

# Rebuilding Education

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## OUR REDESIGN

### Interest-centered learning and “Maatdiploma’s”

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About two months ago we started creating a redesign for the Dutch secondary school educational system. All three of us have a great passion for education, and so our main goal was to share our passion with the students and hopefully let them become as passionate about education as we are. Passion in education matters: what we learn in secondary education lays the foundation for our knowledge about universally important topics such as languages, history and maths. Would education be best if students would passionately follow their courses, or if they move down a set out path? We think most people would prefer the former, whereas the current educational system is doing the latter.

Besides the set of current main courses that all students have to follow, there exists a wide variety of educational fields, such as interdisciplinary fields, or more specialized fields based on the main courses that are being taught. So logically, there would be a high probability that secondary school students' interests wouldn't fit in the limited basic courses that are currently being taught. Because think of all the possible interests one could have around the ages of 15 to 18 and compare this to the courses currently available in the curriculum: you would probably come to the same conclusions as us, namely that there is a large mismatch between the two.

Because of these limitations, we started redesigning the curriculum of the Dutch secondary school education. We will dive into the problem concerning our current educational system in the problem analysis. After that, the redesign is shortly explained, and will be more extensively described in an animated video. Furthermore, we backed up our redesign by scientific justifications.

# Interest-centered learning and “Maatdiploma’s”

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# 1 Problem Analysis

In this report we will focus on the following problem: the mismatch between interests of secondary school students and the available courses in secondary school. Furthermore, we will investigate if this results in students feeling unprepared to start higher education (HBO, WO) and if this problem is a partial cause of the large numbers of students who drop out or switch studies in the first year. In this report, we will only be focusing on the Dutch educational system.

## 1.1 Mismatch between interests and available courses in secondary education

Nowadays, during secondary education of HAVO and VWO, students have to follow a wide range of courses during the first three years and at the end of the third year, they have to choose a profile which focuses on a smaller range of the courses they had during their first three years. Table 1 shows which profiles can be chosen (at the Stanislascollege in Delft) at the end of the third year and which courses are obligatory for this profile.

As shown in Table 1, the number of available courses is very limited, and the courses aren't interdisciplinary at all.

The Dutch high school student organization LAKS measures the satisfaction of Dutch high school students every two years. In their report from 2010, they found out that this satisfaction level dropped as students moved up to a higher year. Furthermore, in all the reports from 2010 to 2016, only around 45% of the students were satisfied with how the different courses were connected to each other. In addition, in the report of 2016 it is shown that especially in HAVO and VWO, teachers struggle with unmotivated students. They state that 24% of VWO students and 28% of HAVO students are dissatisfied by the possibilities of following more courses or doing other extracurricular activities. Another fact that arises from the 2016 report is that 35% of the HAVO students and 31% of the VWO students find that the teachers do not take the students' strong and weak points into account.

Moreover, the Dutch Inspection of Education published a magazine in 2017 in which they showed what the situation currently is for Dutch students in primary and secondary school. In this magazine, it was stated that, at secondary school, it is only possible for 7% of the people to follow courses on a higher level. However, 33% of the students did not know whether it was possible. This fact shows that for most of the Dutch students, it is not possible to get everything out of their talents, and that they are limited by their least strong courses (Inspectie van het onderwijs, 2017).

Table 1. Profiles that a student can choose after the first three years (Stanislascollege, Delft).

