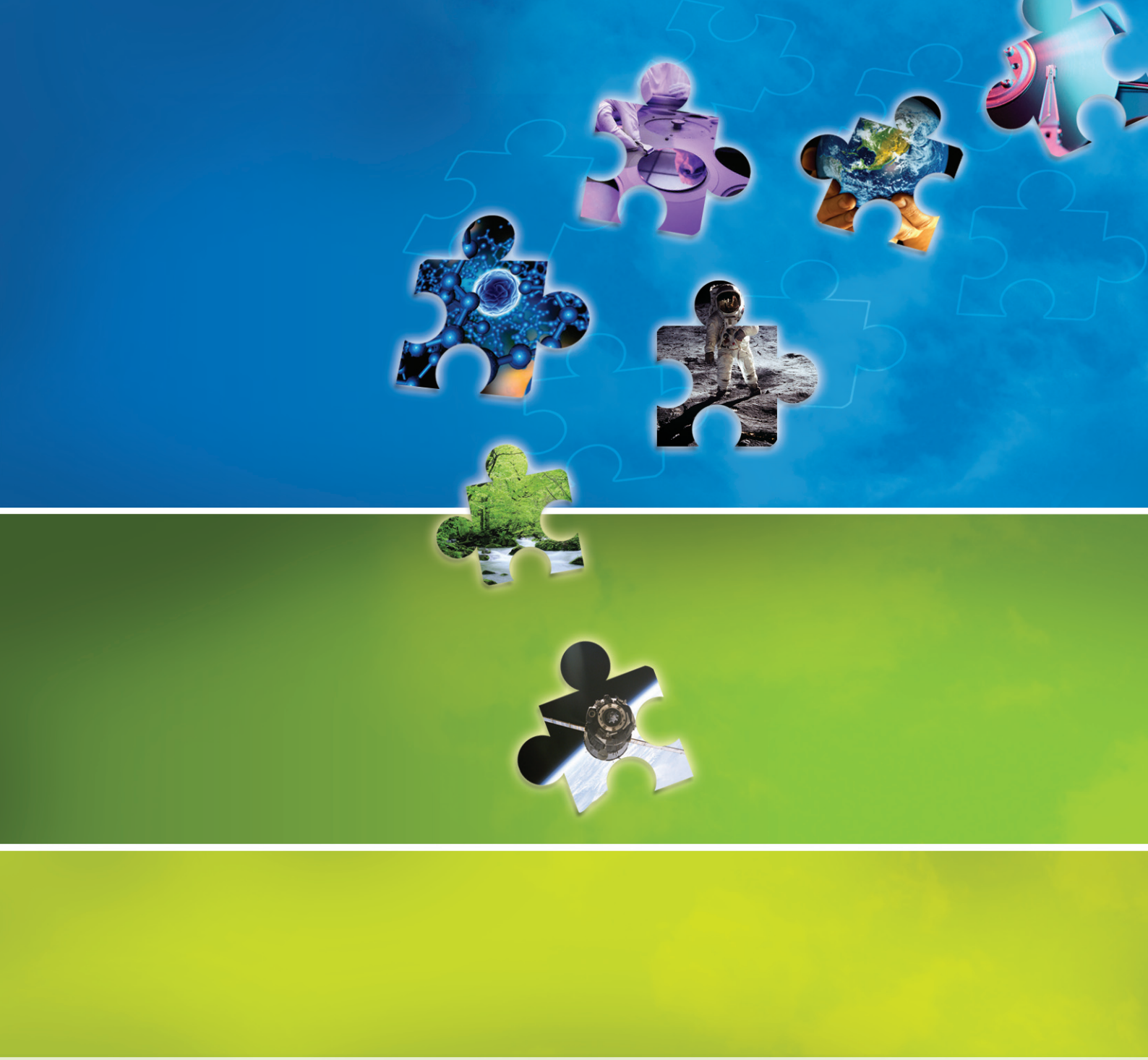
MAIN SOURCES OF S&T INFORMATION

In Malaysia, the television and newspaper constitute the two most important sources of information on S&T **(Table 6)**, while in the USA, it is the television and Internet. However in the USA, the percentages of people accessing these sources of information are lower than the percentages registered in Malaysia. In India, people rely more on the television and radio, and less on the printed word (the newspaper, books and the Internet). The Indians also report getting S&T information from friends and relatives (11.6%). An interesting pattern shared by all three countries is that despite the rapid advances made in various fields of telecommunications and ICT technologies in the last few decades, relatively few respondents in Malaysia and the USA cited the Internet as a source of S&T. The percentage of people accessing the Internet for S&T information in Malaysia is slightly higher than that reported in South Korea (23.0%), but interestingly the South Koreans, like the Americans, reported consulting the Internet more than the newspaper.

Table 6: International Comparison on Sources of Information on S&T (Percent)

Sources	Malaysia (2008)	Malaysia (2004)	US (2006)	India (2004)	S. Korea (2006)
Television	82.4	87.5	39.0	64.7	-
Newspaper	62.1	68.9	11.0	7.6	16.0
Radio	32.1	41.3	2.0	13.0	-
Internet	24.8	21.4	23.0	0.2	23.0

Sources: Science and Engineering Indicators 2006; India Science Report 2005



4 RECOMMENDATIONS

4

RECOMMENDATIONS

Based on the findings of the study, and based on a consideration of the factors that would create a scientifically literate society, this research proposes several recommendations:

1. DEFINING SCIENCE LITERACY

We need to delineate what it is that the public needs to know, and why they need to know, about S&T before we can consider them to be scientifically literate. This will also help us in specifying the various dimensions and the items within these dimensions – to assess their understanding of S&T and other related issues. It is also important to emphasize the fact that the level of S&T awareness and understanding of the public of the "more developed" countries should not necessarily be used as a "benchmark" for Malaysia, as their conception of what it means to be scientifically literate may be different from ours.

2. FOSTERING INTEREST IN SCIENCE THROUGH EDUCATION

Steps should be taken by the Ministry of Education to ensure that science is effectively taught in schools such that students appreciate the value of science and so that they would see the relevance of science to everyday life.

- The Malaysian school curriculum first and foremost should be made relevant to real life. The science education curriculum, especially, should be scientifically relevant, environmentally conscious and technologically up-to-date. It should include more issues and topics dealing with the natural world, the environment, and health.

- The Malaysian science curriculum should strike a balance between two important goals of science education – to promote science literacy for all citizens and to provide pre-professional training in science for those students who might later aspire to a career in science, and would thus require more advanced knowledge of science.

- A review of the curricula of Malaysian primary and secondary schools should be periodically conducted to improve the standard of science education and to ensure that its curriculum meets the needs of society and the nation. We need to look at whether the need for science has been adequately addressed in the teaching of science in schools and whether it is reflected in the science syllabus as well as textbooks.

- The relevant agencies such as the Textbook Bureau should ensure that science textbooks written for the science textbook program focus on developing an appreciation for science by providing examples of the relevance of science and its concepts to everyday events and situations. Further, science textbooks should not be written in a manner that emphasizes definitions over scientific reasoning about data.

Books that are written this way impose science concepts and definitions on the minds of the students, thus preventing meaningful learning of science from taking place. Rather, science textbooks should be written in a way that promotes inquiry and higher-order learning of science concepts. Well-written textbooks that meet the above criteria should be identified and used as benchmarks in the writing of science textbooks for Malaysian schools.

- A web-accessible resource of peer-evaluated instructional materials and best practices should be developed that identifies those materials and best practices that have been proven to be valuable and effective. This resource could include those materials and best practices developed in other countries.

- In-service and pre-service science teaching courses should be conducted and modules developed by Teacher Education Institutions and the Curriculum Development Centre for teachers, where the emphasis should not only be placed on the effective delivery of content, but also on fostering an appreciation for science among their students. In addition, Malaysian science teachers should be specifically trained in the techniques of teaching science through inquiry, and move away from didactic teaching and indoctrination.

- A council responsible for overseeing the science and technology agenda in education should be set up to draw up the following educational standards and oversee their implementation:
  - Standards for science teaching
  - Standards for science content
  - Standards for the professional development of science teachers
  - Standards for assessment in science education
  - Standards for technology literacy for teachers and students

3. ROLE OF THE BROADCAST AND PRINT MEDIA

Given the important role of the television and print media as leading S&T information providers for Malaysians, these agencies and the reporters working for them should be encouraged, or even educated, to focus less on entertainment news, gossips and trivia, and to redirect their efforts to educating the public.

- Local TV programmes should not only provide entertainment, but also play an educational role, that is, to educate the public, especially if these are government-owned channels, by imparting scientific knowledge through educational programmes, scientifically informative commercials, and public discourses on science-and-technology related issues.

- S&T programmes should be developed and geared not only toward the general public, but also toward specific segments of our population, such as women, children, and the rural folk. Given the importance of the media such as the television, radio, and newspaper as sources of information, these issues should be given not just ample, but proper coverage. Also, because TV is the most relied upon source of information by the Malaysian public, special programmes on S&T on the above issues should be developed by the local TV channels such as RTM, because these programmes will reach a larger number of rural folk.

- Given the fact that S&T is a very comprehensive and wide topic, and given the fact that the public consists of diverse groups of individuals,

we need to use different approaches in delivering knowledge or in implementing strategies and programmes, or they risk being considered as uninteresting or even irrelevant to their lives. For example, a big segment of the population that we would like to become more scientifically literate comes from the rural folk and the lower income group who are more likely not to have obtained a very high level of education. Hence programmes should focus on issues that would interest them.

- Women form a significant section of the population, and need to be given attention in creating a more 'scientifically literate' society as they are the primary 'influencers' in shaping the learning input for their children. Initiatives that matter to women, especially mothers, will include programmes that focus on developing healthy, inquisitive, and intellectually capable children, and those that help them to understand the growth requirements of their children.

- The programmes should also focus on the opportunities for women in S&T, and to "demystify" S&T for them. The successes of women in the field of S&T should be given ample coverage, as this will motivate them to go into S&T, and reduce the perception among many that S&T is more suitable for men.

- Efforts should be made to include write-ups on women in newspapers and in women's magazines. Directives could be given to government agencies as well as the corporate sector to distribute information on the achievements of their staff to the respective newspapers or magazines so that they would be aware of these achievements.

4. INCREASING VISITS TO SCIENCE CENTRES

This survey has found not many Malaysians to be aware of or have visited the Planetarium, Petrosains, and so on, when compared to parks, museums, or the zoo. As visiting these science centres is instrumental in improving the public's awareness and knowledge of S&T, the following strategies may be helpful in increasing the public's visits to these places:

- The RTM, being the channel most accessible to Malaysians even in rural and remote areas, may develop brief yet informative segments on what these science centers have to offer so that the public would be aware of and motivated to visit them. These centres could be publicized in an interesting and attractive manner, like our road safety and courtesy campaigns.

- Visits to these centres should be made part of the school curriculum, embedded within the science and the English for Science and Technology syllabi. To facilitate such visits and to give all students the opportunity to visit the centres, schools should provide transportation to and from these places. To assist teachers in making these visits successful, student mentors may be trained to guide their less able peers in gaining knowledge from the visits.

- To increase the number of visits to these centres, the federal and state government should consider setting up science centres in various states in Malaysia. The centres should be located in places that are easily accessible by public transport.

5. ESTABLISHING A NETWORK ON SCIENCE AND TECHNOLOGY AWARENESS

A network should be developed to represent various agencies that promote science and technology awareness programmes, especially in promoting an early and lifelong interest in science and technology among the youth. Such a network should encompass science centres and museums, professional societies and associations, post-secondary institutions, schools and school boards (PTAs), industry, media, government, and individuals.

6. ESTABLISHING AN ONLINE RESOURCE CENTRE FOR SCIENCE AND TECHNOLOGY

Given the rising influence of the Internet and World Wide Web as a source of S&T information, the Ministry of Science in collaboration with the Ministries of Education, Higher Education and Information should seriously consider establishing a website as an online resource centre for S&T consumption for the public. This website or online resource centre should incorporate, among others, recent discoveries in the pure sciences, environmental science, technology, astronomy and medicine, research in S&T being conducted all over the world, brief biographies of S&T giants and contributors, descriptions and virtual tours of S&T centres across the globe, S&T quizzes, and S&T activities for students and teachers. A team of academics and researchers should be formed to look into the feasibility of setting up the website.

7. ROLE OF THE PRIVATE SECTOR

Educating the public about S&T is not the responsibility of the Malaysian government and schools alone; private sectors also play a role in imparting S&T information, and they may do so through the following means:

- By setting up foundations, where awards could be given for undergraduate scholarships in S&T, outstanding research in S&T, outstanding student research in S&T at the school level, and inventions in S&T at the school level. These awards could take the form of prestigious, national awards, associated with, and given the name of that particular private corporation. This will, at the same time, enhance the visibility and image of that corporation in the eyes of the public.

- By setting up or sponsoring programmes aimed at developing interest in S&T, such as national science quizzes for primary and secondary schools, national S&T interest clubs in schools, educational tours, for example, to show students or the general public how computers are assembled, how soap is made, how videos are produced, and so on.

- By organizing roadshows on the latest developments in S&T that involve various companies or corporations.

- By setting up partnerships with the government and universities to provide funding and grants for research on S&T, sponsor studies in needed fields in S&T, and sponsor or organize seminars on the latest developments in S&T.

- By imparting S&T knowledge through creative means, such as billboard advertisements and public information leaflets, of the sort that can be picked up on a visit to the doctor or dentist, or from the lobbies or front desks of their offices.

The government should recognize the public sector that is actively involved in promoting S&T to the public by publicizing its contribution in TV and newspapers. Special tax exemptions should be given to the company for participating in and promoting the S&T agenda for the public.

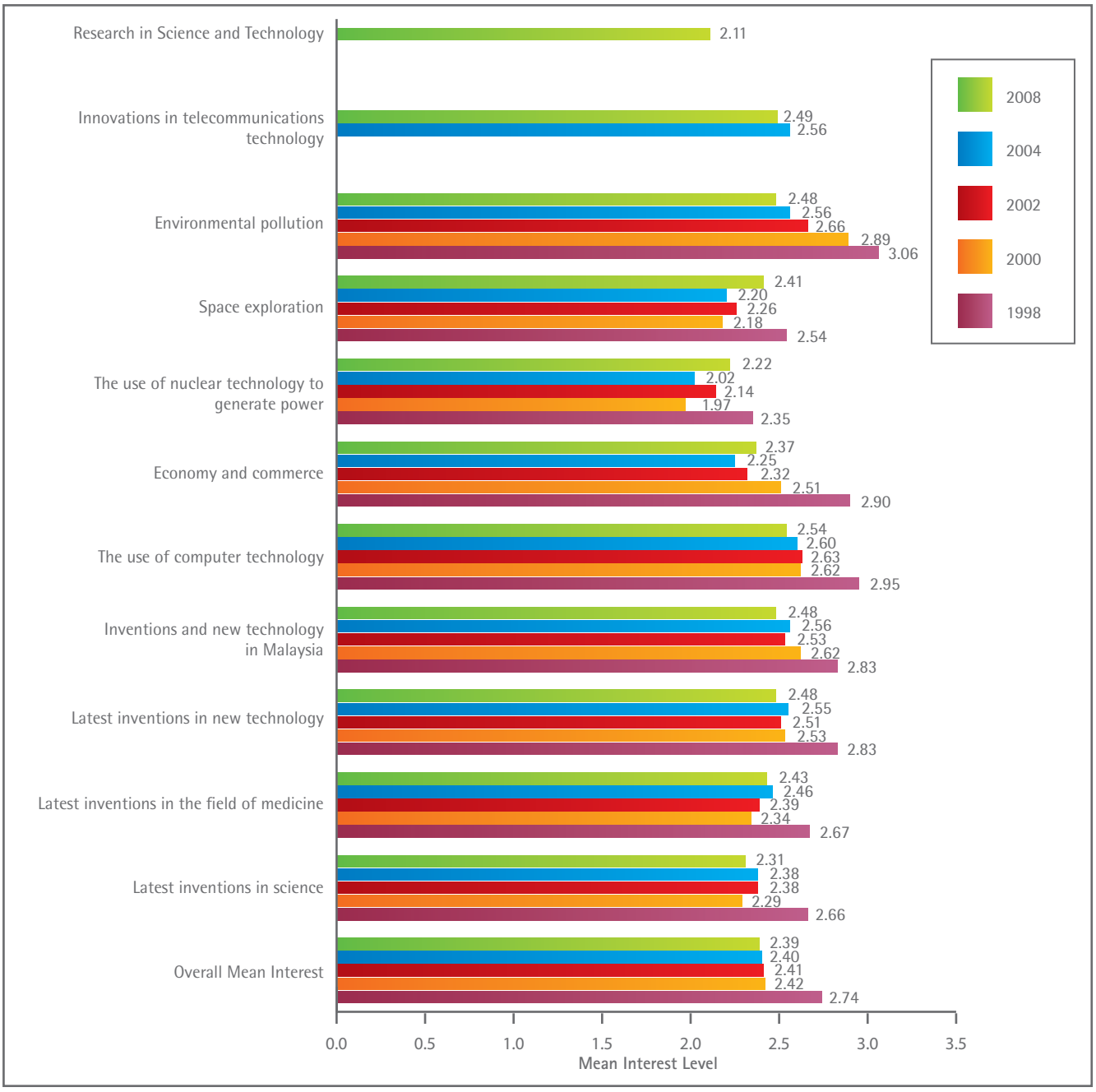
5 APPENDICES

5

APPENDICES

The Public's Perceived Interest in S&T Issued (1998-2008)

