Rise and Fall of ANW

The promise and failure of the cross-disciplinary subject *Algemene Natuurwetenschappen* in Dutch Secondary Education

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History and Philosophy of Science (MSc)

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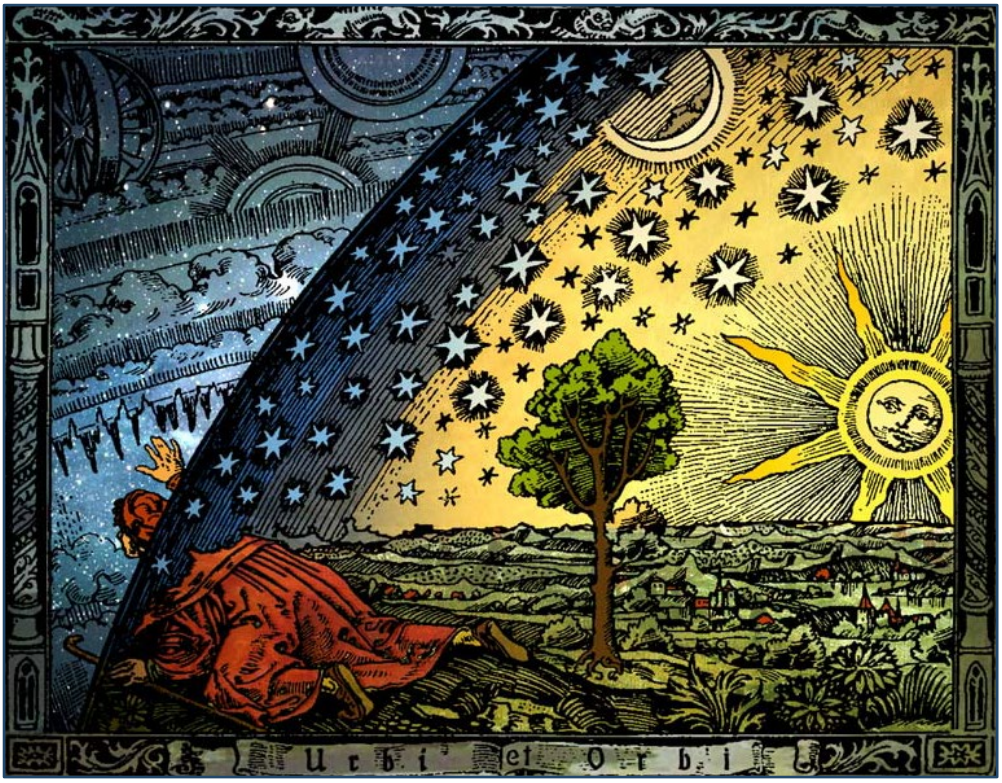

Figure 1. *This image shows a pilgrim discovering the horizon where heaven and earth meet. For me this image tells the story of a discover, searching for its place and meaning in the universe. In a way, one of the aims of Nature of Science education.*

Preface and acknowledgements

Although my interest in physics education can be traced back to my background in teaching, it was not until I followed a course at the Hogeschool Utrecht, taught by Remco Vasterink, that my interest for the history of science was sparked. Throughout my masters program History and Philosophy of Science I followed my interests and searched for a topic which combined education and the history of science. It was not until my internship at the University Museum Utrecht this topic was found, namely *Nature of Science (NoS)*. I've had the privilege to design an educational program with coordinator Hester Ketel concerning *NoS* in the setting of a museum, but during this internship I was surprised by the absence of Nature or Science in regular secondary education. By raising these questions about educational curriculum I stumbled on the forgotten subject *Algemene Natuurwetenschappen* (ANW), which was taught at secondary schools from 1998 - 2015. By mentioning this to my supervisors, I came into contact with Maarten Pieters. He had recently finished his dissertation *Between written and enacted: Curriculum Development as Propagation of Memes,* but was also a prominent actor in the conception and development of this subject. The insights from his dissertation, although primarily the conversations about the topic *ANW and NoS* helped to clarify the developments in the field.

For about a year I worked on this project, balancing writing and studying with my job as a physics teacher. Although the aims I set out in the beginning were wildly optimistic, the advice from several people helped me to set the right course and I'm satisfied to conclude this project at last. Thank you, Daan Wegener, for your supervision and conversations we had about the drama and juice. Your insights helped to remember me the emotions of people are part of history too. Thank you to David Baneke for your advice and perspectives, which helped to enrich my scope. Thank you to Maarten Pieters, Remco Vasterink, and Hester Ketel in inspiring me to pursue this topic. Lastly, I would like to thank my lovely wife, who's been incredibly patient and supportive throughout the past year.

Contents

***Figure 2**. Discussions about the Nature of Science happen more often than you might think. Within science museums around the world activities engage visitors in scientific practice and in this way experience the Nature of Science.*

Introduction

What is the motivation behind this research?

What is the Nature of Science, and why does it matter?

What is the aim of this thesis, and how is it structured?

I. Motivation

The educational concept, *Nature of Science (NoS),* is a concept I became recently aware of while working on a new educational program of the research museum *University Museum Utrecht* (UMU). With my background as a physics teacher in secondary education, I was naturally drawn to this idea of infusing more aspects of history and philosophy of science in science education. The task I was given was to develop a program that would not cover the research questions scientists raised and the answers they found but to focus on questioning those research questions. An aspect the educational team at the museum argued was lacking in Dutch formal science education, an aspect they called the Nature of Science. The five questions below give a good representation of what I aimed for this program should cover:

"1. How is scientific knowledge created?
2. How is scientific knowledge used?
3. How do you determine the reliability of scientific knowledge?
4. How do society and natural sciences influence each other?
5. What is your opinion about certain applications of scientific knowledge? Is everything possible?"[1]

Figure 3. *Fragment from an interview about teaching practices with chatbots.*

[1] Agnes Legierse and Lambert Heijnen, 'Handreiking Algemene Natuurwetenschappen (*ANW*) in Het Schoolexamen van de Vakken Natuurkunde, Scheikunde En Biologie - Havo' (Enschede: Stichting leerplanontwikkeling (SLO), 2006), 10.

Figure 4. *Onderzoekstour (research tour) program at University Museum Utrecht.*

During the development of this educational program the work of Jelle de Schrijver was influential, especially *Mag je aan alles twijfelen? Kritisch denken over wetenschap*. His definition of the NoS is grounded in 10 concepts: context, creativity, empiricism, technology, ethics, doubt, subjectivity, research methods, interpretation, and social environment[2]. This was a fruitful method to think about science from many different perspectives and raise questions about science like the questions stated in the beginning. During the development of this program, I started to reflect on my own teaching practices and those of my colleagues and began to agree the presence of NoS was lacking.

During the thinking process of finding a topic for this thesis, the topic of NoS came up regularly. This brought me into contact with the subject *Algemene Natuurwetenschappen (General Natural Sciences)*, abbreviated as *ANW*. This subject is not widely given anymore in secondary schools since its mandatory status was removed with a curriculum renewal for a part of the students (havo) in 2007 and for remaining students (vwo) in 2015. Many of my prejudices about the absence of NoS in secondary education appear to be related to this specific subject because the five questions I described earlier come from a guideline on the *ANW* subject in 2006.[3] NoS was more prominent in the curriculum in the past, but the status of this subject gradually diminished. My curiosity, but also partly disappointment, gives me the motivation to find out why this happened.

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[2] Jelle De Schrijver, Lotte Boven, and Laura Vervacke, 'MAG JE AAN ALLES TWIJFELEN? KRITISCH DENKEN OVER WETENSCHAP', 2022, 17.

[3] Legierse and Heijnen, 'Handreiking Algemene Natuurwetenschappen (*ANW*) in Het Schoolexamen van de Vakken Natuurkunde, Scheikunde En Biologie - Havo', 10.

II. Nature of Science and ANW today

In order to understand the development of Nature of Science in Dutch secondary education, and to assess this development effectively, a link to a particular subject has to be made. Although elements of Nature of Science are applicable to e.g. the subject's physics, chemistry and biology, their main focus concerns the respected discipline. Contrary to these subjects, the main focus of ANW is on the foundation of the natural science, thus NoS. Therefore, ANW is the perfect subject to track in order to understand the development of NoS in Dutch secondary education. Hence, this paragraph continues in making the definition of NoS explicit and understanding its place in the Dutch educational system today.

The definition of NoS

Nature of Science (NoS) as a concept would be in Dutch considered as the *Aard van Wetenschap*. As professor of Mathematics and Science Education at Illinois Institute of Technology Norman G. Lederman discusses, "At a general level, understanding NoS is often defended as being a critical component of scientific literacy"[4]. Hence, it can be thought of as being similar to scientific literacy. However, the definitions of these concepts do differ. Agreement on what NoS means within the science educators' community is sometimes disputed and vague because it can be confused with the definition of scientific literacy. Lederman points out the definition of NoS which generally is agreed upon to avoid confusion: "NOS typically refers to the epistemology of science, science as a way of knowing, or the values and beliefs inherent to scientific knowledge and its development."[5] The characteristics of scientific knowledge are inherent to the definition of NoS, which are according to him:

1) Distinction between observation and inference.
2) Distinction between scientific laws and theories.
3) Role of human imagination and creativity.
4) Scientific knowledge is subjective and/or theory laden.
5) Scientific knowledge is constructed in a larger culture.
6) Scientific knowledge is never absolute or certain.
7) Scientific inquiry is not the same as NoS.[6]

In section 1.1 the definition of NoS from Jelle de Schrijver (summarized in the *NoS Vingers,* Figure 5*)* is discussed and the characteristics above line up perfectly with the reasoning from Lederman.

[4] Norman G Lederman, 'Nature of Science: Past, Present, and Future', *Handbook of Research in Science Education* Ch. 28 (2007): 831.
[5] Lederman, 833.
[6] Lederman, 833–35.

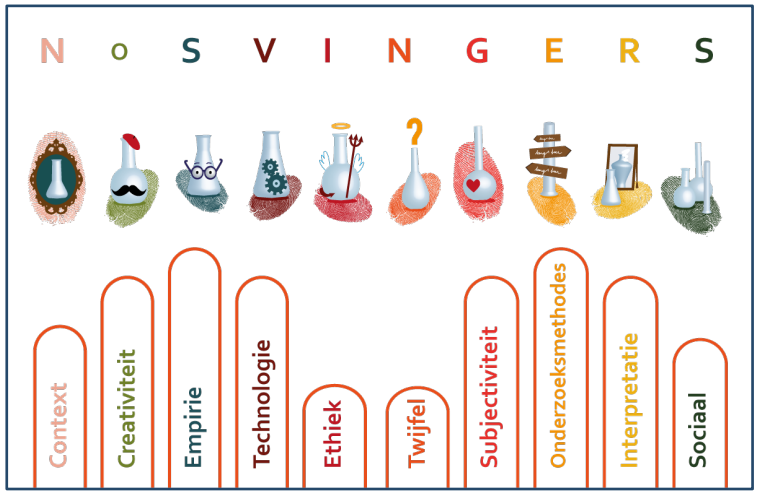

Figure 5 *NoS Fingers, the 10 aspects what Nature of Science encompasses.*

However, one addition to Schrijver's definition is to keep in mind that scientific inquiry is sometimes falsely understood as being the same as NoS. It is critically important that, when assessing source material, the correct definition is used to locate or add aspects of NoS in the curricula and/or ideas. This definition could be than compared to the definition of scientific literacy. Lederman's definition of scientific literacy is based on the *NSTA position statement science-technology-society* and can be summarized as follows: Scientifically literate individuals grasp science's role in everyday decisions, understand society's impact on scientific progress, and appreciate the limitations and benefits of science and technology. They possess key scientific knowledge and recognize the evolving nature of scientific understanding. They also understand technology's applications and ethical considerations, seeking reliable sources for decision-making and contributing to a broader worldview shaped by science education. Although scientific literacy indeed overlaps the definition of NoS, it's main aim is completely different focusing on the effective use of science. In order to do so, NoS is a critical component. When this becomes obvious, one can argue that the teaching of NoS is valuable and mandatory in effective science education.

Eventually, Lederman gives no definite claim about the necessity of NoS in his *Nature of Science: Past, Present, and Future,* since empirical evidence of the effectiveness of NoS is nowhere to be found. Nonetheless, he argues positively that understanding NoS helps students in understanding science as a discipline and to place it in meaningful context.[7] In a later article *Teaching and learning Nature of Scientific knowledge: Is it Déjà vu all over again?*, Lederman indicates the reasons why NoS may not be understood as effective to begin with. According to him, NoS is not effectively taught in schools, since it is rarely taught and

[7] Lederman, 872.

teachers do not possess adequate views or practices themselves.[8] This thesis will not answer the question on how NoS should be taught, since many already thought about this. However, this thesis will historicize NoS education and I will explain why after all these years this type of education is not yet achieved.

The position of NoS and ANW in the current educational system

In recent decades, a lot has changed in the Dutch secondary education curriculum, particularly due to the introduction of the *Tweede Fas*e (second phase) in 1998. With the introduction of the *Tweede Fase,* the subject *ANW* was introduced as well. This educational innovation brought about positive aspects, but also quite some challenges. Educational reform doesn't always carry a positive connotation or does not always seem impactful directly. Yet, it remains crucial that we ensure our education system continues to evolve in line with the times we live in. The focus of this section is to clarify the status of *ANW* as a subject today, and with that the position of NoS education as well.

Updates to the Dutch secondary education curriculum are done by The National Institute for Curriculum Development (SLO) The SLO guides the creation of the *kerndoelen* (core goals), for primary- (PO) and secondary (VO) education, and the *eindtermen* (final terms), which are used as a baseline to create the exams. The examination of students is done on a national level with the central exams (CE), and on a local school level with the school exams (SE). The results from both the CE and SE determine if a student graduates from secondary education. The *Centraal Instituut voor Toetsontwikkeling* (Central Institute for Exam development) abbreviated as *Cito*, is responsible for creating the central exams on a national level[9]. Since *ANW* never had a national central exam, the role of *Cito* in the development of *ANW is* irrelevant. Currently, our education system is undergoing further development, since the *kerndoelen* originate from 2006 and the *eindtermen* from 2007 (physics, chemistry, biology and NLT were updated in 2013). *SLO* has been working on this revision since spring 2022 and are gradually covering every educational domain.[10] Interestingly enough, NoS will be more explicitly included in the written curriculum within the domain of *Mens*

[8] Norman G. Lederman and Judith S. Lederman, 'Teaching and Learning Nature of Scientific Knowledge: Is It Déjà vu All over Again?', *Disciplinary and Interdisciplinary Science Education Research* 1, no. 1 (December 2019): 2, https://doi.org/10.1186/s43031-019-0002-0. *NOSK is sometimes used as an abbreviation of Nature of Scientific Knowledge, which is more specific in its terminology than Nature of Science (NoS) although referring to the same practices.*

[9] Cito, 'Over Cito', n.d., https://cito.nl/over-cito/.