<b>Common part</b>	<b>Profiles &amp; profile courses</b>		<b>Choices (2)</b>	
<ul style="list-style-type: none"> <li>&gt; <i>netl</i></li> <li>&gt; <i>grkc* of lake*</i></li> <li>&gt; <i>entl of ct</i></li> <li>&gt; <i>fatl**, dutl**</i></li> <li>&gt; <i>sptl** of chtc**</i></li> <li>&gt; <i>ckv**</i></li> <li>&gt; <i>lo</i></li> <li>&gt; <i>maat</i></li> <li>&gt; <i>anw</i></li> <li>&gt; <i>lv</i></li> </ul>	CM	<ul style="list-style-type: none"> <li>&gt; wisA of wisC</li> <li>&gt; ges</li> <li>&gt; ak</li> <li>&gt; mux, tex, sptl, fatl, dutl of chtc, fi, grkc* of lake*</li> </ul>	<ul style="list-style-type: none"> <li>&gt; sptl, fatl, dutl of chtc</li> <li>&gt; econ/beco</li> <li>&gt; fi</li> <li>&gt; mux/tex</li> </ul>	
	EM	<ul style="list-style-type: none"> <li>&gt; wisA of wisB</li> <li>&gt; ges</li> <li>&gt; econ</li> <li>&gt; beco</li> </ul>	<i>bij wisA</i>	<i>bij wisB</i>
			<ul style="list-style-type: none"> <li>&gt; sptl, falt, dutl of chtc</li> <li>&gt; ak</li> <li>&gt; fi</li> <li>&gt; mux/tex</li> </ul>	<ul style="list-style-type: none"> <li>&gt; nat</li> <li>&gt; ak</li> <li>&gt; in</li> <li>&gt; fi/mux/tex</li> </ul>
	NG	<ul style="list-style-type: none"> <li>&gt; wisA</li> <li>&gt; schk</li> <li>&gt; biol</li> <li>&gt; ak</li> </ul>	<ul style="list-style-type: none"> <li>&gt; sptl, falt, dutl of chtc</li> <li>&gt; in</li> <li>&gt; econ/beco</li> <li>&gt; fi/mux/tex</li> </ul>	
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NG/NT	<ul style="list-style-type: none"> <li>&gt; wisB</li> <li>&gt; schk</li> <li>&gt; nat</li> <li>&gt; biol</li> </ul>	<ul style="list-style-type: none"> <li>&gt; sptl, falt, dutl of chtc</li> <li>&gt; in/wisD</li> <li>&gt; econ/beco</li> <li>&gt; fi/mux/tex</li> </ul>		

## 1.2 Preparation for higher education

In the 2010, 2012 and 2014 reports of LAKS, it was stated that 20% of the high school students were dissatisfied with the help offered to them in regard of choosing their study, and only around 45% is satisfied each year.

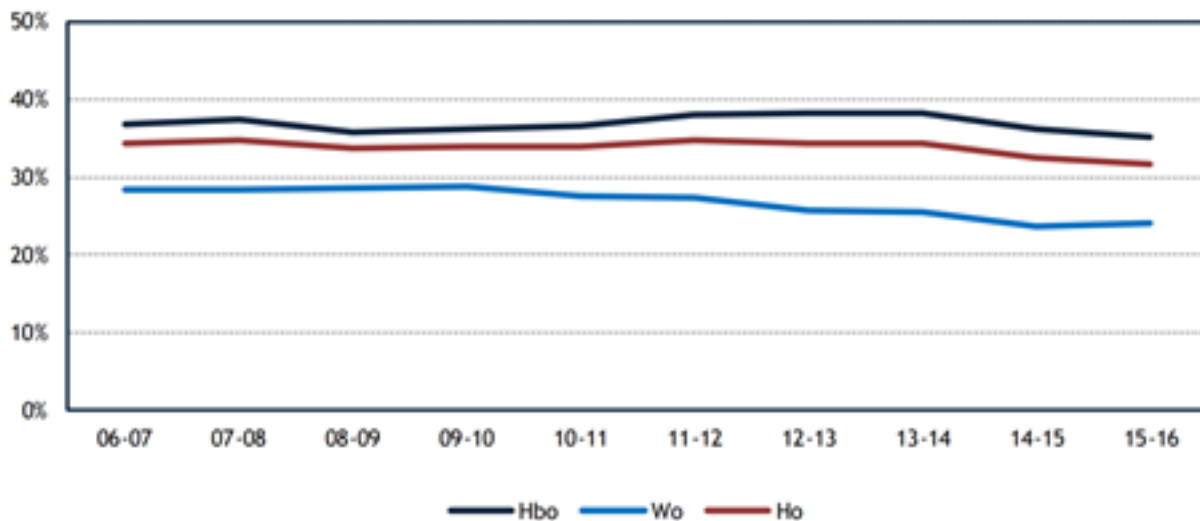
Moreover, the Dutch Onderwijsraad states that the preparation of high school students for higher academic education is not enough. For example, 10% of the students are still doubting about their study choice until the deadline of choosing. Another fact stated in the report is that a big part of the teachers in high school says that their students are not enough prepared for higher education. A final problem in the current preparation of high school students for higher education is that the high school teachers have a very low amount of contact with HBO and WO institutions. Hereby, the teachers have a very limited and/or outdated vision on the higher education, while those teachers are the ones that mainly try to help the students with choosing their further education (Onderwijsraad, 2008).

