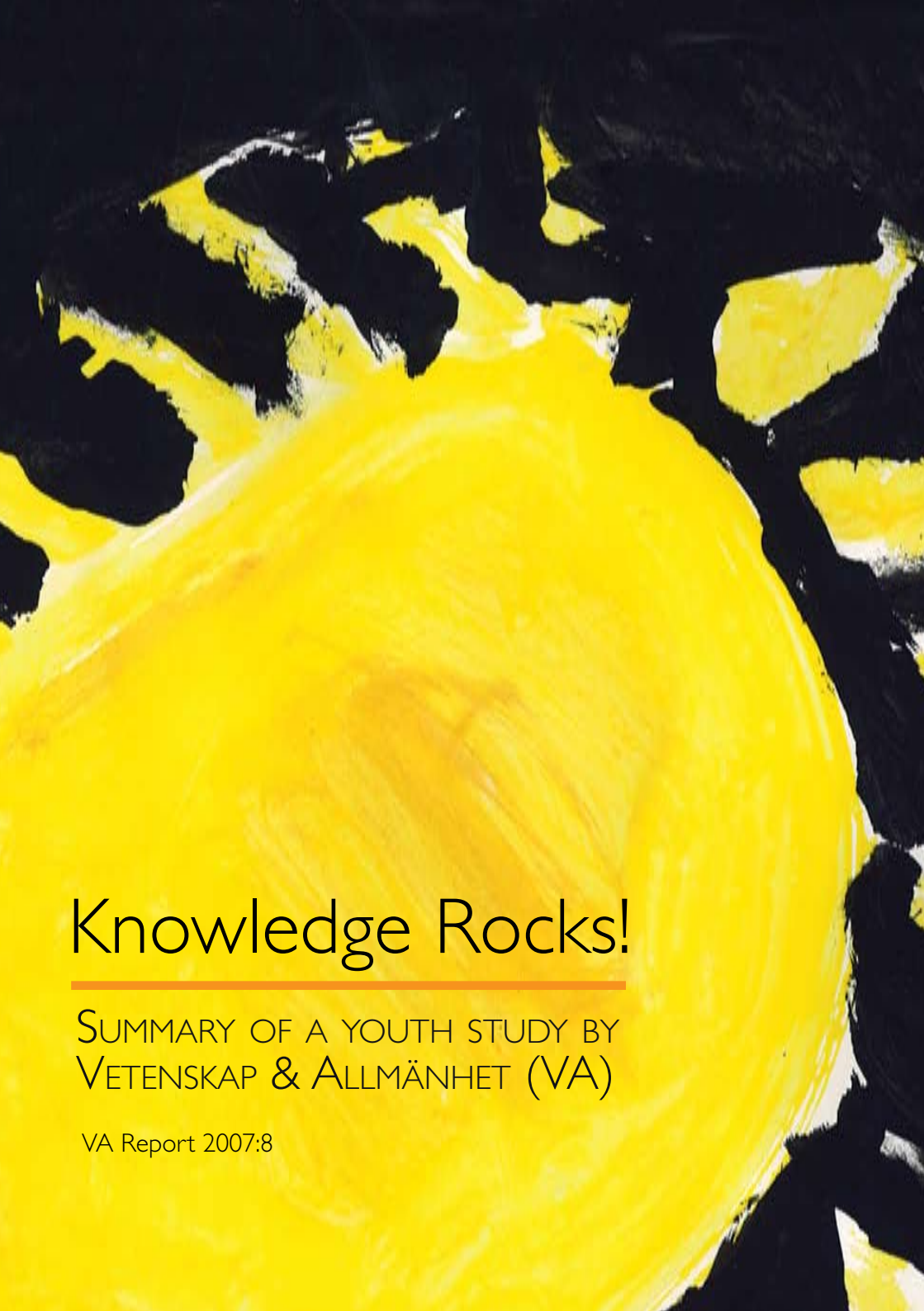


Knowledge Rocks!