[10] SLO, 'Actualisatie van de Kerndoelen', *SLO* (blog), 13 March 2024, https://www.slo.nl/thema/meer/actualisatie-kerndoelen-examenprogramma/actualisatie-kerndoelen/.

& Natuur (People & Nature), something Maarten Pieters, who's work we will discuss in the method, predicted as well:
"Given the influence of social developments, one might presume that the current increase in fake news, and the degrading in social media of scientific knowledge as 'just an opinion,' would increase attention for the curriculum emphasis on Knowledge development in science in written and enacted curricula."[11]

An important source in the development of this new written curriculum concerning all subjects in secondary education is the project curriculum.nu[12], which finished in 2019[13]. The result of this project gives an outline of where the *SLO* update will lead. In the proposals concerning one of the domains *Mens & Natuur* (People & Nature), a paragraph is dedicated to *Aard van Wetenschap* (Nature of Science, NoS) and to *Aard van Technologie* (Nature of Technology, NoT) education[14]. Their description of *NoS* is "Students learn about the role of objectivity, reliability, provisionality and perception of nature in the natural sciences and relate this to everyday life and society."[15] This description does not tick all the boxes that Lederman assigned to the NoS, especially 3 and 5. However, when analysing the entire report it is clear all these aspects are acknowledged. The description of NoT mentions for example the aspect of creativity and innovation in human enterprise and the interaction between technology and science.[16] In the domain *Burgerschap* (citizenship) clear goals are set about globalisation, technology, critical thinking, ethics and the understanding of various perspectives.[17] All these aspects are intertwined with the notion Lederman, de Schrijver and I have with NoS education. Hence, in contrast to the years before 2019, Nature of science appears to be experiencing a revival in the curriculum. What do these changes in the written curriculum effect what is happening in teaching practices? Are elements from the subject *ANW* again

[11] Maarten Lodewijk Maria Pieters, 'Between Written and Enacted: Curriculum Development as Propagation of Memes: An Ecological-Evolutionary Perspective on Fifty Years of Curriculum Development for Upper Secondary Physics Education in the Netherlands' (Utrecht University, 2022), 202, https://doi.org/10.33540/1243.
[12] 'Veelgestelde Vragen', SLO, *Actualisatie Kerndoelen En Examenprogramma's* (blog), 2 February 2023, https://www.slo.nl/thema/meer/actualisatie-kerndoelen-examenprogramma/actualisatie-kerndoelen/veelgestelde-vragen/.
[13] 'Curriculum.Nu', curriculum.nu, 2019, https://curriculum.nu/.
[14] 'Samen bouwen aan het primair en voortgezet onderwijs van morgen' (Curriculum.nu, 10 October 2019), 37, https://curriculum.nu/download/Voorstellen-op-hoofdlijnen-Curriculum.nu.pdf.
[15] 'Voorstellen op hoofdlijnen', 37. Vertaald vanuit het Nederlands: Leerlingen leren over de rol van objectiviteit, betrouwbaarheid, voorlopigheid en natuurbeleving in de natuurwetenschappen en relateren dit aan het dagelijks leven en de maatschappij.
[16] 'Voorstellen op hoofdlijnen', 37.
[17] 'Voorstellen op hoofdlijnen', 24.

reintegrated in our education? In order to answer these questions, understanding the subject *ANW,* and the reasons why it is not part of the mandatory curriculum, could be fruitful knowledge in shaping future education with the Nature of Science aspects.

III. Main research question

The main topic in this thesis is at the intersection of my profession as a physics teacher and the academic field of history and philosophy of science. This motivates me to investigate how NoS manifests itself in secondary education, what it influences and how it is enacted in Dutch secondary education. The main research question is therefore twofold and for clarity split up:

1) Which factors determined the conception of Nature of Science education in the form of the subject Algemene Natuurwetenschappen (*ANW*) in upper general secondary education in the Netherlands in the 1990s?
2) Which factors were responsible for the gradual demise of the subject Algemene Natuurwetenschappen (*ANW*) in upper general secondary education in the Netherlands from its early development till 2007?

IV. Structure of the thesis

The thesis is structured in two parts, each answering one of the research questions above. The first part of this study covers the conception of *ANW* and answers the first main questions of this thesis. This part is split up in two chapters. Chapter 1 covers the historical context of the Dutch educational system, highlighting important aspects that is still in the system today. Chapter 2 covers governmental documents and advisory reports form the archive from the early 80s till the end of the 90s, which These chapters will primarily focus on the first layer of operated curricula. In the second part, an answer is given to the question why *ANW* is not around as a subject today. Chapter 3 covers the early experimental and introduction problems with the *Tweede Fase* and *ANW* from different perspectives. Chapter 4 covers the first growing but than gradual diminishing status of *ANW* till 2007. In these chapters all the three different layers of the curricula will be discussed to understand the developments. In the epilogue I will reflect on the current status of NoS education and incorporate the lessons we can learn from *ANW* to promote NoS education. Additionally, I will discuss contemporary literature in the field of History and Philosophy of Science in Science Teaching to support the advice I share.

V. Method

Although a disadvantage may be that an extensive historical secondary literature concerning this topic is not present till this day, an advantage is the fact that many actors during these educational developments are still alive. One of these central figures is Maarten Pieters, who helped me conceptualizing the previously proposed research questions, determining the relevant sources and understanding the process of curriculum development. Hence, before covering the methodology of this thesis, a brief consideration of the work of Maarten Pieters is necessary.

Curriculum development as propagation of memes

In *Curriculum development as propagation of memes,* Maarten Pieters researched to which extent written and enacted curricula for physics education differed and why this difference would be there. He states his results and makes multiple claims of which the following have influenced the posed research question and methodology of this thesis:

1. The aspect of Nature of Science could be seen as a factor of the curriculum emphasis *Knowledge development in science and Science, technology, and society*. According to Pieters, this curriculum emphasis gained momentum with the introduction of the subject *ANW*.[18]
2. If the expressed wish is to improve Nature of Science understanding by the students, Pieter's research underscores the important role of the professional development of the teacher to reach that wish[19]. Teacher education plays a pivotal role in successfully bridging this gap between written and enacted. Considering the teacher training program is therefore an essential part in the methodology.
3. Attention towards the history and philosophy of science, especially nature of science, deserver a place in the curriculum of teacher education as well as offered professional development programs.[20]

[18] Pieters, 'Between Written and Enacted', 141.
[19] Pieters, 257.
[20] Pieters, 258.

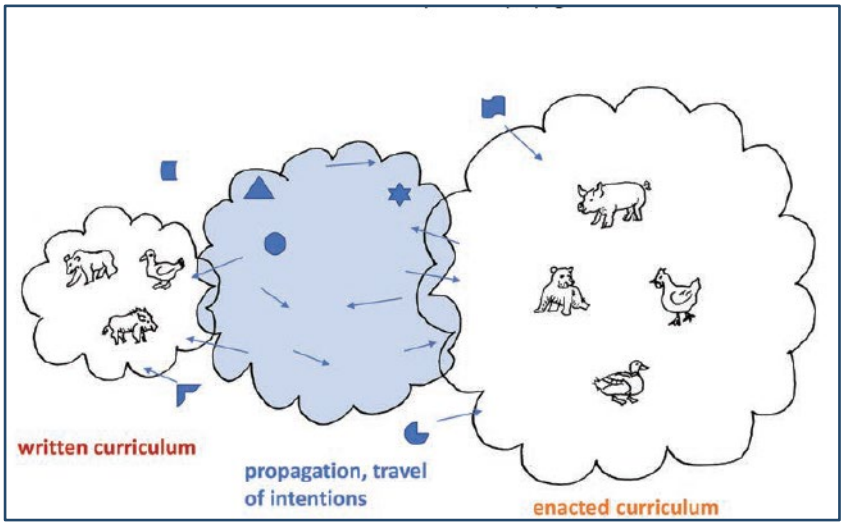

Figure 6. *Image of curriculum intentions traveling, as memes, between the written curriculum and enacted curriculum.*

Curriculum developments are a complex affair and Pieter's dissertation confirms that a development on the level of written curriculum does not guarantee a change in the enacted curriculum. This is visualised in Figure 6, where written curriculum is influenced before it becomes enacted. To understand the curriculum development of a specific aspect, like the nature of science, answers will be found in both these levels, as well as the process in between. Consequently, answering the main question of this research entails the use of a variety of perspectives that manifest themselves in the level of written and enacted curriculum, but also in the propagation and travel intentions. In Figure 7 an analysis of the this variety of stakeholders is done in order to determine which sources can be used to make sure these stakeholders are represented.

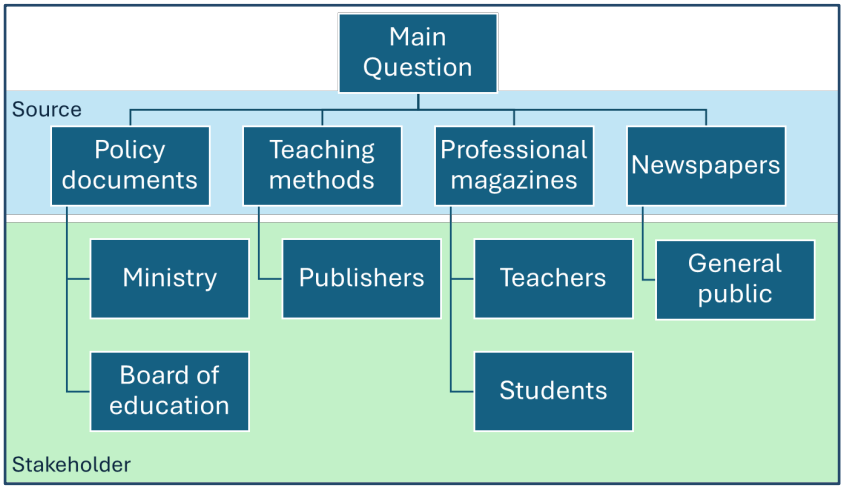

Figure 7. *Analysis of relationship sources and stakeholders.*

Methodology for the Historical Analysis

To provide a satisfactory answer to the two historical main questions of this thesis a diverse collection of source material must be used. These source materials are based on a variety of stakeholders and can be categorised in three levels in which curricula operate. The OCW, SLO and various advisory boards determine what we call 1) core objectives and final terms. With these final terms, publishers and sometimes teachers started to develop 2) textbooks and teaching methods based on these core objectives and final terms. Eventually, teachers use these resources to create lessons and start teaching, thus the 3) practical application in the lesson. This methodology deviates slightly from Pieters description of either written or enacted curricula. However, in my own analysis I determined that the textbooks and teaching methods should be placed in between these two positions. I will express per layer which method I will use.

Layer	Sources	Activity
1. Core objectives and final terms	Policy documents	Archive search → *"Stuurgoep Profiel Tweede Fase"*
2. Textbooks and teaching methods	Teaching methods and textbooks Professional magazines	NVOX database → Discourse about ANW
3. Practical application in the lesson	Professional magazines Newspapers	NVOX database → teaching practices Lexis Nexis → "ANW"

Figure 8. *Layers of written and enacted curriculum.*

Layer 1. Core objectives and final terms.
Throughout the 1990s the ministry OCW and SLO published many reports or articles that describe the development of *ANW*. The primary source of information concerning changes in the curriculum can be found in the National Archive in Den Haag. Reports from the OCW[21], the *Onderwijsraad* (board of education) and various other education boards map out how the formal process of the development of these written curricula went. Especially in the period from 1993 till 1996 when the *Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs* (committee profile second phase secondary education) was leading the development. With a focused search in the archive concerning this *Stuurgroep,* the amount of relevant document is narrowed down. I will close read the selected documents to understand the motives behind the development of *ANW*, but also extract already factors that could have impacted its eventual demise. With the addition to the archival sources, I will also assess relevant online sources published by the OCW, SLO or authors associated to these organizations in later years till 2007.

Layer 2. Textbooks and teaching methods
The textbooks or teaching methods that were developed by publishers can be partly seen as the enactment of the written curricula by OCW and SLO. Assessing various textbooks, but also examining the opinion of teachers in educational magazines, like the NVOX (see Figure 9), gives an overview of how the translation from core goals and end terms towards lesson materials went. By searching through the database of the NVOX with key terms like: *ANW*, Algemene Natuurwetenschappen, Aard van Wetenschap, Nature of Science I will hope to find relevant remarks about the lesson materials. These remarks will help to determine factors that influenced the demise of *ANW*. Relevant literature will be assessed from the period from 1990 till 2007.

Layer 3. Practical application in the lesson
If the set goals eventually reach the classroom is always a difficult question to answer. A way to get understand at least partly the reception of the subject *ANW* is by assessing primarily educational magazines like the NVOX, as well as a variety of newspapers that were published in the period from 1990 till 2007. The methodology is similar to layer 2, except I will use a more extensive database from lexis nexus and focus on how primarily the subject *ANW* was perceived and to which degree it was valued.

[21] Till 1994 it was the *Ministerie van Onderwijs en Wetenschap (Ministry of Education and Science) abbreviated as O&W.*

Figure 9. Cover of the NVOX May 1998

Figure 10. *Wihtin the conception of ANW, not only perspectives from scientists are considered. An interdisciplinary approach is fitting.*

Part I Conception

In which educational landscape was ANW conceived?

By who was this of Nature of Science education carried out?

Which stakeholders were involved in the conception of ANW?