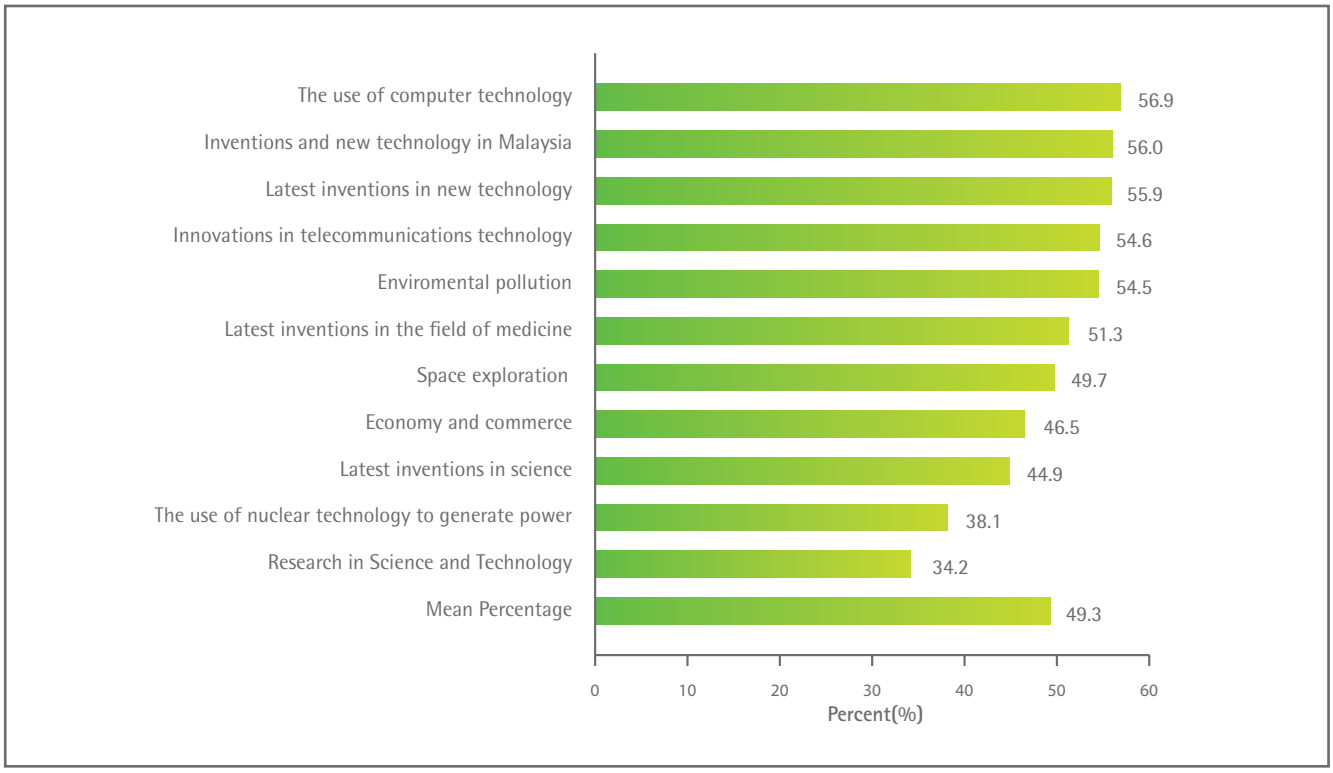
APPENDIX 1



Note: (1998-2002) Interest Level : 4 = Interested, 3 = Moderately Interested, 2 = Slightly Interested, 1 = Not Interested
(2004 & 2008) Interest Level : 4 = Very Interested, 3 = Interested, 2 = Not sure, 1 = Not Interested
Overall mean interest for 2008 is calculated over 11 common items

APPENDIX 2

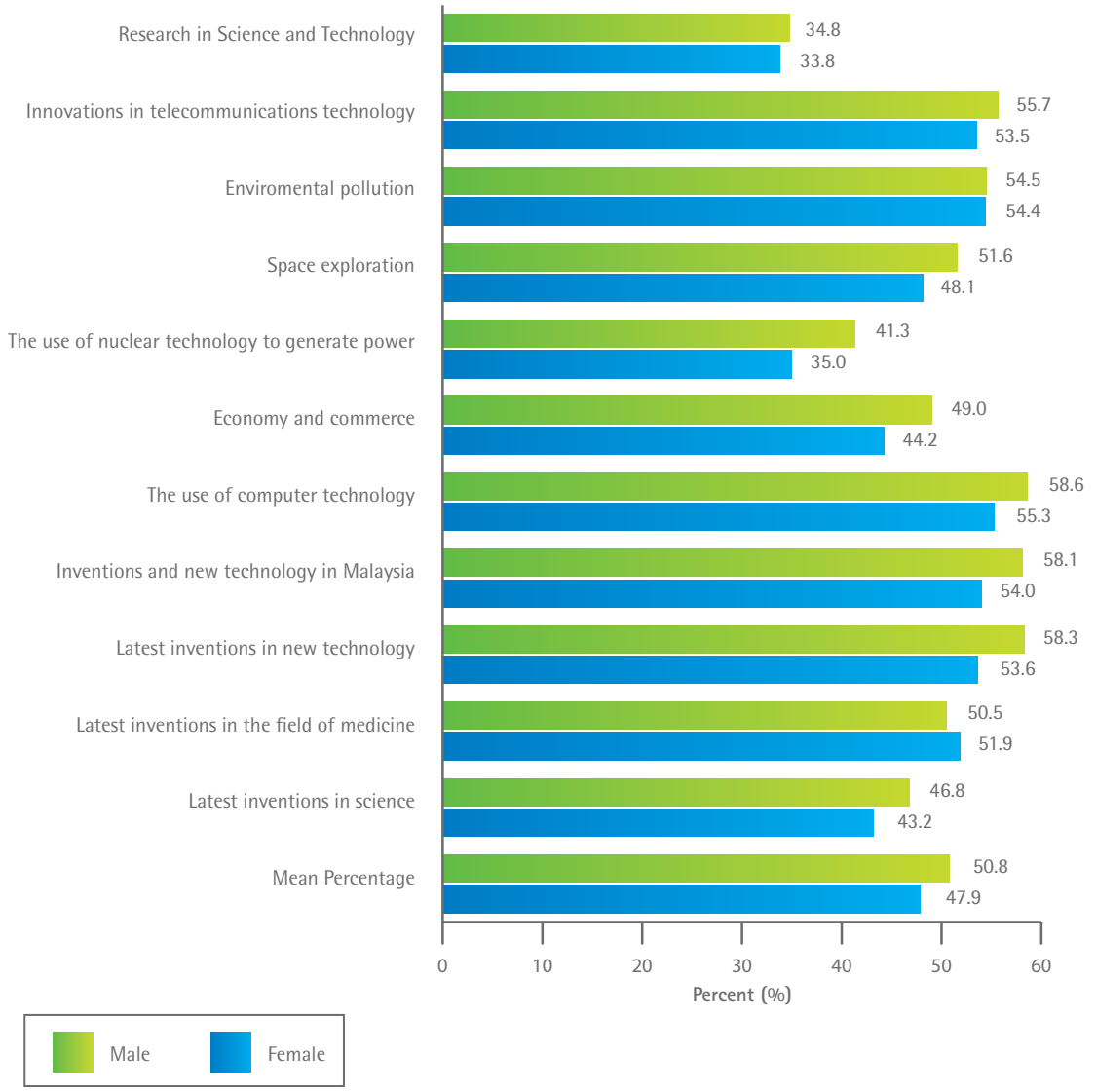
The Public's Perceived Interest in S&T Issued (2008)



