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Bèta&TechMentality

BètaMentality Recalibration

Platform
Talent voor
Technologie

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Background

TechniekTalent.nu, PBT and Tecwijzer (because of a merger, hereafter referred to as the Platform Talent voor Technologie) commissioned Motivaction International B.V. to conduct a quantitative study of young people ages 9 to 17 to provide input for the recalibration of the BètaMentality segmentation model.

The BètaMentality model was developed in 2008 and 2011 at the behest of Platform Bèta Techniek. This segmentation model gave a new perspective on young people and how they are or can be involved in STEM by starting from the values and motives of the young people themselves. Since the creation of the model, BètaMentality has been a starting point for recruitment and communication among many organizations in the education and technical sectors. This approach has proved to be successful, but the high demand for technically educated people remains. Additionally, there have been many changes in the field of technology over the past ten years, and the model's target group has largely aged out of the model. That is why Platform Talent voor Technologie wants to have the BètaMentality model recalibrated.

Motivaction and Youngworks were asked to perform this recalibration. Youngworks performed the qualitative research that was needed for the recalibration. Motivaction carried out the quantitative phase in which we established a division into segments using a research method similar to the one used in 2008 and 2011.

The objective of the research is to recalibrate and expand the content of the BètaMentality model and to broaden the age category of the target group to 9 to 17 years. The aim is to have a model that is in keeping with the contemporary context and that offers action perspectives to education and the business community.

Translator's Note: This Beta&TechMentality research project was carried out in The Netherlands. The results are applicable for the Dutch education and employment market.

Content Guide

Below are some comments to support the interpretation of the texts and results in the report:

- This research report starts with a description of the design of the research that led to the segmentation model: Bèta&TechMentality 2019.
- The results section of this research report first discusses the construction of the segmentation model (seven dimensions). Then the results of the cluster analysis (five segments) are explained and the segments are described.
  - Dimensions in attitude (factor analysis): 7 dimensions
  - Segments (cluster analysis): 5 segments
  - Description of the segments
- The description of the segments is based on the results of the quantitative research. For each segment, the following are discussed in turn:
  - Impression of engineering and technology
  - Impression of technical education
  - Technology in education
  - Profile choice at school
  - Influencers on their impression of technology
  - Own future and technology
  - Use of free time
  - Media use
  - Sociodemographics
  - Their suggestions for making technology more appealing
  - Action perspectives for making technology more appealing
- The description of the segments is based on the relative differences between them. This provides segment-level insights into the aspects that differ among all Dutch young people between the ages of 9 and 17. We report striking differences between the segments that are significant and typical. In the case of questions with answer scales (e.g. the five-point scale ranging from “completely disagree” to “completely agree”), we identify differences if the average on the scale differs significantly from the other segments. For an overview of all the significant differences (over-representation and under-representation) between the segments, we refer to the tables provided.
- In the context of overarching questions about possible shifts between 2011 and 2019, additional analyzes were carried out. We describe those after the results section.

Method and design for the recalibration

motivaction research and strategy

1. Preliminary qualitative phase

In December 2018, Youngworks conducted paired interviews with young people in primary and secondary school: 6 pairs of primary school pupils, 12 pairs of preparatory secondary vocational education (VMBO) students and 12 pairs of senior general secondary education/pre-university education (HAVO/VWO) students. Based on the most important insights from those interviews, various motives were extracted to provide input for the quantitative follow-up phase.

2. Quantitative phase

- In the quantitative phase, a questionnaire was put online from January 3-15, 2019. It surveyed a total of n=1,472 young people between the ages of 7 and 19 from Motivaction's ISO-26362 certified web panel (StemPunt) and the panel from an external agency. Respondents up to the age of 16 were recruited using a sample of parents of children aged 9 through 17, who were subsequently asked to have their children fill in the questionnaire. The sample was representative of Dutch young people in terms of age, gender, education and ethnicity. The cluster solution (the model) is based on that sample.
- The model was constructed with the help of value propositions that were used to determine young people's attitudes toward technology. This approach based on values and attitudes provides more insight into the perceptions, experiences and motivations of the target group and offers more stability than traditional subdivisions based on sociodemographics or behavior.

Questionnaire

- Among other things, the questionnaire presented 59 propositions that were reduced to seven dimensions in a factor analysis (an overview of the dimensions and the propositions on which they are based is given below). Based on the most distinctive dimensions, a statistical cluster analysis was used to form five clusters of young people, each with their own response pattern to these dimensions. In addition, questions were asked about behavior, study and career choices, daily life, and sociodemographics.
- The assumptions on which the 2011 model was based were included again in this study. Unlike the four-point answer scale used in 2011, this study used a five-point scale (ranging from completely disagree to completely agree).

