

**BÈTA&**  
**TECH**MENTALITY

Developing education with impact

# Introduction

Technology plays an increasingly important role in society. For instance, think of the growing role that ICT and technology play in education and healthcare. Or think of the energy transition that affects our mobility, housing and infrastructure. Children and young people will all have to deal with technology in their future careers. Good science and technology education are important for helping them discover where their talents lie and how they can develop them.

The career prospects in technical sectors are excellent and the shortages in various sectors are increasing. This offers many opportunities for young people.

The positive news is that young people more often see a future for themselves in technology. Between 2011 and 2019, interest in a scientific or technical profession increased by 16%, from 36% to 52%. And the future also certainly must include young women. While only 15% of young women indicated that they aspired to a scientific or technical profession in 2011, this percentage rose to 38% in 2019.<sup>1</sup>

At the same time, there is still a lot of work to be done: a larger proportion of young people today think science lessons are more boring than other lessons: 36% in 2011 compared to 47% now. And the number of young people who choose technical paths still does not meet the demand. Many young people remain critical of technical education and science or are not yet sufficiently exposed to the opportunities offered by technical sectors.

That is why we are not there yet and why we can still make good progress, especially by better connecting to the different needs and motivations of young people. The Bèta&TechMentality model shows instructors, teachers, mentors in education, and professionals in business how to inspire a broad group of young people with technology.

## 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.

<sup>1</sup> Source: additional analyses of Bèta&TechMentality: 2011–2019 comparison, Platform Talent voor Technologie

## The intake in VMBO does not meet demand

Compared to 10 years ago, more young people are choosing science and technology, especially in pre-university education (VWO) and, to a lesser extent, in senior general secondary education (HAVO). However, at the preparatory secondary vocational education (VMBO) level, the number of young people choosing a technical profile lags far behind the demand from the labor market and the needs of society.<sup>2</sup>

Before we can inspire more young people with the possibilities of technology, it is important to first know what drives and motivates them. What are their values in relation to technology? What are the barriers that keep them from choosing a technology path? The new Bèta&TechMentality model provides answers to these questions and is based on extensive research among children and young people aged 9 to 17 years. During this stage of life, they form images of professions and sectors, develop preferences, and make choices about their education. For the sake of readability, we will continue to refer to this target group as “young people” throughout this white paper.

## Five types of young people, each with their own motives and triggers

Young people think about technology in very different ways. The Bèta&TechMentality model distinguishes between five types of young people, each of whom we can interest in technology in different ways through education and information. All kinds of factors play a role in this. For example: to what extent are young people already interested in new technology and confident about technological progress? Do young people have the idea that they can take on science and technology and can they improve their skills in this area?

In this white paper, we describe the five types in turn and how they can be inspired by education and communication. You can imagine, for example, that Creative Makers and Social Implementers find different things appealing in education.

## Bèta&TechMentality: research background

The model is based on research among 9- to 17-year-olds from primary education to secondary education (VMBO, HAVO and VWO). The research consisted of two phases:

- Qualitative research: 30 exploratory paired interviews with a total of 60 children and young people, carried out by Youngworks. In it, we explored the motives and barriers that determine how young people experience technology. The insights from the qualitative research phase were translated into value propositions about their motives and attitudes toward technology.
- Quantitative research & segmentation: 1,472 children and young people then filled out a questionnaire. Based on their reactions to value propositions and a factor analysis, we determined the seven underlying dimensions of the model. And based on a cluster analysis, we identified five segments. This phase was carried out by Motivaction.