Note: Interest Level : Interested and Very Interested

APPENDIX 3

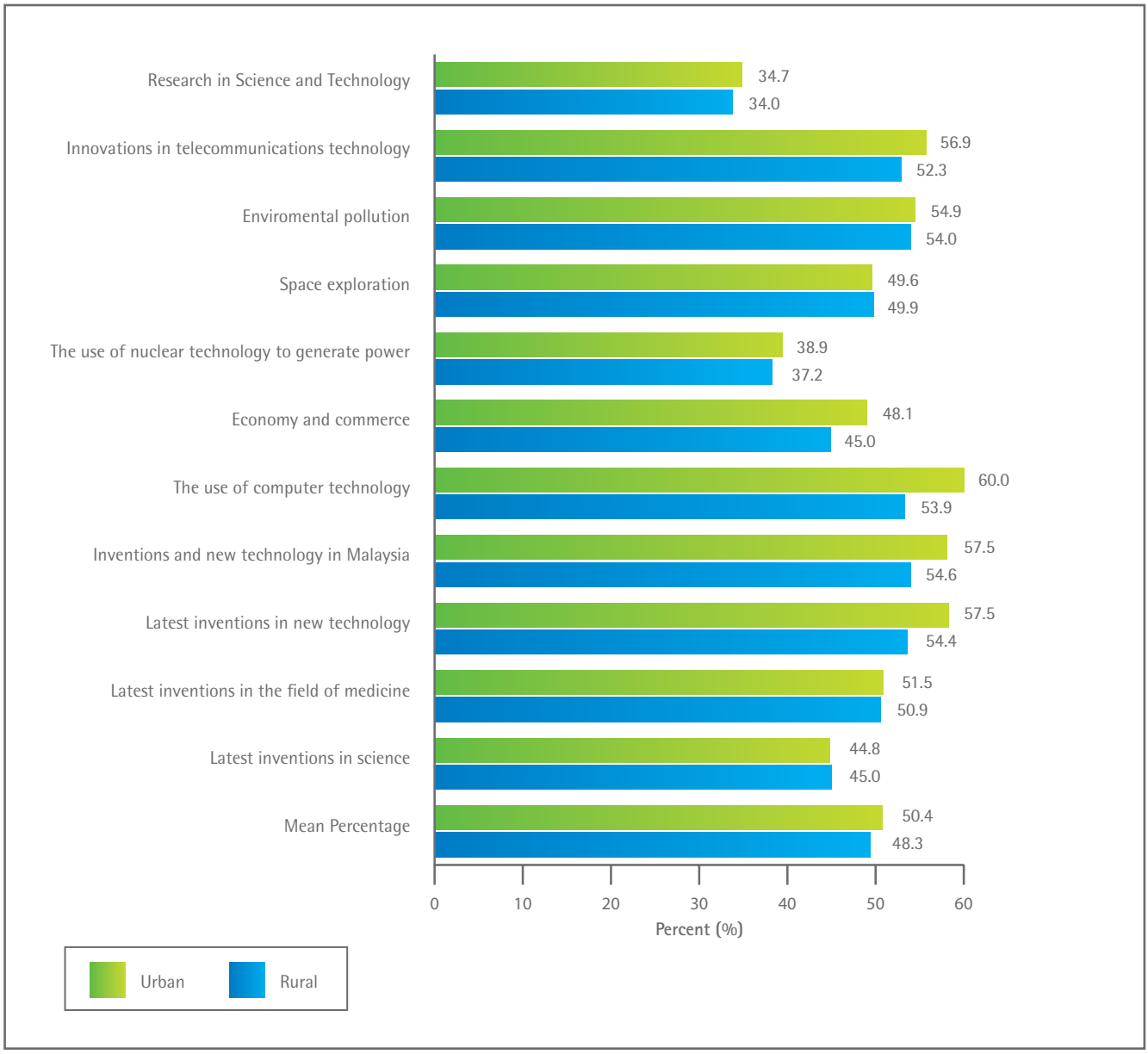
Perceived Interest by Gender 2008



Note: Interest Level : Interested and Very Interested

APPENDIX 4

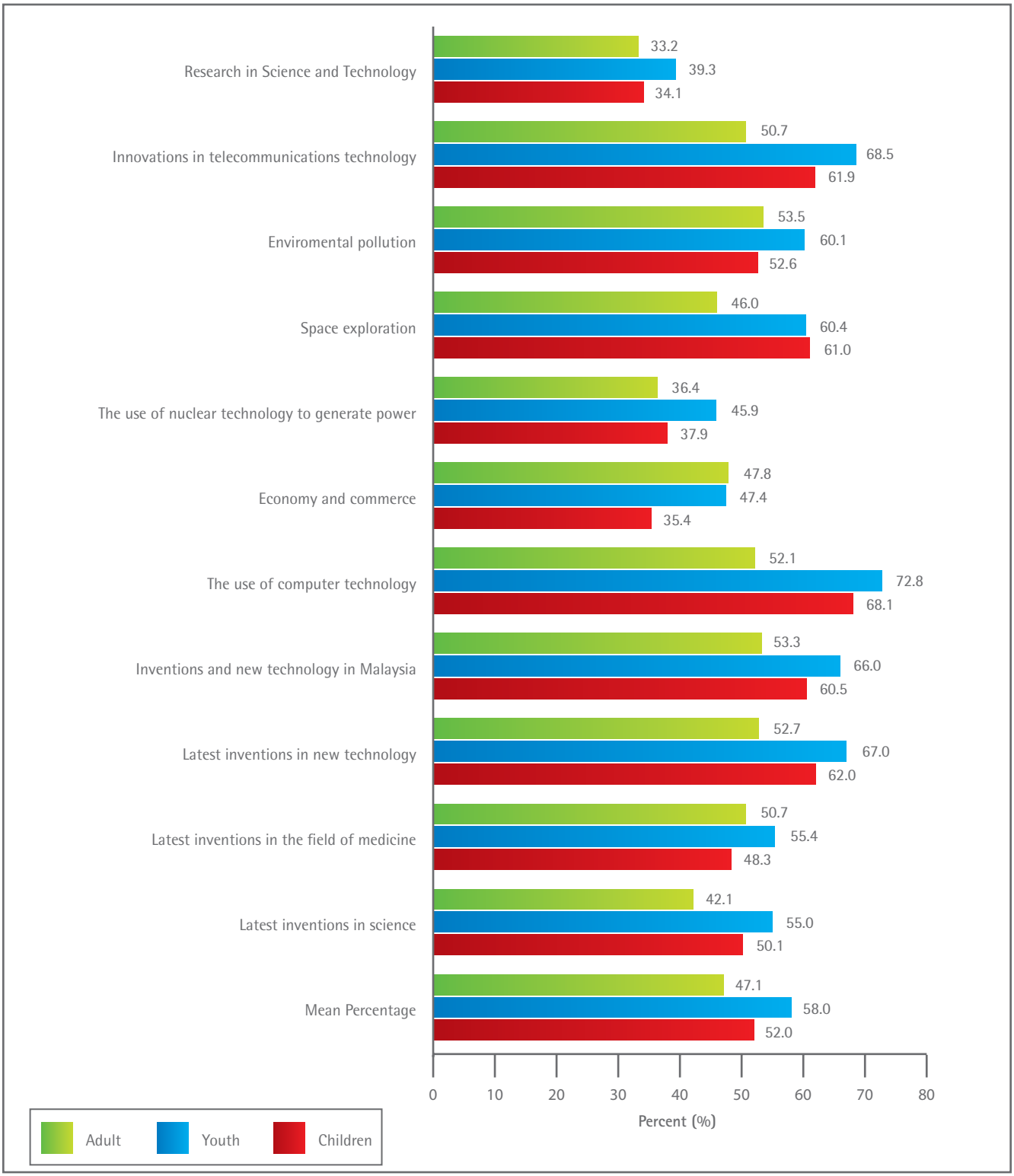
Perceived Interest by Locality 2008



Note: Interest Level : Interested and Very Interested

APPENDIX 5

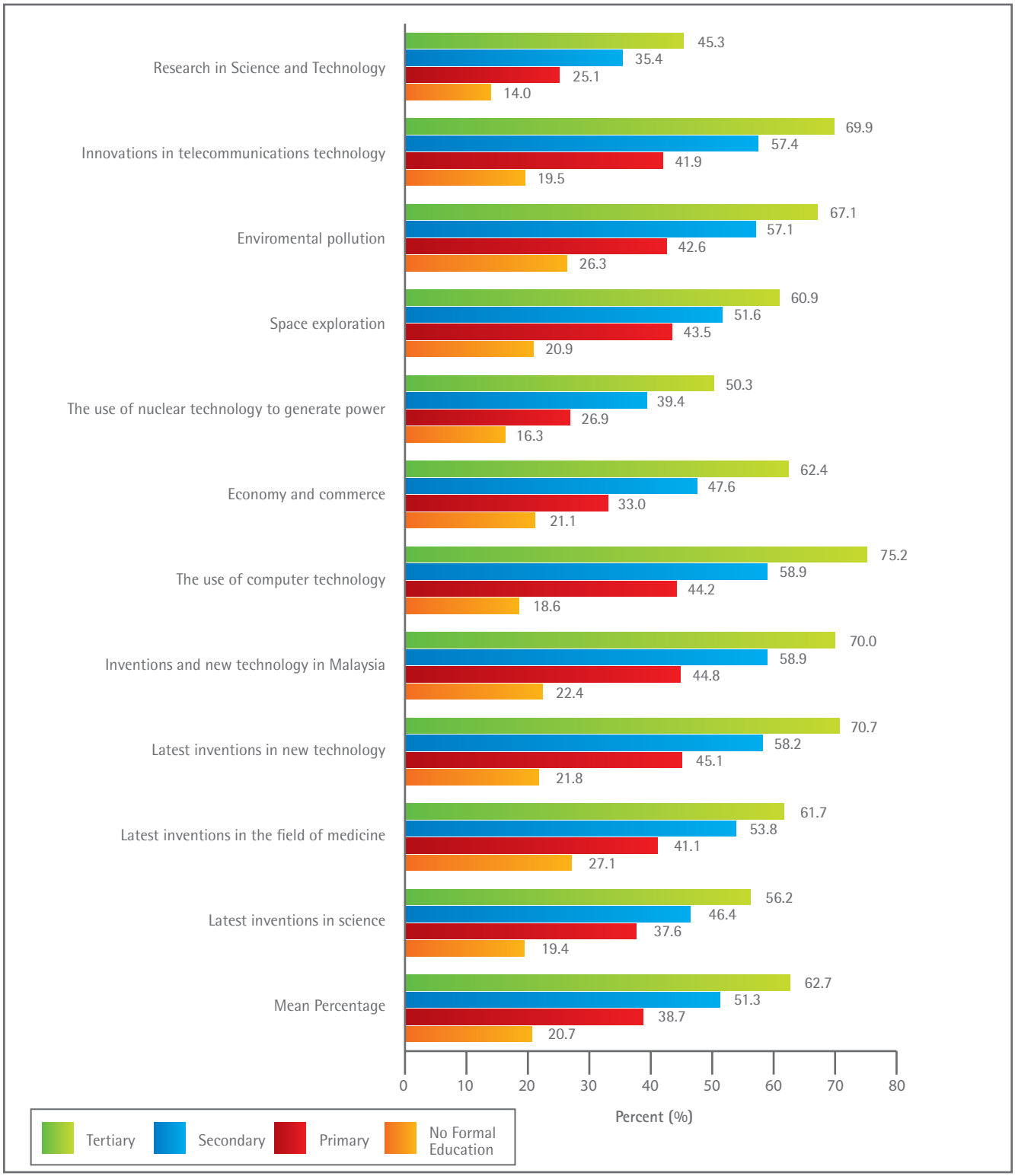
Perceived Interest by Age Group 2008



Note: Interest Level : Interested and Very Interested

APPENDIX 6

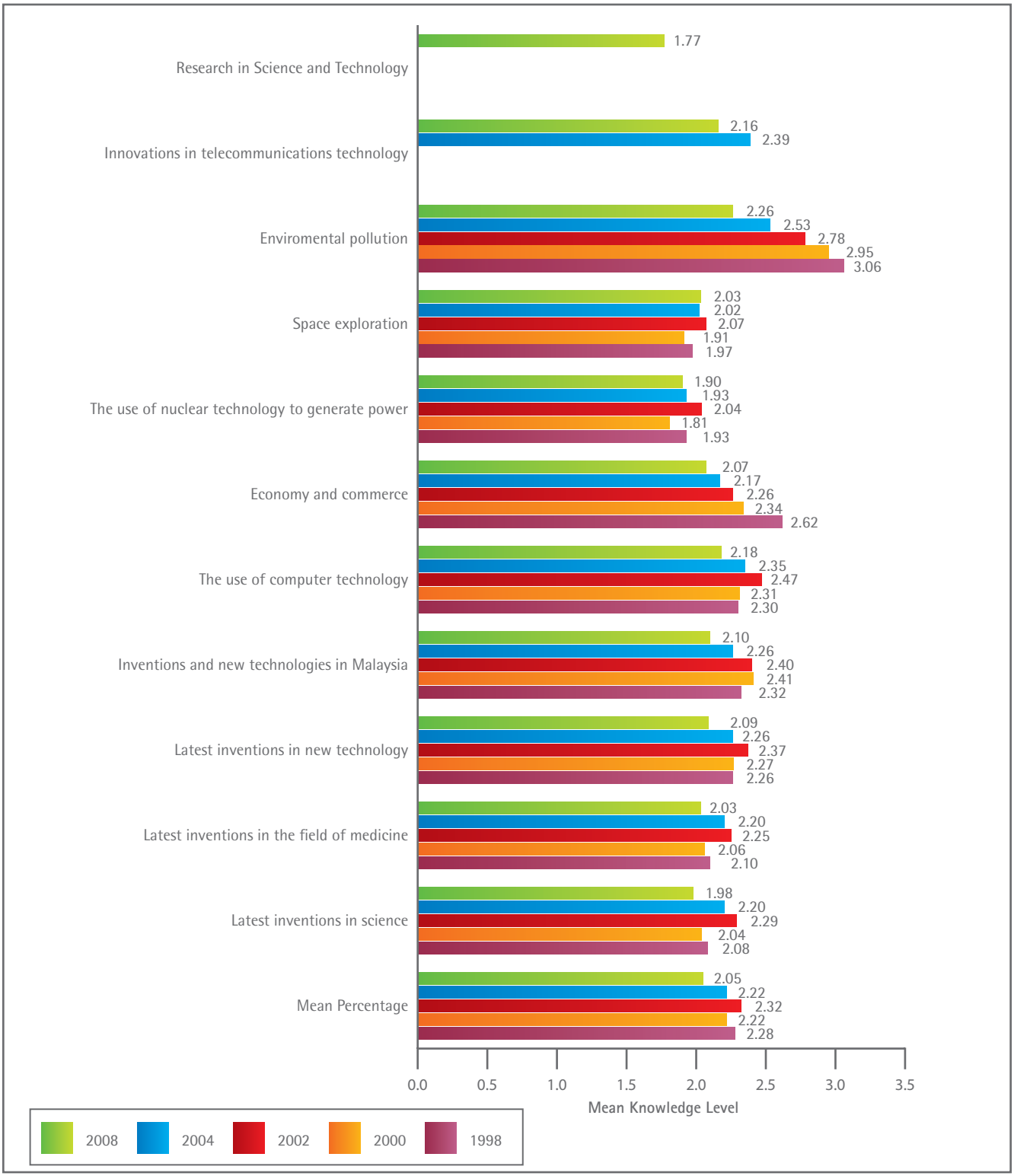
Perceived Interest by Education Level 2008



Note: Interest Level : Interested and Very Interested

APPENDIX 7

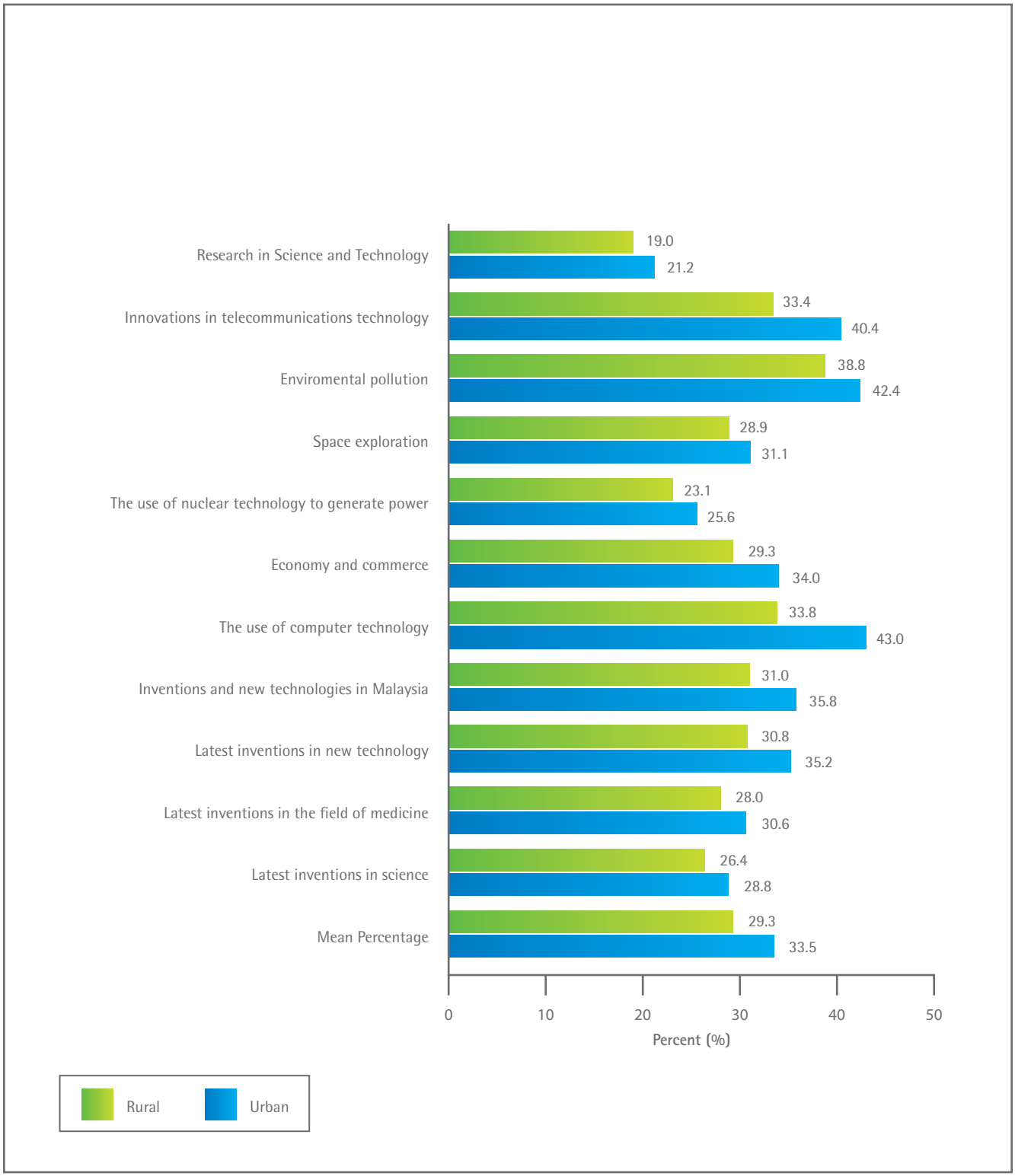
The Public's Perceived Knowledge of S&T Issues (1998-2008)



Note: (1998-2002) Knowledge Level : 4 = Excellent, 3 = Average, 2 = Poor, 1 = None
(2004-2008) Knowledge Level : 4 = Good, 3 = Average, 2 = Weak, 1 = None
Overall Mean knowledge for 2008 is calculated over 11 common items