Method and design

3. Data analysis

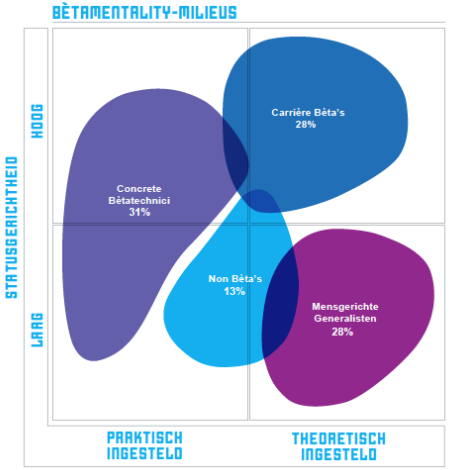
- A factor analysis was used to determine which of the 59 value propositions together form a dimension (or property).
- Based on those dimensions, a subdivision into segments was made using a cluster analysis, with the aim of creating segments that were internally as similar as possible, but which differ as much as possible from one another on these dimensions.
- Finally, a description of the segments was written that included the answers to the other questions.

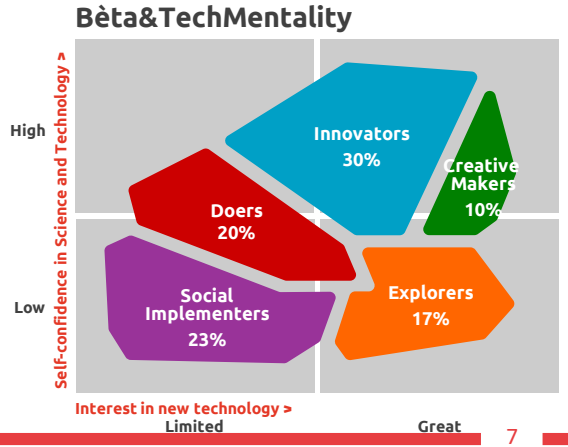
BètaMentality 2011 vs. Bèta&TechMentality 2019

The recalibration looked at the extent to which the 2011 model is still applicable to today's young people. Due to the changed context, content expansion, and broadening of the target group and the results, it appeared that the earlier model no longer reflects the current situation. For that reason, it was decided in consultation to choose new dimensions and segments for the 2019 Bèta&TechMentality model. Similarly, the new segmentation model has five segments, each of which offers a clear distinction in terms of how young people view technology.

The main differences between BètaMentality 2011 and Bèta&TechMentality 2019 are:

- Age categories: the 2011 model included young people aged 12 to 24, while the 2019 model included young people aged 9 to 17.
- Basic dimensions: in 2011, 17 propositions were used to compile five factors and four dimensions; in 2019, 24 propositions were used to compile seven factors and five dimensions.
- The content and naming of the Bèta&TechMentality model changed based on new analyses from which statistically different dimensions, segments and axes emerged. For example, the axes in the model: in 2011, we chose practical vs. theoretical and low vs. high status orientation; in 2019, we chose limited vs. great interest in new technology and low vs. high self-confidence in science and technology. These are the strongest segmenting and meaningful factors in 2019 out of the seven factors that were compiled.





Results | Dimensions

Dimensions

Scores on propositions form seven dimensions

A total of 59 propositions were included in the questionnaire. A factor analysis of the answers to these propositions identified seven dimensions.

An interpretation of those dimensions led to the following names of the dimensions:

- Self-confidence in science and technology
- Confidence in technological progress
- Interest in new technology
- Appreciation and respect
- Social commitment
- Technology can be learned
- Practical orientation

These dimensions were based on 24 propositions. Responses to those propositions determined the segment to which a respondent would be allocated.

The following sheets show the corresponding propositions for each dimension.

Dimensions

Dimension 1: self-confidence in science and technology

- I'm not smart enough to do anything with technology*
- It's hard to do well in scientific subjects*
- I frequently do not understand the teacher's explanations of technical or scientific subjects*
- I'm afraid I'm not smart enough for science and technology subjects*

In summary, they have great confidence in their technical capacity. That's why a technical education is for them.

Dimension 2: confidence in technological progress

- Scientific and technical people are important to society
- Technology can help people
- Technology is becoming increasingly important in the world
- I have confidence in the progress of technology

In summary, technology is and will remain important for people and society. They have great confidence in technological advances.

Dimension 3: interest in new technology

- It would be fun to make my own games
- I think robots are cool
- I would like to design new things

In summary, technological developments are cool, not only to use but also to develop themselves.

Dimension 4: appreciation and respect

- I want to have a profession that my parents/guardians can be proud of
- A good salary is important to me
- It's important that my job is prestigious
- I would like others to be proud of me

In summary, pride and recognition from others are important. This is now mainly about the appreciation of parents and others, and later will also include tangible rewards in a professional situation.

Dimensions

Dimension 5: social commitment

- I would like to commit myself to society
- I think it's important to do something for the environment
- I would like to someday have a job in which I can dedicate myself to society

In summary, it's important to be involved in society by doing something for the people around you and/or the environment.

Dimension 6: technology can be learned

- Everyone is suited to technology
- Technology can be learned, even if you have less talent for it
- You don't have to be handy to do something with technology

In summary, technology is there for everyone. If someone does their best, they can become good at it.

Dimension 7: practical orientation

- I like practice more than theory
- I want to do something with my hands in the future
- I like studying and reading books more than making something with my hands*

In summary, making something concrete or doing something technical is much more fun than learning the theory behind it or thinking about the technical design.

