

## 1 History of the graduate course in Prosthetics and Orthotics in the Netherlands.

Since the early 70's in the Netherlands a wish for a four-year full time graduate (Bachelor.) course in prosthetics and orthotics exist, denoted as a HBO course. The need for a prosthetic and an orthotic course at this level was already mentioned in 1974. At his time an international study week on prosthetic / orthotic education took place (Hughes 1976). HBO stands for "Hogere BeroepsOpleiding", and can be compared with the English equivalent Polytechnic or graduate course. A common translation is also a University study of professional education. It will offer the graduates an ingenieur title (ing.) or from 2004 a Bachelor title.

Compared to countries like Germany, the United Kingdom and the United States of America, the development of a prosthetic and orthotic course in the Netherlands did not developed until after World War II. The lack of large numbers of amputees as a result of World War I (1914-1918), The Netherlands was in that time a neutral country, is a possible reason. Up and till that time orthotists and prosthetist received their theoretic education in Germany, and learned their skills in practice in the Netherlands, figure 1-1a and 1-1b shows a card tray with a reference to "fachliche Vorschriften zur Regelung des Lehrlingswesens im Orthopädie, dated 1938. (In eng. professional regulations to the vocational training of prosthetist and orthetists, dates 1938.). This card is to be found in the library of the Leipziger University. In Leipzig, Germany. This card tells us that already in 1938 people were engaged into orthopedics in relationship with education. Despite the lack of training facilities, orthopedic companies, workplaces did exist already in 1901. Martin Loth founded the Martin Loth Orthopedic Industry.

After World War II the ministry of War did had that availability of an orthopedic workshop and a rehabilitation was founded in 1949 by a social insurance provision (by social insurance bank) (Sociale Verzekeringsbank) and a medical doctor with knowledge of prosthetics was appointed. (Klaus, 2003). In 1950 the Sociale Verzekeringsbank founded a new rehabilitation centre and installs the association Orthobanda (Vereniging Orthobanda) with a committee vocational training.

At the date of July the 18<sup>th</sup>, 1950 the industrial disability assurance board appointed a 'prosthetic committee' to play an advisory role towards this board.

In 1953 the rehabilitation council

was formed and came into place of the industrial disability assurance board. This council was also involved in education and January the 8<sup>th</sup> in 1957 a course was started according a model of modern apprenticeship. In 1961 the first three bandagists and ten prosthesists / orthosists graduated.

After paying a visit to the United States of America, Western-Germany and the United Kingdom, Mr. H. Vlijm (inspector rehabilitation centre social insurance provision) concluded that course only by modern apprenticeship can not be sufficient enough for the near future. Although since 1949 progress have been made, the prosthetic devices do not meet that level of perfection what is required, partly due to amputation levels which are not optimal, and a leak of sufficient trained protesists / orthesists. It is therefore that plans have been made for higher vocational education, which should start the first time in 1964. This step should be considered as the first step to Higher vocational education (HBO).

A number of initiatives have been undertaken in order to establish a prosthetic and an orthotic Bachelor. level course. In 1977 an advisory committee under responsibility of professor R. Rozendal, started the design of four new course, Primary (prostheses), Secondary (orthoses), Tertiary orthopaedic technician), and the "meister-bildung". In 1980 the primary and secondary course has been started. The other two did not.

Further going developments, both national as well as international, gave the SOFOB (Stands for foudation courses for flebology orthopedic and bandagist) Stichting opleidingen flebologie, orthopedie, en bandagist) enough leads to do more research in order to investigate if this type of training could be adopted in the Higher Vocational



Figure 1-1a  
Card tray with literature data,  
library of the Leipziger University



Figure 1-1b  
Card tray: Fachliche Vorschriften zur Regelung des  
"Lehrlingswesens".  
Library of the Leipziger University

This initiative led to a part-time variant, called " orthotics / prosthetics expert course", (Kemenade, 1992). This course was designed as a two-year part-time course and was meant as a continuation of the vocational training, which was offered by the Koning Willem I college in Den Bosch. From 1999 this course is given by the "Stichting Vakopleidingen Gezondheidstechnische Beroepen" (Foudation for Technical Health education), SVGB in Nieuwegein near to Utrecht.