Summary of a youth study by Vetenskap & Allmänhet (VA)

VA Report 2007:8

Brief facts about VA's youth study

The study's overall purpose is to learn more about the way in which young people view science and knowledge, and how their attitudes and opinions evolve. The study consists of several parts:

- Analysis of data collected from VA's annual attitude surveys conducted between 2002 and 2007, telephone interviews and postal questionnaires. The VA Report 2007:4 **Ungdomars syn på Vetenskap** (Young people's view of science).
- In depth interviews with children aged 10–12 and teenagers aged 16–17 on how they view knowledge, research, science and researchers to gain an understanding of how they think, what affects them and how their attitudes are evolving. VA Report 2007:5 **Unga om kunskap** (Young people on knowledge).
- Pilot study of the image of researchers presented in the media through analysis of a selection of comics and TV programmes read and watched by children and young people. VA Report 2007:6 **Galna, virriga och ondsinta?** (Crazy, confused and malicious?)
- Analysis of evaluations of activities aimed at stimulating interest among children and young people in science and technology, with a focus on what is being evaluated and which factors reportedly lead to positive results. VA Report 2007:7 **Projekt utan effekt?** (Projects without effect?)
- A broad overview of Swedish and international literature on young people's values and attitudes towards science, researchers and education has been integrated into the study and is referred to in the reports.

The study was financed by the Marcus and Amalia Wallenberg Foundation. The media image study was made possible by a contribution from the Helge Ax:son Johnson Foundation.

Vetenskap & Allmänhet (Public & Science) aims at promoting dialogue and openness between the public – especially the young – and researchers. It endeavours to stimulate greater dialogue around issues that concern people, and to connect these issues to science. The association's members are a number of organisations, public authorities, companies and individuals. All of the VA studies, some available in English, can be found at www.v-a.se

Knowledge Rocks! Summary of a youth study by Vetenskap & Allmänhet (VA)
VA Report 2007:8

Cover picture: Patrick Henningsson, age 9, Degerfors
Translation: Diane Högsta
ISSN: 1653-6843
ISBN: 978-91-85585-42-7 (printed)
Urn:nbn:se:vetenskapochallmanhet-2007-8-eng (pdf)

Publisher: Vetenskap & Allmänhet
Box 5073, SE-102 42 Stockholm, Sweden
Telephone: +46 8 791 29 00
E-mail: info@v-a.se
Website: www.v-a.se

Knowledge is vital

KNOWLEDGE is a good thing. This was the opinion of all of the children and teenagers who took part in the interviews conducted for the study. Several of them regarded knowledge as vital; without knowledge we cannot amount to anything. But there can be both good and bad knowledge and it's not good to have too much knowledge.

SCIENCE, on the other hand, has a negative connotation among many of the teenagers in the study. It is associated with natural science, which they feel is considered by people in general to be "superior" to other areas, such as the subjects they themselves are studying. Children in the younger age group (age 10–12) find it hard to relate to the concept of science at all.

For most, science is something that has to be discovered; experiments that bubble and fizz – it's about methods and it's not particularly useful.

RESEARCH is perceived as positive. Research leads to results and new knowledge – it's useful. Areas that children and teenagers associate with research include medicine, dinosaurs or solving crimes.

The younger children – but not the older ones – talk about "researching" things in school, which means studying things in more detail.

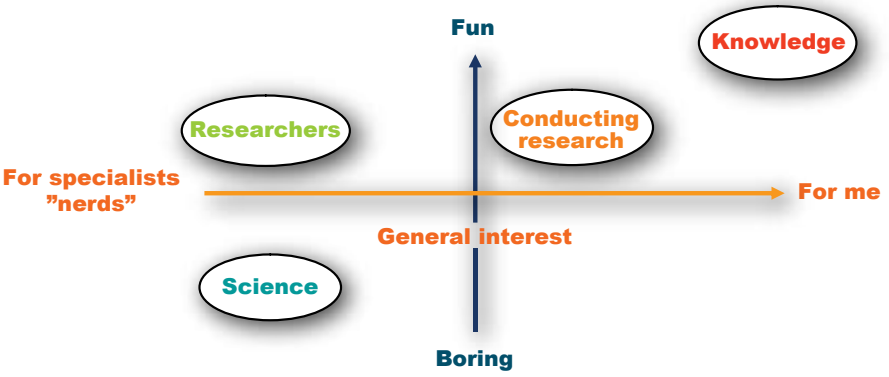
The diagram illustrates how the young people in the study relate to knowledge, research, researchers and science.