*These propositions were presented to the respondents in this way. In the analysis, the propositions were 'reversed', meaning that a high score on the proposition (agree) became a low score (disagree) and vice versa. For example, the scores on the propositions reflect the degree of 'self-confidence in science and technology' (instead of no self-confidence in science and technology) and the scores on the three propositions that measure 'practical orientation' reflect a comparable 'positive' direction.

Results | Segments

Segments

Scores on the dimensions form five segments with unique attitudes toward technology

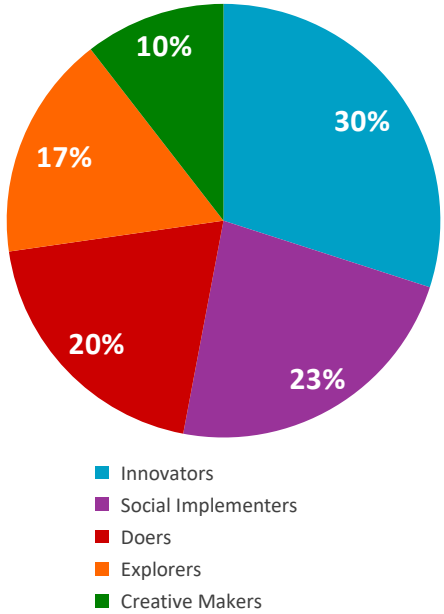
Young people differ in the extent to which the seven dimensions apply to them. The study resulted in five different segments, each with their own attitude toward technology. In this attitude, each segment shows as much similarity as possible within the segment and differs as much as possible from the other segments. The segments were named in consultation with TechniekTalent.nu and Youngworks. The segments are:

- Innovators (30%)
- Social Implementers (23%)
- Doers (20%)
- Explorers (17%)
- Creative Makers (10%)

On the following pages, the results for each segment will be presented in the following order:

- General description
- Impression of engineering and technology
- Impression of technical education
- Technology in education
- Profile choice at school
- Influencers of their impression of engineering
- Own future and technology
- Use of free time
- Media use
- Sociodemographics
- Their suggestions for making technology more appealing
- Action perspectives for making technology more appealing

Size of the segments



Segments

Visual representation of the five segments

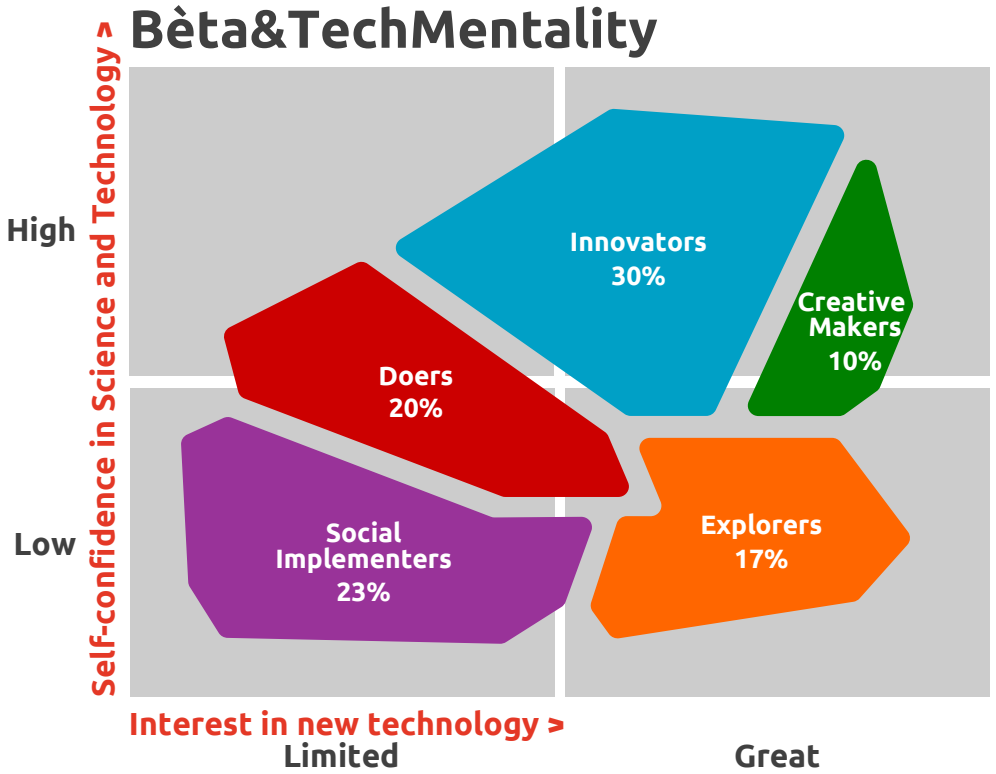
The segments are visually represented on two axes.

Horizontal axis | Interest in new technology

The extent to which young people are interested in new technical developments (e.g. games, robots) and want to contribute to those developments themselves. Limited: less interested in new technology and less motivated to design new things themselves. Great: great interest in technological innovations and working on technology by developing new things themselves.