Every new initiative in starting a new full time four-year education must have been approved by the government, represented by the Minister of Education and Science. A new course or study must therefore be presented to the Minister by a so-called "t" document, (croho stands for centrale registratie opleidingen hoger onderwijs, in English: central register for university studies leading to a Bachelor degree). This document consists of all relevant information concerning the new course. In February 2000 a croho document for the "Hogere Beroepsopleiding Orthopedische Technologie" (HBOT), in English: Higher Professional Education in Orthopedic engineering, is presented to the Minister of Education and Science, (Holtkamp, 2000). This education is to can be compared with a graduate (Bachelor. - level) course in prosthetics and orthotics.

The Fontys University in co-operation with a Belgium University, the Katholieke Hogeschool Kempen, made this course possible. In this co-operation two main goals had to be achieved. Firstly, to make a cost-effective course in prosthetics and orthotics for Dutch students in the Netherlands, bearing in mind that only a limited number of students will attend each year this course. The number of students who start the course will be, in three to four years from now, approximately 18-25 each year. The second main goal is to get into a real co-operation between the two Universities because Dutch students will attend an amount of lectures and skills at the Catholic University Kempen (in Dutch KHKempen KHK). Therefore there must be a comparative educational system and student-information system developed.

To be more specific, the Dutch educational model is a four-year full time program for Dutch students. Belgium students only have to attend three years of education in Belgium. Dutch students will start their education the first year at the Fontys University in Eindhoven. The second year students will go to Belgium to receive together with the Belgian students their education. The Third year is a mixed year. The first half is a follow up from the second year.

The second part of the third year is a practical clinical period, a traineeship. Dutch students will fulfill this period within company's or hospitals in The Netherlands. The final year again is a mixed year. Part of it is a final practical period, and part of it is finalization of the theory.

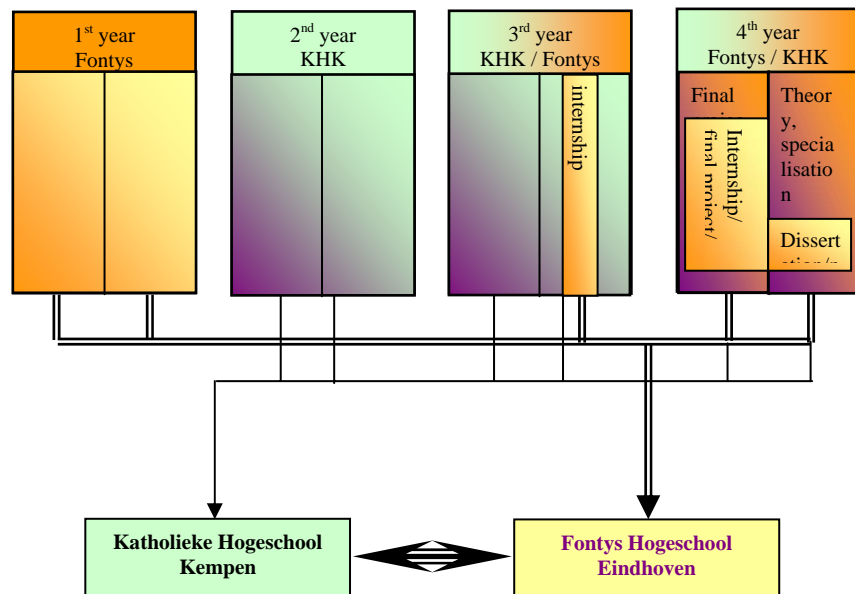


Figure 2 Educational model of the Bachelor degree course in The Netherlands used by Fontys in co-operation with the KHKkempen

the prosthetics and orthotic work field, consultants, teaching staff, both from Fontys as well from the KHKempen. Then again at the courses, practical training and so on has to fit within a very tight financial framework.