## 1.3 Numbers of dropouts and switches

In the Dutch educational system, dropping out and switching is a big problem. High numbers of students drop out or switch every year (Figure 1).

Figure 1 shows that the numbers of dropouts decreased a little bit in the previous years. However, still approximately 32% of all students in the Dutch higher education are dropping out or switching in their first year of their study. One problem that then arises is money. Namely, students need to pay approximately 2000 euros each year to study, but the government pays approximately 8000 euros per student for each year as well. Keeping in mind that each year, around 150.000 students start with their study in higher education, meaning that the government spends approximately 384 million euros per year on students who won't continue their study. This is a large amount of money which could as well have been used for other important issues, such as education development (Miltenburg, 2016).

*Figure 1.* Percentages of Dutch first year students in HBO and WO who drop out or switch. Ho stands for HBO and WO combined. (ResearchNed, 2017)



# 2 The Redesign

## 2.1 Content of the redesign

The three main problems we focus on are 1) the mismatch between the interests of the students and the available courses in secondary education, 2) the weak preparation for higher education and 3) the relatively high numbers of dropouts and switches in the first year of higher education.

To solve these problems, we redesigned the curriculum of HAVO and VWO education. In this redesigned curriculum, the first three years of HAVO and VWO will be the same as they currently are, but at the end of year 3, the interests of the students are investigated. This is needed for the next three years in which we will introduce “interest blocks”, where HAVO and VWO students will be able to follow courses of their own interests, which can overlap with academic studies (like an interest in cars can overlap with the study field of vehicle engineering). An example of how interests could be linked to academic studies, is given in 2.2, page 7. The available interest blocks will be based on the interests of the students, which have been investigated, and will be updated as well with new interests of students or changes in interests, in years 4, 5 and 6.

Our idea is that Honours students (possibly in combination with a student from the Education sciences bachelor program) will teach these interest blocks at secondary schools or at universities/HBO-schools, after they received training in how to teach. The idea behind this, is that a lot of interests can be linked to the wide variety of courses available in all possible bachelor programs.

In order to make the HAVO and VWO students aware of the link between their interests and specific bachelor programs, we also designed a digital application, called StudyMatch. In this application students can see what bachelor programs they are allowed to follow based on the courses they are following in secondary school. Each bachelor program is also linked to interest blocks in the application, in order to create the availability for students to learn more about a bachelor program and see if it really is a match as they thought it would be.

Ideally, students would also be able to switch from HAVO to VWO or the other way around in specific courses. If secondary schools would allow students to do so, the application could be useful, because students can easily see how their study possibilities are changing with their courses. Required for the latter, is that all universities and HBO institutes set up a list with specific secondary school courses, including the required level, that is needed for each bachelor program they offer.

In order to create an image of all these changes we would like to implement at secondary schools, we made a video of our redesign: <https://www.youtube.com/watch?v=ZI3C6mZe-qU&feature=youtu.be>