Vertical axis | Self-confidence in science and technology

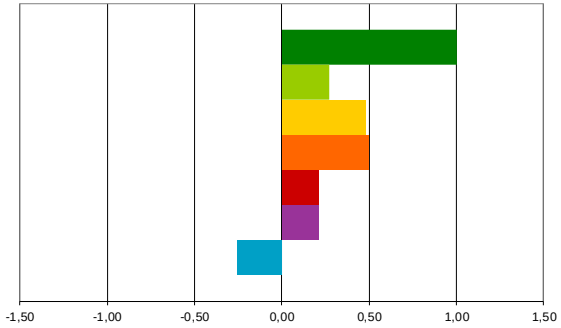
The extent to which young people have confidence in their own technical capacity. Low: the feeling that I do not have enough talent or aptitude for technology because it's difficult and therefore not for me. High: technology is easy for me and I'm good at it.



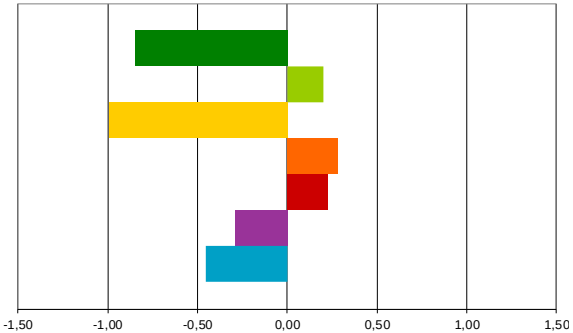
Segments

Five segments - scores on the seven factors

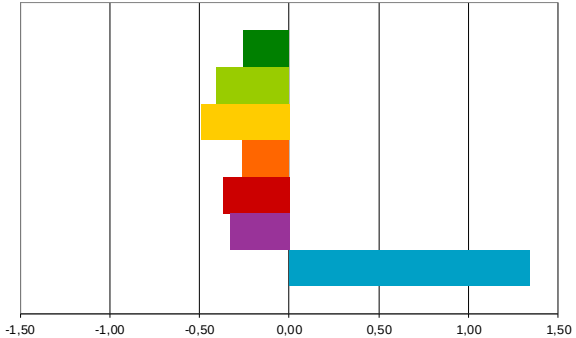
Segment 1: Innovators



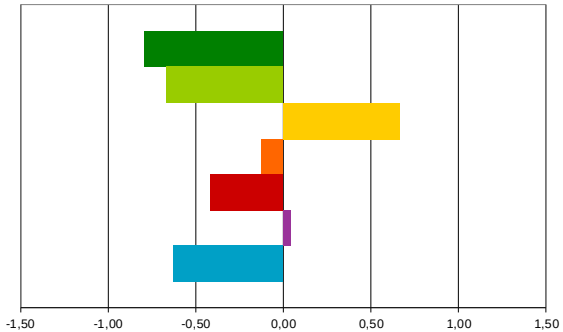
Segment 2: Social Implementers



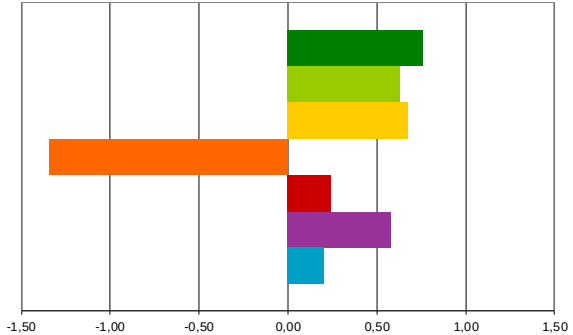
Segment 3: Doers



Segment 4: Explorers



Segment 5: Creative Makers



The seven factors:

- Self-confidence in science and technology
- Confidence in technological progress
- Interest in new technology
- Appreciation and respect
- Social commitment
- Technology can be learned
- Practical orientation

Segments

Segment 1: Innovators

Young people with a strong interest in technology and a fascination with technological developments. According to them, technology will only become more important in the future. They are creative and are optimistic about the degree to which a person can become skilled in technology.

General description

These young people are genuinely interested in (new) technology. They believe that technology is important for themselves, society, and the future. Technological developments fascinate them. They are more creative and innovative and less practical. Nevertheless, they like to make things themselves and preferably for others. At school and in their free time, they enjoy working with technology in the form of trials and experiments. They not only enjoy technology at school but think they are good at it. They are open to a job in technology and are extrinsically motivated by status and (financial) appreciation. They believe everyone is suited for technology and that it's possible to become better at it. That's important because technology will become increasingly important in the future.

Impression of engineering and technology

- They spontaneously associated engineering with creative aspects such as designing and developing.
- They spontaneously made a strong association between technology and progress, innovation, and the future.
- Words they think fit technology: creativity (creative, beautiful objects, design, designing, making), innovative, attractive (cool, trendy), challenging (exciting, interesting, educational) and not too difficult (easy).
- Words they found less suitable for describing technology: complicated/difficult, boring, dirty hands.