## Seven dimensions

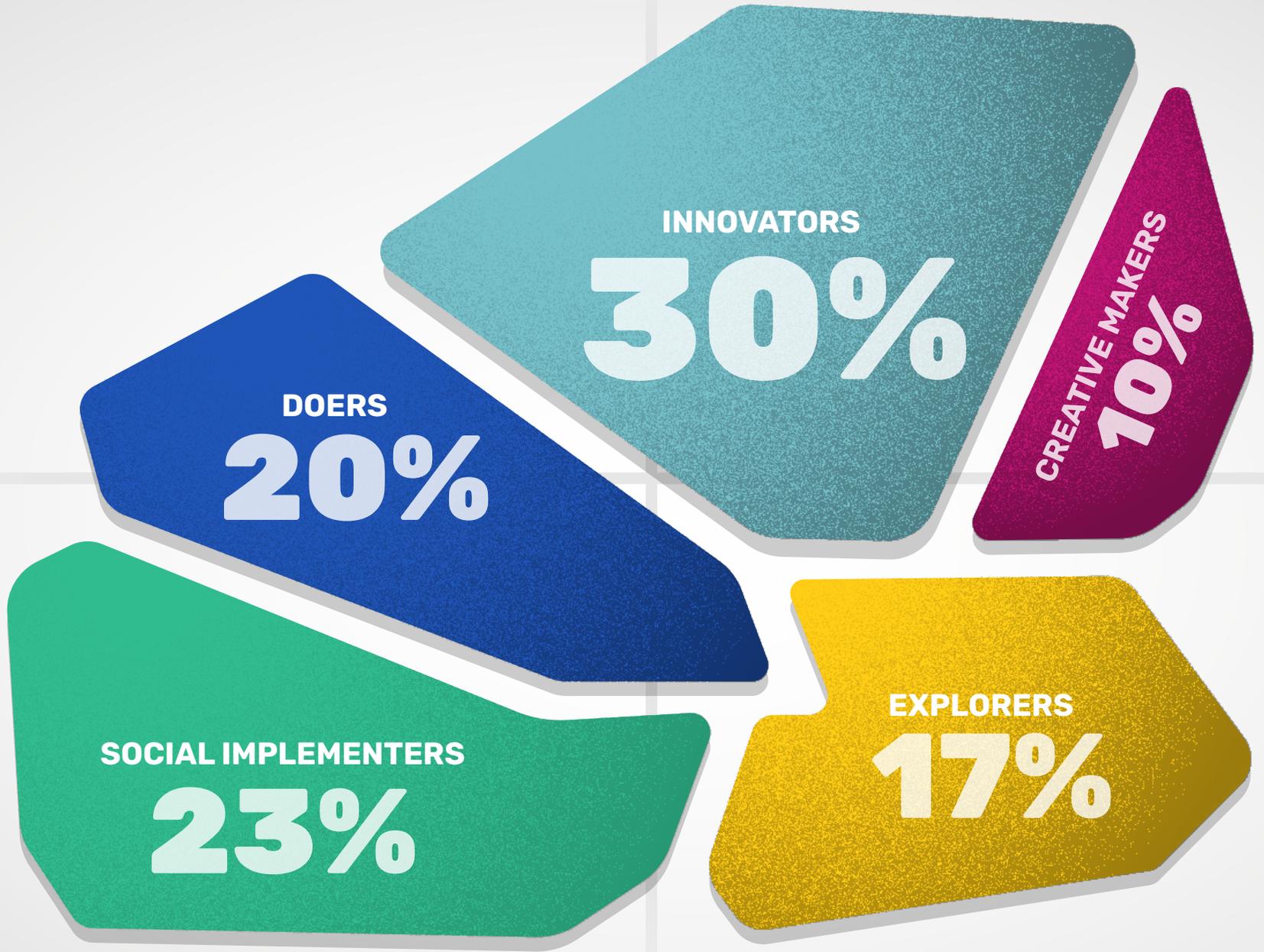
The five Bèta&TechMentality types all score differently on these seven dimensions:

1. Self-confidence in science and technology
2. Confidence in technological progress
3. Interest in new technology
4. Appreciation and respect
5. Social commitment
6. Technology can be learned
7. Practical orientation

**HIGH**

self-confidence in science and technology

**LOW**



**LIMITED**

interest in new technology

**GREAT**

## **Bèta&TechMentality: what's new?**

The Bèta&TechMentality model is the long-awaited update to the successful BètaMentality, which was developed in 2007 and updated in 2010. The new research was carried out between November 2018 and January 2019. The world has changed over the past eight years: new dominant stories about technology have emerged and young people have started to look at technology differently. That is why this research focuses on a target group between the ages of 9 and 17 years, because it is becoming increasingly clear that young people develop images about professions and their suitability for them at a very early stage. This range was ages 12 through 24 in the previous research. This is also reflected in the research results and has led to the model being completely updated, with new axes (the basis of the model) and types.