> It's good to be well-informed and it's fun. It's dangerous to think that you know everything." Girl age 16–17

> It's not good to know too much because you get teased for being a nerd." Boy age 10–12

> It's a good thing to have and it's good to be able to teach others. It's not good to know the wrong things, for example how to hack into other people's computers." Girl age 10–12

> It makes me think of natural science – a term to get irritated about. It seems as if it's supposed to be more important. When we had Linné Week we had to choose between societal studies or science. But society is about science as well, isn't it?" Girl age 16–17



Must be useful

Young people are less likely than adults to consider science and technology difficult to understand and are less likely to think that researchers do things without considering the risks. Basically, young people have less "respect" for research and science than older people. They also have **less confidence in researchers** – both those in academia and those working for companies.

Sweden is an extremely secularized country where young people are highly individualistic. Secularization here means repudiating all types of authority – not only the church, but also science and politics etc. The lower level of "respect" among young people for science and researchers is part of this.

People who trust politicians often also trust researchers and research. Trust in one authoritative figure or body is believed to be linked to trust in another. Confidence in research and researchers is also tied to the view that government funds should be invested in research.

Accordingly, young people in most cases believe to a lesser extent than older people that it is important to invest in research. The most obvious exception is space research.

Young people have somewhat **lower expectations of science** and research than older people and they have a less positive view of scientific development. This is also true for technological developments.

On the other hand, young people – despite the fact they do not want to invest in research to the same extent – have **higher expectations when it comes to climate research**. They answer with a slightly higher frequency than people over 30 that they believe research will help slow down climate change.

Young people to a greater extent want research to lead to **useful results**. In particular, the young people between 16 and 19 years and those who finished after secondary school (at age 16) often feel that researchers should only be doing things that produce useful results. They also feel that it is not as important to invest in research that does not have the primary objective of being useful.

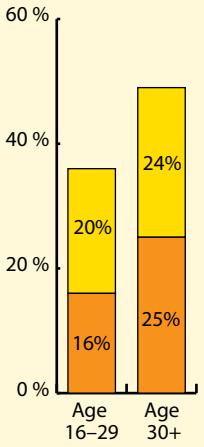


Figure 1: "Science and technology are too difficult for most people to understand." Telephone interviews 2006.

> There's bad research and good research. Good research could be a cure and bad research is nuclear weapons."
> Girl age 10–12

> Maths is useful when you go shopping."
> Girl age 10–12

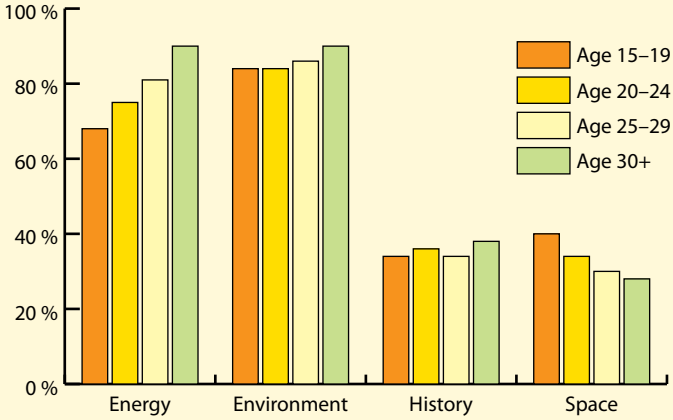


Figure 2:
How important do you think it is for Sweden to invest in world-class research in the following areas? Percentage very/quite important. Postal questionnaires 2002–2006.