Impression of technical education

- Characteristics that fit with technical subjects at school: many practical examples and experiments, future-oriented, useful, good teachers and explanations, being able to do a lot themselves.

Segments

Segment 1: Innovators

Technology in education

- According to them, a lot of attention is paid to technology at school. They associate it with fun learning activities in which they get to work hands-on with experiments/practicals. They also think technology is future-oriented and therefore interesting and useful.
- In addition to enjoying it, they also are more likely to think they are good at technical and scientific subjects.

Profile choice at school

- They choose challenging courses, partly because they think that you can also learn difficult things.
- They believe that if you choose a technical track, you can still go in any direction.
- Mixed/profession-oriented preparatory secondary vocational education (VMBO): they are more likely to choose a Manufacturing, Installing and Energy profile and think they excel at it. They also enjoy a Mobility and Transport profile.
- Theoretical VMBO: they are more likely to choose a Technology profile and think they excel at it. Economics also seems to be a good profile for them.
- Senior general secondary education/pre-university education (HAVO/VWO): they are more likely to choose a Nature & Technology profile and think they excel at it. They also enjoy a combined Nature & Technology and Nature & Health profile.

Influencers of their impression of technology

- They are more likely to have one or both parents/guardians working in a technical or scientific job. They also indicate that their parents/guardians have played an important role in shaping the image they have of technology and in their final choice of a school profile.
- They aspire to a profession that their parents/guardians can be proud of, which is important in the context of their extrinsic motivation.
- The internet and television programs are important sources for their associations with engineering and technology.

Segments

Segment 1: Innovators

Own future and technology

- This segment also envisions a job for themselves in technology and related fields such as IT, nature and the environment, cars / transport / maritime shipping / aerospace / space travel, science, architecture, and construction. They are also attracted to large tech companies like Google, Apple, or Tesla. They look up to people with a technical profession.
- They want to see the following aspects reflected in their future profession:
    - Opportunity to be creative
    - Commitment to society (making things that others can also use)
    - Doing something for the environment
    - Prestige, recognition, and salary are important

Use of free time

- More often spend their free time on: (online) games, sports, making things, doing experiments/trials, playing games with others.
- More often play various games at home or online, such as Fortnite or Minecraft.

Media use

- Use social media relatively less often and for shorter periods of time.
- Sometimes follow vlogger Dylan Haegens.

Sociodemographics*

- More male (61%).
- More pre-university education (VWO) students.

**They are spread across all sociodemographic variables, but these characteristics are relatively over-represented.*

Segments

Segment 1: Innovators

Their tips for making technology more attractive

- Make it clear what you can do with it later.
- Use more new technology in lessons.
- Spend more time on it at school.
- Have teachers give more examples.
- Focus on people and society.

Action perspectives for making technology more appealing

- This segment belongs to the low-hanging fruit when it comes to enthusiasm for technical education. Engineering and technology are already very attractive to this segment. The challenge in this segment is primarily related to facilitating and meeting their needs. This includes:
    - Highlighting the role of technology in the future. What developments are currently taking place and what impact will they have on people, society, and nature?
    - Highlighting creation, design, and innovation in addition to the practical technical fields.
    - Having teachers who can sketch future developments in an inspiring way and link them to practical education.
    - In the context of their extrinsic motivation, appealing to their desire for prestige, recognition and a good salary.
- In communication, it is good to appeal to their fascination with robots, games, and large tech companies like Apple and Tesla.

Segments

Segment 2: Social Implementers

Young people with little self-confidence in their technical skills. According to them, technology is a talent you have or that you cannot or can barely learn. In any case, they think that they are not smart enough for technology and they become more enthusiastic about caring for people and society.

General description

These young people do not believe that technology is for everyone. They are not interested in technology themselves and seem to have given up in an educational sense on technology at school. They don't think they are smart enough and they need more guidance in technical subjects; if it were easier, they might be more interested. They don't see the added value of technology for themselves, based in part on their traditional image of technology (working with your hands). It would help if technology was made easier and more fun at school, with good teachers and concrete examples. Focus on what you can do with it yourself and what it can mean for others (e.g. in healthcare).

Impression of engineering and technology

- They mainly spontaneously associated technology with complexity (difficult, complicated, too complex) and unattractiveness (boring, uncool, dirty hands). They also think that technology is not something for them.
- Words they found less suitable for describing technology: beautiful objects, cool, working independently and future-oriented.

Impression of technical education

- Characteristics that fit with technical subjects at school: less easy, boring and not useful, no nice textbooks, few good teachers and explanations, being able to do little themselves.

Segments

Segment 2: Social Implementers

Technology in education

- They are not charmed by technology at school and more often think that they are bad (or very bad) in technical and scientific subjects.

Profile choice at school

- Mixed/profession-oriented preparatory secondary vocational education (VMBO): they are more likely to choose a Care & Welfare profile and think they excel at it. They also think they excel at an Economics & Entrepreneurship profile.
- Theoretical VMBO: they are more likely to choose an Economics profile and think they excel at it. They also are not attracted to a Technical profile and think they would not excel at it.
- Senior general secondary education/pre-university education (HAVO/VWO): they are more likely to choose an Economics & Society or Culture & Society profile. They also are not attracted to a Nature & Technology profile or combined profile that includes technology and think they would not excel at it.