## 2 Recent developments.

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In February 2002, the Dutch government introduced a new system concerning grades and titles of students whom have finished their education. This is called the Bachelor / Master system and the titles Bachelor and Master (in the Netherlands known as the BA/Ma system). This system is introduced for a number of reasons. One of them is to make an easier comparable system to those from abroad. This change is one of the results of the “Bologna-statement” (*Bologna, 1999*), made by all the Ministers of Education in Europe at Bologna at June 19<sup>th</sup> 1999. It is also an ambition to start a dual study variant in P&O education at Bachelor level and start this in 2004-2005.

### 3 An overview of the school system in the Netherlands

In the Netherlands after finishing primary education children has to make a choice for one of the forms of secondary school-systems. A variety of programs, courses and school-types are available. Depending on capabilities and wishes of young students from the age of 12, choices can be made out of very practical courses till very theoretical courses. The compulsory education of pupils is from the age of 4 till the age of 16. From the age of 16 till the age of 18 there is a kind of partial compulsory education (*OC&W*). In figure 3. this school system is visualized.

Choices can be made out of VMBO, HAVO or VWO. VMBO stands for Voorbereidend Middelbaar Onderwijs in eng. Pre-intermediate vocational education, HAVO stands for Hoger Algemeen Vormend Onderwijs in eng. These three kinds of educational systems are mend for pupils form the age of 12. They all start with the basic (secondary school) curriculum, (the first phase). This basic curriculum usually takes three school years and consists out of a very broad set of course options, which is in principle for all pupils the same. After finishing the basic curriculum students will enter the second phase. This phase is a more in depth study. This second phase is not for every student the same. Depending of choices of profile and school type variations in study load can be recognized of a study load of 3200 hours in case of a HAVO student and 4800 hours for VWO students.

#### 3.1 The Basic curriculum.

All schools start the first year whit the basic curriculum. During this period all pupils will deal with a broad composed set of course options, which does not differ a lot per school system. A lot of time is spending on dealing with practical everyday situations. Pupils have to do a lot of things by their selves and they have to questions themselves: what can I do with what I’ve learned. The length of the basics curriculum can varies from school to school, in principle it will take three years. But a period of two or four years is also possible. In a way, the exact length of the basic curriculum is not defined; the program will gradually convert into that from the higher school years. Most schools for secondary education with more than one education types know a first class of secondary school of one or two years. This transitional year is amongst other things mend for postponing the choice for VMBO, HAVO or VWO. Therefore students will have some extra time to make up their mind and find out where they want to go, depending on their capabilities.

#### 3.2 Course program in the basic curriculum.

The basic curriculum contains at least the following subjects: Dutch, English, German or French, History and Civics, Geography, Economics, Gym, Mathematics, Physics and Chemistry, Biology, Care (maintenance) Informatics, Technology, and Arts. Schools have to show in the basic curriculum how the various subjects are related to each other. Schools have to point out in their curriculum how the diversity of the different subjects is linked together. This can be realized in several ways. One of the possibilities is to deal with the different subjects in a variety of course programs. Another possibility is to cluster the subjects in large projects. For example, an item can be “nature”. This item will combines subjects like physics, biology and chemistry. After finishing the basic curriculum a definitive choice must have been made concerning the follow up in their Secondary education school program. This is a choice as mentioned before between VMBO, HAVO or VWO.

#### 3.3 Description of different types of educational systems.

##### 3.3.1 VMBO, Pre-intermediate vocational education

Pre-intermediate vocational education is a new school type introduced at the 1<sup>st</sup> of August 1999. This pre-intermediate vocational education consists out of “so-called” educational roads, coming into place of the VBO and MAVO. This change of education must improve the connection to the (MBO). The pre-intermediate vocational education knows four sectors with a determined chosen set of course options. The final sector choice must be made at the end of the second school year. An educational road is the study route students have to follow starting with the basic-curriculum and finishing with the connecting secondary education. All four educational roads lead to the level of intermediate vocational education. The four educational roads are:

- A theoretical educational road;
- A mixed educational road;
- A profession aimed educational road;
- A cadre profession aimed educational road.

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The first possibility, (theoretical educational road) offers an access to the vocational training (level 3) and middle management training (level 4) of the intermediate vocational education plus an access to HAVO, the school of higher general secondary education. Subjects like mathematics and French language or German language are compelled. Every educational road can be chosen out of four sectors. The four sectors are; technology, healthcare and welfare, economy, agriculture.