Chapter 1. History of Dutch Education

The focus of this thesis will be on the manifestation of the Nature of Science in upper general secondary education. Since Nature of Science is primarily an aspect found in the subject *Algemene Natuurwetenschappen (ANW)*, the historical analyses will be centred around this subject. The subject was taught in Dutch secondary schools from the end of the 1990s till 2015, at the two school types: *hoger algemeen voortgezet onderwijs* (higher general secondary education), abbreviated as *havo* which encompasses two-years, and *voorbereidend wetenschappelijk onderwijs* (preparatory university education), abbreviated as *vwo* which encompasses three-years. Hence, the scope of this thesis will be focused on this timeslot, as well as these two school types. However, in this chapter a general overview of developments in the Dutch educational system is given since the 19th century and a review of the literature that has been written about the *Tweede Fase* and *ANW* in particular. Some characteristics of the educational system, like its structure, aspects of *verkokering* and the balance between tailored education and equal opportunity can be better understood when placed in an historical context. This chapter may be unnecessary if you have extensive prior knowledge about the Dutch educational system.

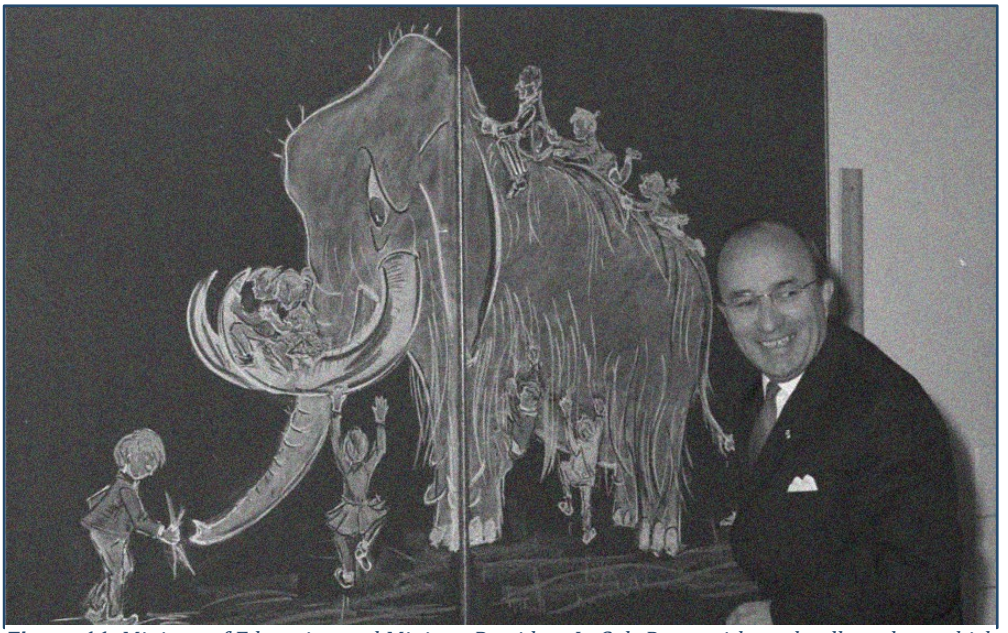

Figure 11. *Minister of Education and Minister President Jo Cals Poses with a schoolboard, on which a Mammoth is drawn.*

1.1. Dutch Secondary Education pre-Tweede Fase

Evaluating the evolution of secondary education is not clear cut and what was understood as secondary education in the past is different than today. Fortunately, there is extensive secondary literature to get an idea of developments in education. This section is therefore intended to briefly outline this development and subsequently place them besides the developments in the 1990s and 2000s.

Development in the 19th and first half of the 20th century

Generally, education was initially confined to the clergy and aristocracy during the Middle Ages. Gradually it became more inclusive with the onset of the Renaissance and Enlightenment periods.[22] This inclusivity gained momentum in the 19th century, propelled by the demand of an educated workforce due to the industrial revolution.[23] However, at the beginning of the 19th century there was no compulsory education in the Netherlands. The first school law from 1806 posed education should be accessible to everyone but did not make anything mandatory.[24] Throughout the 19th century the *schoolstrijd* (school battle) was present in the development about policy. Slowly the role of the church in providing education decreased and public schools became funded equally. The education museum in Dordrecht has various laws in its collection about this period, including the constitution of 1848. This constitution was an important milestone in the *schoolstrijd* since it stated clearly "with respect for everyone's religious concepts"[25]. Freedom of education was ensured, but it was not until the new constitution of 1917 that both public and Christian school types were funded equally, and we can speak of a certain equality in education as well.[26] In the subsequent year of 1918, the government installed an own department concerning education, as well as culture and science. This marked the start of the OCW, which stands for *Ministerie van Onderwijs, Cultuur en Wetenschap* (ministry of Education, Culture and Science).[27]

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[22] Onderwijsmuseum, *Een Korte Geschiedenis van Het Onderwijs* (Dordrecht, 2016), 4–5, onderwijsmuseum.nl.

[23] P.Th.F.M. Boekholt and E.P. de Booy, *Geschiedenis van de School in Nederland* (Assen: Van Gorcum, 1987), 257, https://www.dbnl.org/tekst/boek009gesc01_01/index.php.

[24] Ministerie van Onderwijs, Cultuur en Wetenschap, 'Geschiedenis', rijksoverheid.nl, n.d., https://www.rijksoverheid.nl/ministeries/ministerie-van-onderwijs-cultuur-en-wetenschap/organisatie/geschiedenis.

[25] Pieter Verrips, 'Toen En Nu', vrijheid van onderwijs, *1848* (blog), n.d., https://vrijheidvanonderwijs.nl/historie.php?ID=2.

[26] 'Schoolstrijd 1848-1920 (Tweede Fase) Een Chronologisch Overzicht', Onderwijsgeschiedenis, n.d., https://www.onderwijsgeschiedenis.nl/tijdvakken/schoolstrijkd-van-1848-1920.

[27] Ministerie van Onderwijs, Cultuur en Wetenschap, 'Geschiedenis'.

The landscape of secondary education in the Netherlands is characterized by the diversity of educational institutions catering to different academic levels and vocations. This diversity is still present today, with a variety of levels to make sure students can accomplish educational achievement on their respected level. However, the landscape from 1920 till 1968 was more extensive with school types like: *Uitgebreid lager onderwijs* (*ULO)*, *Handelsschool*, *Hogere Burger School (HBS), Middelbare school voor meisjes (MMS), Lyceum, Gymnasium, Uitgebreid Technisch Onderwijs (UTS), Nautische school, Huishoud- en landbouwhuishoudonderwijs*[28]. Education was shaped in categories, sometimes quite precise to accommodate specific professions or to focus on a specific group, like the secondary school for girls (MMS). It became increasingly unclear how these different school types were related, and it was hard for students to jump from one type of education to the other one.[29] Although the coexistence of these diverse school types underscores the Netherlands' commitment to providing tailored education, the lack of integration damaged the freedom and opportunity for students. Educational reform was necessary to solve this problem.

From the '*Mammoetwet*' till the '*Tweede Fase'*

A pivotal moment in the history of Dutch secondary education was the enactment of the *Wet op het Voortgezet Onderwijs* (Law on secondary education), which is better known as its nickname *Mammoetwet* (Mammoth Act) since the law initiated a giant reorganization[30]. Figure 11 shows the than serving Minister-President Jo Cals, responsible for the enactment of the Mammoth Act. His Cals-Cabinet can be characterized as centre-left and Christian-social-democratic. In a chapter 4.3 the influence of politics on educational policy is explained more explicit. However, it is obvious that the *Mammoetwet* is a clear example of the enactment of these political values in the educational system. This landmark legislation was introduced in 1968 and aimed to overhaul the educational system by streamlining the different types of schools, thereby breaking down traditional barriers between academic and vocational tracks[31]. The *Mammoetwet* aimed to create equal opportunities for students of all backgrounds, by unifying the curriculum across comprehensive schools. However, within the system different types of schools to give tailored education are still present. A remnant from the years before the *Mammoetwet.* The legislation aimed to promote educational flexibility and adaptability. It resulted

[28]Boekholt and de Booy, *Geschiedenis van de School in Nederland*, 263–81.
[29] Boekholt and de Booy, 282.
[30] Pieters, 'Between Written and Enacted', 44.
[31] Boekholt and de Booy, *Geschiedenis van de School in Nederland*, 285.

in the educational structure that is the foundation of the structure we have today (Figure 12), on which was iterated in the 80s and 90s (Figure 13). Sometimes this structure is referred to as the 'teabag model', in which the lower levels mavo and havo are more simple and less extensive variants of the vwo-level.[32]

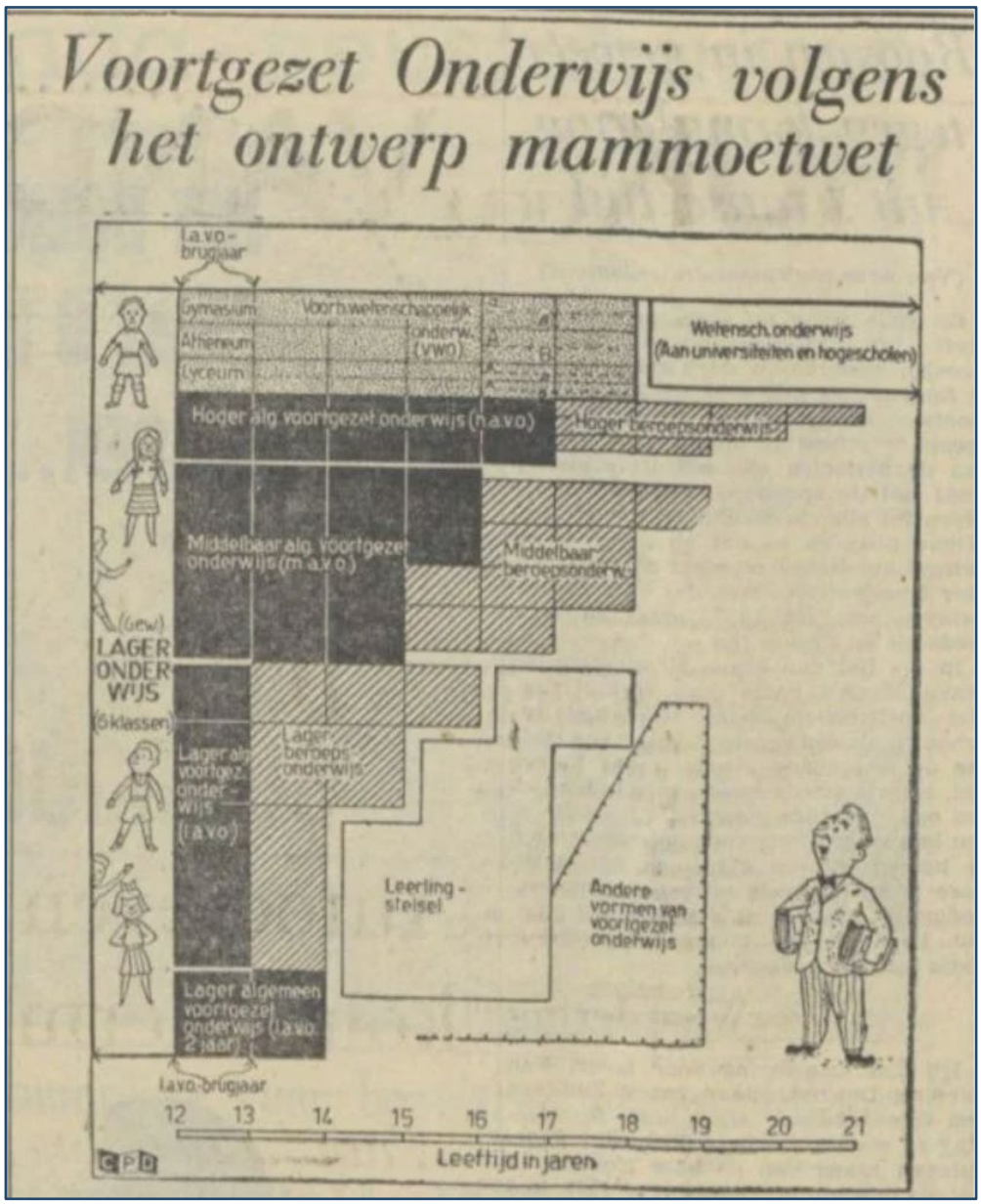

Figure 12. *The design of secondary education according to the Mammoth Act.*

[32] Ria Bronneman-Helmers, Lex Herweijer, and Ria Vogels, *Voortgezet onderwijs in de jaren negentig* (Den Haag: SCP, Sociaal en Cultureel Planbureau, 2002), 15.

Following the implementation of the *Mammoetwet*, Dutch secondary education did not stop developing. Often ideas about the structure of the secondary educational system were found in the ideology of providing equal opportunities. An ideology that's always been in balance with the other task secondary education is given, namely ensuring selection for further or higher education.[33] Various ideas about improving this balance were proposed in the years following the *Mammoetwet,* of which the *middenschool* was probably the most prominent construct[34]. In the *Countourennota* of 1975, the *middenschool* was proposed to increase equal treatment and opportunity for students aged between 11/12 till 15/16.[35] The *middenschool* would have encompassed the first three years of secondary education, without any selection yet. The *middenschool* was never realised, but this development does highlight the debate in the 70s and 80s between equal opportunities, versus a correct selection procedure on the other. Both standpoint defended by different political parties and views (see 4.3). Nonetheless, a remnant of the ideas of the *middenschool* can be found in the *basisvorming*, which was introduced in 1993, and the *Tweede Fase.*[36]

Educational developers started to split up secondary education in two phases, namely the *Eerste Fase* (first phase) and *Tweede Fase* (second phase). The *basisvorming* can be seen as the first phase and is a compromise between the two conflicting standpoints concerning equality and selection. The *basisvorming* stated a set of general learning aims students should reach after two or three years[37]. However, in the 1980s and 1990s developments surrounding equality, selection and the desire for a clear general education played a key role. In this landscape of educational division, developments surrounding the second phase started, a turbulent context to say the least.

1.2. *Tweede Fase* and *ANW*

As discussed in the introduction, the Tweede Fase was an educational reform introduced in 1998. The educational institution *SLO* and the ministry *OCW* published a considerable amount of literature about this reform. While extensive reflective literature, primarily from these institutions, exists, there is a notable absence of historical scholarship tracing its evolution due to its relative recent emergence. Similarly, *ANW,* a subject integral to the *Tweede Fase*, poses challenges in accessing historical material, particularly as it ceased being

[33] Bronneman-Helmers, Herweijer, and Vogels, 11.
[34] Bronneman-Helmers, Herweijer, and Vogels, 11.
[35] Bronneman-Helmers, Herweijer, and Vogels, 19.
[36] Bronneman-Helmers, Herweijer, and Vogels, 19.
[37] Bronneman-Helmers, Herweijer, and Vogels, 20.

mandatory only in 2015. Consequently, secondary historical literature on *ANW*'s development is scarce, necessitating a diverse set of sources to construct a comprehensive historical narrative. This section is intended to give a brief overview of educational developments since the conception of the *Tweede Fase*, as well as to clarify the limitation and possibilities in sketching a narrative about development of the *Tweede Fase* and *ANW*.