Influencers of their impression of technology

- Their parents/guardians are less important sources for their associations with engineering and technology. They have no clear external influencers on their impression of technology.

Segments

Segment 2: Social Implementers

Own future and technology

- In their later career, they would like to be involved in caring for and educating people and children and would like to work with their hands. They don't see themselves working in professions related to engineering, transport, science, computers, or architecture.
- They don't think of themselves as creative, handy or smart enough for technology and don't see any challenge in designing or developing new things.

Use of free time

- More often spend their free time on: caring for animals, listening to/making music, reading.
- Less likely to spend their free time on: playing (online) games, tinkering with machines/motors.

Media use

- Use social media relatively more often and for longer periods of time.
- Sometimes follow vloggers Nienke Plas and Monica Geuze.

Sociodemographics*

- More female (66%)
- More aged 15 to 17 years
- More secondary school students, relatively more senior general secondary education (HAVO) students.
- More vocational secondary school (MBO) students

**They are spread across all sociodemographic variables, but these characteristics are relatively over-represented.*

Segments

Segment 2: Social Implementers

Their tips for making technology more attractive

- Make technology easier.
- Focus on people and society.

Action perspectives for making technology more appealing

- This segment seems to have a persistently negative image of technology, mainly due to a lack of talent and competencies. It's a challenge to convince them of the opportunities that technology can offer them because they are convinced that they have no talent for it. That's why it is important to give them extra guidance with technology at school, to encourage the idea that they can indeed do it and to focus on what they can do with it themselves and what it can mean for society. Mention the role that technology plays in the fields they are attracted to, such as healthcare.
    - Focus on the fact that technology is wide-ranging and especially plays an important role in fields like healthcare, economics and society (and that they can influence them!).
    - Make technology easier and more accessible at school by offering extra support, nicer textbooks, and enthusiastic teachers.
    - Foster the idea that they can learn technology or confirm that they have already done so.
    - Also clarify the different degrees of technical education. Make a distinction between soft (e.g., designing, creations, CT scans in healthcare) and hard (e.g., programmers, technicians) technical educations/professions.
- In communication, it's good to emphasize that technology is for everyone and is part of everything, even things they might not expect. You can positively surprise them with that realization!

Segments

Segment 3: Doers

Young people with a certain interest in technology, but not in the theory behind it. They think technology is especially nice if you can work with it yourself and it is not made more difficult than it is.

General description

These young people are especially practically minded in most areas, including the technical field. They are less aware of the fact that technology is interwoven in society and they only see it in professions that they would be unlikely to choose for themselves. They aren't attracted by the status or progress of technology but find it especially attractive to work with technology.

Impression of engineering and technology

- They spontaneously associated technology with electricity, employment and occupations such as repairman, auto mechanic, electrician, plumber, carpenter, construction worker, operator, techie, technician, or engineer.
- Words they think fit technology: devices (machinery, equipment, tools), cars, and working with your hands or getting your hands dirty.
- Words they found less suitable for describing technology: modern, design, cool, laboratory, easy.

Impression of technical education

- Characteristics that fit with technical subjects at school: being able to do a lot themselves. They just don't find the subjects easy and don't like the textbooks.

Segments

Segment 3: Doers

Technology in education

- They think they don't get much technology at school.
- They don’t think they are very good at technical or scientific subjects and find those subjects difficult.

Profile choice at school

- Mixed/profession-oriented preparatory secondary vocational education (VMBO): they are more likely to choose a Green profile and think they excel at it. The same goes for a Building, Living, and Interiors profile. They are also attracted to a Hospitality, Bakery, and Recreation profile.
- Theoretical VMBO: they are more likely to choose a Care & Welfare profile or, less often, an Economics profile. They are not attracted to a Technical profile.
- Senior general secondary education/pre-university education (HAVO/VWO): no notable differences in profile choice.

Influencers of their impression of technology

- Their parents/guardians are less important for their associations with engineering and technology.
- They have no clear external influencers on their impression of technology, nor do they have specific people or sources that were important when choosing a secondary school/profile.
- In this sense, they seem to be reasonably “unimpressionable”: they experience little external pressure and feel able to make their own choices.

Segments

Segment 3: Doers

Own future and technology

- They often have no idea what they want to do later, although they tend toward a practical direction where they can work hands-on.
- They don't think they are very good and smart at technology; they think it's too difficult.
- They want to see the following aspects reflected in their future profession: hospitality, animals, personal care. That mainly comes from the motivation to "be busy" and not necessarily a drive to contribute to society.
- They are less enthusiastic about the idea of working in nature, behind a computer or at a scientific job. Prestige and salary are not important to them.

Use of free time

- More often spend their free time on: listening to/making music.
- Less likely to spend their free time on: conducting trials/experiments, reading, playing games with others.