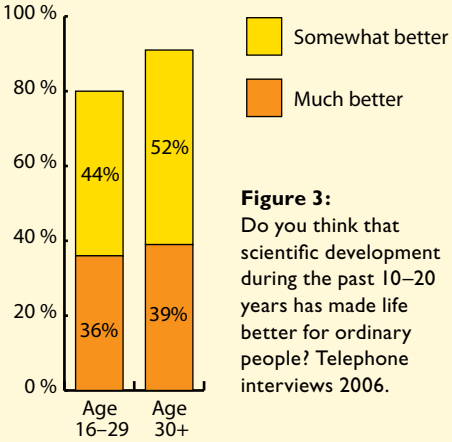


Figure 3:
Do you think that scientific development during the past 10–20 years has made life better for ordinary people? Telephone interviews 2006.

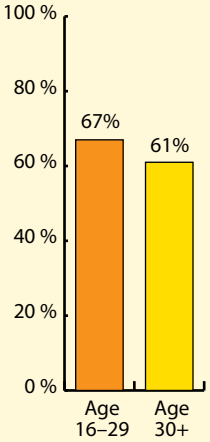


Figure 4:
Do you think there is a good chance that research will help to slow climate change within ten years? Percentage answering yes. Telephone interviews 2006.

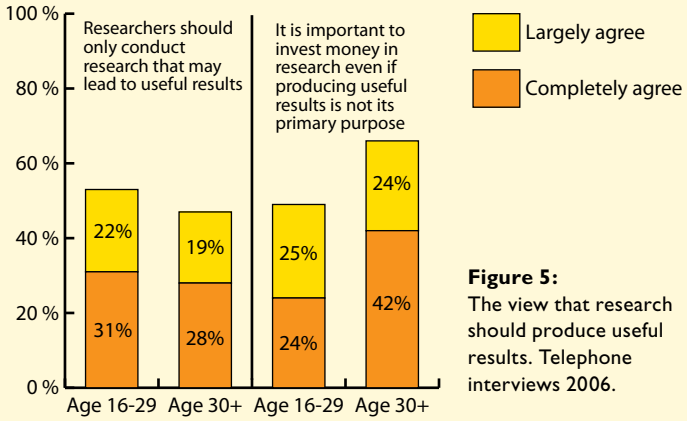


Figure 5:
The view that research should produce useful results. Telephone interviews 2006.

Figure 6:
Percentage with a very or quite high level of confidence in how researchers conduct their work. Postal questionnaires 2002–2006.

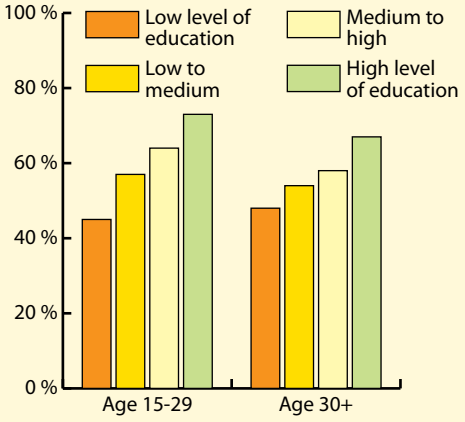
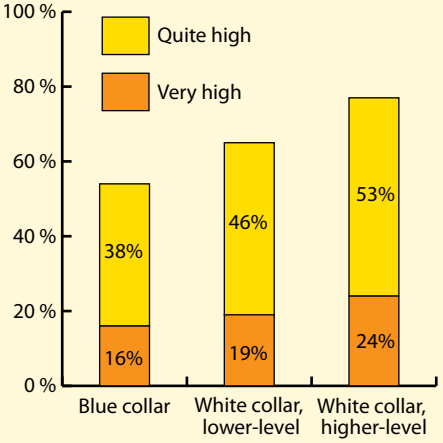


Figure 7:
How large confidence do you have in how researchers conduct their work? Young people aged 15–29 from different backgrounds. Postal questionnaires 2002–2006.



The young are different

Young people do not form a homogenous group. Values and attitudes do not automatically develop at a certain age but are instead influenced by experiences, education and background. Analysis of the data gathered by VA from the attitude surveys clearly shows that such factors, in most cases, play a bigger role in shaping attitudes than age.

EDUCATION is, in most cases, the strongest distinguishing factor – among both young people and older people. People with higher education have greater confidence in researchers, have a more positive view of scientific and technological developments, believe to a greater extent that even the kind of research that is not immediately useful is important and want more government funds to be invested in Swedish research.