## **Next steps: tools for applying the model in 2019**

Platform Talent voor Technologie develops various products and workshops related to the Bèta&TechMentality and an update of the '7 Worlds of Technology'. From fall 2019, these will be available to educational institutions and businesses to help them apply the Bèta&TechMentality to the education design or career orientation and guidance.

In this white paper, we will first explain the five types of young people one by one.

What are the main characteristics of the different types? How do they look at technology?

And how can you inspire them? In the last section, we will describe how you can get started with the model: how can you apply it as a company, sector, or educational institution?



**INNOVATOR**

**“I read a lot of comic books, especially Donald Duck. There are a lot of inventions in there. Not those things that explode, but really handy new things. I would like to become an inventor. Being a researcher also sounds fun.” (Mick, age 11, explaining the “inventor” profession)**

## Who I am

Innovators are young people who enjoy working with technology. They think they are good at it and can handle it. There’s no lack of self-confidence in this group. Young people are growing up in a world in which technology is increasingly present and part of life. Innovators are optimistic about this: technology plays a positive role and helps the world move forward. According to this group, technology will play a crucial role in solving climate problems. To get that done, you not only have to do and make, but also really understand some of the formulas or the theory behind innovations or new inventions. Yet Innovators are not just doing things for themselves and the world: they also want to be able to be proud of what they do and receive recognition for it from their environment. Innovators are not the inventors who stay in their attics with an idea; they want to make it a success and be seen.

## What I think

Innovators have positive associations with technology. These associations are sometimes more abstract, like “progress” or “future.” They also think of what they can do to achieve that progress: developing and designing. You don’t have to explain to these young people that there are good future prospects in technical fields. They hear that from their social environment, a relatively large portion of which is working in a technical profession. They see technology as a path that can take you in many different directions. That’s why this group has already often chosen a technical direction for their education. Their image of technology is high-tech: a clean environment with plenty of career opportunities.

## What I’m looking for

Trigger: Let me experience which innovations I can create to make the people around me proud.

**Education:** Challenge Innovators with assignments in which practice and theory are well intertwined. Don’t make it too easy. Offer them opportunities to show off or share their creation, for example in a small exhibition or on an online platform. Innovators also believe that more school time should be spent on doing experiments and carrying out creative assignments. Make sure it is high-tech.

**Career orientation and guidance:** Innovative and large tech companies like Apple, Google, and Tesla attract these young people. That makes sense: fascinating innovations are invented there and working for such an employer is well respected. Show these types of companies (international and local) during career orientation and guidance and indicate which degree programs you can follow to end up there.

## Facts

- A good salary is important to me -> 82% agree (average 67%)
- I think robots are cool -> 77% agree (average 57%)
- I would like to commit myself to society -> 71% agree (average 60%)
- 61% male, 39% female

A woman with blonde hair, wearing a bright yellow short-sleeved top and tan high-waisted trousers, stands in the center of the frame. She is smiling and looking slightly to her right. The background is a vibrant green with various white line-art icons: a speech bubble with a face, a hand holding a card with 'ON' and 'OF', a heart with a pulse line, and a flower. The overall aesthetic is clean and modern.

# **SOCIAL IMPLEMENTER**

**“Technology doesn’t seem like something for me. It has nothing to do with the body or with sports, so I don’t see it as an option.”**  
(Nina, age 14, VWO)

## Who I am

Social Implementers are not yet very familiar with technology. They have little interest in new technology, such as robots or designing new things. And they lack self-confidence: somewhere they have gotten the impression that they are not good at subjects like technology, math, and physics. In addition, they often see science subjects as things you cannot learn: you have to be good at them already. This creates a double obstacle: technology and science aren’t really fun and also require extra effort. Nevertheless, Social Implementers are a group that can be included: they want to make a difference for society and other people. They also see that people with a technical or scientific background are important for that society. Their doubt is mainly in the question: can I be that myself?

## What I think

Social Implementers are more likely to associate technology with complexity (technology is difficult or complicated) and with unattractiveness (boring, not cool, and dirty hands). This traditional image is partly due to the fact that they see fewer examples either at home or at school of what they can do with technology themselves, now and in the future. For example, people in their social environment are less likely to work in technical professions. Social Implementers now more often choose a profile or sector in the direction of healthcare, culture, or economics. For some of them, a technical direction would actually fit well because technology plays an important role in their area of interest.