Changing the educational structure and landscape

The educational reform *Tweede Fase* (second phase) already started in the early 80s and is still part of the Dutch educational system. This educational reform was complex and contained a multitude of changes to the educational curriculum, as well to its pedagogical and didactical environment due to the *studiehuis* (*Studiehuis*). Figure 13 helps to clarify the position of the *Tweede Fase* in the educational path of the students (encircled red). The *Tweede Fase* focusses on the last 2, 3 or 4 years of secondary education (h)avo or vwo, before students go off to higher education or university.

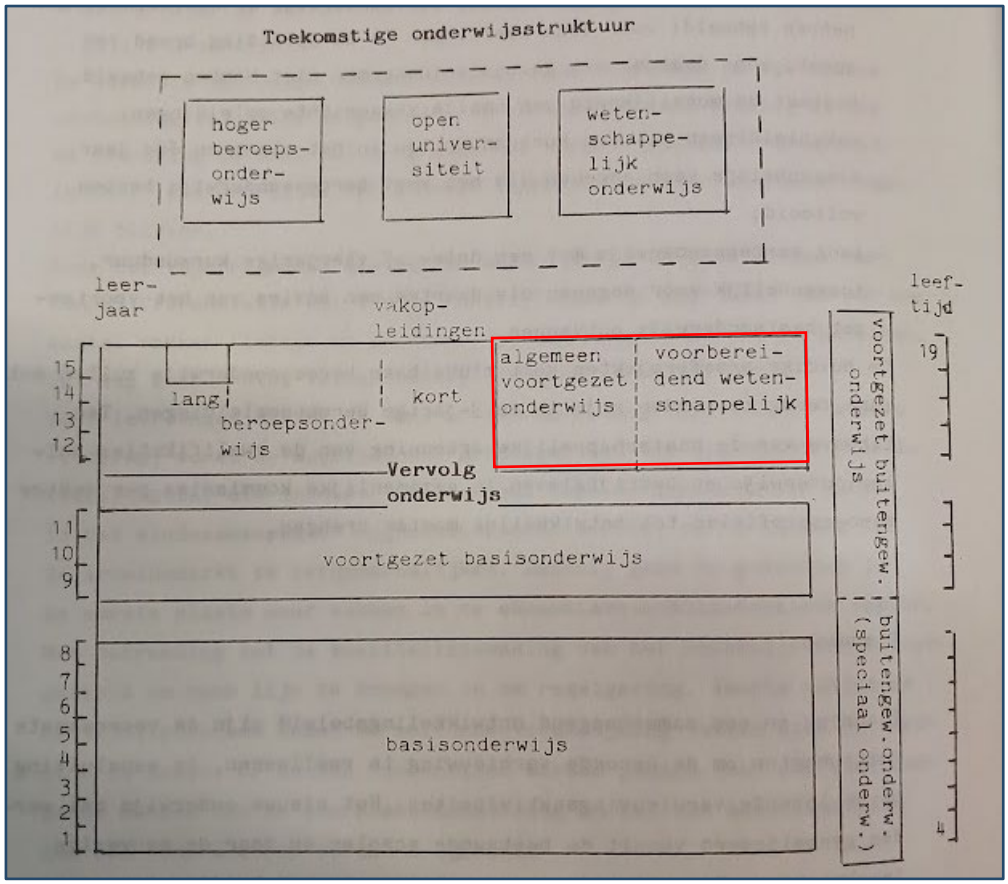

Figure 13. *Toekomstige onderwijsstructuur (Future educational structure), presented in the 80s.*

With the introduction of the *Tweede Fase*, not only the subject *ANW* was introduced, but also *Cultuur en Kunstzinnige Vorming* (Cultural and Artistic Education), abbreviated as CKV. These subjects were completely new to strengthen the general knowledge of the students, as well as to work on study skills and learning methods. However, these general subjects did not emerge without opposition, as the original plan also included the subject *Mens- en Maatschappijwetenschappen* (Human and Social Sciences), abbreviated as MMV[38]. The three subjects shared the aspect of interdisciplinarity and the broadening of produced knowledge. It battled an aspect of *Verkokering* in education, more extensively discussed in 2.1, subchapter 'First publication of the focus group in 1994'. According to Theresia Carpaij, the backlash from teachers about these subjects stemmed primarily from the fear of compromising hours in the existing subjects.[39] Hence, it is interesting to assess to which degree this 'distribution of lesson hours' played a role in the development of *ANW*.

ANW was a quite innovative subject. Focusing on academic skills, the grand narratives in science, how scientific knowledge is constructed and its interdisciplinary aspects. This was in line with the ideology of the *Studiehuis*. In a growing digital world, the *Studiehuis* was there to focus more on skills instead of mere knowledge. To promote autonomy instead of only competence. However, this didactic method did not stand the test of time and died in the background of other educational reforms.[40] The cartoon in Figure 14 expresses one of its pitfalls. It is fruitful to consider to what extend the failure of the *studiehuis* influenced *ANW*?

Figure 14. *Studiehuis is about doing it on your own.*

[38] Theresia Cornelia Carpaij, *Anders kijken naar het studiehuis: een analysemodel voor onderwijsvernieuwing* (Apeldoorn: Garant, 2010), 27.
[39] Carpaij, 35.
[40] Ad van de Lisdonk, 'Studiehuis En Tweede Fase Stierven Een Zachte Dood', Promptus, 23 November 2007, https://www.promptus.nl/studiehuis-en-tweede-fase-stierven-een-zachte-dood/.

Creating a historical narrative

Since this comprehensive introduction of the *Tweede Fase*, education has not remained static. The *Voorbereidend middelbaar beroepsonderwijs* (Preparatory secondary vocational education), abbreviated as VMBO, was introduced between 1999 and 2002[41], the name "basisvorming" was replaced by *onderbouw* in 2003, and since 2006, a new regulation has been in place distinguishing between a core curriculum and a differential part[42]. In 2007, the *Tweede Fase: Nieuwe Stijl* (second phase in a new style) was introduced, giving students more flexibility in the composition of their subject packages[43]. In addition to this adjustment, *ANW* also lost its status as a compulsory subject in the common core for *havo* in 2007. Following the change in the status of the *ANW* subject in HAVO, the subject of Nature, Life, and Technology (NLT) also emerged[44]. Practices in science teaching seem to be in a constant cycle of reform after reform. Like *ANW*, this subject is not compulsory but can be offered solely as a school exam. Eventually *ANW* was degraded as a mandatory subject in VWO in 2015 and lost with this the aspect of Nature of Science in its mandatory core curriculum.

Although a lot has been written about the *Tweede Fase,* there still is a lack of historical scholarship concerning this topic, especially about *ANW*. However, a variety of sources can be used to create a historical narrative. Since the introduction of the *Tweede Fase* impacted the pedagogical and didactical role of the teacher as well, a lot of (reflective) literature has been written about pedagogical and didactical practices. Developments in these practices are often in relation to societal trends and changes[45], hence it is an important aspect to consider when trying to understand the social and cultural context in which an education reform took place (more on that in 4.3). In reaction to these changes the opinions from teachers or practitioners in the field are written down in newspapers and educational orientated magazines. Primary sources are in an abundance to construct this historical narrative of *ANW*.

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[41] J.R.V.A. Dijsselbloem, 'Parlementair Onderzoek Onderwijsvernieuwingen: Tijd Voor Onderwijs', Pub. L. No. 31 007, 2007–2008 Nr. 6 (2008), 17.

[42] Dijsselbloem, 39.

[43] Centraal Bureau voor de Statistiek, 'Tweede Fase Nieuwe Stijl', cbs.nl, *Leerlingen in Het Vwo Kiezen Steeds Vaker Natuurprofiel* (blog), n.d., https://www.cbs.nl/nl-nl/nieuws/2010/36/leerlingen-in-het-vwo-kiezen-steeds-vaker-natuurprofiel/tweede-fase-nieuwe-stijl.

[44] Vereniging NLT, 'Feiten En Cijfers', verenigingnlt.nl, *Over Ons* (blog), n.d., https://www.verenigingnlt.nl/over/feiten-cijfers/.

[45] Marc Verboord, 'Literatuuronderwijs van Mammoetwet naar Tweede Fase':, 2004, 19.

Chapter 2. Conception of ANW

In the *Nationaal Archief* in Den Haag, many documents from the *Onderwijsraad* (board of education) from the 1980s till 2000 are stored. The *Onderwijsraad* gives independent advice about educational policy and regulations that are conceived and discussed in the *Eerste Kamer* (Senate) and *Tweede Kamer* (House of Representatives).[46] Therefore, the archive of the *Onderwijsraad* is an extensive source concerning the developments of educational policy. Educational reforms about the *Tweede Fase* are discussed in detail from multiple perspectives, e.g. the *Onderwijsraad*, Ministry of OCW or specifically its State Secretary. In this chapter we move chronologically through time and follow the developments of educational policy to understand what enfolded. With the context described in chapter two and the in depth analysis of chapter three, an answer will be given to the first research questions: Which factors determined the conception of Nature of Science education in the form of *ANW* in upper general secondary education in the Netherlands in the 1990s?

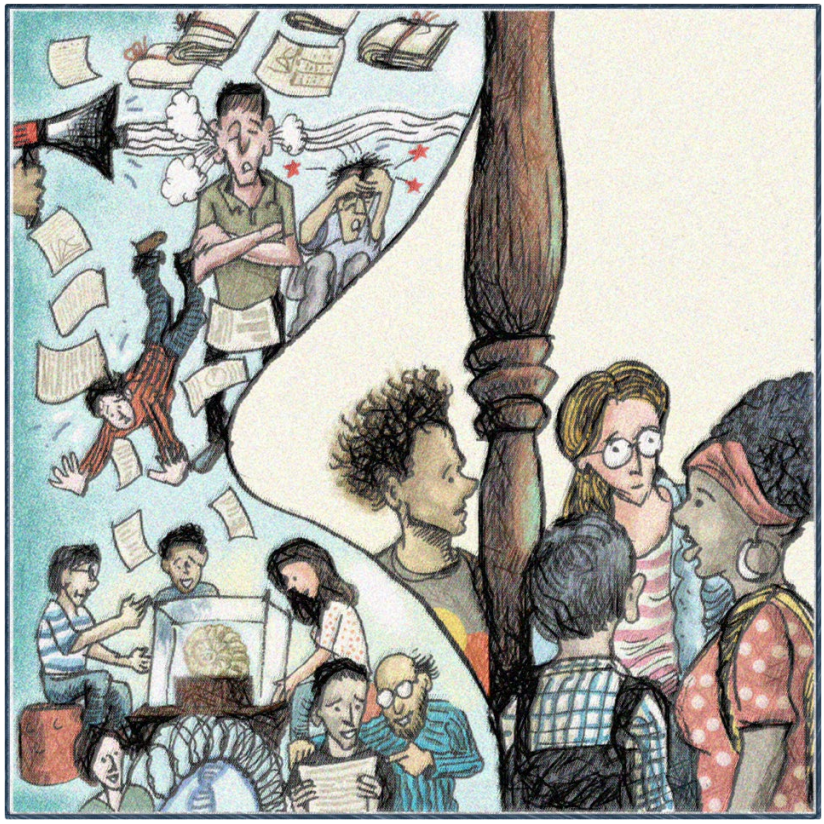

Figure 15*. In the conception of ANW, dialogue among students about the experiences of the natural sciences was central..*

[46] Ministerie van Onderwijs, Cultuur en Wetenschap, "Over Ons", Onderwijsraad, 5 juni 2023, https://www.onderwijsraad.nl/over-ons.

2.1. Early development of the *Tweede Fase*

In the beginning of the 80s the structure of the whole secondary educational system was still being discussed. The focus of these reforms was primarily to increase equality for student to get the same chances, as well as to increase the cohesion of the educational system. The ideas included were e.g. an extension of the havo program with one year (to a total of 6 years like vwo), and the introduction of *leerstofblokken.*[47] However, the proposal concerning the havo extension was never realised and various counsels like the *Raad voor het Jeugbeleid* was not convinced that it would contribute to the general level of education that was given to the havo students.[48] The idea of more focused study programs in the form of these *leerstofblokken* or later called *vakkenpakketten* (subject packages) did start to spread throughout the education sector. Although it was still conceptual and not yet desirable according to the secretary of state for education and sciences.[49] The secretary feared that the study programs would result in a more individualistic approach of education, and a loss of the broad and general aspect of secondary education. This fear was shared by *de inspectorale werkgroep* that provided an advisory report concerning these early developments. Despite shared concerns about fragmentation[50], the idea of *vakkenpakketten* seemed worth exploring to improve the structure and cohesion of the educational system.[51]

Discussion memorandum 1991

Almost a decade later, educational reform took off with the 'discussion memorandum': *Profiel Tweede Fase voortgezet onderwijs* from 1991 published by the State Secretary for education and sciences J. Wallage.[52] This was the first

[47] 'Nu zorgen voor morgen: op weg naar een samenhangend geheel van onderwijsvoorzieningen', Advies (De Inspectorale werkgroep commentaar onderwijsnota's, June 1983), 41–42, Den Haag, Nationaal Archief.

[48] 'Tweede fase vervolgonderwijs: "bovenbouw bijgesteld"', advies (Raad voor het Jeugdbeleid, 3 March 1983), 56, Den Haag, Nationaal Archief.

[49] W. J. Deetman, 'Nota ter voorbereiding van een wet inzake de opzet en inhoud van een nieuw stelsel van vervolgonderwijs', Nota (Ministerie O&W, 9 September 1982), 104, Den Haag, Nationaal Archief.

[50] 'Nu zorgen voor morgen: op weg naar een samenhangend geheel van onderwijsvoorzieningen', 42.

[51] Deetman, 'Nota ter voorbereiding van een wet inzake de opzet en inhoud van een nieuw stelsel van vervolgonderwijs', 103.