APPENDIX 8

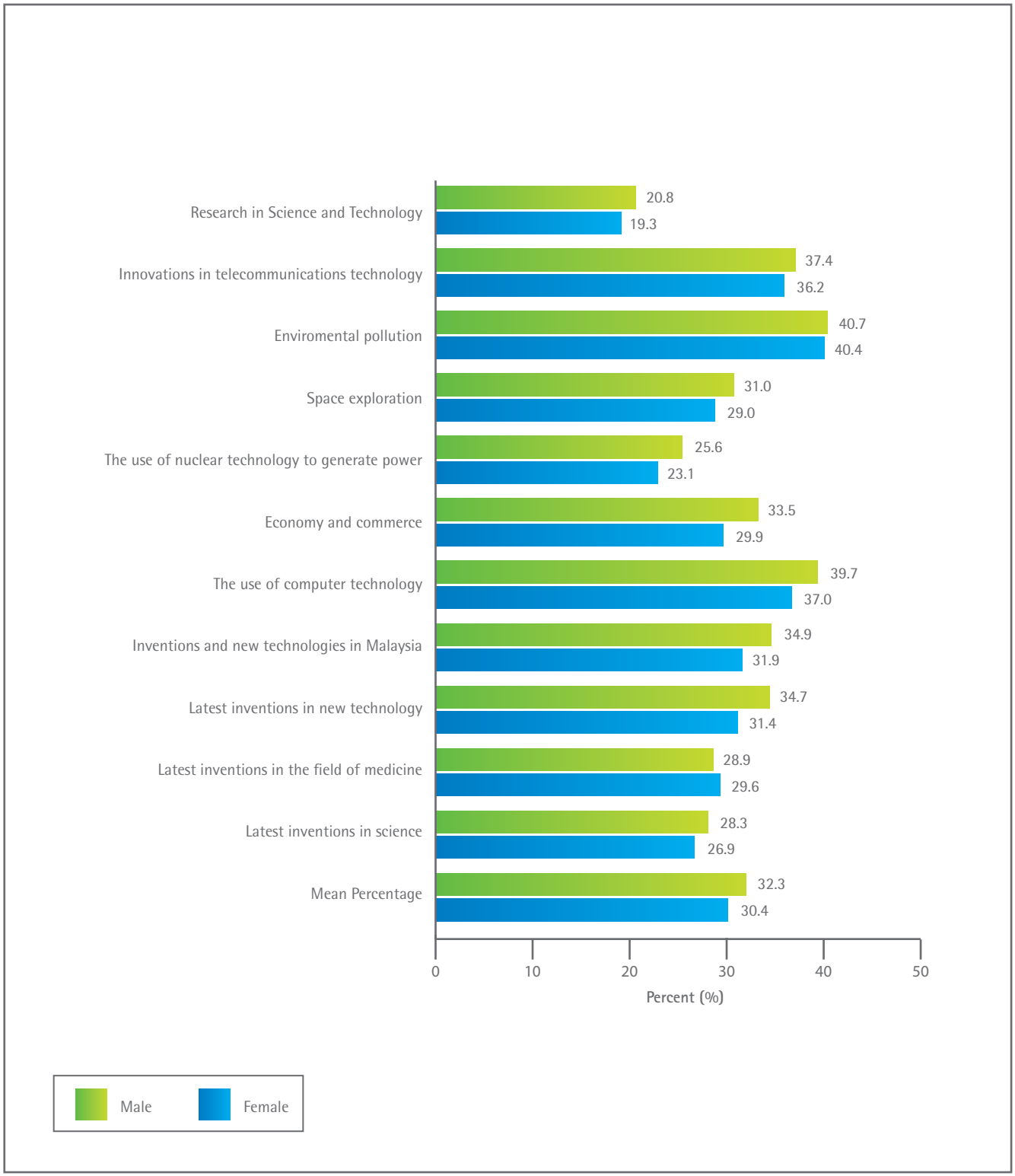
Perceived Knowledge by Locality 2008



Note: Level of Knowledge = Average + Good

APPENDIX 9

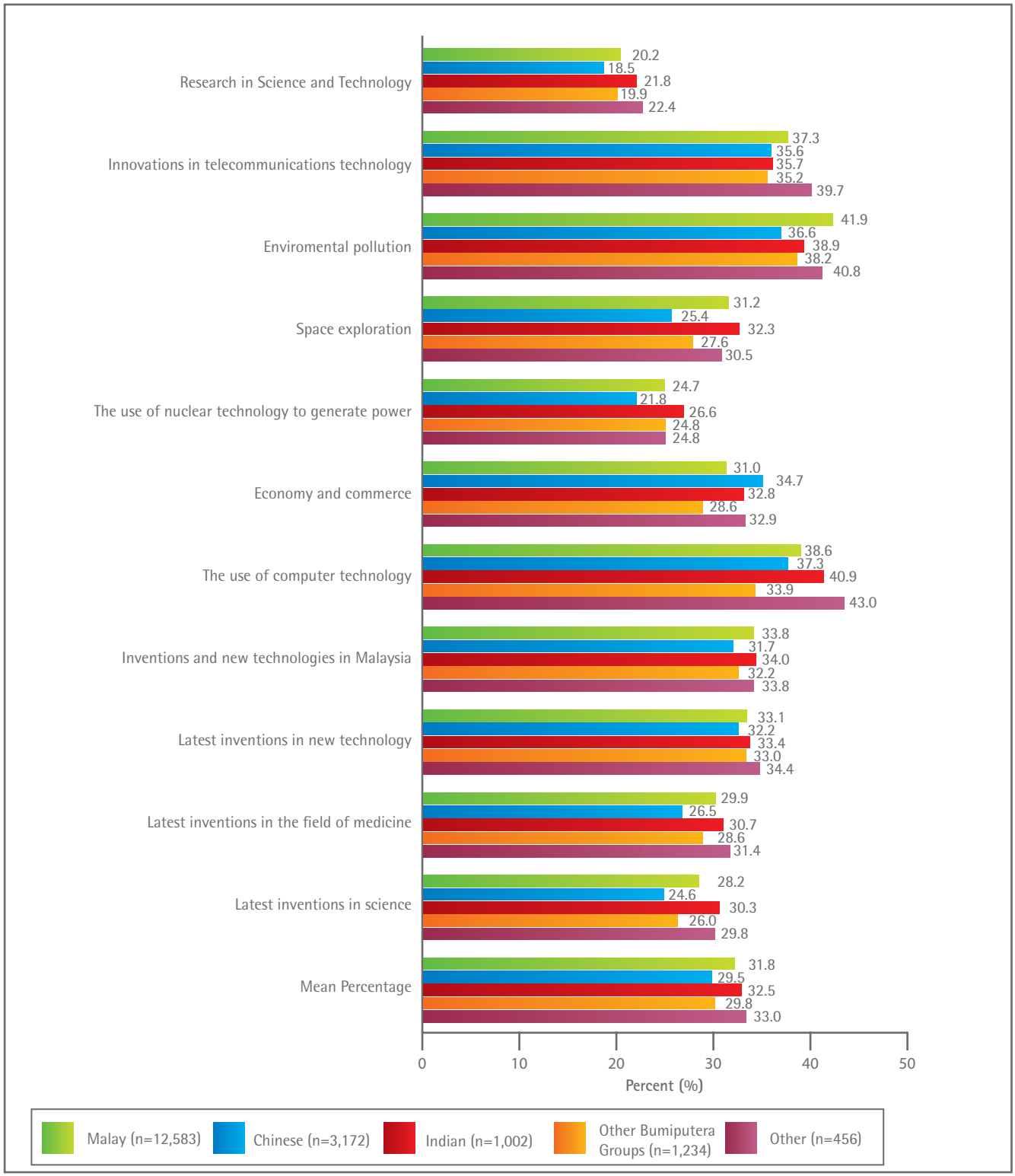
Perceived Knowledge by Gender 2008



Note: Level of Knowledge = Average + Good

APPENDIX 10

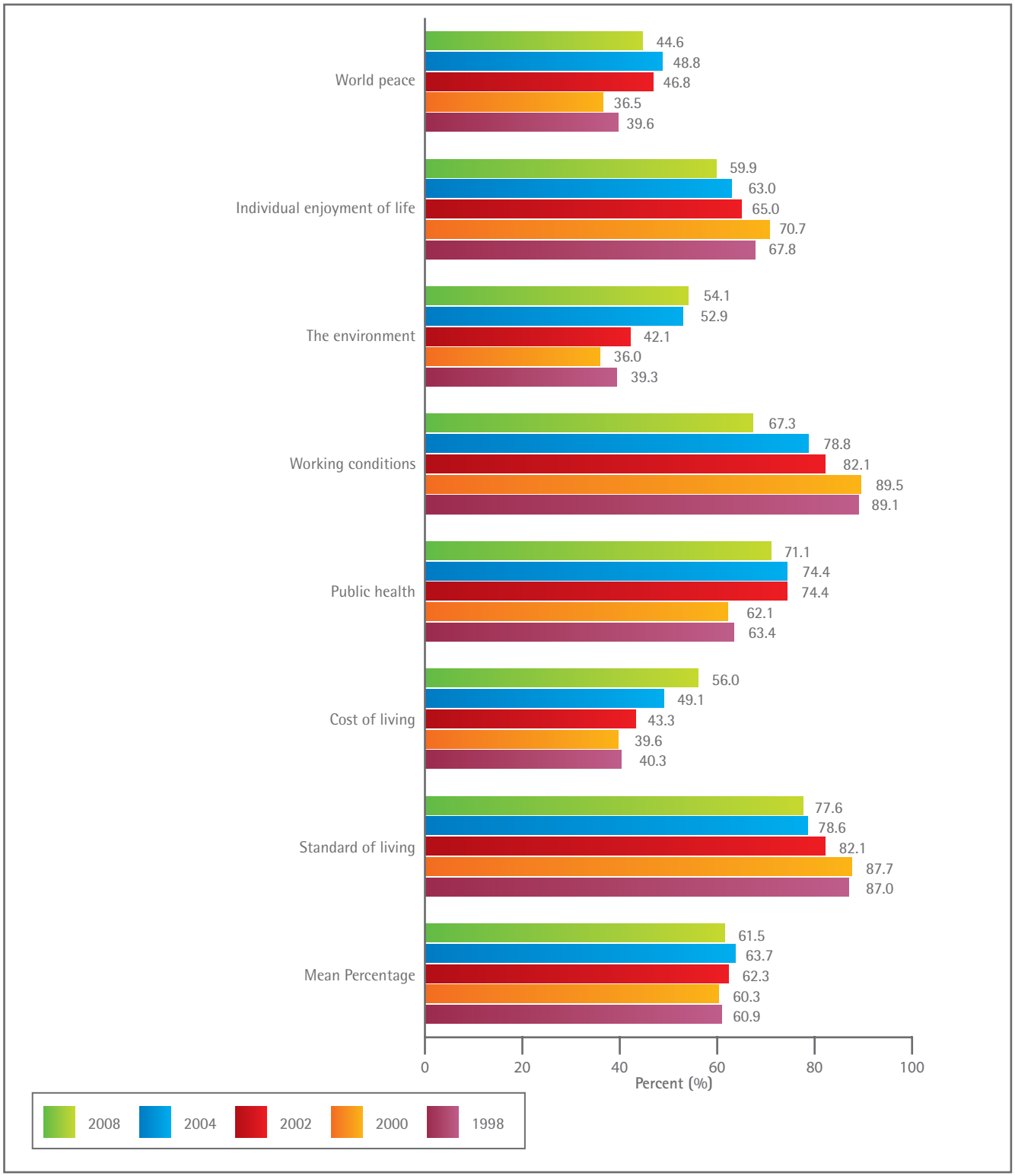
Perceived Knowledge by Ethnicity 2008



Note: Level of Knowledge = Average + Good

APPENDIX 11

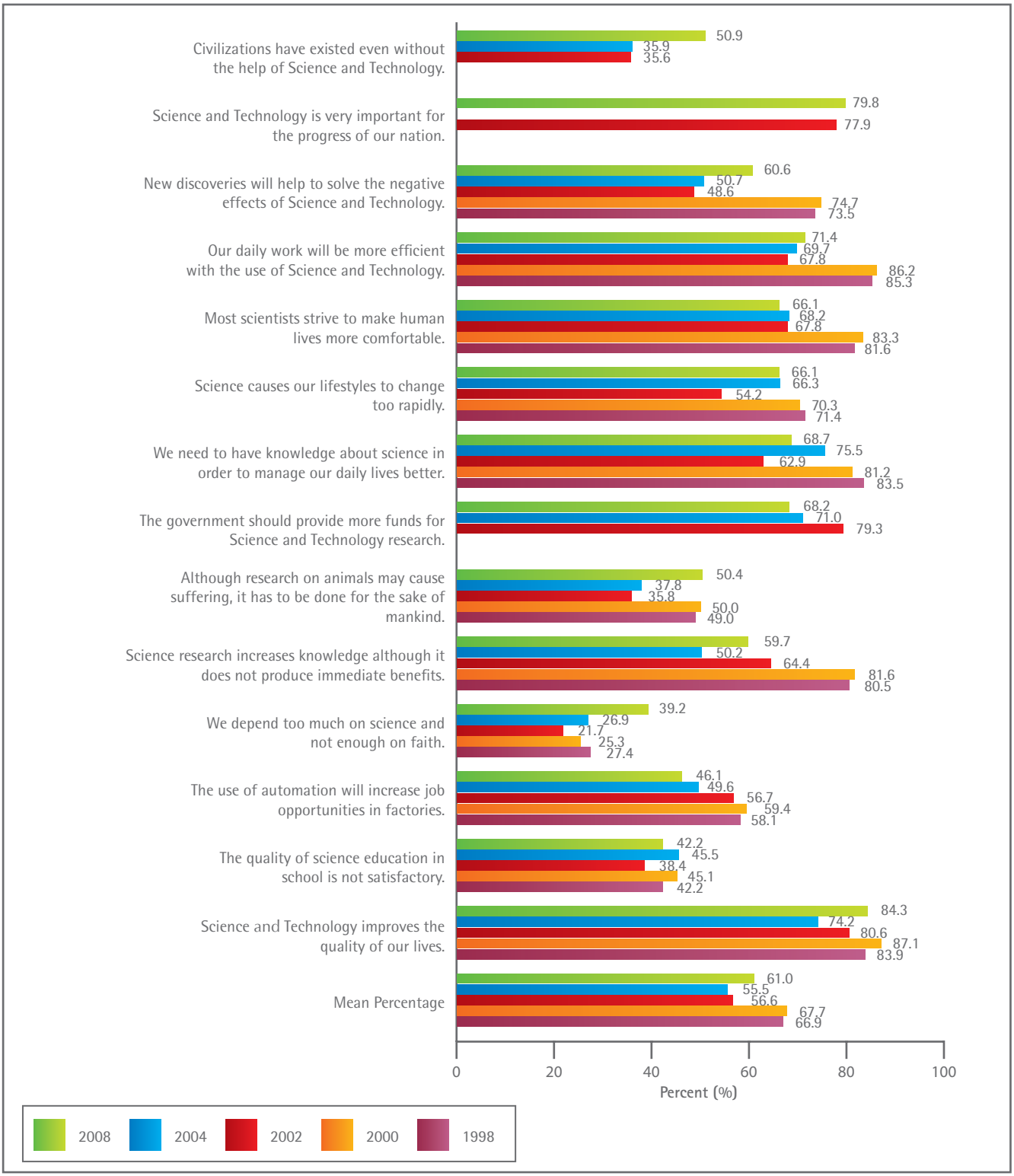
Public Attitudes Towards S&T on General Issues (1998-2008)



Note: This graph shows the percentage of the Malaysian public who stated that S&T has a positive effect on the above issues.

APPENDIX 12

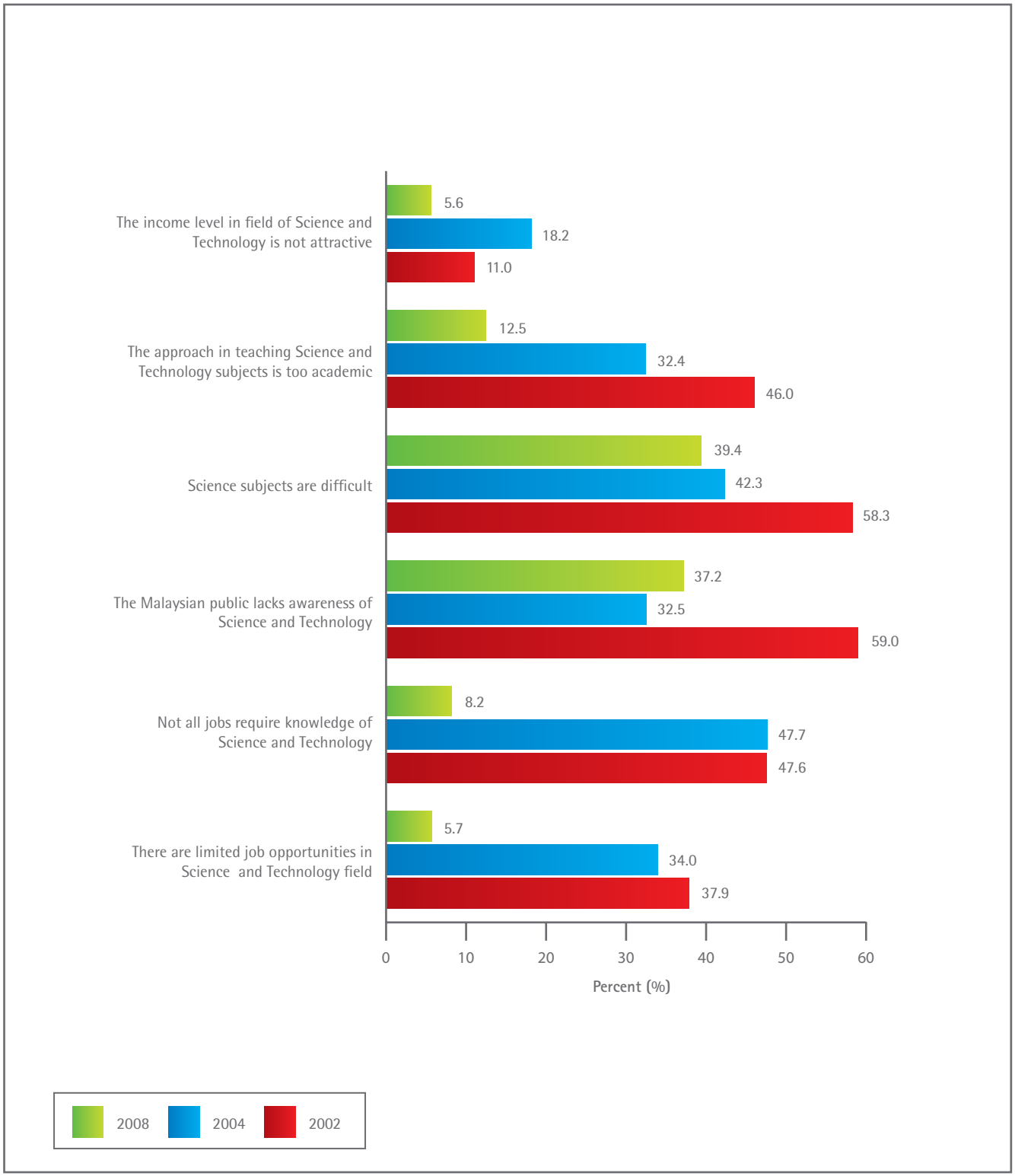
Public Attitudes Towards S&T on Selected Issues (1998-2008)



Note: This graph shows the percentage of the Malaysian public who agreed to the above statements.

APPENDIX 13

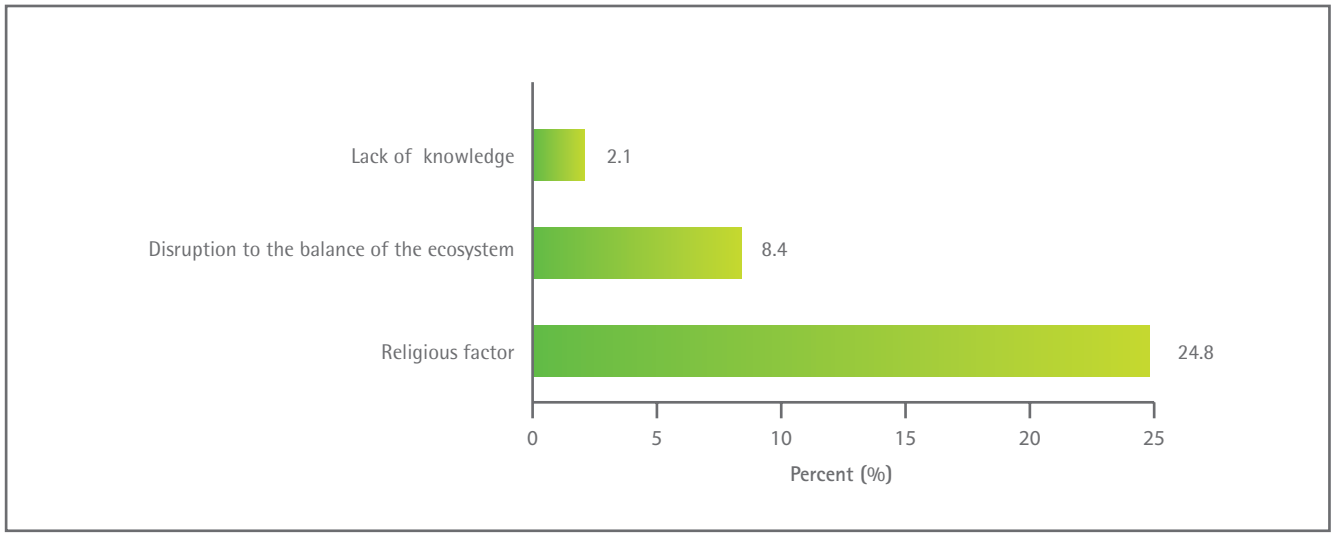
Public Opinions on Job Opportunities on S&T (2002-2008)



Note: This graph shows the percentage of the Malaysian who agree to the above issues.