The attitude patterns are similar regardless of age group, but in certain cases, the differences are more distinct among young people. Young people up to age 20 have not completed higher education. Lower age and a lower level of education thus coincide and may be difficult to differentiate.

FAMILY BACKGROUND, i.e. parents' education and/or occupation, also makes a difference. Those from white-collar homes have in general a more positive attitude towards science and research than those from blue-collar homes.

PLACE OF RESIDENCE is significant in certain cases – among both young people and older people. Those living in sparsely populated areas often have a slightly more negative attitude towards researchers and

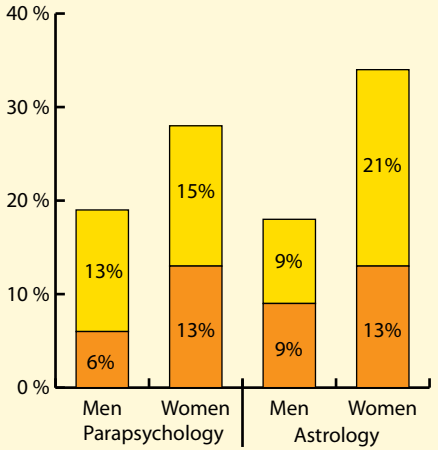


Figure 8:
How scientific are the following areas on a scale from 1 to 5? Telephone interviews with 16–29 year-olds, 2003 and 2006.

research than city or big city dwellers, who have the most positive attitude.

GENDER-BASED DIFFERENCES sometimes exist; for example in opinions about the extent to which different areas are scientific. Young people are slightly more likely than older people to think that astrology and parapsychology are scientific; particularly in the case of young women. This is one of a few questions where there are relatively big differences between the genders. Men often think that it is important to invest in research in the fields of energy, transport technology and IT, while women, to a greater extent, favour environmental and traffic safety research. Young men are more likely than young women to believe that research should not merely be focused on things that can produce useful results. The gender-based differences are largely the same in the population in general.

Astrology and astronomy are often confused by young people in the interviews and it is clear that the term "scientific" is in general a difficult concept.

There is, however, almost no link between how scientific astrology is believed to be and attitudes towards research. In other words, people who regard astrology as a science may well have great confidence in research and researchers!

> Language is scientific – so that we can talk in other countries." Boy age 10–12

> (About astrology) It depends on how you look at it. When you talk about space and the stars, that's scientific, but when you talk about things like horoscopes, that's not very scientific." Girl age 16–17

> We have a Norwegian woman where I live. She can read Tarot cards and that's a science to learn. All I see is two men, but she sees much more. She places several cards on the table and looks at the pictures. That's science. It's something you have to learn." Girl age 16–17

It takes engaged people to engage!

In order for people to engage other people in what they are saying, they must themselves be engaged, knowledgeable and interested in their topic. This was clearly apparent in the interviews as well as in the literature. When teachers have these qualities, they make a big impression. But all too few teachers have the ability to get their students excited about what they are teaching.

Other individuals may also be role models and people that young people listen to, such as coaches, yoga instructors or other adults.

If a topic touches people or is perceived as important or topical, it sparks their interest. This, of course, applies to both young and older people. But what actually sparks a person's interest varies according to age and past experiences. Placing knowledge in a context, relating it to everyday things and not being limited by the confines of a topic are important for people's ability to comprehend. These conclusions can be drawn from the in depth interviews conducted for the study, from analysis of project evaluations and from reviewing the literature, as well as from dialogues arranged by VA between young people and researchers.

Young people mainly *trust* their parents and friends and these individuals are also the ones who, according to the literature, to the greatest extent influence the values of young people.

Meet young people "on their own turf"!

The study shows that the home, school and the Internet are the most significant arenas where there are adults present who young people listen to and trust, and where they also meet each other and interact.

The Internet is important for young people as a ...