[52] "De Parlementaire Besluitvorming Inzake de Invoering van Basisvorming, Leerwegen en Profielen Tweede Fase in het Voortgezet Onderwijs' - Parlementair Onderzoek Onderwijsvernieuwingen; Rapport 'Omstreden Onderwijsvernieuwingen - Parlementaire Monitor", 22 maart 2009, https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3k9m3zdvnw.

iteration of memorandum concerning the *Profiel Tweede Fase*, and discussion it surely sparked. The memorandum was introduced to tackle primarily the lack of connection between secondary havo and vwo education to higher education and university, as well as the one-dimensional subject clusters, ineffective learning paths students chose and the unequal dispersion of the multicultural Dutch population among the various educational levels.[53] The policy note expressed grand ideals but stumbled in its elaboration. Early critics on the memorandum shared similar thoughts from the 80s with the fear of fragmentation or, as described in a yearly report from the *Tweede Kamer*, a *fuikwerking* (Trap effect).[54]

In this memorandum from 1991 the structure of the *Tweede Fase* is explained as threefold. With the introduction of subject packages, also called profiles, students have: 1) a general part; 2) a profile part and 3) a free choice part. This structure is similar to the structure of today. However, in the list of general subjects, nothing is yet mentioned about *Algemene Natuurwetenschappen (ANW)* or a 'science' orientated subject.[55] What is mentioned is a fusion of the subject physics and chemistry and a separation of a more general and technical part. These separation of aspects in subjects would not only limit to physics and chemistry, but would also apply the e.g. languages in the structure of sub-subjects.[56] The general sub-subjects are part of the students' general education, while the more specific sub-subject can be part of the choses profile.[57] This construction is clearly the early variation on the three subjects *ANW*, MMW and CKV proposed in later stages of the educational reform.

Critical views of various boards

The name *Discussion memorandum was* given since the content of the memorandum was open for discussion from April till November 1991.[58] Among the various boards of education there were quite critical views which they

[53] 'Profiel tweede fase voortgezet onderwijs', Advies (Sociaal-economische raad, July 1991), 11, Den Haag, Nationaal Archief.

[54] 'Profiel van de tweede fase voortgezet onderwijs', Pub. L. No. 22645, 1 (1992), 24.

[55] 'Profiel van de tweede fase voortgezet onderwijs' (Ministerie van Onderwijs & Wetenschappen, 1991), 107, Den Haag, Nationaal Archief.

[56] 'Profiel van de tweede fase voortgezet onderwijs', 103.

[57] 'Profiel van de tweede fase voortgezet onderwijs', 103.

[58] 'Wijziging van de Wet op het voortgezet onderwijs, de Wet op het hoger onderwijs en wetenschappelijk onderzoek en de Wet educatie en beroepsonderwijs in verband met verbetering van de aansluiting van het voorbereidend wetenschappelijk onderwijs en het hoger algemeen voortgezet onderwijs op het hoger onderwijs (profielen voortgezet onderwijs)', Pub. L. No. 25168 nr. 3, 1996–1997 (1996), 2, zoek.officielebekendmakingen.nl/kst-25168-3.html.

clearly wanted to share and discuss. However, there was also criticism on the aspects that were still negotiable, as the education council learned after inquiring with the department that not the entire memorandum would be open for discussion[59]. Herman J. Jacobs of the *Stichting Samenwerkingsverband Organisatie Voor Onderwijsvernieuwing (*Foundation Cooperative organization for educational innovation), abbreviated SOVO, is also not pleased with the state's secretary deterministic attitude, and that there does not appear to be an open discussion.[60] Nonetheless, organization supplied the State Secretary with sufficient feedback.

The *Onafhankelijke Onderwijs vak Organisatie* (Independent education profession organisation), abbreviated as O3, expressed their concerns since they got the impression that the broad general development after the *basisvorming* would become less important and that emphasis is placed on preparation for higher education and university.[61] Although the problematic connection between higher education and university was one of the factors that sparked the educational reform, O3 and S. Dijkstra also indicated that a key role in tackling this problem is reserved for higher education and the universities themselves.[62] These worries are expressed and repeated by the *Stichting SOVO*,[63] as well as by the *Onderwijsraad.*[64] The biggest point of criticism was therefore the fear that the focus of secondary education on the general education of knowledge will be lost, and that it would shift to merely meeting the entry requirements of higher education and universities. This one-sided transition is something Mantel & Oosterlaan argued against, as they believed it is extremely important that both systems must grow towards each other.[65]

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[59] 'Advies Nota profiel tweede fase voortgezet onderwijs', Advies (Den Haag: Onderwijsraad, 7 August 1991), 1, Den Haag, Nationaal Archief.

[60] 'Enkele kritische kanttekeningen bij de NOTA PROFIEL VAN DE TWEEDE FASE VOORTGEZET ONDERWIJS', Advies (Amerongen: Stichting Samenwerkingsverband Organisatie voor Onderwijsvernieuwing, November 1991), 4, Den Haag, Nationaal Archief.

[61] 'Commentaar op de Nota "Profiel van de tweede fase voortgezet onderwijs"', Advies (Dordrecht: Onafhankelijke Onderwijs Vakorganisatie, June 1991), 8, Den Haag, Nationaal Archief.

[62] S Dijkstra, 'Commentaar op de nota "Profiel van de tweede fase voortgezet onderwijs"', Advies (Hengelo, May 1991), 2, Den Haag, Nationaal Archief.

[63] 'Enkele kritische kanttekeningen bij de NOTA PROFIEL VAN DE TWEEDE FASE VOORTGEZET ONDERWIJS', 1–2.

[64] 'Advies Nota profiel tweede fase voortgezet onderwijs', 4.

[65] A. Mantel and E. Oosterlaan, 'Nota "Profiel van de tweede fase v.o.": Opmerkingen ten aanzien van de toerusting voor arbeidsmarkt hoger onderwijs', Notulen, April 1991, 1, Den Haag, Nationaal Archief.

However, the focus on higher education was not the only point of critique. The O3 expected the planned reform is in need of a well backed up funding, since "individualizing learning paths in the lower grades, offering profiles, dividing subjects into a number of sub-subjects and providing more study and career guidance are all things that cost money"[66]. It comes to no surprise that similar organizations expressed their worries about the practicality of all the plans.[67] The *onderwijsraad* expected that *deelvakken* (sub-subjects) would create fragmentation and an overload of offered subjects.[68] Another committee expected the State Secretary to be too optimistic about the solvability of this connection problem between secondary and higher education.[69] The NGL-Blad (magazine of the teachers' union) also discussed the findings of the *onderwijsraad*. In this magazine it is stated that not everything is seen as problematic and that the *onderwijsraad* shared positivity about the general concept of the ideas. However, there is talk of such drastic adjustments that they still need to be discussed properly to ensure that it is clear what effect all adjustments will have.[70]

Follow-up memorandum *1992*

"In many commentaries, the fear has been expressed that the introduction of the profiles would come at the expense of general education. The starting point of the memorandum is precisely that for the upper years of havo/vwo, a broad general education, at a substantially higher level than that of the basic education, is necessary."[71] According to the state secretary, this has not been adequately emphasized in the previous memorandum, although it was the intention. It is precisely the elimination of the free choice packages and the incorporation of profiles with a broader general education that prevents the one-sided alpha- or beta-oriented subject packages. The state secretary's desire is to establish a strong general education component, and he affirmed that it should always be the intention that all subjects are of a general educational nature.[72] An important confirmation towards the councils, that were quite hesitant about this

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[66] 'Commentaar op de Nota "Profiel van de tweede fase voortgezet onderwijs"', 8. *Vertaald uit het Nederlands*

[67] 'Commentaar op de Nota "Profiel van de tweede fase voortgezet onderwijs"', 2.

[68] 'Advies Nota profiel tweede fase voortgezet onderwijs', 10.

[69] 'Notulen c.q. verslag van de gezamenlijke vergadering van de afdelingen secundair onderwijs en de Centrale commissie EFSO', Notulen (Den Haag: Commissie EFSO, 7 June 1991), 3, Den Haag, Nationaal Archief.

[70] W.T.G. Dresscher, 'Problemen verwacht met deelvakken', *NGL Blad*, December 1991, 13, Den Haag, Nationaal Archief.

[71] J. Wallage, 'Vervolgnota "Profiel van de tweede fase voortgezet onderwijs"', Pub. L. No. 079–534465, 1992 Nota (1992), 34.

[72] Wallage, 35.

development. "The profiles are certainly not intended solely to provide a strongly sector-oriented pre-education. The memorandum should have been clearer about this."[73]

The state secretary also provided a response to the feedback from many parties. He believed that the concept of 'general education' is too quickly attributed solely to social and arts subjects, while according to him, exact sciences are also part of a broad general knowledge. "A package consisting, for example, only of languages, geography, and history would apparently be seen as 'strongly general education' in such an approach, and a package with many exact sciences as less general. The question is whether this is a correct approach. The exact sciences also belong to culture and contribute to personal and social development."[74] The motivation and approach of the state secretary provided a clear direction, emphasizing the importance of natural science subjects for general education, which is certainly recognized here. The state secretary mentioned the desire for more cross-pollination between disciplines, where the natural sciences are not only considered in mathematical traditions but also in human and cultural-historical perspectives.[75] "This also includes paying some attention to the fundamental nature of the natural sciences and the boundaries that arise from them. This is important at this stage of education: during this age phase, much of the 'shaping' of the students' perception of these subjects takes place. Dividing the subjects of physics and chemistry into a general sub-discipline and a 'technical' sub-discipline offers opportunities for this."[76] A clearer reference to the desire for General Science Education (*ANW*) was not earlier mentioned in this context.

Reception of the follow-up memorandum

The follow-up memorandum seemed to please the *onderwijsraad*, since they expressed their appreciation towards the state secretary in assessing all the reactions and advice that were shared about the discussion memorandum.[77] However, they still expressed pressing concerns like the premature implementation date of August 1, 1995. This would cause overlap with students that just experienced the reform of the *basisvorming* and was greatly discouraged by the *onderwijsraad.* They also highlighted insufficient attention in the follow-up memorandum to the necessary shift in teachers' mindset and

[73] Wallage, 34.
[74] Wallage, 34.
[75] Wallage, 35.
[76] Wallage, 36.
[77] 'Vervolgnota "Profiel van de tweede fase voortgezet onderwijs" en Beleidsbrief "Het Voorbereidend Beroepsonderwijs"', Advies (Onderwijsraad, 16 November 1992), 1, Den Haag, Nationaal Archief.

doubts regarding its feasibility[78]. During the preparatory phase, the Council referred to the *basisvorming*, which was in its final year before implementation at the time. However, they noted the vagueness surrounding its identity and training aspects, mentioning concerns about the clarity of subject matter, desired teaching skills, and the overall feasibility. The support provided in the field thus far is perceived as inadequate, a signal according to the Council for the necessary educational renewal in the second phase[79]. Additionally, the *onderwijsraad* criticized the Follow-up Memorandum for its lack of consideration of the impact of proposed policies on teacher training program content. An aspect earlier in this paper acknowledge as possibly an important actor in the fulfilment of curriculum change. In its conclusion, the *onderwijsraad* emphasized the need for greater acknowledgment of the education sector's realistic capacity to responsibly implement desired changes. Furthermore, significant concerns are raised about the financial underpinning and the available resources in schools to offer adequate support.

Another actor that advised on the follow-up memorandum is the *Vereniging van Hogescholen* (Association of Universities of Applied Sciences). This association brings an interesting perspective to the mix. They underscored the need for a qualitative approach to education in particular havo, noting concerns about the extensive curriculum, which often exceeded the available time in the upper years. They advocated for a reduction in the curriculum's volume, allowing for more meaningful engagement with the material. Additionally, they stressed the importance of general study skills and social communication abilities, essential for success in higher education.[80] Lastly, they advocated for the inclusion of philosophy not only in vwo but also in havo, recognizing its potential to cultivate critical thinking skills necessary for navigating diverse academic fields in higher education.[81] Considering these comments, it becomes evident *ANW* like education was well received and promoted.

In addition to gathering advice from the *onderwijsraad* and other advisory parties, the state secretary had also appointed two advisors to provide guidance in the development. The advice presented a clear picture of the direction the state secretary should take, emphasizing general education and study/learning

[78] 'Vervolgnota "Profiel van de tweede fase voortgezet onderwijs" en Beleidsbrief "Het Voorbereidend Beroepsonderwijs"', 13.
[79] 'Vervolgnota "Profiel van de tweede fase voortgezet onderwijs" en Beleidsbrief "Het Voorbereidend Beroepsonderwijs"', 14.
[80] 'Advies vervolgnota profiel van de tweede fase van het voortgezet onderwijs', Advies (Den Haag: Vereniging van Hogescholen, 8 October 1992), 5, Den Haag, Nationaal Archief.
[81] 'Advies vervolgnota profiel van de tweede fase van het voortgezet onderwijs', 6.

skills supported by profiles. "Through discussions with subject associations of the applied sciences, it has become evident to us that the amount of curriculum for the upper years is not only excessively large but also overly specific and far from being general education. This applies to both chemistry and physics as well as mathematics. If these subjects become more broadly educational in nature, they will appeal to more students rather than deter them."[82] While this implied a reduction in curriculum content in the upper years, the advisors argued that it does not equate to a loss of quality. Complaints about insufficient problem-solving skills and a lack of mastery of the curriculum existed in both higher professional education and academic education, with the solution lying more in skills development than in the curriculum itself. The advisors strongly advocated for an urgent revision of the content of the applied sciences subjects.

The aspect of general education continued to be emphasized in the advice. "For clarity, it may be necessary to underline that secondary education as a whole is general education and that general education is not limited to the compulsory part of each profile. Both the profile-oriented and free-choice parts are universally educational in content and only specific in the sense that they lay a foundation for the desired further education."[83] It seemed to be a recurring trend to emphasize the general educative nature of secondary education, paving the way for what would later become the proposal for the extensive general component with the three subjects MMW, CKV, and *ANW*. This ideology can partly be traced back to this advice and the period of educational reform.