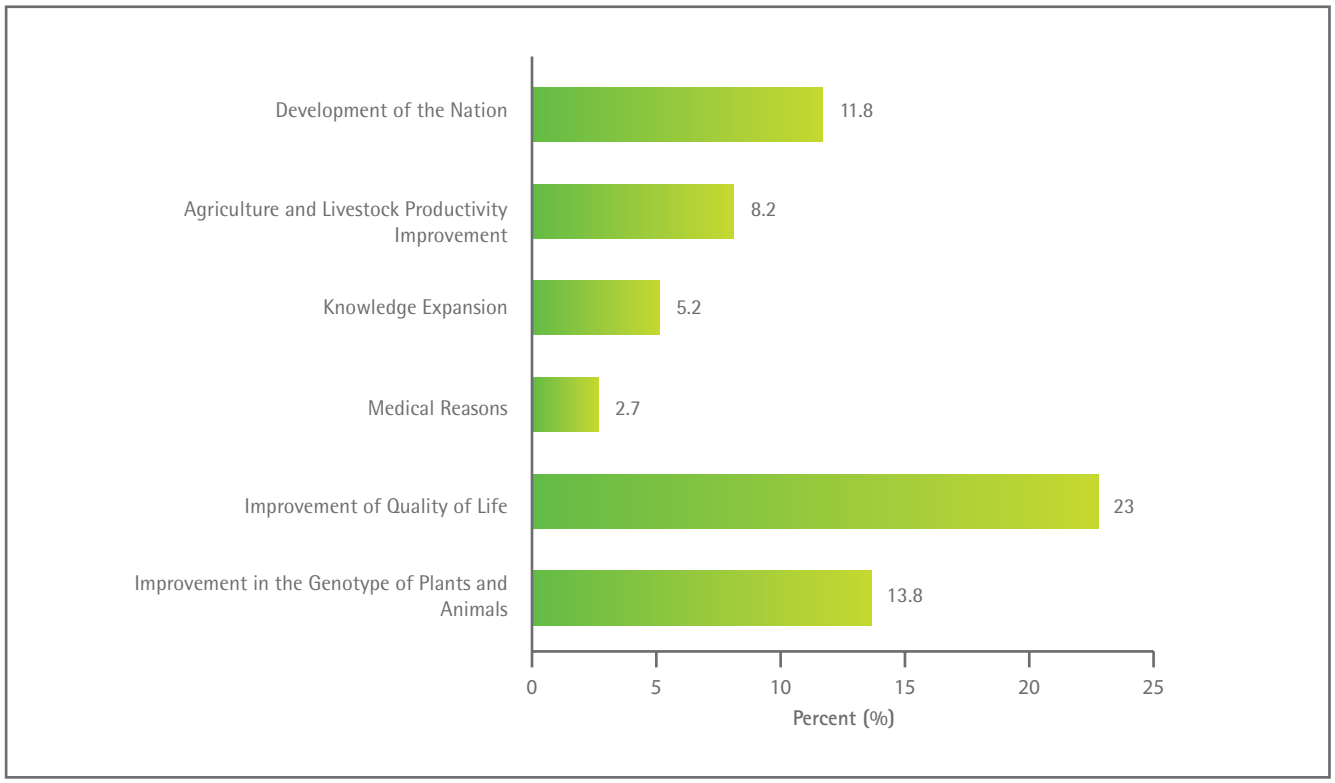
APPENDIX 14

Reasons for Disagreement with Genetic Engineering 2008



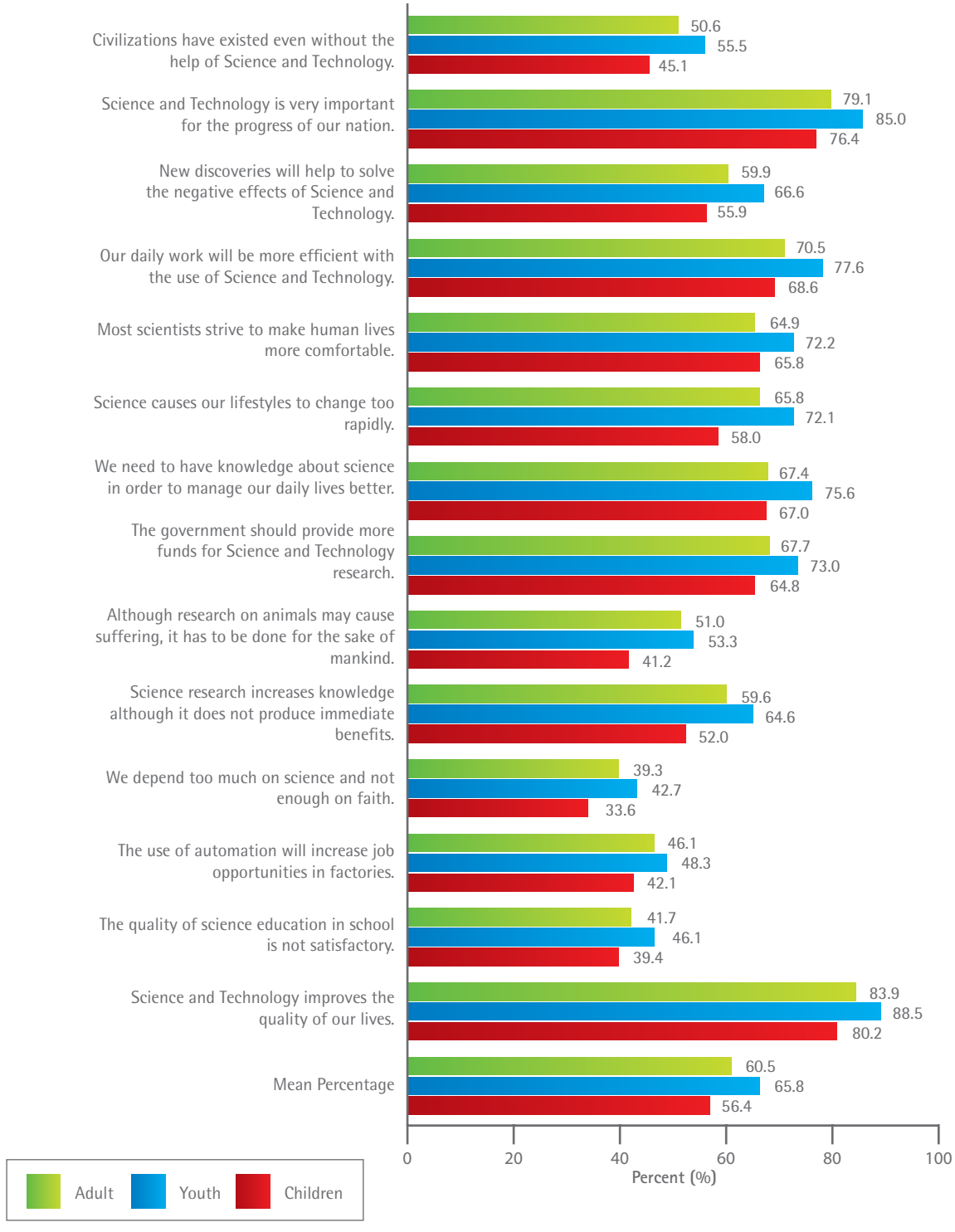
APPENDIX 15

Reasons for Agreement with Genetic Engineering 2008



APPENDIX 16

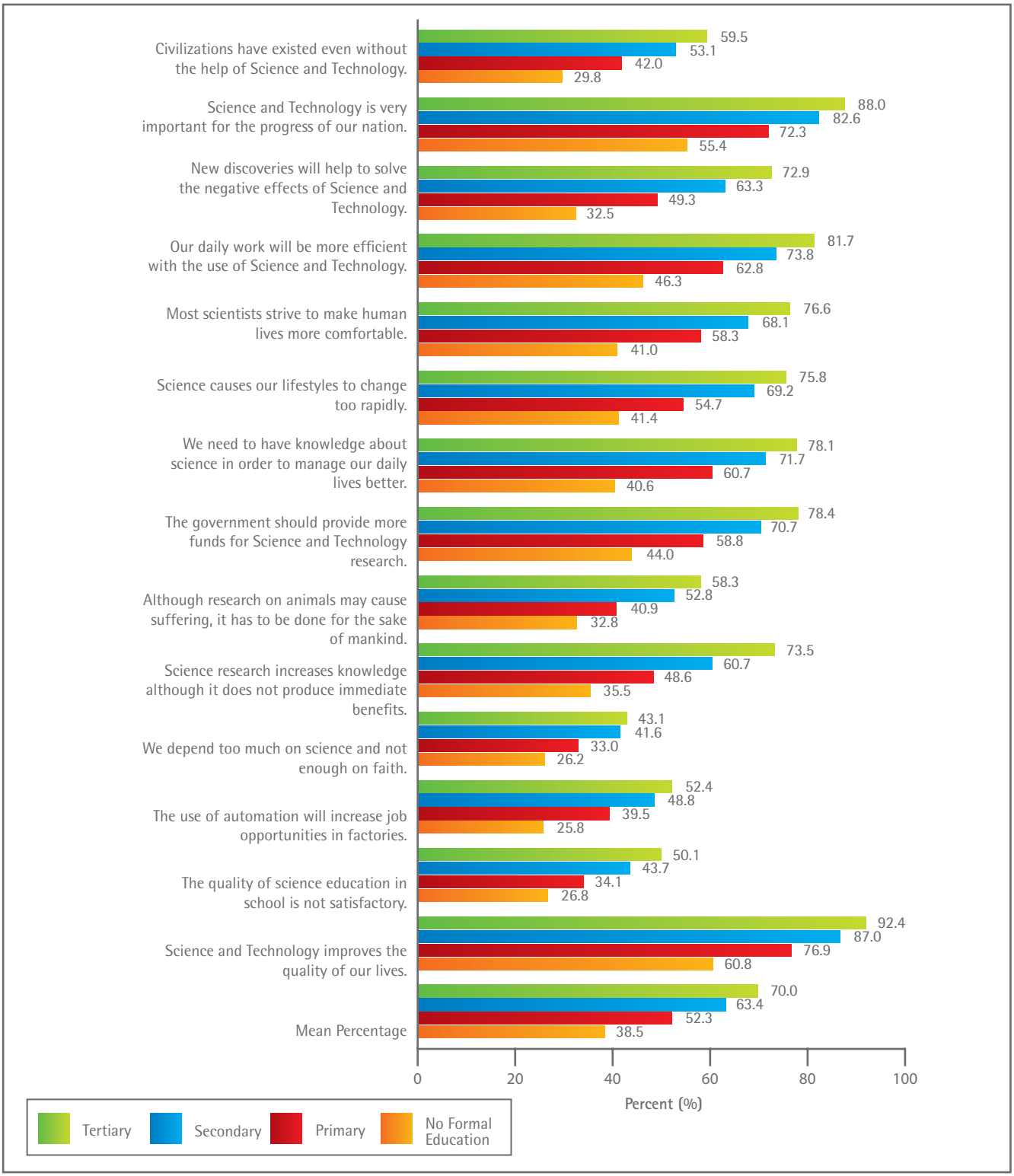
Public Attitude Towards Selected S&T Issues by Age Group 2008



Note: This graph shows the percentage of Malaysian who agree to the above issues.

APPENDIX 17

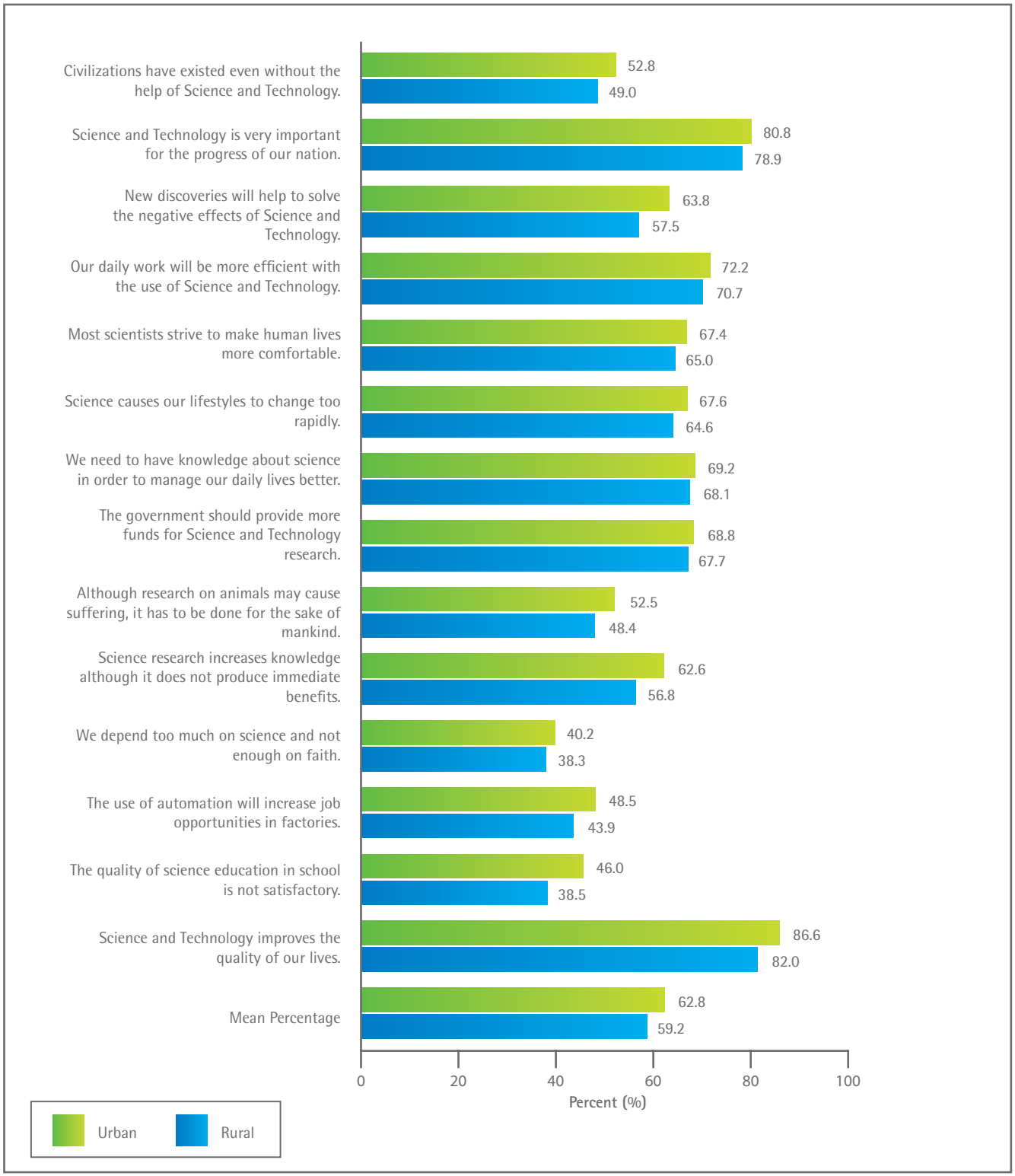
Public Attitudes Towards Selected S&T Issues by Educational Level 2008



Note: This graph shows the percentage of the Malaysian public who agreed to the above issues.

APPENDIX 18

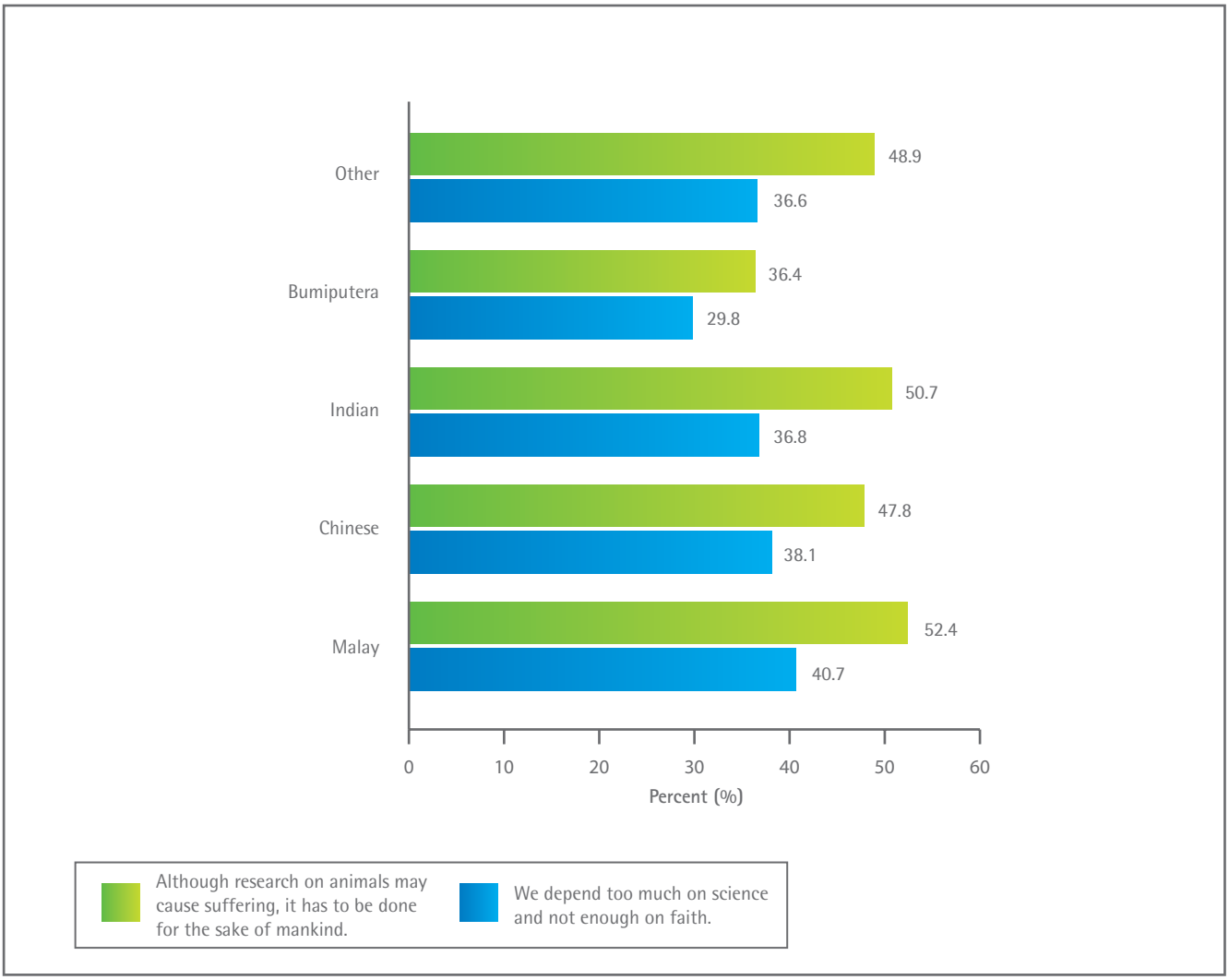
Public Attitudes Towards Selected S&T Issues by Locality 2008



Note: This graph shows the percentage of the Malaysian who agree to the above issues.