## 2.2 Examples interest blocks

<i>Academic study</i>	<b>Linked interest-blocks</b>
Computer science	<p>Introduction to programming  <i>Target group:</i> students with an interest in programming</p>
Econometrics and Operations Research	<p>Data science  <i>Target group:</i> students with an interest in math and what we can do with data, maybe learning about a linear regression (like <math>y = ax + b</math> but then with different meanings of the letters in the formula).</p>
Media, art, design & architecture	<p>Creative writing  <i>Target group:</i> students with an interest in writing, different kinds of writing: media articles, speeches (for example political), novels.</p> <p>Modern architecture  <i>Target group:</i> students with an interest in the design of buildings, or an interest in urban architecture: how to plan a city? In combination with students with an interest in drawing, there could also be an interconnected interest block where students learn to make architectural drawings.</p> <p>Fashion design  <i>Target group:</i> students with an interest in fashion, marketing and design.</p>
Psychology	<p>Neuro- &amp; Cognitive Psychology  <i>Target group:</i> students with an interest in biology and the interaction between people. Discusses the brain, but also cognitive aspects such as memory and attention.</p> <p>Business Psychology  <i>Target group:</i> students with an interest in HRM (Human Resources Management) and leadership, teamwork and stress in the workplace.</p>
Philosophy	<p>The Good Life  <i>Target group:</i> students with an interest in discussing the “meaning of life”: Are we on earth to just feel good and have fun? Or is there a higher purpose? When does someone live a <u>good life</u>?</p> <p>The Brain vs Mind discussion  <i>Target group:</i> students with an interest in challenging questions such as “does the mind reside in the brain or does the brain reside in the mind?”</p>
Medical Natural Sciences	<p>Medical Physics  <i>Target group:</i> students with an interest in how we can apply physics for medical imaging and medical therapies</p> <p>Pathophysiology  <i>Target group:</i> students with an interest in human diseases and treatment of them</p>



# 3 Scientific Justifications

In order to see how our redesign fits in the current scientific theories about educational systems, we analyzed our redesign from three existing scientific perspectives. The first perspective focuses on the implementation of a redesign: would it be possible for us to implement our redesign according to the implementation model of Michael Thomas, and how would this affect other factors in the educational system? The second perspective, is the perspective of a secondary school student: would our redesign improve the student engagement in the classroom? And finally we will discuss the use of digital techniques in the classroom, which is relevant for our StudyMatch application, because what scientific evidence currently exists on using technology in education?

## 3.1 Implementation model

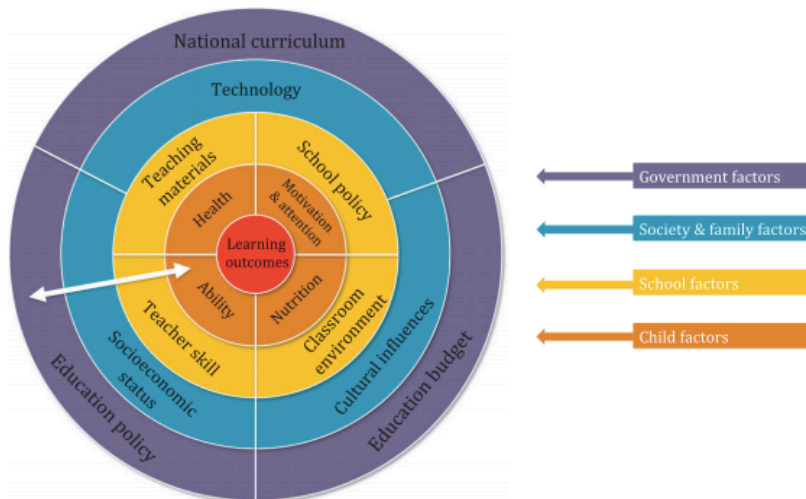
In our proposed redesign, concerning both interests blocks as well as the introduction of the StudyMatch application and their interconnection, the aim is to improve the educational outcomes of students. In our redesign the latter is expected to occur in two ways. Learning outcomes of students are namely increased, since students would be broader educated by using the interests blocks and are able to specialize themselves in their own fields of interests which would motivate them more than doing something that is not really interesting to them. Moreover, by letting students start using the StudyMatch application, in which they can find what further education possibilities (including recommended corresponding interest blocks) they have, giving their current secondary school courses, students are expected to be better prepared for their further education.

Thomas et al. (2018) describe a model concerning the implementation of educational redesigns, in which they state that educational redesigns concerning changes in students' learning outcomes can be supported or constrained by certain factors. They name four factors, as given in Figure 2: child factors, school factors, society and family factors and government factors. If we would apply this model to our redesign, which requires a change in what qualifications the school educates the students and in what resources they give them, we would be operating in the outer layer of the circle, especially in the "Education policy" and "National curriculum". However, our redesign can also be implemented more locally. Secondary schools can decide by themselves whether they are going to implement interest blocks or not. They can also decide by themselves whether they are going to use the StudyMatch application to link the secondary school courses to academic studies, and they can also decide by themselves whether students can follow courses on different levels. The latter however, is only possible if WO and HBO institutes would make up the list with specific requirements, as mentioned in the redesign, but overall the main changes that should take place concern the individual school policies, instead of national policy.