Support for a 'science-like' general subject is already expressed. *The Vereniging van Samenwerkende Nederlandse Universiteiten* (Association of Dutch Universities), abbreviated as VSNU, is also of the opinion that a 'science-like' subject should be included in the compulsory part, since it trains critical thinking that is inherent in these subjects.[84] Their report also discussed extensively the sub-disciplines in which the ideology of general education is reflected. By dividing subjects into parts, it is possible to consider a general educative part alongside a more specialized technical part. This approach received much positivity from the advisors, although concerns are raised about feasibility, increased study workload, and the need for likely cultural changes in the school teaching environment.[85]

[82] J.C. Visser 't Hooft and L. Markensteyn, 'Rapportering van de adviseurs tweede fase voortgezet onderwijs', Advies, January 1993, 8, Den Haag, Nationaal Archief.
[83] Visser 't Hooft and Markensteyn, 8.
[84] Visser 't Hooft and Markensteyn, 9.
[85] Visser 't Hooft and Markensteyn, 19.

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The educational reform initiated with the 'discussion memorandum' in 1991 marked a significant step towards addressing the disconnect between secondary education and higher education. While the memorandum aimed to rectify various shortcomings in the educational system, such as ineffective learning paths and unequal educational opportunities, it faced criticism for its lack of clarity and open discussion. Concerns were raised about the potential loss of focus on general education and the emphasis on preparing students solely for higher education. What becomes clear in this early struggle is the imbalance in the envisioned purpose of the *Tweede Fase.* On the one hand it should give a sufficient general education, on the other hand it is more specialized and prepares students better for higher education/university. An imbalance that can be understood when considering the history of our Dutch educational system.

Despite these challenges, the subsequent follow-up memoranda sought to address these issues, emphasizing the importance of a broad general education and the exploration of *deelvakken*. Stake holders seemed to have had consensus about the need to revise the curriculum, but to also promote this more holistic approach of (science) education. An ideology which partly originated from the goal to give every student sufficient general knowledge. Nonetheless, concerns persisted regarding the feasibility of implementation and availability of resources to support the proposed changes. Moving forward, the logical step was to start working on the ideas in more detail. This was done, and a *Stuurgroep* (focus group) started to work on the project in 1993. Their main task was to start developing a more extensive concept of the *Tweede Fase*.[86]

2.2. Stuurgroep *Profiel tweede Fase*

In 1993 the educational reform transitioned towards a new phase, thinking about the *Tweede Fase* in more detail. Hence, the state secretary founded a *Stuurgroep* (focus group) of experts, which was decided based on consultation with the Tweede Kamer (House of Representatives). The focus group operated under the administrative responsibility of the State Secretary[87]. The task of the focus group encompassed a multitude of guidelines, as well as several stated preferences. In the written assignment to the focus group, their role was described as to primarily give advice and to facilitate the state secretary in the process of development. Key problems that were raised in the past years, like the balance between the profile part, the free part, and the general part are on

[86] 'OOVO-93.022 OOVO-Bijeenkomst', Besluit (Onderwijsraad, March 1993), 1, Den Haag, Nationaal Archief.
[87] 'OOVO-93.022 OOVO-Bijeenkomst', 2.

top of the list to tackle. Furthermore, the focus group explored in which manner each profile is balanced, but to also encourage the beta profiles, and to motivate and guide students in their choices that lay ahead[88]. Noteworthy guidelines set for the focus group included:

1. Changing the approach to studying. Instead of a leading lesson schedule, the total study time is considered, including self-activity. It is based on a 40-hour workweek, and study skills are incorporated into the program.[89]
2. The possibility of introducing a compulsory subject "Science."[90]
3. The possibilities of including, for example, logic/argumentation and/or philosophy in the vwo program and thus combining more examination components.[91]

Therefore, the composition of the focus group also marked the point *ANW* has been conceived. There was a desire for interdisciplinarity, a clear foundation of scientific knowledge in the general part, the possibility of integrating philosophy into the vwo, and the desire to make study skills more prominent in the program. The subject of *ANW* has attempted to address all these aspects, but was this too much of a good thing? Did the subject try to take on too many things simultaneously, making it unclear what is identity was? These questions are central in the second part of this chapter.

First publication of the *Stuurgroep* in 1994

The publication of the *stuurgroep* was *Scharnier tussen basisvorming en hoger onderwijs* (Pivot between basic education and higher education) and further elaborated on the previous memorandum from the perspective of this focus group. It is therefore a starting point for a new phase in the development of this educational reform. According to the *stuurgroep,* the necessity of the reform is obvious. The education at the time is based on a compartmentalized, fragmented view of human beings and the world. The holistic approach, about which many stakeholders agreed upon as well in the previous chapter, is by the *stuurgroep* an evident view of how education should be offered and organized.[92] In practice,

[88] 'OOVO-93.022 OOVO-Bijeenkomst', 3.
[89] 'OOVO-93.022 OOVO-Bijeenkomst', 2.
[90] 'OOVO-93.022 OOVO-Bijeenkomst', 3.
[91] 'OOVO-93.022 OOVO-Bijeenkomst', 3.
[92] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Tweede Fase: Scharnier tussen basisvorming en hoger onderwijs, een uitwerking op hoofdlijnen van de nota's profiel van de tweede fase van het voortgezet onderwijs', Publicatie (Ministerie van Onderwijs & Wetenschappen, January 1994), 9, Den Haag, Nationaal Archief.

this entails the shift in focus on more cross-disciplinarily subjects and working methods in which the acquisition of (study) skills are reflected.

Additionally, the focus group took the question from the (future) labour market seriously and emphasized on the importance of the Dutch knowledge economy and the increasing importance of internationalization and the education of students with a technical or beta-oriented study.[93] The focus group also incorporated three societal developments into the redesign. This concerned: 1) explosive increase in knowledge, which requires choices to what can be covered in secondary education; 2) the growth of communication possibilities and knowledge acquisition outside of school; 3) increasing degree of internationalization.[94] These developments meant that teachers not only acted as instructors but also as a guide for students in learning how to learn.[95] These three developments are also reflected in the solutions offered by the focus group, which in turn are reflected in the focal points of the subject *ANW.*

In *Scharnier tussen basisvorming en hoger onderwijs*, the subject *ANW* is mentioned for the first time in the curriculum. Although we have seen this mentioned in previous documents with different names and shapes, for example as a sub-subject of physics and chemistry. In this publication, the ideology finally comes together. References to the *Nature of Science* showcase how inherent this aspect was in the conception of *ANW* as a subject:

"In addition, and perhaps primarily, it is important for someone's general education to gain some understanding of how scientific knowledge has been developed. How phenomena in the natural sciences are described (often using models) and brought together in mutual coherence. How they can be influenced and lead to predictions as reliable as possible. These elements could find their place in a newly developed field of study, which also addresses technological aspects [Nature of Technology]. The subject must be of a general educational nature, which here means that the subject matter is placed in a historical, philosophical, economic, and societal context."[96]

[93] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 10.
[94] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 14.
[95] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 15.
[96] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 28–29.

Figure 16. *Cover of the publication 'Een uitwerking op hoofdlijnen' from the Stuurgroep profiel Tweede Fase.*

The idea behind the interdisciplinary approach is the interaction between disciplines and the presence of cross-disciplinary skills. Organizations like the NGL (Teacher's Union)[97] or the *onderwijsraad* were positive about the proposals regarding these interdisciplinary approaches. [98] By highlighting topics from different fields of study, they aimed to counteract the *verkokering van het onderwijs* (compartmentalization of education). Figure 17 portays this idea, in which in this example science becomes intertwined within society and collaborates with the many different perspectives that are represented. Students

Figure 17. *Science does not have to be limited in its methodology. Collaborations with different people with different perspectives is an aspect considered in ANW as well.*

[97] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens', *2e Fase Berichten*, 2 February 1994, 2, Den Haag, Nationaal Archief.

[98] 'Vergadering van de afdeling 2A van de Onderwijsraad', Notulen (Onderwijsraad (Afdeling 2A), 4 March 1994), 1, Den Haag, Nationaal Archief.

should look at society with an open mind, rather than through a *verkokerde* lens.[99] Although this concept of *verkokering* is not mentioned earlier in the discussed advisory reports, the term is not new in the political domain.

Throughout the 1990s the ministry of Education and Sciences underwent a drastic reorganization, in which decreasing the aspect of *verkokering* was a major focal point.[100] In the political context *verkokering* refers to the effect when certain, often societal problems, are only assessed from one perspective in which a certain ministry works on. When you only look at financial-economical aspects, while the problem is rooted in more specific local-societal aspect, your view becomes *verkokerd* and the solutions given will not suffice.[101]

However, when assessing reports from councils throughout this period references to the term *verkokerd* were not promptly given. Hence, this concept seems to be imposed on the educational sector from the political view, instead of a problem that arose from the sector itself. Nonetheless, minister Jo Ritzen talks about *verkokering* as one of the most pressing problems in education.[102] According to Ritzen, it is the unused talent due to the structure of the educational system that is the biggest loss.[103] The term *verkokering* seems to be jargon from the Hague to talk about the inherent problem of a system with boundaries and boxes in general. To counteract the problem, these boundaries should be torn down but not too much to lose the structure at all. At the end of the 1990s, *verkokering* at the ministry of OCW, after the reorganization, does not seem to be resolved. Instead of a *verkokerd* structure, ministry officials now need to include so many stakeholders they talk about a signature-culture. Paradoxical way to try to get rid of *verkokering.*[104]

Ironically, these paradoxical results manifest itself towards the end of the 1990s in education as well. When there was a big emphasis by various actors on students to chose subjects like physics and chemistry, the narrow view

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[99] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Tweede Fase: Scharnier tussen basisvorming en hoger onderwijs, een uitwerking op hoofdlijnen van de nota's profiel van de tweede fase van het voortgezet onderwijs', 29.

[100] 'RITZEN TEVREDEN MET MINISTERIE NA REORGANISATIE', *Het Financieele Dagblad*, 25 May 1994, 1, Lexis Nexus.

[101] R Zunderdorp, 'Het regeringsbeleid gaat aan versplintering ten onder', *NRC Handelsblad*, 20 July 1994, 1, Lexis Nexus.

[102] D.P. Schiethart and J. Verbraeken, 'DE DELFTSE HUISKAMERGESPREKKEN BIJ JO RITZEN', *Het Financieele Dagblad*, 12 May 1998, 1, Lexis Nexus.

[103] Schiethart and Verbraeken, 2.

[104] Sheila Kamerman and Frederik Weeda, 'Eilandenrijk met een imagoprobleem; HET BOLWERK - ONDERWIJS', *NRC Handelsblad*, 17 November 1998, 2, Lexis Nexus.

verkokering resulted in a lot of students choosing a 'beta' profile but not being able to succeed in a study afterwards.[105] A development which shows problems in the educational sector do not always originate in the (changing) society, but sometimes in the (changing) policies that are imposed.

Study load and the studiehuis

"Je moet bij mij niet aankomen met verhalen over een te zware studielast"
"You shouldn't come to me with stories about a study load that is too heavy."[106]
~ Nell Ginjaar-Maas

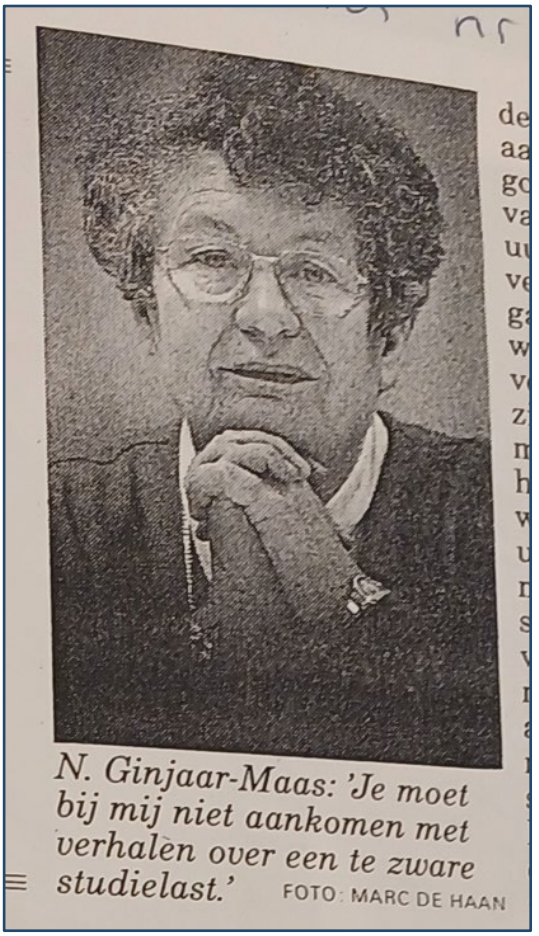

Figure 18. *During the early conception of the Tweede Fase and the Studiehuis was Nell Ginjaar-Maas State Secretary of Education.*

[105] Anton van Hooff, 'Brede vorming', *NRC Handelsblad*, 6 March 1997, 2, Lexis Nexus.
[106] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens', 4.

With the introduction of the *Tweede Fase*, the methodology of calculating the amount of study load changed as well. Instead of only considering the lessons students would have to follow, the time they worked beside the lessons was also taken into consideration.[107] However, debates about the increasing study load were certainly present. This becomes especially prevalent since the first two publications of the series of articles *2e Fase berichten* (second phase messages) covered this topic extensively. The *2e Fase berichten* served as a communication tool to keep stakeholders, including teachers, school leaders, parents, and students, informed about developments, changes, and other relevant information regarding the *Tweede Fase*. Although not all publications are easily accessible, it can be expected they covered policy updates, advice, practical guidelines, and other information relevant to schools and individuals involved in education during this reform period.

The first publication covered an extensive interview with the former state secretary Nell Ginjaar-Maas, in which she discussed the aspects of the upcoming educational reform that were relevant for students, school leaders and teachers. The most discussed topic was about study load, in which Ginjaar Maas clearly expressed you should not have to be worried: "We're basing this on a workload of 38 hours per week… being prepared for further studies, leading them to enter into the societal middle and upper class, where you work at least 38 hours per week, if not more."[108] According to Ginjaar-Maas, the developments steered towards the right amount of study load, but she did share an important criteria for the study load to be recognizable. "When we say 38 hours should be worked, I do expect that 38 hours are actually worked."[109]

To let the reform succeed, Ginjaar-Maas expected there to be a culture shift. Students should become co-owner of their own learning path and therefore create more responsibility. A didactical approach (not uncommon in the educational sector) based on the ideology to support the learner's intrinsic motivation.[110] To support this approach, the *Stuurgroep* thinks about school as a *studiehuis* (study home).[111] An approach which is not entirely new and already pioneered in few secondary schools like the Roland Holst College in Hilversum.