- meeting place
- tool for gathering facts
- news source
- game provider
- diary

> Our psychology teacher is great and interesting too. It's more of a discussion than just a teacher standing there talking. That makes it interesting." Girl age 16–17

> You trust people you know well." Boy age 10–12

> Our old history teacher could teach us without a book. It was fun to listen to him – he knew a lot about history and things like that." Boy age 16–17

> We want to listen to people with a lot of energy and who are excited about what they are saying. We often listen more to younger people. There was this yoga instructor who came to talk to us. She was great – we really listened." Girl age 16–17

> NTA[1] is probably science. I don't know what it stands for. Technology or something. We get to make things out of clay." Girl age 10–12

[1] NTA – Science and Technology for All – is a Swedish project aiming at supporting school teachers in their efforts to stimulate pupils' curiosity, interests and knowledge in science and technology.

Evaluate the effects!

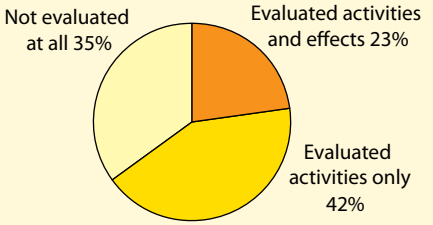
Many initiatives are being taken to stimulate interest among young people in knowledge – particularly natural science and technology. But all too few of these initiatives are being evaluated to learn about the effects they are having. This is evidenced in a review of 26 Swedish projects and competitions.

While it is true that two out of three activities have been evaluated, most have only been evaluated in terms of the actual activities carried out and not their effect on attitudes, interest or education/career choice. Many of the project managers feel that it is hard to know what to evaluate and the best way to go about it.

A number of factors are believed to result in favourable effects. The success factors and effects that the evaluations highlight are illustrated in the diagram below.

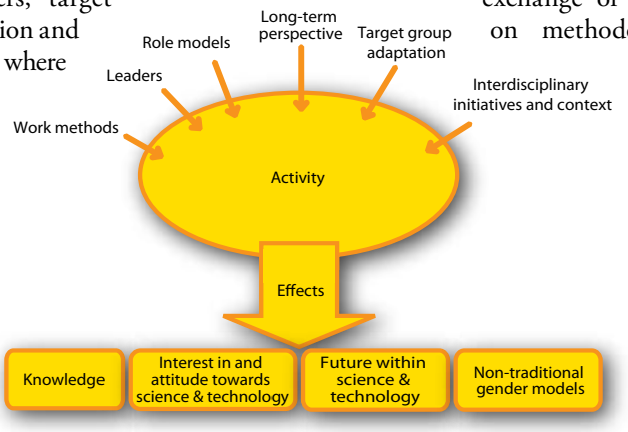
The most important factors in influencing knowledge, interest, attitudes and thoughts about a future within science & technology seem to be: role models and leaders, target group adaptation and work methods where knowledge or technology is placed in a context that the participants can relate to and find interesting.

Figure 9:
Percentage of analysed activities that have been evaluated/have not been evaluated.



It seems to be difficult, however, to succeed in breaking traditional gender models and in some cases the opposite effect was actually noted.

Evaluation is needed in order to make sound decisions on new initiatives. But this, of course, requires the allocation of resources for evaluation right from the start. Also, practical support and exchange of experiences on methodologies are needed.



Respect is declining

Young people have less "respect" for research. This is shown, among other things, by the fact that the percentage of young people who feel that science and technology are too difficult for most people to understand is declining, as is the percentage that believe that researchers do not pay enough attention to the risks. The opinion that the technological development has made life better has been weakening for a couple of years and now we can see a slight fall also in the percentage of people who feel that the scientific development has made life better for ordinary people. Meanwhile, the demand for "useful" research is increasing among young people.

The attitude adjustments over time are largely the same for young as for older people. Young people have, in many cases, gone "a step further," which indicates that the trend will continue in the future.

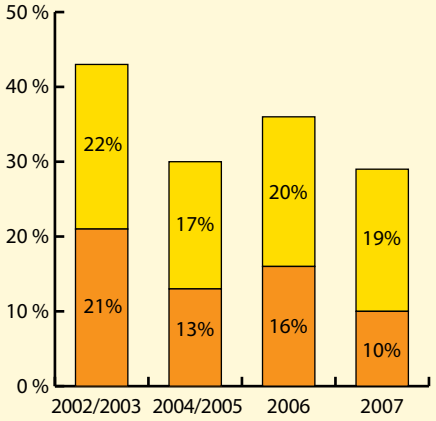


Figure 10:
"Science and technology are too difficult for most people to understand."
Telephone interviews with 16–29 year-olds, 2003–2006.