A special form of Pre-intermediate vocational education is modern apprenticeship. In this kind of education a large amount of time is spent at the company or institution where the student is working for three or four days a week. The one day that is left is used to follow classes at the school.

### 3.3.2 MBO, Intermediate vocational education

After finishing pre-intermediate vocational education students have the ability to access intermediate vocational education. This education type is aimed directly at the profession. Of course also here are four levels to distinguish, assistant (1), basic professionalist (2), office-holder (3), middle management (4). Succeeding in a positive way gives then access to school of higher general secondary education HAVO, or HBO, school of higher vocational education. Up and till the year 2000 the only possibility to study prosthetics and orthotics was to a level of intermediate vocational education in a regular way. The basic training of orthopedic technicians started in 1960 (Hughes, 1976). In a broad variety of study routes students were trained into this work field. In the early days at the Koning Willem 1 college, Den Bosch and later on, from 1998 at the Stichting Vakopleidingen Gezondheidstechnische Beroepen in Nieuwegein.

### 3.3.3 HAVO and WO, Higher general secondary education, respectively Pre University education

The school for higher general education takes five years of study and is indented for preparation to higher vocational education.

Pre University education takes six years and is mainly intend for preparation to scientific university education. Pre-university education also known as Grammar school consists out of two school variant; Athenaeum and Gymnasium. At the Gymnasium all pupils are teached in Greek and Latin language, At the Athenaeum it was or Greek or Latin.

Just as in case to Pre-intermediate vocational education and Lower general secondary education there is also a educational reform process going on at this moment at the higher general education and Pre University education. The renewal is based in the disappearance of free choice in subjects to examination. In stead there is now a choice out of four study-profiles:

- Nature and Technology;
- Nature and Healthcare;
- Economics and Society;
- Culture and Society.

Each profile has a common part, which is equal to all study-profiles. There is also a part that is specific for each study-profile. At last there is also a free study part. In this free part a student will be able to join certain subjects from other profiles, which will enlarge the possibilities for students to enter University education.

Also a part of the educational reformation in this part is the introduction of what is called "study-house." This is obviously not a new building but a concept in guidance or counseling the students, which is aimed at self-activation and an independent way of studying.

As mentioned earlier to succeed the five years of study at higher general education a study load of in total 8000 hours must have been set aside, (the first phase: three years times 1600 hours plus, the second phase: 2 years times 1600 hours). In case of pre-university education a study load of 9600 hours must have been set aside.

### 3.3.4 Higher vocational education, University of professional education and University education

Contrary to the Anglo-Saxon countries where there is only one type of University offering a Bachelor, Master and PhD courses, in the Netherlands two kinds of University exists.

The first type of University is one, which offers four-year course (6720 hours of study load, 1680 hours each year) of higher vocational education. It is best described as a University of professional education and it offers Bachelor level courses leading to a Bachelor or ing. title. Next to this there are a number of Universities of professional education who are offering also a Masters degree up and till now mostly in cooperation whit an English University, but in the near future also independent of foreign University. The second type is the academic University. This University offers a Master course leading to a Master or ir. title. This is a five-year course with a study load of 8100 hours. Also research to obtain a doctoral degree PhD or Dr. at this type of University is possible. The level of Masters degree is described as an academic master, while a MSc degree obtained at a University of professional education is described as a practical master. Of course, the future will tell if this distinction is appropriate especially in relation to the new Bachelor / Master structure.

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Higher vocational education knows a variety of specializations. There are possibilities for instance in a number of directions possible.

Technological course: engineering, informatics (known as HTS technical college),  
Healthcare: nursing, physiotherapy,  
Economics: school/institute for business administration and economics  
Social: psychology.

### *3.3.5 University of professional education*

In order to get access to a school of higher vocational education, a university of professional education, a least intermediate vocational education or higher secondary education or, pre-university education, both also known as grammar school is required. Important in acceptance a student in new course is the study-profile choice, which has been made. To join a technical study at the university the study-profile also must have been technical, otherwise the differences are too large in order to guarantee a successful study in the coming years. The same applies for studies in healthcare etc. However there are always exceptions to this kind of rules. The prosthetics and orthotic Bachelor course is therefore an example. Both a technologic as well as a healthcare profile is allowed for this study.