APPENDIX 19

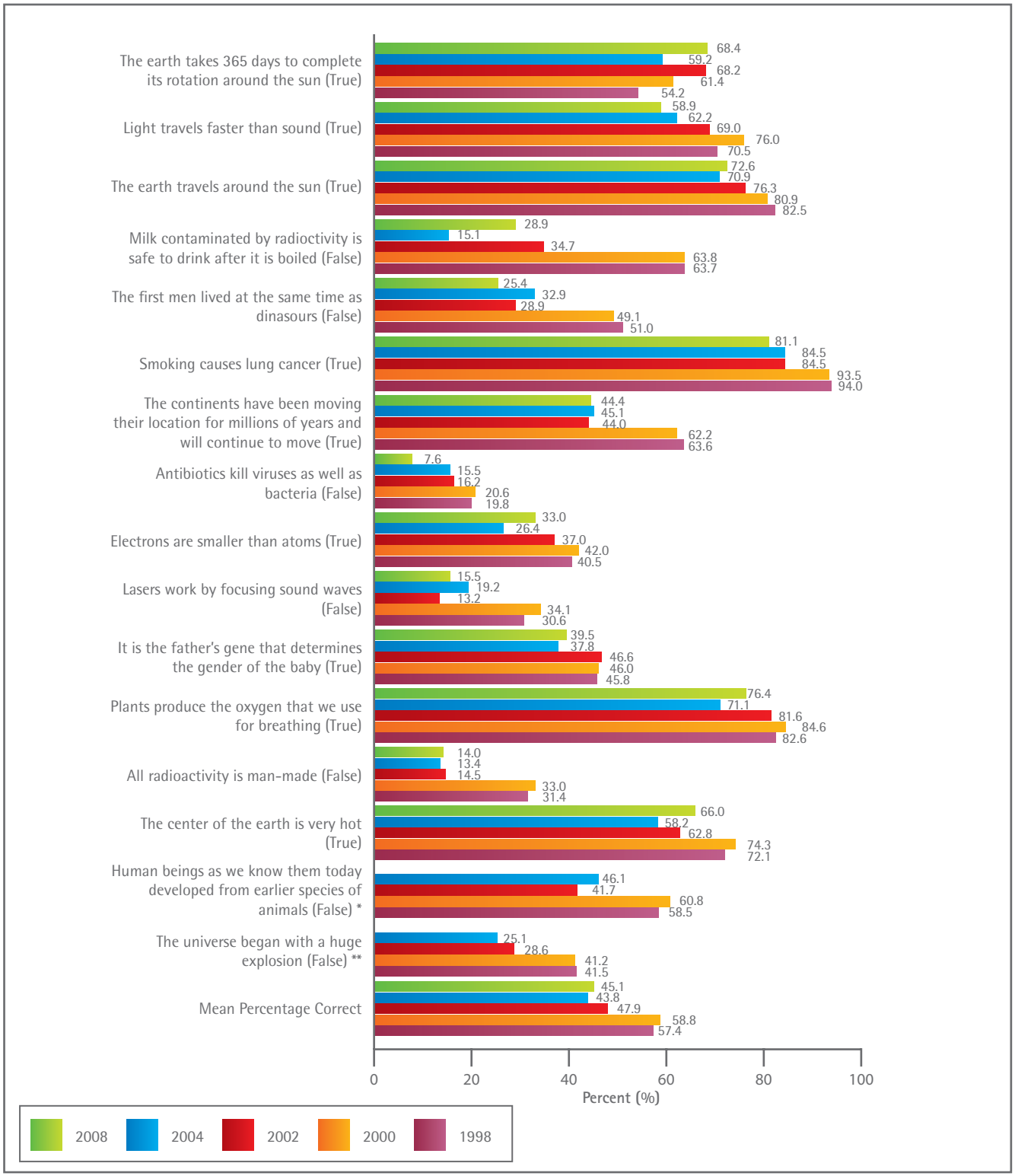
Public Attitudes Towards Selected S&T Issues by Ethnicity 2008



Note: This graph shows the percentage of Malaysian who agree to the above issues.

APPENDIX 20

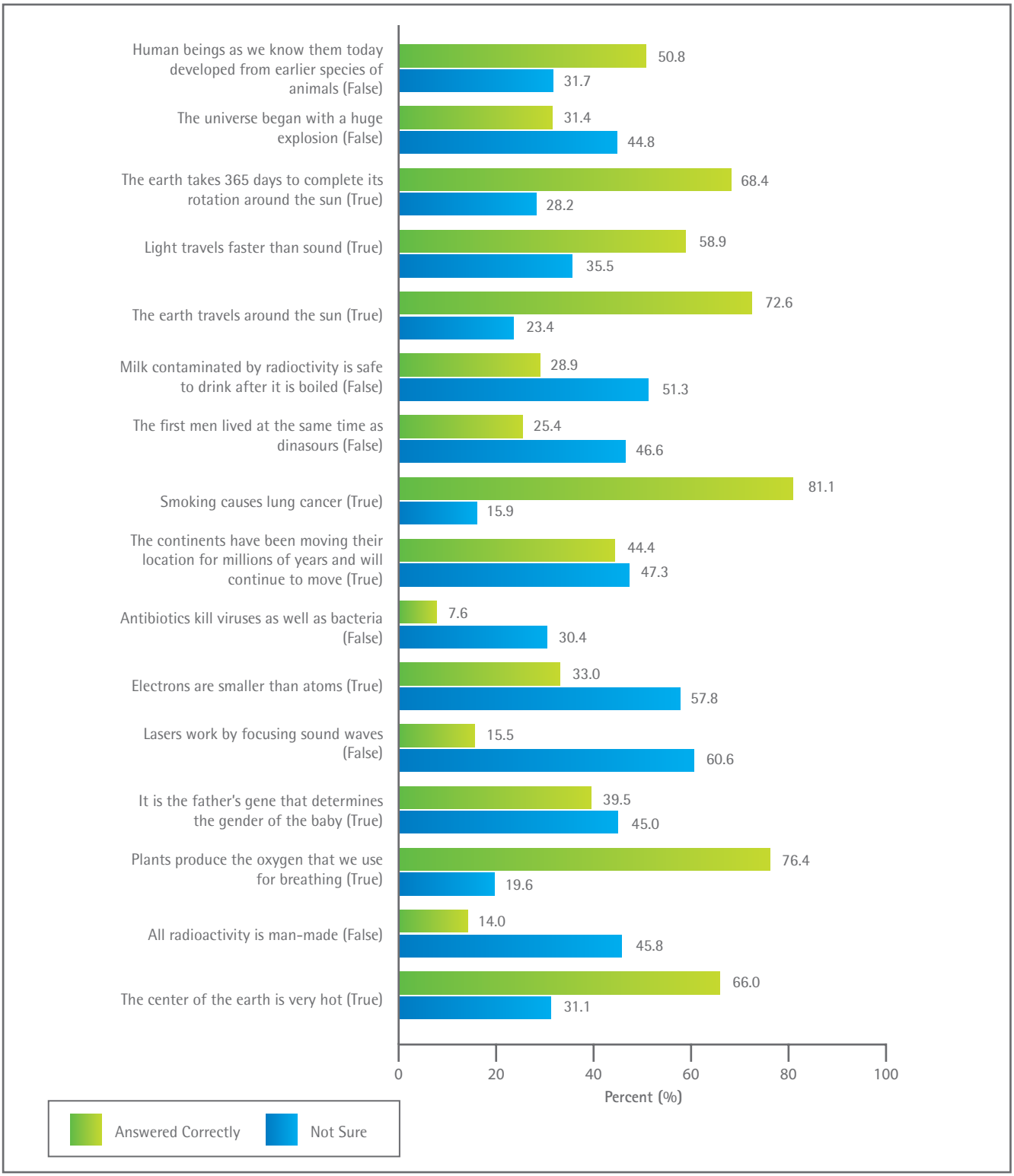
Public Understanding of S&T Issues (1998–2008)



*Note: In the 2008 S&T survey, the items marked * and ** have been excluded from the calculation of the mean percentage of correct answers*

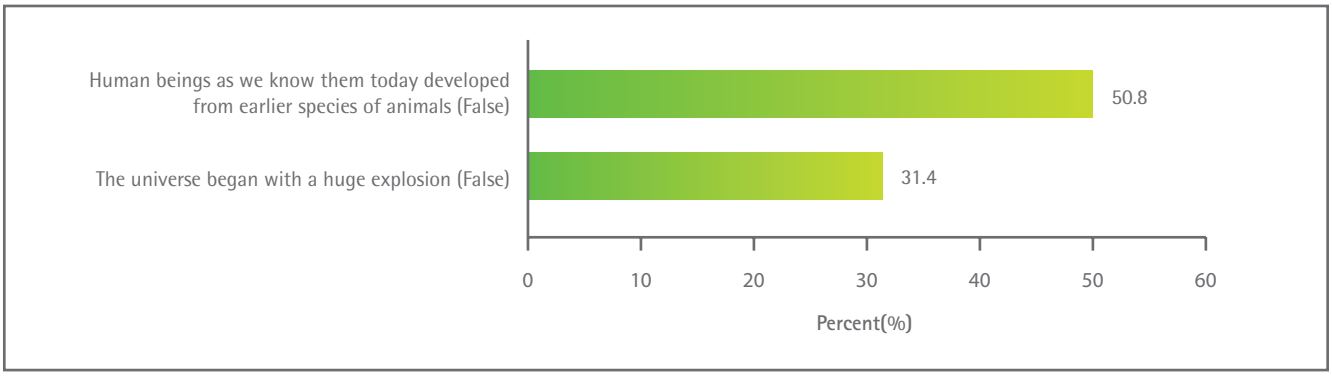
APPENDIX 21

Public Understanding of S&T Issues 2008



APPENDIX 22

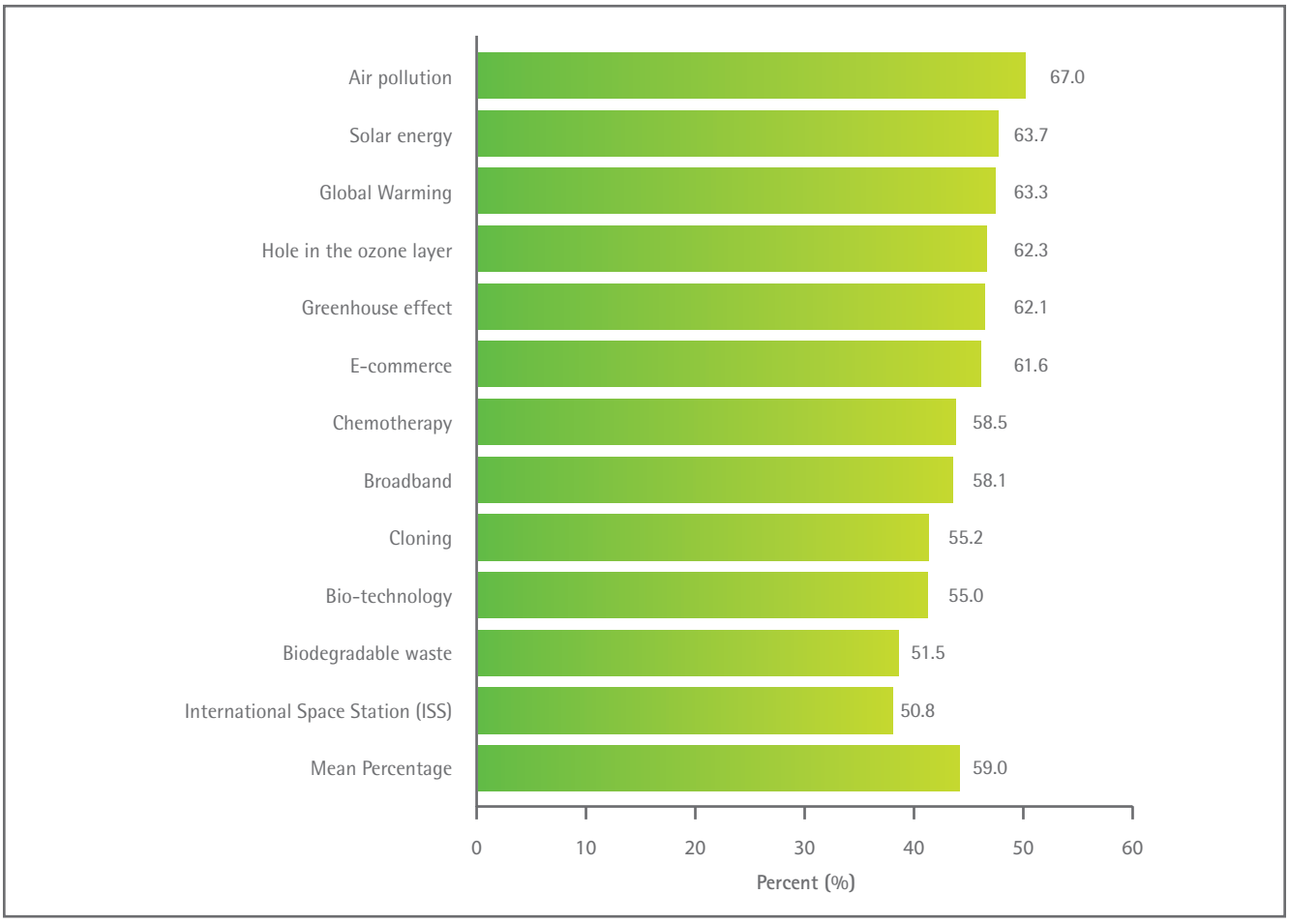
Public Understanding on Theory of Evolution and Big Bang Theory 2008



Note: The graph shows the percentage of respondents who correctly responded to the above statements