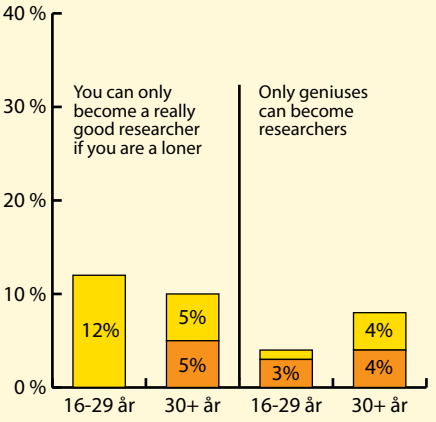


Figure 11:
Opinions about researchers.
Telephone interviews 2007.

More meetings!

The stereotypical image of researchers is rife in "popular culture media" aimed at children and young people. The researcher is in most cases a white male, often antisocial and sometimes crazy.

There are, however, things that counterbalance the stereotypical figures – the Swedish TV programme Hjärnkontoret (The Brain Office) is one example. Here, real, often young, researchers are involved. But even in this programme some stereotypes exist. The themes are usually science, technology or medicine and the participants often wear lab coats and/or are in a laboratory environment.

According to the literature, there are plenty of stereotypes on the big screen as well. Perhaps the characters in fiction and drama need to be stereotypes, particularly if they are to appeal to younger children? Other occupational groups are also caricatured in stories and on film.

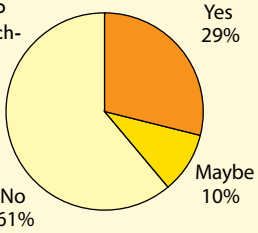
It is evident that most children and young people have stereotypical attitudes towards researchers – at least when they draw them or talk about what a researcher "is" or "is like."

On the other hand, in VA's telephone interviews in 2007 half as many young people as people over thirty thought that only geniuses can become researchers. Only one out of ten of both young and older people think that a good researcher must be a loner.

Future plans. Naturally, the image that young people have of different occupations influences their choices. One out of three states that they would like to be a researcher in the future. Young women are less interested than young men. Those living in big cities are more interested than those in sparsely populated areas, and interest increases with educational levels. The children participating in the interviews and the teenagers in particular were not interested in becoming researchers themselves. They could, however, identify possible future researchers around them, i.e. young people that are particularly interested in a certain subject and perhaps even a bit "nerdy."

Role models are important. When researchers meet children and teenagers the stereotypical media images are challenged. The opportunity for young people to meet researchers and ask questions can break down biased opinions and also spark their enthusiasm – particularly because they are being "listened to." But in order for researchers to be willing and able to be role models, they need to be rewarded for their efforts!

Figure 12:
Would you like to work as a researcher within some scientific field in the future? Telephone interviews with 16–29 year-olds 2006.



(On researchers) A man has straight hair, a woman has her hair tied up in a bun." Girl age 10–12

(About being a researcher) Imagine if you don't discover anything; then you have wasted your whole life on something and not discovered anything." Boy age 16–17

From another planet?

Young people don't care.
They don't listen to adults.
They are not interested in education and knowledge.
Their dream job is being a reality TV star.

Is this really true? This is the question that Public & Science (Vetenskap & Allmänhet, VA) has tried to answer through a study in several parts that is summarised in this report. Some of the lessons learned:

- Young people are interested in knowledge
- "Science" may have a negative connotation
- Meet young people on their own turf!
- People who are engaged are engaging
- "Usefulness," context and relevance are important
- Young people are different – they have different expectations and attitudes based on their experiences
- Evaluate the effects of initiatives to stimulate interest in science among young people!
- Researcher stereotypes are rife in the media
- Create opportunities for researchers to meet children and young people!

vetenskap & allmänhet