## What I’m looking for

Trigger: Let me discover how I can use technology myself to improve people’s lives.

**Education:** At school, these students have difficulty focusing on abstract math formulas or chemical formulas. Because of their insecurity, they are more likely to throw in the towel (“I can’t do this”). That’s why you should give them assignments with an appealing context, like those within the ‘7 Worlds of Technology’. Which social problem do I tackle with which solution? It’s not the robot itself that’s interesting, but what that robot can do for people.

**Career orientation and guidance:** Show this group role models and stories that do not fit the standard technical picture. Think of the context of technology in healthcare: how do robots improve care in a hospital? And what career options does that offer? Here too, the context within which you can make a positive impact is more important than the technical action you will perform later.

## Facts

- It’s hard to do well in scientific subjects -> 48% agree (average 33%)
- I like studying and reading books more than doing something with my hands -> 31% agree (average 22%)
- 66% female, 34% male

**DOER**



**“I like to do chemistry experiments, but actually we almost never do that.” (Lea, age 14, HAVO)**

## Who I am

First and foremost, doers are practical. They prefer to work with their hands; they would rather avoid theoretical stuff (things for which the purpose is unclear). Their practical mindset is not yet linked to technology. A challenge with this group is that they have negative feelings about technology and think they aren't good at it. At the preparatory secondary vocational education (VMBO) level, they are now more likely to choose fields like hospitality, bakery and recreation or green.

## What I think

Doers mainly associate technology with electricity and professions like repairman, auto mechanic, carpenter, or construction worker. In addition to these professions, they think of tangible things such as appliances, cars, and working with your hands. Their image of technology is that it's old-fashioned; for example, they associate it with “modern” and “progress” less often than other groups. In particular, they feel that in education as it is currently provided there are too few opportunities for them to work with technology themselves: to make things or to carry out experiments. And they lose interest in the theoretical side of, for example, mathematics, which they feel a lot of time is devoted to.

## What I'm looking for

Trigger: Let me get to work with technology earlier and discover that it's fun to work with it.

**Education:** These young people want to work first and then learn more about the underlying principles and formulas later. Put doing at the center of education and bring fun, practical assignments into the classroom. In this respect, primary and secondary schools now differ enormously. Experiences with making and testing are the entry point for this group to see that technology can be fun, and for them to develop self-confidence.

**Career orientation and guidance:** Show professions and role models that get their motivation and satisfaction from doing and making things themselves. These could be passionate technical professionals (engineers, mechanics) who can relate to the fact that not everyone is already a fan of technology, but who can speak well about what they make, how they do it, and what their working day is like. But it goes without saying that career orientation and guidance activities aimed at the Doer should get young people to work on exciting assignments themselves. Preferably this should involve modern technology, so their old-fashioned image of technology becomes more positive.

## Facts

- I like practice more than theory -> 95% agree (average 55%)
- I want to do something with my hands in the future -> 82% agree (average 42%)
- 45% are VMBO students (average 29%) and 14% are HAVO/VWO students (average 31%)

**EXPLORER**



**“I really don’t know what I want to do yet. Fortunately, I don’t have to choose a profile until the end of this year.”  
(Lana, age 14, theoretical VMBO)**

## Who I am

While new stories about technology have a lot of influence on many other groups of young people, this is less true for the Explorer. Explorers are still looking for a direction that suits them. That could be something with technology, but also something completely different, like healthcare or economics.

They don’t yet link technology to their own hobbies and interests. However, they do have a critical attitude about the role that technology plays toward the future. Does technology really lead to good progress? Aren’t self-driving cars dangerous? And will we continue to communicate from person to person or will everything soon be digital? Explorers like to think about such things.

## What I think

Explorers are more neutral toward technology and their image of it is less fixed. They have fewer spontaneous associations with technology, and their spontaneous image is still a bit conservative. At the same time, it is interesting that they get excited about high-tech examples when we present them to them: robots, designing new applications, drones, developing new materials, and so on. They just don’t have enough contact with it, or they don’t yet know if they can handle technology and they don’t have insight into their own technical talent. This can deter them from going in a technical direction. That is certainly a challenge in preparatory secondary vocational education (VMBO), where young people have to choose a profile at a young age: a technical profile (e.g., Manufacturing, Installing and Energy) can feel too specific when compared to profiles they see as broader. At the same time, that is the advantage for students in more academic secondary education (HAVO and VWO): young people see the combined Nature & Health and Nature & Technology profile as the direction in which you keep all your options open.