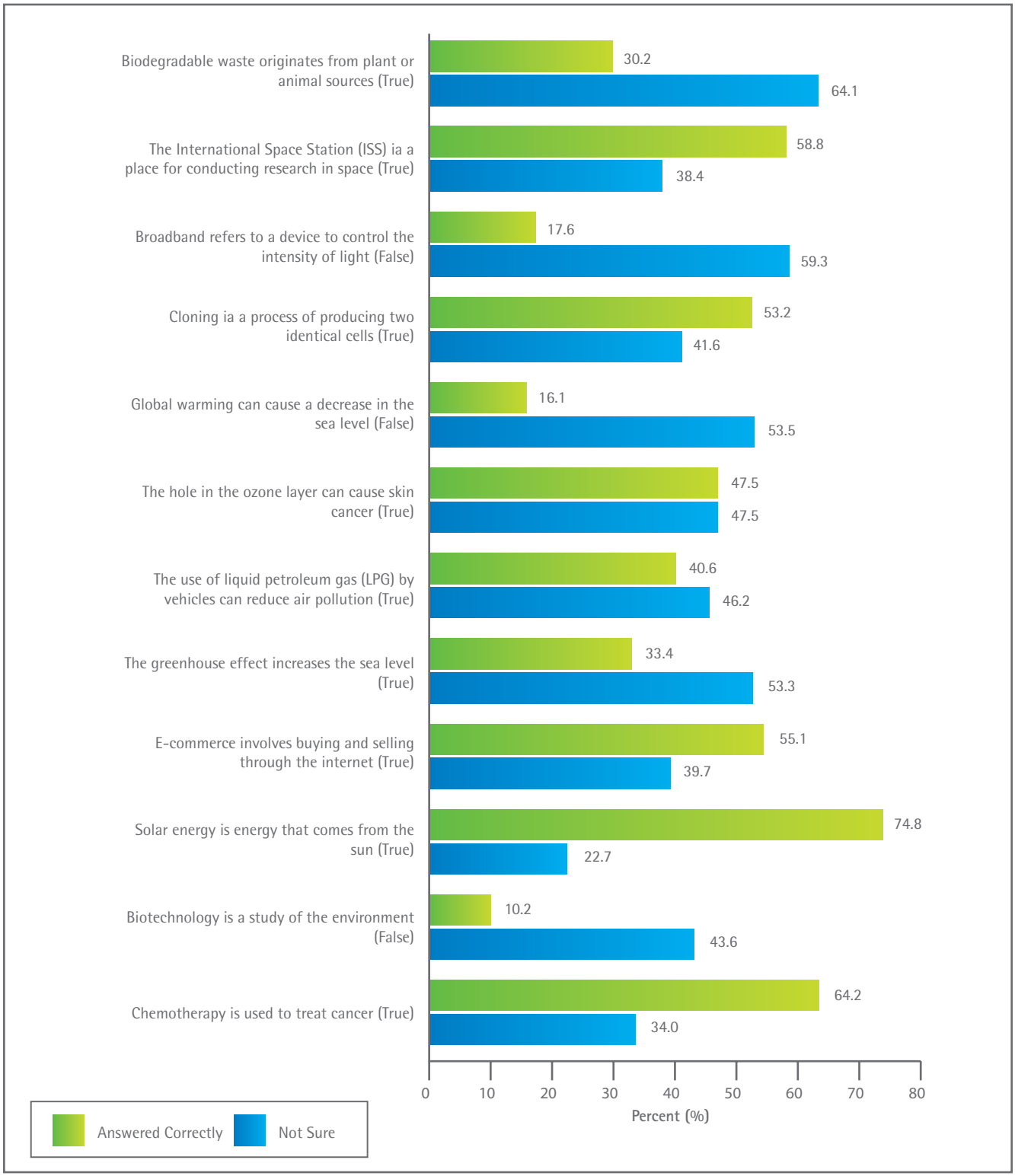
APPENDIX 23

Public's Subjective Understanding of S&T Concepts 2008



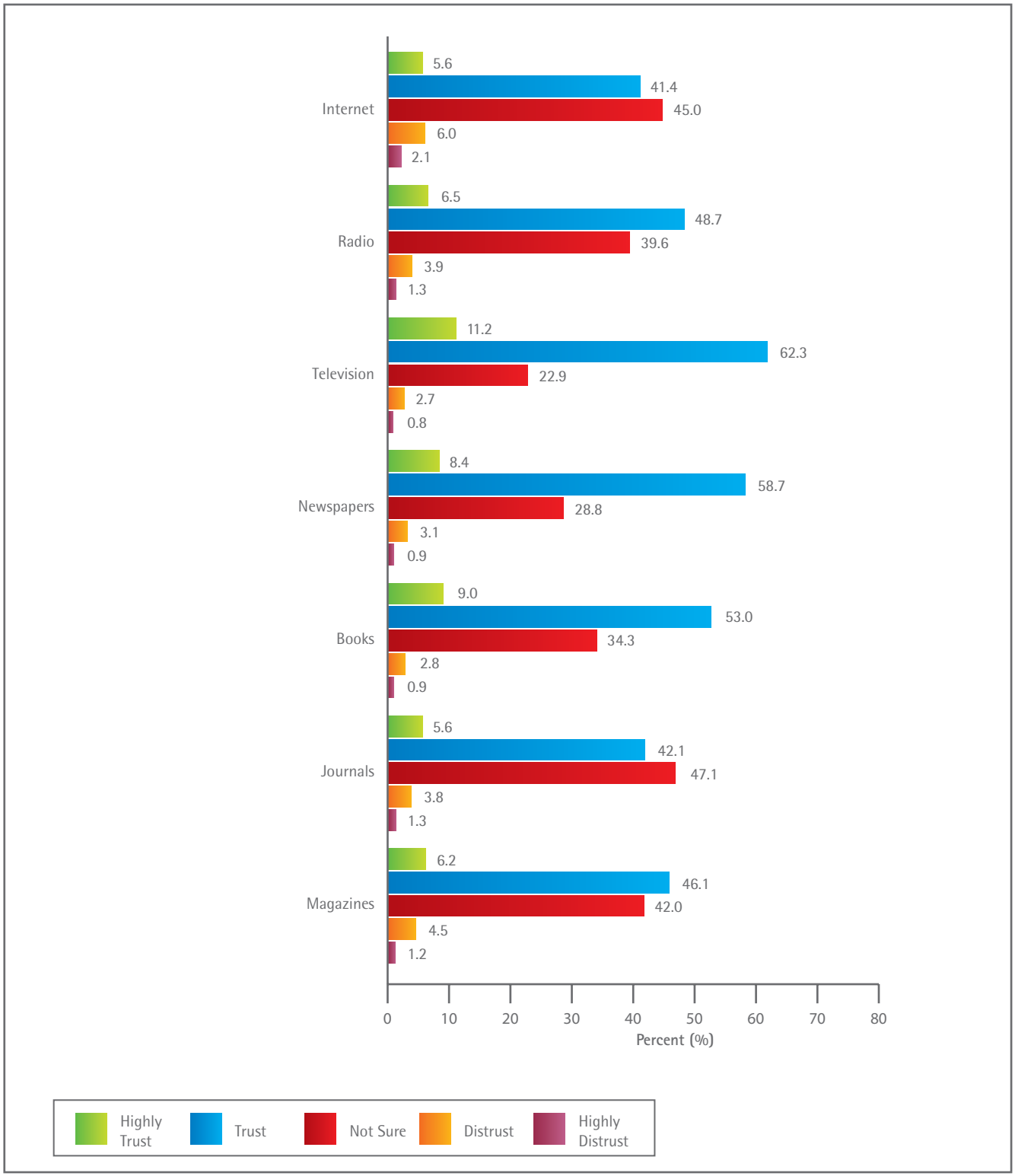
APPENDIX 24

Public's Objective Understanding of S&T Concepts 2008



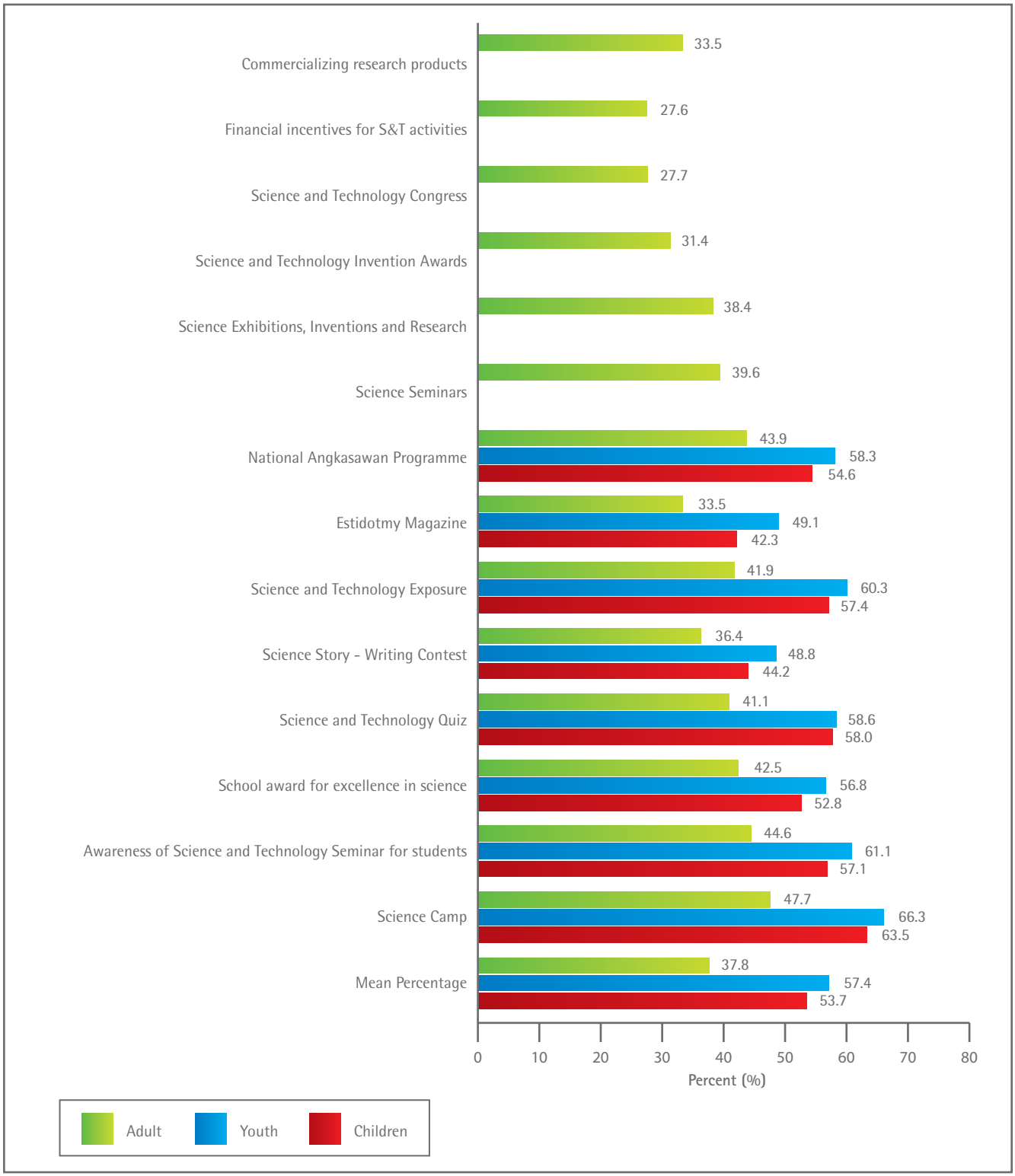
APPENDIX 25

Level of Trust in the Media 2008



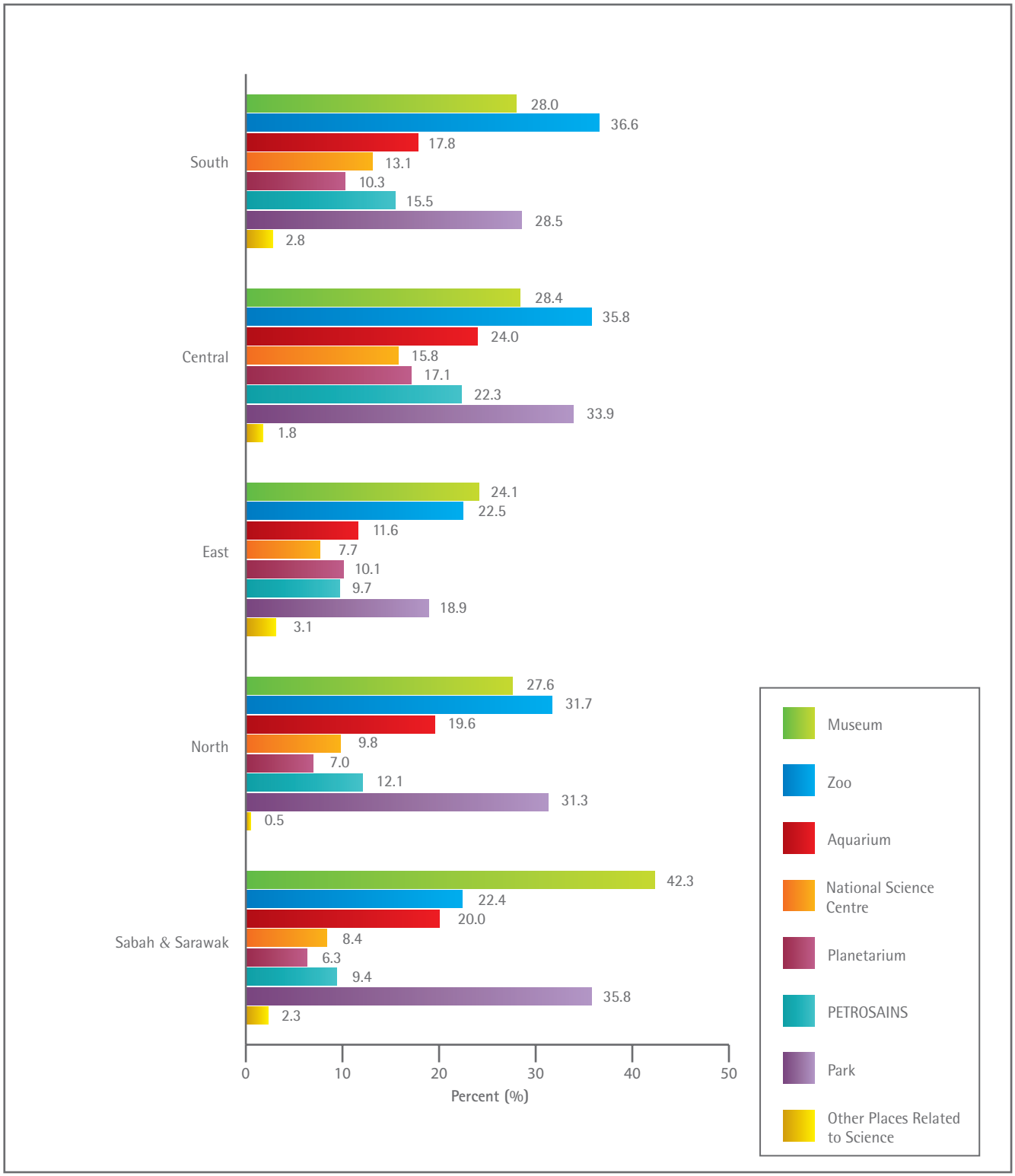
APPENDIX 26

Public Awareness on S&T Programmes 2008



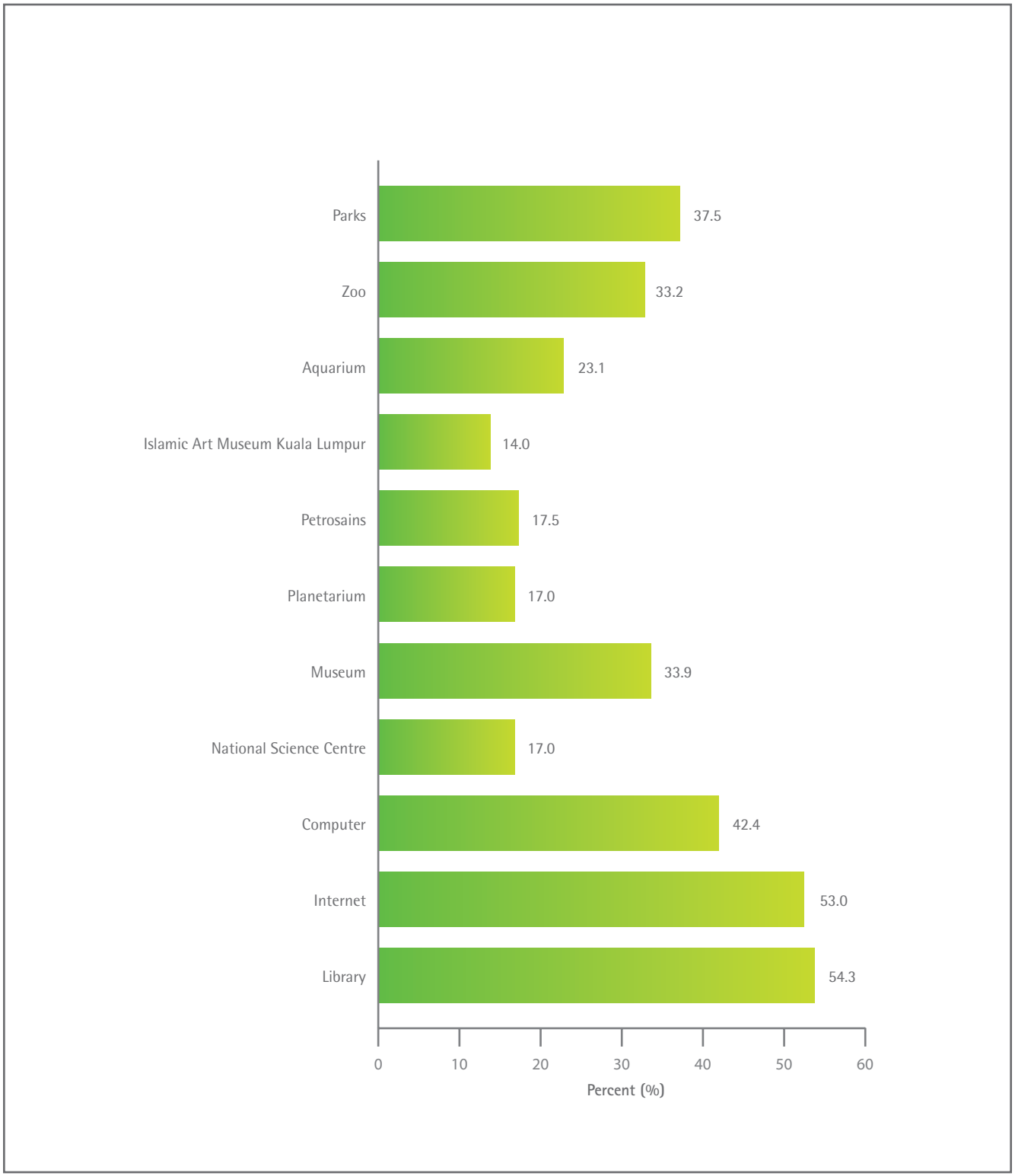
APPENDIX 27

Visits to S&T Related Places by Zones 2008



APPENDIX 28

Accessibility of S&T Facilities 2008



6 QUESTIONNAIRE FORM

6 Questionnaire
Borang Kaji Selidik

Series	:	
State	:	
DP	:	
DB	:	
BP	:	

The Public's Awareness of Science & Technology Malaysia 2008

Kajian Kesedaran Awam Terhadap Sains & Teknologi Malaysia 2008

Malaysian Science and Technology Information Centre,
Ministry of Science, Technology and Innovation, Malaysia
Pusat Maklumat Sains dan Teknologi, Kementerian Sains, Teknologi dan Inovasi Malaysia.

and

IIUM Entrepreneurship and Consultancies Sdn. Bhd.,
International Islamic University Malaysia

October 2008

A. MEDIA

NEWSPAPERS

1a. How often do you normally read newspapers in a week?

a. Not at all (Please proceed to Question 2a)	○
b. Once a week	○
c. 2 – 3 times a week	○
d. 4 - 6 times a week	○
e. Everyday	○

1b. State your interest level in the newspaper section(s) listed below.

(1) Not Interested (2) Less Interested (3) Interested (4) Very Interested

	Local				Foreign			
a. Politics	○	○	○	○	○	○	○	○
b. Current issues/opinions and letters	○	○	○	○	○	○	○	○
c. Entertainment	○	○	○	○	○	○	○	○
d. Science and Technology	○	○	○	○	○	○	○	○
e. Sports	○	○	○	○	○	○	○	○
f. Religion	○	○	○	○	○	○	○	○
g. Other (Please specify _____)	○	○	○	○	○	○	○	○

MAGAZINES

2a. Do you read the following materials?

	Magazines	Journals
a. Yes	○	○
b. No (Please proceed to Question 3a)	○	○

2b. If **YES**, how often did you read magazines/journals/books in the last 6 months?

	Never	Seldom	Often	Title of Magazines /Journals/ Books
Magazines				
a. Science	○	○	○	.....
b. Non-science	○	○	○	.....
Journals				
c. Science	○	○	○	.....
d. Non-science	○	○	○	.....
Books				
e. Science	○	○	○	.....
f. Non-science	○	○	○	.....

TELEVISION (TV)

3a. Do you watch TV?

a. Yes ○

b. No (Please proceed to **Question 4a**) ○

3b. On average, how many hours do you spend watching the following programmes in a day?

(1) < 1 hour (2) 1-2 hours (3) 3-4 hours (4) > 4 hours

	Local				Foreign			
	1	2	3	4	1	2	3	4
a. News	○	○	○	○	○	○	○	○
b. Documentary	○	○	○	○	○	○	○	○
c. Entertainment	○	○	○	○	○	○	○	○
d. Science and Technology	○	○	○	○	○	○	○	○
e. Sports	○	○	○	○	○	○	○	○
f. Religious Programmes	○	○	○	○	○	○	○	○
g. Other (Please specify_____)	○	○	○	○	○	○	○	○

3c. On average, how many hours in a day do you spend watching programmes aired on the following TV channels:

(1) Never (2) < 1 hour (3) 1-2 hours (4) 3-4 hours (5) > 4 hours

	1	2	3	4	5
a. RTM 1	○	○	○	○	○
b. RTM 2	○	○	○	○	○
c. TV3	○	○	○	○	○
d. NTV7	○	○	○	○	○
e. 8TV	○	○	○	○	○
f. TV9	○	○	○	○	○
g. ASTRO	○	○	○	○	○
h. IPTV (Internet Protocol TV)	○	○	○	○	○

	Yes	No
3d. Are you an ASTRO subscriber?	○	○

(If you are **NOT** an ASTRO subscriber, please proceed to **Question 4a**)

3e. On average, how many hours in a day do you spend watching programmes aired on the following ASTRO channel groups?