As mentioned, the redesign is expected to change the students' learning outcomes in two ways. After changing the school policy to allow for our redesign, this could improve the students' "Motivation & attention", because they get the opportunity to follow courses in their own, specific, fields of interests. In addition to that it could improve the students' "Ability", since students would be better prepared for the content of their further education. Therefore we expect that both "Motivation & attention" and the students' "Ability" are changed in a way that makes them supportive factors for the students' "Learning outcomes".



Figure 2. Factors that support and constrain changes in learning outcomes.



## 3.2 Student engagement

For our second scientific justification perspective, we are using the following theory on student engagement and the interaction between students and their teacher: there are three types of engagement, namely behavioral engagement, emotional engagement, and cognitive engagement (van Uden, Ritzen, & Pieters, 2016). Behavioral engagement can be described as observable behavior towards school, such as being on time. Emotional engagement is best described as the feelings towards school and specific subjects, and cognitive engagement involves the understanding of the importance of education. These engagement types all have a negative relationship with early dropout (i.e., if you have high engagement, you have a low probability of dropping out, whereas if you have low engagement, you have a high probability of dropping out), and a positive relationship with learning outcomes (i.e., high engagement is related to high learning outcomes, low engagement is related to low learning outcomes).

In our redesign, we have a main, direct focus on emotional engagement and an indirect focus on cognitive engagement. The introduction of interest blocks clearly increases emotional engagement of students: if they get the possibility to do something that they picked themselves, it is logically assumed that they find this more interesting and have more positive feelings towards school. Cognitive engagement can also be increased by our redesign, in two ways. Firstly, if schools would allow students to switch their levels, students are able to see in StudyMatch how their future academic study possibilities change with their switches in levels in specific courses. Secondly, StudyMatch gives students the overview of all their possibilities for further education and the links between these possibilities and available interest blocks. For the second option, it is not necessary for a student to have the possibility to switch between levels, as long as their school has implemented the interest-blocks. In these ways, students are aware of their possibilities and how these are linked to their own interests, which increases their cognitive engagement: it will make sure that the students are involved in their decisions from an earlier age and that they are carefully nudged to think about their future.

### 3.3 Technology and personalized education

One part of the renewed curriculum is the implementation of the StudyMatch application. This application is a form of technology, which is used to make the education more personalized. Namely, personalized education consists of instructions or feedback in which the pace of learning and way of teaching is adjusted to the needs of the individual student (Khurana, 2018).

Of course, the implementation of the StudyMatch application doesn't cover all these aspects of personalized education, but it does provide individual instructions about the possibilities for students in further education, based on their current courses. Moreover, if we would extent the StudyMatch application with the ability for students to fill in their academic studies of interest, the application would be able to provide the students automatically the linked interest block and study programs. This, of course, would be a form of personalized education.

However, why do we need personalized education? Well, this is needed because all students are different and have different needs. For teachers, it is amazingly hard to find out what the needs of every student are. Artificial intelligence, on the other hand, can find out the needs of a student and then adjust their instructions/feedback to those needs and by this provide the students with personalized education. Hereby, the student gets the relevant input for his or her learning process.

# 4 Personal Evaluations

## 4.1 Stan Meinders

VU FACULTY OF SCIENCES

Who are you?

My name is Stan Meinders and I am 19 years old. Currently, I am studying Medical Natural Sciences so I am very interested in the natural sciences. However, I'm very interested in societal issues as well and I think education is the foundation of society, so solving issues in education can be the beginning of solving societal issues.

What was your contribution to the project and why?

The project of our group was to solve the problem that there is a mismatch between the interests of high school students and the available courses at high school. At first, I really had to get familiar with the subject of redesigning education so Eva and Annelou came up with the most ideas to find a solution for the problem. However, I think I have been able to help a lot in elaborating the solution, so it became a very realistic solution which hopefully can be implemented.