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[107] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'De studielast van leerlingen', *2e Fase Berichten*, 16 February 1994, 4, Den Haag, Nationaal Archief.

[108] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens', 4.

[109] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 4.

[110] Edward L. Deci and Richard M. Ryan, *Intrinsic Motivation and Self-Determination in Human Behavior* (Boston, MA: Springer US, 1985), https://doi.org/10.1007/978-1-4899-2271-7.

[111] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens', 4.

Ginjaar-Maas was extremely optimistic and confident that the didactical approach would spread throughout the Netherlands like a snowball effect.[112]

In the second publication of *2e Fase berichten*, further elaboration is provided on the approach to the study load and how it was calculated. The study load approach by the research bureau MesoConsult was portrayed in a positive light, revealing that students experienced less workload than what was stated on paper, contrary to what teachers believed.[113] Despite this publication, there was criticism on the study load approach and the development of education towards a more individualistic model. The NGL (teachers' union) for example, questions whether the significant freedom that the study load approach will offer for some students might be detrimental.[114] Nonetheless, the trend of individualization continues within education and is discussed more in depth in chapter 4.3. At the end of 1994 the *Stuurgroep* would publish part 2 of their *Scharnier tussen basisvorming en hoger onderwijs* which is more elaborate and called *Tweede Fase vernieuwt.*[115]

Tweede Fase vernieuwt

In the later publication from the *stuurgroep* more details were shared about primarily the set goals and skills for each subject, as well as the expected study load hours that were assigned to each subject. Remarks from the *stuurgroep* on the feedback that was given on the first part was not addressed extensively, although it's clear the *stuurgroep* is working on a well-balanced study load. [116] About *ANW* a more extensive list of mainly skills was formulated.[117] These skills clearly demonstrate the general nature of the subject, but the actual content guidelines were still not present. In December 1994 the *Vakontwikkelgroep ANW* started, which were given the task to create content guidelines for the subject and to formulate the examination program.[118]

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[112] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 5.

[113] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'De studielast van leerlingen', 2.

[114] 'NGL-commentaar op hoofdlijnen', *NGL Blad*, 24 February 1994, 1, Den Haag, Nationaal Archief.

[115] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Tweede Fase vernieuwt: Scharnier tussen basisvorming en hoger onderwijs deel 2', Publicatie (Ministerie van Onderwijs & Wetenschappen, October 1994), Den Haag, Nationaal Archief.

[116] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 28.

[117] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 118–21.

[118] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Tweede Fase Examen in het studiehuis', Publicatie (Ministerie van Onderwijs & Wetenschappen, December 1995), 15.

In the following year 1995 the *onderwijsraad* responds on the *Tweede Fase vernieuwt*, in which they agree upon the study load model. They do doubt the realisation of the number of 1600 hours study load per year, but they understand the expectation of students to work 40 hours for 40 weeks.[119] Interestingly, the number of hours was increased from 38 to 40. In a report from the *Tweede Kamer* about the *Tweede Fase vernieuwt*, discussion about primarily the dispersion of hours was prevalent and no comments were made about the possibly high study load expected from students. [120]

The *onderwijsraad* added some further remarks regarding the subject *ANW*, also mentioning the potential trivial nature that has been frequently noted before. Firstly, the connection to historical, philosophical, and socio-economic context sounded very idealistic to the *onderwijsraad*. Secondly, they mentioned that the environment should have a place in the content of the subject. An example given is "knowledge is power," which can be discussed with the example of petroleum and industry. Thirdly, the council emphasized the need for a necessary orientation period for the subject *ANW* to clarify the possible structure of the subject before delving into various themes. [121] However, in general the reception of the subject is quite positive and in debates in the *Tweede Kamer* they refer to *ANW* as "exceptionally meaningful enrichment" and that it is of great importance the subject receives its own place the educational program[122].

In the last phase of the *Stuurgroep* in 1996, it becomes evident nothing drastic is going to change in their views about the *Tweede Fase* and *ANW*. The roadmap is laid out, which specified the start of the enrolment of the *Tweede Fase* and *ANW* in the school year 1998-1999. The ideology of the *Studiehuis* became more widespread and it had set the goal that eventually every school would develop

[119] Wijziging van de Wet op het voortgezet onderwijs, de Wet op het hoger onderwijs en wetenschappelijk onderzoek en de Wet educatie en beroepsonderwijs in verband met verbetering van de aansluiting van het voorbereidend wetenschappelijk onderwijs en het hoger algemeen voortgezet onderwijs op het hoger onderwijs (profielen voortgezet onderwijs), 10.

[120] 'Vaststelling van de Begroting van de Uitgaven En de Ontvangsten van Het Ministerie van Onderwijs, Cultuur En Wetenschappen (VIII) Voor Het Jaar 1995', Pub. L. No. 23 900 VIII, 1994–1995 nr. 104 (1995).

[121] 'De tweede fase vernieuwt', Advies (Den Haag: Onderwijsraad, February 1995), 4, Den Haag, Nationaal Archief.

[122] Vaststelling van de begroting van de uitgaven en de ontvangsten van het Ministerie van Onderwijs, Cultuur en Wetenschappen (VIII) voor het jaar 1995, 5.

towards using this educational methodology.[123] However, the *Wijziging van de Wet op voortgezet onderwijs* did not directly make this mandatory at the start of the educational reform. Something which is quite considerate, since the task of teachers in the *studiehuis* changes drastically:

"In addition to teaching, there must be provision for guidance, assigning tasks and assignments, assessing study results, promoting collaboration between students, engaging in closer consultation with colleagues regarding student progress, and ensuring provision of educational resources and information and communication technology. In short, a hive of activity!" [124]

Besides the structure of the reform, the *Stuurgroep* set up various subject development committee's and assigned them to create some advice about the final exam program for that particular subject. Especially *ANW* required a completely new exam program, of which the first concept was published in December 1995 by the *Vakontwikkelgroep ANW.* Besides the examination program, a *Projectgroep ANW* was formed with the task of developing experimental lesson material, which was scheduled to be tested in the beginning of 1996.[125] This publication marked the end of the activities of the *Stuurgroep,* and the beginning of a more experimental phase of *ANW*. The *Projectgroep ANW* built their experimental lesson material on the basis of the exam program the *Vakontwikkelgroep ANW* formulated. This would imply they incorporated the many characteristics of what *ANW* should be about. That they emphasized on the evolution of significant scientific concepts within historical, philosophical, and socio-economic frameworks. Simultaneously, they included practical examples and focused on the development of (natural) science and technology that fits the framework of the *Studiehuis*.[126] In the next chapter we will find out if the experimental material lived up to their promises.

[123] Wijziging van de Wet op het voortgezet onderwijs, de Wet op het hoger onderwijs en wetenschappelijk onderzoek en de Wet educatie en beroepsonderwijs in verband met verbetering van de aansluiting van het voorbereidend wetenschappelijk onderwijs en het hoger algemeen voortgezet onderwijs op het hoger onderwijs (profielen voortgezet onderwijs), 5.

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[125] Henny Kramers-Pals, 'Op weg naar een succesvolle invoering', *NVOX*, September 1997, 330, NVON, https://nvon.nl/nvox/nvox-1997-7-geheel.

[126] Stuurgroep Profiel Tweede Fase, 'Advies Examenprogramma's havo en vwo: Algemene Natuurwetenschappen', Publicatie (Enschede: SLO, 1995), 3, Den Haag, Nationaal Archief.

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In 1993, the educational reform entered a new phase, transitioning towards a more detailed development. To facilitate this process, the State Secretary established a focus group of experts, selected in consultation with the *Tweede Kamer* (House of Representatives). Operating under the administrative responsibility of the State Secretary, the focus group was tasked with providing guidance and facilitating the implementation process. Central to their agenda were key issues such as balancing the curriculum components and promoting interdisciplinary approaches. Earlier claims in the conclusion of 2.1 come to fruition and their activities led to the conception of Algemene Natuurwetenschappen (*ANW*).

The publication of *Scharnier tussen basisvorming en hoger onderwijs* marked the first step in this development. This publication proposed a holistic educational approach, emphasizing on interdisciplinary subjects and the acquisition of essential (study) skills which are reflected and synthesized in *ANW.* Discussing scientific knowledge in historical, philosophical, and socio-economic context, activities proposed in *ANW*, showcase the interdisciplinary element and the relationship to Nature of Science. The introduction of the *Studiehuis* influenced the development of *ANW* as well, focusing greatly on the essential skills that are represented in the new subject. In a way, *ANW* became a tool for the *Studiehuis* to succeed.

However, challenges surrounding *ANW* and the *Tweede Fase* seem to be highlighted by the various councils. These worries were focused on the need to strike a balance between depth and breadth in the curriculum. As discussions progressed, concerns arose regarding the study load and the transition towards a more individualistic educational model and the fear of a therefore growing inequality. While debates continued, stakeholders expressed optimism about the positive impact of the reforms, particularly regarding *ANW*. Despite challenges, the reform set a clear direction for the future of education in the Netherlands.

2.3. Answer to the first question

With the conclusions from chapter two and the context from chapter one, an answer to the first proposed research question can be given:

Which factors determined the conception of Nature of Science education in the form of the subject Algemene Natuurwetenschappen (ANW) in upper general secondary education in the Netherlands in the 1990s?

Nature of Science emerged as a concept in Dutch secondary education in the shape of an ideology at the end of the 1980s and beginning of the 1990s, which in turn resulted in the conception of the subject *ANW*. Factors which are central in ANW do not originate out nothing but are clearly a product of its time, society and political landscape. We can summarize these factors in three categories:

1) **Sufficient general education:**

A big emphasize was on a broad general education, which was reflected in standpoints from councils and government officials. Especially when students had to choose between profiles that oriented them towards a specific domain, this general part was essential. From a social political perspective this was also there to ensure equality. ANW should be for all students and ensured they could assess, understand and value the (natural) sciences.

2) **Preparation for higher education:**

In order to improve the connection between higher education and secondary education, more focus was on (study) skills. Therefore, the focus and aim of ANW was entirely different than its related disciplines physics, chemistry and biology. It became a tool for the *Studiehuis* to show the new learning methodologies. Not only the content, but it's didactics was entirely new.

3) **interdisciplinary education to support an open-minded society.**

The element of *verkokering,* prevalent in politics and inherent in the structure of the educational system, was counteracted with the idea of interdisciplinary education. In chapter two the evolution of the educational system was described, showing how the compartmentalization of the system has always been there. Tackling an effect like *verkokering* required understanding of the need to balance a rigid educational structure with more mobility, choices and possibilities.

Looking ahead, the next chapter will delve into the period of introduction of the *Tweede Fase*, providing an opportunity to explore the broader context in which *ANW* was implemented. Within this chapter, tension among stakeholders was limited between councils and policy makers. But in the following chapter, all three layers of the operated curricula (see methodology) are considered to understand the developments. Of course, with the intention to finally understand why *ANW* was gradually valued less in the educational program.

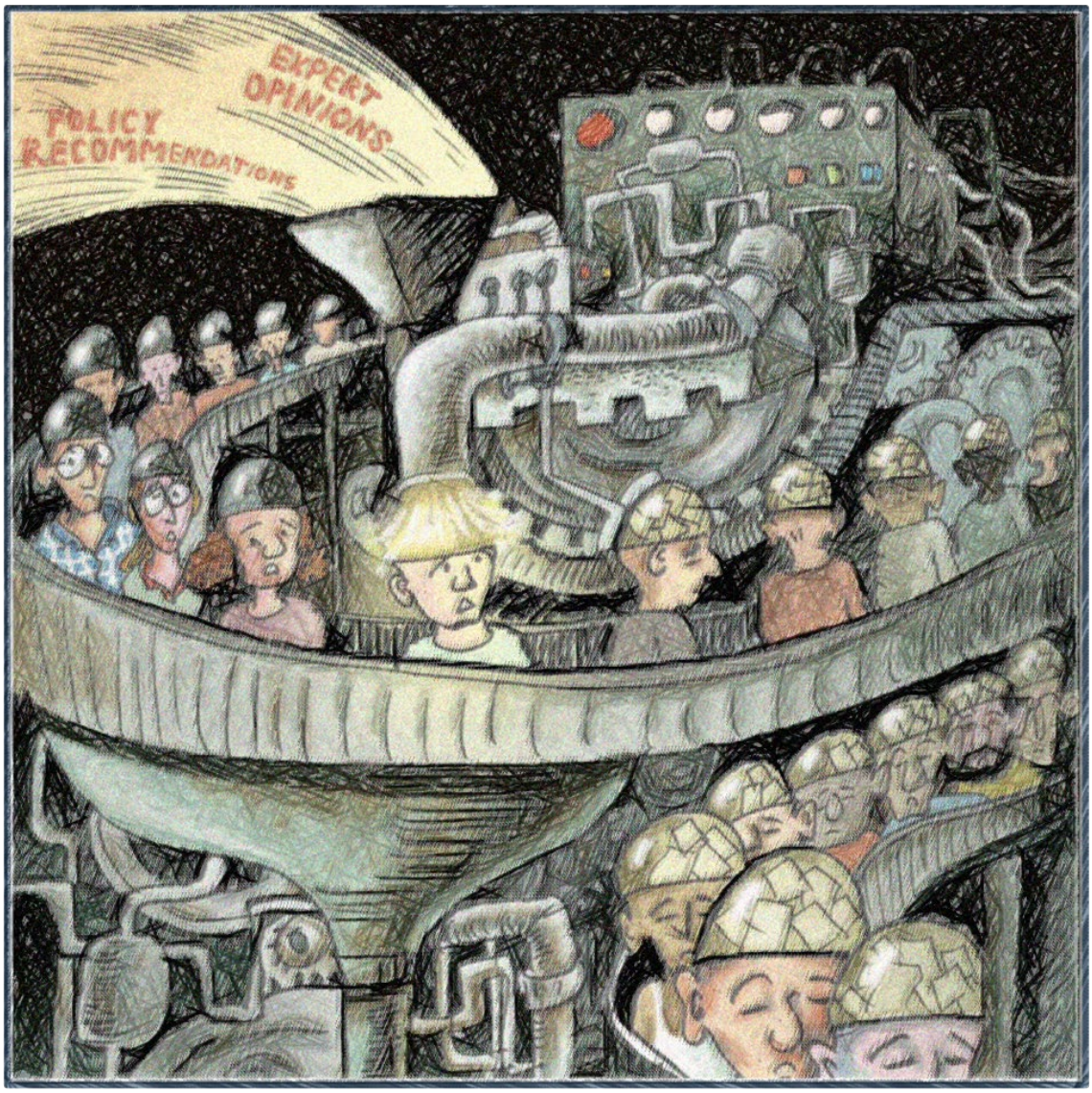

Figure 19. *The ideology behind ANW in the conception phase, does not reach schools as expected. As this illustration highlight, the bureaucratic machine or other mechanism is society change the eventual outcome to something else.*

Part II Demise

How underwent the early introduction of ANW?