(1) Never (2) < 1 hour (3) 1-2 hours (4) 3-4 hours (5) > 4 hours

	1	2	3	4	5
a. News (eg. CNN, BBC, Bloomberg, Al-Jazeera etc)	○	○	○	○	○
b. Sports (eg. ESPN, Super Sports, Star Sports etc)	○	○	○	○	○
c. Music (eg. MTV, Channel V, Hitz.TV etc)	○	○	○	○	○
d. Entertainment (eg. Astro Ria, Star World, HBO etc)	○	○	○	○	○
e. Learning (eg. Discovery Channel, History, Nat Geo etc)	○	○	○	○	○
f. Kids (eg. Cartoon Network, Ceria etc)	○	○	○	○	○
g. Other (Please Specify_____)	○	○	○	○	○

RADIO

4a. Do you listen to the radio?

a. Yes ○
b. No (Please proceed to **Question 5a**) ○

4b. If **YES**, please select the radio programmes that you often listen to.
(You may choose more than one)

a. News ○
b. Science and Technology ○
c. Entertainment ○
d. Religious Programmes ○
e. Sports ○
f. Education ○
g. Politics ○
h. Health ○
i. Agriculture ○
j. Other ○
(Please specify_____)

4c. How many hours in a day do you usually spend listening to the radio?

a. < 1 hour ○
b. 1 - 2 hours ○
c. 3 - 4 hours ○
d. > 4 hours ○

5. DIGITAL MEDIA

5a. Do you use the following facilities?
(If **NONE** of the following is applicable to you, please proceed to **Question 6**)

	YES	NO
a. Internet (World Wide Web)	○	○
b. E-mail	○	○
c. 'Chat'	○	○
d. Blogs	○	○
e. SMS/MMS	○	○
f. Internet phone	○	○
g. Video conferencing	○	○
h. Web camera	○	○
i. Online games	○	○

5b. If **YES,** how often do you use the facilities in a week?

	(1) Never	(2) 1-3 times	(3) 4-6 times	(4) Everyday
a. Internet (World Wide Web)	○	○	○	○
b. E-mail	○	○	○	○
c. 'Chat'	○	○	○	○
d. Blogs	○	○	○	○
e. SMS/MMS	○	○	○	○
f. Internet phone	○	○	○	○
g. Video conferencing	○	○	○	○
h. Web camera	○	○	○	○
i. Online games	○	○	○	○

5c. Where do you normally use the Internet-related facilities?
(You may choose more than one)

a. Office ○
b. School ○
c. University / College ○
d. Home ○
e. Cyber Café ○
f. Public Library ○
g. Eating Outlets (Starbucks, Old Town White Coffee etc) ○
h. Other ○
(Please specify _____)

6. MISCELLANEOUS

6. Where do you get most of your information about Science and Technology?
(You may choose more than one)

a. Newspapers ○
b. Radio ○
c. Television ○
d. Magazines ○
e. Journals ○
f. Internet ○
g. Books ○
h. Conferences/Seminars ○
i. Exhibitions ○
j. Brochures ○
k. School ○
l. Other ○
(Please specify _____)

7. What is your level of trust in the information on science and technology disseminated by the following media?

(1) Highly Distrust (2) Distrust (3) Not sure (4) Trust (5) Highly Trust

	1	2	3	4	5
a. Magazines	○	○	○	○	○
b. Journals	○	○	○	○	○
c. Books	○	○	○	○	○
d. Newspapers	○	○	○	○	○
e. TV	○	○	○	○	○
f. Radio	○	○	○	○	○
g. Internet	○	○	○	○	○

B. VISITS / EXHIBITIONS / SEMINARS / FORUMS

8. In the past year, how many times did you visit the following places?

	0	1	2	3	4 or more
a. Museum	○	○	○	○	○
b. Zoo	○	○	○	○	○
c. Aquariums (eg. Underwater World, etc)	○	○	○	○	○
d. National Science Centre	○	○	○	○	○
e. Planetarium	○	○	○	○	○
f. PETROSAINS	○	○	○	○	○
g. Parks (i.e. Bird, Marine, Botanical, Technology)	○	○	○	○	○
h. Other places related to science (Please specify _____)	○	○	○	○	○

9. In the past year, how many times did you attend the following exhibitions/seminars?

	0	1	2	3	4 or more
a. Higher Education	○	○	○	○	○
b. Information and Communications Technology (ICT)	○	○	○	○	○
c. Science and Technology (Not including ICT)	○	○	○	○	○
d. Art	○	○	○	○	○
e. Book	○	○	○	○	○
f. Other (Please specify _____)	○	○	○	○	○

C. KNOWLEDGE AND AWARENESS OF SCIENCE AND TECHNOLOGY

10a. Have you ever read or heard about the following?

	Yes	No
a. Chemotherapy	○	○
b. Biotechnology	○	○
c. Solar energy	○	○
d. E-commerce	○	○
e. Greenhouse effect	○	○
f. Air pollution	○	○
g. Hole in the ozone layer	○	○
h. Global warming	○	○
i. Cloning	○	○
j. Broadband (e.g Streamyx)	○	○
k. International Space Station (ISS)	○	○
l. Biodegradable waste	○	○

10b. If **YES**, how would you rate your understanding of the following issues?

	(0) None	(1) Weak	(2) Average	(3) Good
	0	1	2	3
a. Chemotherapy	○	○	○	○
b. Biotechnology	○	○	○	○
c. Solar energy	○	○	○	○
d. E-commerce	○	○	○	○
e. Greenhouse effect	○	○	○	○
f. Air pollution	○	○	○	○
g. Hole in the ozone layer	○	○	○	○
h. Global warming	○	○	○	○
i. Cloning	○	○	○	○
j. Broadband (e.g Streamyx)	○	○	○	○
k. International Space Station (ISS)	○	○	○	○
l. Biodegradable waste	○	○	○	○

11. In your opinion, state whether the following statements are **TRUE (T)** or **FALSE (F). If you are uncertain of the truth or falsity of the statements, choose NOT SURE (NS).**

	T	F	NS
a. Chemotherapy is used to treat cancer.	○	○	○
b. Biotechnology is a study of the environment.	○	○	○
c. Solar energy is energy that comes from the sun.	○	○	○
d. E-commerce involves buying and selling through the Internet.	○	○	○
e. The greenhouse effect increases the sea level.	○	○	○
f. The use of liquid petroleum gas (LPG) by vehicles can reduce air pollution.	○	○	○
g. The hole in the ozone layer can cause skin cancer.	○	○	○
h. Global warming can cause a decrease in the sea level.	○	○	○
i. Cloning is a process of producing two identical cells.	○	○	○
j. Broadband refers to a device to control the intensity of light.	○	○	○
k. The International Space Station (ISS) is a place for conducting research in space.	○	○	○
l. Biodegradable waste originates from plant or animal sources.	○	○	○

D. PUBLIC INTEREST IN AND KNOWLEDGE OF SCIENCE AND TECHNOLOGY

12. How would you rate your interest in and knowledge of the following issues?

Interest Level			
(1) Not Sure	*(2) Not Interested*	*(3) Interested*	*(4) Very Interested*
Knowledge Level			
(1) None	*(2) Weak*	*(3) Average*	*(4) Good*

	Interest				Knowledge			
	1	2	3	4	1	2	3	4
a. Latest inventions in science (eg. Cloning, stem cells)	○	○	○	○	○	○	○	○
b. Latest inventions in the field of medicine.	○	○	○	○	○	○	○	○
c. Latest inventions in new technology	○	○	○	○	○	○	○	○
d. Inventions and new technologies in Malaysia	○	○	○	○	○	○	○	○
e. The use of computer technology	○	○	○	○	○	○	○	○
f. Economy & commerce	○	○	○	○	○	○	○	○
g. The use of nuclear technology to generate power (eg. electricity)	○	○	○	○	○	○	○	○
h. Space exploration	○	○	○	○	○	○	○	○
i. Enviromental pollution (eg. open burning that causes haze)	○	○	○	○	○	○	○	○
j. Innovations in telecommunications technology (eg. telephone, Internet etc)	○	○	○	○	○	○	○	○
k. Research in Science and Technology	○	○	○	○	○	○	○	○

E. PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY

13. In your opinion, are the following statements **TRUE (T) or FALSE (F)? If you are uncertain of the truth or falsity of the statements, choose NOT SURE (NS).**

	T	F	NS
a. The center of the earth is very hot.	○	○	○
b. All radioactivity is manmade.	○	○	○
c. Plants produce the oxygen that we use for breathing.	○	○	○
d. It is the father's gene that determines the gender of the baby.	○	○	○
e. Lasers work by focusing sound waves.	○	○	○
f. Electrons are smaller than atoms.	○	○	○
g. Antibiotics kill viruses as well as bacteria.	○	○	○
h. The continents have been moving their location for millions of years and will continue to move.	○	○	○
i. Smoking causes lung cancer.	○	○	○
j. The first men lived at the same time as dinosaurs.	○	○	○
k. Milk contaminated by radioactivity is safe to drink after it is boiled.	○	○	○
l. The earth travels around the sun.	○	○	○
m. Light travels faster than sound.	○	○	○
n. The earth takes 365 days to complete its rotation around the sun.	○	○	○

F. THE MALAYSIAN PUBLIC'S RESPONSE TO CONTROVERSIAL THEORIES

14. In your opinion, are the following statements **TRUE (T) or FALSE (F). If you are uncertain of the truth or falsity of the statements, choose NOT SURE (NS).**

	T	F	NS
a. The universe began with a huge explosion.	○	○	○
b. Human beings as we know them today developed from earlier species of animals.	○	○	○

G. BENEFITS AND HARM OF SCIENCE AND TECHNOLOGY

15. Science research has more **positive effects** than **negative effects**. What is your opinion?

a. Agree ○
b. Disagree ○
c. Not sure ○

16. Please state whether Science and Technology has **POSITIVE EFFECTS (PE), NEGATIVE EFFECTS (NE)** or **NO EFFECT (NO)** on the following aspects. If you are uncertain, choose **NOT SURE (NS).**

	PE	NE	NO	NS
a. Standard of living	○	○	○	○
b. Cost of living	○	○	○	○
c. Public health	○	○	○	○
d. Working conditions	○	○	○	○
e. The environment	○	○	○	○
f. Individual enjoyment of life	○	○	○	○
g. World peace	○	○	○	○

17a. Have you heard of **genetic engineering**?

a. Yes ○
b. No (Please proceed to **Section H**) ○

17b. If you have heard of **genetic engineering**, do you agree that it should be practiced?

a. Yes ○
b. No ○
c. Not sure ○

17c. If **YES** or **NO**, please state your reason(s): _____

17d. Have you heard or read about the following?

a. Genetically Modified Organism (GMO) ○
b. Stem cell ○
c. Transgenic plant ○
d. Dolly ○

H. PUBLIC AWARENESS AND PARTICIPATION IN SCIENCE AND TECHNOLOGY

18. Are you aware of or have you ever been involved in any programmes/activities stated below? If **YES**, is the program effective to increase the level of public awareness on Science and Technology?

Program/Activity (Children, Youth, and Adults)	Awareness		Participation		Effectiveness	
	Yes	No	Yes	No	Yes	No
a. Science Camp	○	○	○	○	○	○
b. Awareness of Science & Technology Seminar for students	○	○	○	○	○	○
c. School award for excellence in science	○	○	○	○	○	○
d. Science and Technology Quiz	○	○	○	○	○	○
e. Science Story – Writing Contest	○	○	○	○	○	○
f. Science and Technology Exposure (i.e. Science and Technology documentaries, video clips, films)	○	○	○	○	○	○
g. Estidotmy Magazine	○	○	○	○	○	○
h. National Angkasawan Programme	○	○	○	○	○	○

Do you have any suggestions to improve any of the above programmes?

_____

_____

(Adults)						
i. Science Seminars	○	○	○	○	○	○
j. Science Exhibitions, Inventions and Research (I'TEX/INNOTEX/S&T Expo)	○	○	○	○	○	○
k. Science and Technology Invention Awards	○	○	○	○	○	○
l. Science and Technology Congress	○	○	○	○	○	○
m. Financial incentives for S&T activities (IRPA/IGS/DAGS/TAF)	○	○	○	○	○	○
n. Commercializing research products	○	○	○	○	○	○
o. Other (Please specify_____)	○	○	○	○	○	○

Do you have any suggestions to improve any of the above programmes?

_____

_____

I. ATTITUDE TOWARDS SCIENCE AND TECHNOLOGY

19. Do you agree that we need to place greater emphasis on Science and Technology?
    a. Yes ○
    b. No ○
    c. Not sure ○

20. Do you think that jobs in Science and Technology are attractive?
    a. Yes ○
    b. No ○

21. Please give your opinion of the following statements, which are related to job opportunities in Science and Technology.

	Agree	Disagree	Not Sure
a. There are limited job opportunities in Science and Technology fields.	○	○	○
b. Not all jobs require knowledge of Science and Technology	○	○	○
c. The Malaysian public lacks awareness of Science and Technology.	○	○	○
d. Science subjects are difficult	○	○	○
e. The approach in the teaching of science is too academic	○	○	○
f. The income level in the field of Science and Technology is not attractive.	○	○	○

22. Would you consider getting a job in Science and Technology?
    a. Yes ○
    b. No ○
    c. Not Applicable ○

23. Do you agree with the statements below?

	Agree	Disagree	Not Sure
a. Science and Technology improves the quality of our lives.	○	○	○
b. The quality of science education in school is not satisfactory.	○	○	○
c. The use of automation will increase job opportunities in factories.	○	○	○
d. We depend too much on science and not enough on faith.	○	○	○
e. Science research increases knowledge although it does not produce immediate benefits.	○	○	○
f Although research on animals may cause suffering, it has to be done for the sake of mankind.	○	○	○
g. The government should provide more funds for Science and Technology research.	○	○	○
h. We need to have knowledge about science in order to manage our daily lives better.	○	○	○
i. Science causes our lifestyles to change too rapidly.	○	○	○
j. Most scientists strive to make human lives more comfortable.	○	○	○
k. Our daily work will be more efficient with the use of Science and Technology.	○	○	○
l. New discoveries will help to solve the negative effects of Science and Technology.	○	○	○
m. Science and Technology is very important for the progress of our nation.	○	○	○
n. Civilizations have existed even without the help of Science and Technology.	○	○	○

J. INFRASTRUCTURE AND FACILITIES

24. Do you have access to the following facilities? If YES, please state where.

	Access		Where		
	Yes	No	At home	< 20 km	≥ 20 km
a. Library	○	○	○	○	○
b. Internet	○	○	○	○	○
c. Computer (PC)	○	○	○	○	○
d. National Science Centre	○	○	○	○	○
e. Museum (National Museum, State Museum etc.)	○	○	○	○	○
f. Planetarium	○	○	○	○	○
g. PETROSAINS					
h. Islamic Arts Museum Kuala Lumpur	○	○	○	○	○
i. Aquarium	○	○	○	○	○
j. Zoo	○	○	○	○	○
k. Parks (i.e. Bird, Marine, Botanical, Technology)	○	○	○	○	○
l. Other	○	○	○	○	○

(Please specify _____)

K. DEMOGRAPHIC PROFILE OF RESPONDENTS

25. Residence **(to be filled by the enumerator):**
    - ○ Rural
    - ○ Urban

26. Ethnic group:
    - ○ Malay
    - ○ Melanau
    - ○ Iban
    - ○ Bidayuh
    - ○ Kadazan
    - ○ Orang Asli
    - ○ Chinese
    - ○ Indian
    - ○ Other Bumiputera Groups
    - ○ Other (Please specify _____)

27. Belief system:
    - ○ Islam
    - ○ Buddhism
    - ○ Hinduism
    - ○ Christianity
    - ○ Confucianism
    - ○ Taoism
    - ○ Other (please specify _____)

28. Age:
    - ○ 12 - 15
    - ○ 16 - 20
    - ○ 21 and above

29. Sex:
    - ○ Male
    - ○ Female

30a. Highest educational level attained:

- ○ No formal education
- ○ Primary school (UPSR)
- ○ Low secondary (LCE/SRP/PMR)
- ○ High secondary (MCE/SC/SPM/SPMV)
- ○ Pre-University (STPM/HSC/Matriculation)
- ○ Certificate
- ○ Diploma
- ○ Degree (Undergraduate)
- ○ Degree (Postgraduate)

30b. Educational stream:

- ○ Social Science and Humanities
- ○ Business / Economics
- ○ Science / Engineering / Medical
- ○ Technical / Vocational
- ○ Religious
- ○ Non-streamed
- ○ Other (Please specify _____)

31. Job status:

- ○ Professional
- ○ Administration
- ○ Support Staff
- ○ Business Owner
- ○ Agriculture-Related Work
- ○ Student
- ○ Retiree
- ○ Job Seeker
- ○ Homemaker
- ○ Other (please state _____)

32. In which sector are you employed?

- ○ Government
- ○ Private
- ○ Statutory Body
- ○ Self-Employed
- ○ Other (please state _____)

33. State your estimated household monthly income.
    - ○ Less than RM500
    - ○ RM500 < RM999
    - ○ RM1,000 < RM2,999
    - ○ RM3,000 < RM4,999
    - ○ RM5,000 < RM6,999
    - ○ RM7,000 or more

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ISSN 1394-9209
9 771394 920007