## What I’m looking for

Trigger: Let me explore which technical directions there are and what my talent is within them.

**Education:** It’s important that this group come into contact with more high-tech examples of technology. Not only through the media, but also at school. They get excited about that. By working with exciting examples of technology, they can discover for themselves what they like and what they are good at. That is often less practical for this group, so don’t just let them make something, but also design it, manage it, or think about the technology’s user.

**Career orientation and guidance:** Show these young people and let them experience that they can go in many directions with technology. Give them clear examples. Young people who don’t yet know technology very well won’t easily choose a direction that feels too specific to them. The ‘7 Worlds of Technology’ can help with this: they show technology in seven contexts that are recognizable and concrete for young people. Think, for example, of the world of People & Health or Nutrition & Nature. By placing technology in a variety of contexts and showing future-oriented examples, you can stimulate the Explorer.

## Facts

- I have no idea what I want to do later. -> 55% agree (average 42%)
- I like studying and reading books more than making something with my hands. -> 40% agree (average 22%)
- It would be fun to make my own games. -> 74% agree (average 52%)
- 41% of this group is 9 through 11 years old (average 32%)

**CREATIVE  
MAKER**



**“If something is explained in physics or chemistry class, I will experiment with it at home. Soon I’m going to do something with electricity at home with my dad, because we’re learning that at school now.” (Joanna, age 13, VMBO)**

## Who I am

For Creative Makers, being involved with technology is something they like to do. In other words, they are young people with a strong intrinsic motivation. Because technology itself is a hobby, it is less important what you achieve with it.

Appreciation from others or status are therefore unimportant. What is important is finding the best solution to a challenging problem or making a difficult device work. For example, how can I make a robot move? At the same time, these young people are not only fixated on the technology itself: they are also socially involved.

## What I think

As is unsurprising for young people who choose to work with technology in their free time, Creative Makers have positive opinions of technology and a broad perspective on it. For instance, they think of concrete things like devices, machinery and electronics, as well as the roles that they like to fulfill themselves: designing and developing. But they also think of creativity and challenge. A challenge is something positive for this group: they think they can handle technical subjects. And not understanding something isn’t a problem: to this group, technology is something you can learn as long as you do your best.

There is a reason why they want to do their best to get better at technology: in addition to being fun, technology is also a means of solving major societal challenges. For example, technology plays a positive role in the field of climate change or healthcare.

## What I’m looking for

Trigger: Challenge me to come up with the best solution to a technical question.

**Education:** The Creative Maker is interested in new and challenging technology and enjoys working with it. In other words, they are enthusiasts who quit if there is too little tension or challenge, or if there are too many frameworks. Make technology exciting and give them space to discover things for themselves.

**Career orientation and guidance:** Occasionally link teaching content and interesting questions to degree programs and companies that also deal with those sorts of questions. That allows young people to discover step by step what degree programs are available and which job and education would fit them best.

## Facts

- Technology can help people -> 97% agree (average 84%)
- It’s hard to do well in scientific subjects -> 12% agree (average 33%)
- 61% of this group are male

## Getting started with Bèta&TechMentality

The model is a lens for looking at young people. Not as a single target group, but with a nuanced perspective: which sub-target groups exist? How do young people differ from each other? And what is needed to inspire different types of young people? In this section, we will describe how you can apply the model. There are several fields of application:

- Education: How do you ensure that you organize education in such a way that it inspires a broad group of young people?
- Career orientation and guidance: How do we properly inform young people about the possibilities of technical disciplines?
- What can you pay attention to when recruiting, so a larger group is attracted by your communication?

Platform Talent voor Technologie (PTvT) is developing multiple tools that can help school leaders, directors, deans, teachers, or professionals in the business world to analyze their current practice and shape future activities, education, and communication. This is based on the knowledge about young people in the Bèta&TechMentality model and the experiences of schools and companies that are actively working on the model and the '7 Worlds of Technology'.