What was the most valuable thing you learned during Rebuilding Education?

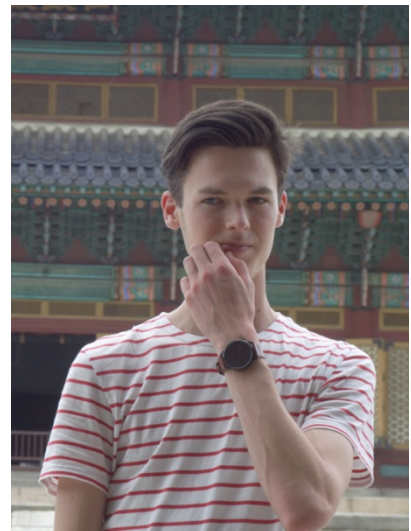
The most valuable thing I learned during the course Rebuilding Education was during a talk with Albert when visiting Academie Tien. He told about how education can help and needs to help to make our society less divided. So the poor and the rich and the natives and the immigrants have the same chances to fulfil their needs.

What do you hope to accomplish with your redesign?

With our redesign, I really hope that students can follow their passion and that education will become interesting for everyone again.

What advice would you give to the students that will follow the course in 2019?

Follow your passion and make your solution realistic!



## 4.1 Annelou Engwegen

VU SCHOOL OF BUSINESS AND ECONOMICS – Department of Economics and Operations Research

Who are you?

I have a great interest in societal problems, especially in thinking of them and solving them. The current educational system is one of these problems that I spend a lot of time thinking of. Rebuilding Education is the first course, as far as I know, that really focuses on an actual problem and where you are really free to solve it in your own way!

What was your contribution to the project and why?

Eva was a very enthusiastic person. She also had a lot of ideas in redesigning education and I think I contributed with asking the right questions. Over time, we slowly came closer to our final solution. Stan was really our balance in working together, he always stayed calm between the two (hyper)active types he worked with.

What was the most valuable thing you learned during Rebuilding Education?

I learned a lot from doing this project, since you are operating in a field that you only have experienced by yourself (from having followed secondary education), instead of a field that you only studied on theoretically. It is really nice that the course offers you the opportunity to discuss your redesign with the director of a secondary school, Academie Tien, namely Albert Wijnsma, and you continuously create new ideas while the course goes on by all people that are thinking with you.

What do you hope to accomplish with your redesign?

Of course I hope that it will be implemented!

What advice would you give to the students that will follow the course in 2019?

Don't be afraid of Albert!



## 4.1 Eva Bus

### VU FACULTY OF BEHAVIORAL AND MOVEMENT SCIENCES

Ambitious, enthusiastic, creative: three words which I think describe me and my contribution to this project. I am a second year Psychology student with a great passion to make a change, particularly in education and the field of neuropsychology. This made it an easy choice for me to pick the course Rebuilding Education.

In the project, I feel like I was the one who mostly came with ideas and alternative ways of looking at the problems we encountered, while stimulated by Annelou & Stan who kept asking critical questions to create a strong foundation for our redesign. I very much enjoyed working with them since we had one common goal and interest, but all come from diverse backgrounds (namely Biomedical Sciences, Econometrics and Psychology), which led to a very interactive and productive working environment.

In the course Rebuilding Education I learned to have an open mind. I learned to look at a problem from different perspectives instead of just my own expertise, to think big and I definitely learned that there is so much to improve, large or small, in the current educational system.

Personalized learning, so-called “Maatdiploma’s” and changes of the curriculum have been on the agenda of the Ministry of Education for ages, and we know this. I do not expect that we are appointing new issues that no one has ever thought of before. However, I hope that, through our redesign, we revisit these important problems and motivate others to do something by showing them a concrete example of how these issues could possibly be turned around, what the benefits are of doing this and why it is so very important for things to change.

For students joining the Rebuilding Education 2019 gang, I would like to say: this course is not like any other course out there. Your paper will not be thrown in trash after it’s graded, it will not be just “another exam grade” on your list. Your ideas and your redesigns matter, people will listen to you and respect you for the time and energy you have put into it. So, don’t let anything hold you back and make use of this unique opportunity for your voice to be heard!



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