Media use

- Use social media for relatively longer periods of time (1-3 hours a day).
- Sometimes follow vloggers Enzo Knol and Stuk tv.

Sociodemographics*

- More aged 15 to 17 years
- More basic profession-oriented/middle management-oriented preparatory secondary vocational education (VMBO) students and vocational secondary school (MBO) students
- More likely to live in the east of the Netherlands (Overijssel, Gelderland, Flevoland)

**They are spread across all sociodemographic variables, but these characteristics are relatively over-represented.*

Segments

Segment 3: Doers

Their tips for making technology more attractive

- Make technology more practice-oriented.

Action perspectives for making technology more appealing

- This segment offers prospects for enthusiasm. There is already a certain interest in technology and it can be further fueled in a practical and concrete way. Not with difficult stories and theoretical backgrounds, but by letting them experience for themselves what you can do with technology.
    - Don’t focus on the word “technology,” but on “doing.” They want to be hands-on in every area, even when it comes to technology.
    - Technology should not be imposed; they are not easily influenced and still make their own choice.
- Accessible communication and practical examples are a good way to inspire them. Also think of examples in which technology and new developments do not play a major role.

Segments

Segment 4: Explorers

Young people who are indifferent to technology. Technology is something they don't really relate to, although they are quite fascinated by games and robots and want to develop new things. They don't yet know their own technical talent.

General description

These young people do not see the direct added value of technology on an abstract level (including for people and society). They do not make the link between concrete technical developments and the bigger picture, so they often have no clear opinion about various themes in the context of technology. They say they have little interest in technology themselves, and they have a conservative view of it: few social possibilities, more for young men than for young women, and working with your hands or in the laboratory. Nevertheless, they have a certain fascination with new technological developments. They play relatively more games and think that robots are cool. They would like to design/develop things, as long as they're not too practical. If they are offered new technologies at school and insights into what technology is all about, these "clean slates" might become interested in technology. It's also important to give them confidence and confirmation. They don't think they are smart enough for technology and they are not encouraged to choose a profession that they like (while they are open to a technical profession), but they can be influenced by external sources.

Impression of engineering and technology

- They have few spontaneous associations with engineering and/or technology. They have particularly few strong associations with building/making things, designing/developing, vehicles/machines, electricity and computers.
- According to them, there are few words that fit with technology. Words they find less appropriate: creativity (modern, creative), innovative, interesting, practical (making, with your hands) and tools.

Impression of technical education

- They less often think that these characteristics fit with technical subjects at school: many practical examples and experiments, future-oriented, good teachers, useful, being able to do a lot themselves.

Segments

Segment 4: Explorers

Technology in education

- They think they get a lot of technology at school, but think it is not presented in a concrete enough way and does not connect to their interests. For example, they think it would be fun to make their own games.
- They often *don't* know whether they are good at technical or scientific subjects, but they're a little worried that they are too difficult or that they're not smart enough for them because they often don't understand the teacher very well either.

Profile choice at school

- Mixed/profession-oriented preparatory secondary vocational education (VMBO): no striking differences in profile choice; they often don't know what they have an affinity for and are unclear about what they excel at. An Economics & Entrepreneurship profile often seems more fun to them.
- Theoretical VMBO: no striking differences in profile choice or what they enjoy.
- Senior general secondary education/pre-university education (HAVO/VWO): no striking differences in profile choice or what they enjoy.

Influencers of their impression of technology

- When asked about important resources for their ultimate choice of a secondary school/profile, they often mention siblings, aunts/uncles, cousins, friends, primary school teachers, career choice tests, youth workers, and vloggers.
- Friends/classmates and vloggers are important sources for their associations with engineering and technology.

Segments

Segment 4: Explorers

Own future and technology

- More often than not, they have no idea what they want to do later or what they want to do in their future job. *Less* often, something with people, children, or animals.
- They think that if you choose technology, you already know what you want you want to be later. They are open to doing something with technology later, but they're not yet sure about it.
- Their parents/guardians are less likely to encourage them to choose a profession that they like.
- They are quite interested in having their own company and are also attracted to tech companies like Google, Apple, and Tesla. They also think it's great fun to come up with innovative things and develop games. Nevertheless, they do not see direct job opportunities in technology. They don't seem to make (or are unable to make) the link between creative initiatives and companies and the term "technology."

Use of free time

- Less often spend their free time on specific activities.
- When they play games, they often spend more time per day on average doing so, especially on Fortnite.

Sociodemographics*

- More 9- to 11-year-olds, primary school students.
- More frequently live in the west of the Netherlands (Utrecht, North Holland, South Holland excl. the three large municipalities)

**They are spread across all sociodemographic variables, but these characteristics are relatively over-represented.*

Segments

Segment 4: Explorers

Their tips for making technology more attractive

- Use more new technologies at school.
- Clarify what you can do with it later.

Action perspectives for making technology more appealing

This segment has a stereotypical view of the terminology around “technology,” even though deep down they’re eager to be creative in the form of coming up with and developing new things. They’re also fascinated by new technological developments. It’s important to stimulate this creativity. The challenge lies primarily in making education attractive and offering prospects for the future. They need to know that choosing technology would still allow them to go in all sorts of (creative) directions later.