As mentioned a university of professional education course has a duration of four study year. Year one is a general introduction to the chosen study. Year two is going into dept in a theoretical way and offers in a number of cases the opportunity to visit the work field during practical and or clinical hours. The third year is again going more into dept and a full-scale clinical period is implemented. The forth year is the completion of the course. A large period of internship including a project in completion of one's study and final exams are part of it.

This type of education nowadays is next to formal lectures and classes, based on the principle of problem-based learning.

### *3.3.6 University education.*

University education leading to a Master degree is a five-year course. The Master course distinguishes from the Bachelor course by dealing with more abstract theory. Utilization of applications is somewhat lesser as in professional education.

In this kind of study also a large amount of practical and if appropriate clinical internship is implemented.

## **3.4 Changes in secondary and higher vocational and university education.**

In the preceding paragraphs the school system is described. Also is a few times referred to an educational reform process. Within the scope of designing education it is necessary to have some understanding of why things are changing in order to be able to adjust or fine-tune the new designed course.

### *3.4.1 Professional column.*

A major change in the coming years concerning the vocational education in each professional level is that all education trajectories must be geared to another, in order to get a better functioning professional column. A demand for higher practically-orientated educated people is increasing as published in "Van Binnen naar Buiten, (Boekhoud, 2001) and (Den Dool, 2000). The growing need for information and communication technologists (ict) is an important cause. Due to this reason a lack of people with a secondary or higher vocational training in other work fields has developed. Research shows that the number of students changing from secondary general education and pre- university education to higher vocational education are stabilizing, therefore no growing numbers from this trajectory.

Growth can be established by a better move on from Pre-intermediate vocational education to intermediate vocational education and from there to secondary vocational education. Growth must therefore be established from within the professional column.

However to many students drop out by non-connecting programs, different "worlds", other subjects, atmosphere, different didactic approaches etc. Therefore, transparency and made to measure education must be improved. It is of importance that this is noticed, because although the profession and therefore the education for prosthetics and orthotics in pre-intermediate and intermediate vocational are small, the same kinds of problems are identified. Especially the fact that both study routes are operating in a way of modern apprenticeship modern in contrast with higher vocational education, which is four year full-time education.

## **4 European interests.**

Besides national, also international interests are important. The European council of Ministers has in 2000 the ambition declared to make out of Europe one of the most dynamic and competitive region of the world. A well-educated population is therefore very important. Another agreement is made to decrease the number of dropouts in 2010 till 50%.





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## 5 Glossary

lower general secondary education	MAVO.
(lower) technical school	LTS
intermediate technical school	MTS
Intermediate secondary school	MBO
technical college	HTS
higher vocational education	HBO
HBO council, (council for higher vocational education)	HBO raad
school/institute for business administration and economics	HEAO.
modern apprenticeship	leerlingwezen = part of VMBO
university	universiteit
pre-intermediate vocational education VMBO	Voorbereidend Middelbaar Onderwijs
school of higher general secondary education	HAVO = Hoger Algemeen Vormend Onderwijs
pre-university education VWO	Voorbereidend Wetenschappelijk Onderwijs
Pre-intermediate vocational education	VMBO Voorbereidend Middelbaar Onderwijs in eng.
Secondary education	Voortgezet onderwijs
Visitation and Judging Institute, VJI	Visiterende en en Beoordelende Instantie, VBI
The Netherlands Accreditation OrganizationBody	Nederlandse Accreditatie Organisatie NAO
Intermediate vocational education	MBO Middelbaar beroeps onderwijs
Pre-intermediate lower vocational education	VBO Voorbereidend Beroeps Onderwijs
Lower general secondary education	MAVO Middelbaar Algemeen Vormend Onderwijs.
Professional column= a column in which all specific vocational education routes are situated, beginning with lower via secondary up and till higher vocational education.	Beroepskolom