For example, there will be a self-scan with which you can check the extent to which your career orientation and guidance activities and any activities to promote the influx of technology are "Bèta&TechMentality-proof." In addition, PTvT is developing a roadmap to start the discussion within schools about the current role of perceptions and what could be improved as a result of the insights in applying technology in education and other activities. Various workshops are also offered. These instruments will be available at [www.betatechmentality.nl](http://www.betatechmentality.nl) starting in fall 2019. In addition, PTvT offers inspiration by providing good examples of schools and companies that apply the Bèta&TechMentality model.

## Action perspectives

The Bèta&TechMentality model offers various types of action perspectives. In some cases, the dimensions of the model are the starting point; in other cases, action perspectives are guided by the types in the model.

### Perspective 1. Taking action on the various dimensions.

The two most important dimensions in the model are about the students' degree of self-confidence in and with scientific subjects and technology, and the degree of their (intrinsic) interest in new technology. These offer immediate insight into an action perspective.

There are a number of major challenges and opportunities in the underlying dimensions (see page 3):

**Increase self-confidence** by challenging young people at their own level, letting them learn in small steps and encouraging them when they need it. Many young people now lack the self-confidence to choose a technical path. They don't think they're handy or smart enough, and sometimes they also think that technology is not something you can learn but something that you already have to have an aptitude for. The role of the teacher and parent/guardian is crucial in this respect: encourage young people to persevere, even when they do not immediately succeed. And avoid the "unsuitable" label.

**Bring the outside world into education.** This is where your skill as a teacher comes into play. How do you introduce content-related concepts into contexts that are attractive to a variety of students? Do you use environmental contexts, thematic contexts, or labor-market-related contexts? There are many tools you can use to make these choices. The '7 Worlds of Technology' can help you find stories from the labor market and society and bring them to life. Jet-Net & TechNet offer a window to the business world and also think of organizing guest lessons and company visits. Strategies such as adding games and competition to education can have a motivating effect.

**Introduce children and young people to different roles** that they can play in technology and offer them experiences. The names of the different types already indicate the relevant type of direction and role. After all, there are countless roles to be played in the professional field: from researcher to designer, maker to user. It's important that young people encounter these roles and preferably also experience them firsthand. Therefore, as a school, enter into partnerships with companies or networks in which schools collaborate with companies (e.g., Jet-Net & TechNet, Sterk Techniekonderwijs, Toptechniek in bedrijf or the regional Wetenschap en Technologie (W&T) networks, all successful networks in the Netherlands.

## **Perspective 2: Connect to the five Bèta&TechMentality types**

The five types differ from each other and all have different starting points. All these groups will have to deal with technology in their future and will be able to choose their own further technical education. But they each have their own trigger and/or barrier. Follow the steps below to apply the model within your context, whether it is about designing education or setting up and organizing career orientation and guidance activities.

### **Step 1. Explore the now | Analysis**

If you want to inspire more young people with technology, start by looking at the now. What do you do now as a school, a teacher or a mentor? What does your teaching look like or how do you organize career orientation and guidance activities? And an important question here is which Bèta&TechMentality target group(s) are you (implicitly) targeting? Which types do you serve well? And for which ones do you do too little? Be critical in your evaluation: the question is not only are you doing something aimed at this target group, but are you also doing it well?

### **Step 2. Set the course | Target**

In this second step, you formulate objectives. What result do you want to achieve?

And which types would you like to focus on? Broadly, you can choose from three strategies:

- **Going deeper/focusing:** more focus on one or more types. With a certain project, you may want to focus strongly on the making side of technology and will therefore decide to focus on Innovators and Creative Makers. How can you use the insights into these target groups to work out or improve your idea as well as possible?
- **Broadening:** you decide to focus on several types that you are appealing to less at the moment. What are the triggers for those target groups? If you also want to trigger Social Implementers with your project, which roles or contexts could you add?
- **Differentiating:** combining the previous two strategies by developing more deeply and more broadly.

### **Step 3. Course Correction | Change**

This is the phase where you make changes. For example, you develop a new lesson that matches the triggers of the types you have in mind, or you develop a policy to increase self-confidence and give feedback differently with your teacher team. The change is in keeping with the drivers and triggers of the types you have in mind.

### **Step 4: Gain ground | Evaluation**

In this last phase, you evaluate. Has your course correction led you to inspire more young people? How do young people rate the implemented changes? Your evaluation will undoubtedly show you points for improvement. Then you can determine the next steps.



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