  - More technology at school in the form of developing games or creative challenges in which they can let their minds run free.
  - Focus on the value for the future and explain that choosing technology is not as static as it seems (e.g., by showing them inspiring examples of creative entrepreneurs).
- Especially use (visual) examples when communicating about technology to introduce them to its possibilities for themselves, others and the future.

Segments

Segment 5: Creative Makers

Young people with an intrinsic motivation for technology. They experience no external pressure on their concept of technology and find recognition and prestige extremely unimportant. They are aware of their technical interest and talent, but they are not yet entirely sure how they want to shape that in the future.

General description

These young people have associations with concrete technical forms, such as devices and electronics, but also with abstract forms such as design and development using technology. In their view, technology is attractive and challenging. They think that they are handy and good at technical subjects in school. They also think that everyone is capable of learning technology, and that's important because technical people can help advance society (e.g., with environmental issues) and they would like to contribute without expecting status or recognition in return.

Impression of engineering and technology

- They spontaneously associated technology with concrete objects such as devices and machines, and electronics, and with design and development.
- Words they think fit technology: creativity (creative, designing, developing), appealing (cool), challenging (interesting), not too difficult (easy).
- Words they found less suitable for describing technology: complicated/difficult, boring.

Impression of technical education

- Characteristics that fit with technical subjects at school: lots of practicals, good teachers and explanations.

Segments

Segment 5: Creative Makers

Technology in education

- Technology at school is associated with good and challenging education, in which they both want to work in concrete terms and think about it on a more abstract level.
- They also more often think of themselves as good and handy in technical subjects.

Profile choice at school

- They believe that if you choose a technical track, you can still go in any direction.
- Mixed/profession-oriented preparatory secondary vocational education (VMBO): they are more likely to choose a Media, Design, and ICT profile and also enjoy a Manufacturing, Installing and Energy profile.
- Theoretical VMBO: Technology seems to be a particularly attractive profile to them and they think they excel at it.
- Senior general secondary education/pre-university education (HAVO/VWO): they are more likely to choose a Nature & Technology profile and think they excel at it.

Influencers of their impression of technology

- They have few external influencers; only their primary school teachers are crucial to their image of technology.
- They also experience no external pressure from parents/guardians when making choices about technology, but they are later encouraged to choose a profession that they enjoy.

Segments

Segment 5: Creative Makers

Own future and technology

- They are less certain what they want to do later but they see themselves in a technology-related job, perhaps in combination with fields like media, design and ICT, manufacturing/installing or nature and the environment.
- They want to see the following aspects reflected in their future profession:
  - Something with nature and the environment, science and computers/IT, not with people
  - Designing new things and developing games
  - Prestige, recognition and salary are unimportant

Use of free time

- More often spend their free time on: (online) games with others, reading, and enjoying making things.

Media use

- Use social media relatively less often.

Sociodemographics*

- More boys (61%)
- More 9- to 11-year-olds, primary school students
- Relatively more pre-university education (VWO) students
- More often live in suburban communities

**They are spread across all sociodemographic variables, but these characteristics are relatively over-represented.*

Segments

Segment 5: Creative Makers

Their tips for making technology more attractive

- They gave no explicit advice but, in any case, it doesn't need to be made "easier" or more focused on people and society.

Action perspectives for making technology more appealing

- This segment is already convinced of the value and appeal of technology for society and the future. This vision comes from within themselves and no longer needs to be fueled from the outside. However, it's important to continue interesting this group with challenging education on both concrete and abstract levels. This could be achieved by:
  - Drawing attention to the role of technology in society and for the future with an emphasis on the impact value of nature and the environment.
  - Relating technology to media/ICT and science.
  - In technical education, combining a hands-on approach to technology with designing and programming new technology (e.g., games).
- In communication, it is good to implicitly encourage their self-confidence in technology by informing them about cool new developments and challenging them educationally rather than by giving them personal compliments or focusing on the status of technology.

APPENDIX

Appendix | Technical research details - quantitative

- **Fieldwork period**
  - The fieldwork was conducted from January 3–15, 2019
- **Respondent selection method**
  - From the Motivaction StemPunt panel
  - By a specialized respondent selection agency
- **Incentives**
  - Respondents received points for the StemPunt savings program as thanks for their participation in the research
- **Weighting**
  - The research data is weighted (also see the weighted and unweighted data appendix) with the Mentality calibration file serving as a re-weighting framework. With regard to sociodemographic data, this calibration file is weighted according to the Gold Standard of Statistics Netherlands (CBS).
- **Use of third-party suppliers**
  - Motivaction used the services of specialized companies for the following activities in this study: respondent selection
- **Retention period of primary research files**
  - Digitally available primary research files are kept for at least 12 months after completion of the research. Video and audio recordings on CD and written primary files that are not digitally available (e.g., completed questionnaires) are stored for up to 12 months after completion of the research.
- **Other technical research details**
  - Other technical research details and an example of the questionnaire used in this research are available to the client on request

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