Which support did it got to continue developing?

How did the public respond to ANW, and did it live up to its expectations?

Chapter 3. Introduction of ANW

After the task of the *Stuurgroep* had been completed and the *Vakontwikkelgroep ANW* had completed the assignment of designing a concept examination program, the *Projectgroep ANW* continued with the elaboration. To avoid confusion, it is important to separate especially these last two groups. The *Vakontwikkelgroep ANW* was responsible for the development of the examination programme, appointed by the *Stuurgroep Profiel Tweede Fase.* In turn, the *Projectgroep ANW* was formed from a partnership between SLO and the *Centrum Didactiek Bètawetenschappen (*Centre for Didactics Science of Utrecht University), abbreviated as CDβ, for the further elaboration of the *ANW* subject in the form of experimental teaching materials and a retraining programme.[127] However, there is overlap in members in both working groups.

In this chapter the road to and introduction of *ANW* is central. Understanding how the subject was introduced, may help us understand why the subject did not remain an important pillar of the *Tweede Fase*. To do this we first start with the views of members from the *Projectgroep ANW* on the experimental status of *ANW,* who published articles in *Tijdschrift voor Didactiek der B-wetenschappen*. Was the ideology behind *ANW*, formulated in the previous part, enacted? Is the *ANW* that started in 1998 and 1999 the *ANW* that was envisioned, and what did the *Projectgroep ANW* contributed to it? These questions will be answered in 3.1.

We will then chronologically move forward, pointing out critique or support from different perspectives. In this way it becomes clear the field of tension moved around constantly between policy makers, councils, publishers, teachers and students. Source material from primarily the *NVOX* as well as a variety of Dutch newspapers will be used in order to answer questions like: which stakeholders influenced the development process of ANW, and what was the view of teachers and other stakeholders in the field of this new subject? These questions will be answered in 3.2.

Lastly, we will look into the spread-out introduction of ANW over two years. Some schools started in 1998, but all schools had to start in 1999. Although in 1998 the introduction was not perfect, especially the start of *ANW* in 1999 brought a lot of controversy. In 3.3 we will focus on the drama that enfolded in this period and determine how this may have damaged the development of *ANW* as a whole.

[127] Kramers-Pals, 'Op weg naar een succesvolle invoering', 330.

3.1. The experimental phase of *ANW*

Before *ANW* was implemented in 1998, experimental lesson material was tested and evaluated in spring of 1996 and subsequently in the spring of 1997. At the end of 1997 the *Projectgroep ANW* finished their work and published their experimental lesson material and advises. Parallel to the development of lesson material, a training was setup for teachers. In beginning of 1997 this was with a small group as an experiment. The following year the training was setup in a bigger scale as preparation for the launch of the subject in August 1998. Although these developments seem to happen chronologically on first glance, everything happened in a very limited timeframe and therefore started to overlap.

To start with, agreement between the *onderwijsraad* and the *Vakontwikkelgroep* was actually not reached on the examination program in the summer of 1996. In the sixth issue of the NVOX in 1996, Theo van Welie criticizes the advice of the *Onderwijsraad* about not including the theory of evolution in the attainment targets of *ANW*. According to the *Onderwijsraad*, the theory of evolution "could do violence to the individual worldview of students".[128] According to Van Welie, who is himself a member of the *Vakontwikkelgroep*, the intention of the program is not to ignore the philosophical aspect, but to make visible the relationship and the sore spots between science and religion. According to him, this is exactly what *ANW* should be about.[129] Remarkably, the *Projectgroep ANW* was busy shaping the experimental lesson material, while the *onderwijsraad* was still criticising the level of end terms in the exam program which the *Projectgroep* uses as starting point. Parallel as well to these developments, publishers are working on *ANW* teaching and student materials yet against the advice expressed by the Ministry of OCW.[130] Developments in the *ANW* subject seem to run alongside each other at the various levels of the written and enacted curriculum in an unconstructive way. This pattern characterizes the process from 1996 till the enrolment in 1998.

In a special issue of the *Tijdschrift voor didactiek der β-wetenschappen* (TDβ), published towards the end of 1997, several related and probably coordinated articles have been published about *ANW* in a thematic number. Although called a magazine as well, the target audience of the TDβ is clearly different from the target audience of the NVOX. The more academic style and its discussed subjects

[128] Theo van Welie, 'De Beagle is weer gestrand', *NVOX*, June 1996, 260, NVON, https://nvon.nl/nvox/nvox-1996-6-geheel.
[129] van Welie, 260.
[130] Anneke van Ammelrooy, 'Nieuw prachtvak laat niet langer op zich wachten', *NVOX*, December 1996, 478, NVON, https://nvon.nl/nvox/nvox-1996-10-geheel.

hint it is more aimed at an academic audience working as teacher trainers, researchers or policy makers, than towards teachers themselves. In this section four of these articles are discussed to get an idea of the development of *ANW* in 1996 and 1997. Three out of four of the authors were either part of the *Projectgroep ANW* or *Vakontwikkelgroep ANW,* hence giving insight in their perspective on ANW its development.
These publications are the result of the *Projectgroep* carrying out the following activities:
"- carrying out a preliminary study into the content of and experiences with a subject such as *ANW* in the Netherlands and abroad.
- writing and testing teaching materials in practice.
- advising authors of educational publishers.
- writing a curriculum.
- making a proposal for the in-service training of teachers."[131]

These five aims have been tackled by the *Projectgroep ANW*, a description of which is given by H.M.C. Eijkelhof, chair of the *Projectgroep ANW*[132], M. Pieters, member of the *Projectgroep ANW* and secretary of the *Vakontwikkelgroep ANW*[133] & M. Kapteijn, chair of the *Vakontwikkelgroep ANW*[134] and chair of the commission responsible for the teacher retraining[135]. When considering the set-out method, these three authors cover the three layers on which the curricula operate as well. Eijkelhof considered the preliminary study into content and experiences, but also of the experimental teaching material (layer 2 & 3). Pieters described what considerations need to be taken in the development of teaching materials and a curriculum (layer 1 & 2). Kapteijn discussed experimental retraining courses for *ANW* teachers (2 & 3). Although the articles are all related, we'll discuss them separately for clarity purposes, especially when looking ahead to the problems ANW will face described in 3.2. Which problems did each of these authors expected? Could we argue *ANW*'s failure is due to its lacking experimental phase, or can we conclude that the *Projectgroep ANW* did what they could?

Experience with experimental lesson material

Eijkelhof's work is a good start, looking at the constructive character of these authors. To begin with, Eijkelhof sets the tone when it comes to the idea behind *ANW*, but also where it comes from. According to him, *ANW* is a profession in which (technological) content is placed in historical, philosophical, economic

[131] Eijkelhof, 111
[132] Kramers-Pals, 'Op weg naar een succesvolle invoering', 333.
[133] Kramers-Pals, 330.
[134] van Ammelrooy, 'Nieuw prachtvak laat niet langer op zich wachten', 478.
[135] Kramers-Pals, 'Op weg naar een succesvolle invoering', 332.

and social contexts. "This sound was not new: such education had been advocated for years by the Science-Technology-Society (STS) supporters."[136] Hence, it would be expected that experience at home and abroad with STS education helps *ANW*. For example, four English-language methods were consulted that appear to be functional at first glance, but which, upon further investigation, do not fit well with the form, interaction, content, or simply the goals pursued with *ANW*.[137] Despite that, useful elements can be used as inspiration. Two Dutch methods were also consulted: Theory of Knowledge, which originated from international schools, and *Natuurhistorische Oriëntatie* (Natural History Orientation), which was taught as a subject at the OS Bijlmer in Amsterdam.[138] Both courses provide inspiration, but also do not provide a concrete blueprint for the *ANW* subject.[139] Eijkelhof's analysis shows: ANW is new.

Thus, in 1995 the project group started designing new experimental teaching materials on the subject areas: Life, Biosphere, Matter, and Solar System & Universe.[140] Remarkable in Eijkelhof's article, is the immediate emphasis on the shortcomings of the trial period. For example, the writing time for the teaching material was limited to two to three months. "This is not much, given the many discussions about subject content and didactics that are necessary to design teaching materials for a multidisciplinary subject without any tradition that has to be taught by teachers with a generally monodisciplinary background."[141] In the end, the program was tested with six 4havo and four 4vwo classes, but unfortunately not even all the themes were completely tested due to class cancellations.[142] It is striking that *ANW*, promoted as an essential subject for the success of the *Tweede Fase* and *Studiehuis* receives according to the developers such limited time.

The results of the research lead Eijkelhof to a number of conclusions about the lesson material, as well as student experiences. For example, he described that in the beginning, students had mixed feelings about the *ANW* subject. Some were neutral about it, while others approached it negatively due to the perception of

[136] H M C Eijkelhof et al., 'Ervaringen met experimenteel lesmateriaal voor het vak Algemene Natuurwetenschappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997): 111, https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.
[137] Eijkelhof et al., 113.
[138] Eijkelhof et al., 113.
[139] Eijkelhof et al., 114–15.
[140] Eijkelhof et al., 115.
[141] Eijkelhof et al., 116.
[142] Eijkelhof et al., 118.

overlapping content. The different didactical approach and more freedom to work project based in the lessons was appreciated. The identity of the profession, as well as its concrete usefulness, was not recognized by everyone. This is shown in a survey, since only one-third of the students understood aspects that were also the intention of the designers, such as: 'you learn how biology, chemistry and so on are created'.

One of the main conclusions is that pupils do not yet have a sufficient idea of the identity of the subject.[143] This in turn explains the diverse reactions of the students in both a positive and critical way. Eijkelhof therefore described the trial period as very useful, since positive aspects, such as providing space for different learning styles, but also critical aspects, such as the vague identity, come to the surface.[144] Especially the lack of a distinct identity will be a reoccurring theme, of which it is clear Eijkelhof did not had a solution.

ANW on curriculum level

Pieters collaborated further on the identity of *ANW* and started to give shape to a structure which helped to clarify *ANW's* position. To do so, Pieters began by exploring the experimental results Eijkelhof covered already. "It was fun to do, but it's not yet clear to me what *ANW* is about."[145] According to Pieters, this remark by a student emphasized the strengths and weaknesses of the profession. Connecting to daily events and interests of the student can easily be done, but because the overarching aims are connected at a high level of abstraction, cohesion for students is sometimes hard to find.[146] Pieters therefore emphasized that a working set-up, a question skeleton, is essential in determining the identity of the subject. For him, this is a combination of object and method.[147]

[143] Eijkelhof et al., 125.
[144] Eijkelhof et al., 125.
[145] M Pieters, 'De mens, materie, modellen, machten van tien: overwegingen bij een leerplan Algemene Natuurwetenschappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997): 129, https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.
[146] Pieters, 129.
[147] Pieters, 145.

	1	2	3	4	5	6	7	8	9	10
A Waar haal je kennis vandaan?	x	o	x		x			o		
B Hoe gebruik je kennis?			o	x	x	x			o	x
C Hoe weet je dat iets waar is?	x		x	x			x	o		
D Mag alles wat kan?						x				o

Figure 20. *Ten general end terms, linked to the four process questions. The x means the relation is intended, but not clear. The o means the relation is obvious.*

Therefore, it becomes clear that Pieters does not want to commit himself to a particular content. He specifically stated that the *ANW* curriculum must be designed in conjunction with the didactics, by taking into account the *content questions and process questions asked.*[148] The program can then be designed on the basis of these *process questions* and be connected to a topic that highlights this aspect. Eventually, this question skeleton became the validation of the four chosen domains Eijkelhof already mentioned: Life, Biosphere, Matter, and Solar System & Universe. Hence, the design of *ANW* and its identity, on the curriculum layer of core goals and end terms, is inherently connected to the didactics that make the subject work. I would even claim that the identity of *ANW* cannot be found in its choses topics, but exclusively in its didactics. When embracing this claim, it comes to no surprise *ANW* struggled with a vague identity throughout its lifespan.

In the end, Pieters expressed the challenge for both the developers and the *ANW* teachers in the subject. They must succeed in making the identity of the subject self-evident. Pieters warns the developers by referring to the work of Monk and Osborne (1997): don't make *ANW* a subject in which stories appear every now and then in order to bring in some 'human interest' and don't focus too much on the epistemological approach by only talking about the rules of science. "Science is not just methodology, it is also interpretation; not only syntax, but also semantics."[149] It is clear from Pieters' description that *ANW* should not become a subject with a sum of science subjects. Knowing that the teachers who will teach *ANW* will graduate from the science subjects, Pieters expects it to be quite a challenge for both developers and teachers. It requires a paradigm shift from the mono profession perspective to a meta level in which methodological,

[148] Pieters, 142.
[149] Pieters, 136.

ethical and hermeneutical questions are central.[150] In contrast to Eijkelhof's work, Pieters gives a more detailed approach on how to tackle *ANW's* vague identity. Nonetheless, in later publications in the NVOX discussed in 3.2, this expected difficulty for both teachers and publishers becomes reality.

Teacher training program

The last contribution of the *Projectgroep ANW* in the *Tijdschrift voor didactiek der Bètawetenschappen*, which is still to be discussed, is Kapteijn's work on the experimental training course in *ANW*. This course was set up as a training for teachers of biology, chemistry, physics (and later limited geography) and ran from January to July 1997. Good to note right away is that the development of this course only started in October the year before.[151] Kapteijn admitted that setting up the course was sometimes an improvised process, with only a few broad discussions about the content and approach. In the end, it was also planned that six Dutch universities, with a teacher training programme in these three scientific subjects, would provide the training courses in January 1998, but in January 1997 these parties were still in full discussion about the cooperation.[152] A worrying start to say the least.

The proposed duration of the course was 120 hours, during which the students put together a portfolio in a cooperative manner during the course duration[153]. Something that was received positively by the participating teachers in a later evaluation. However, several challenges remained. For example, it was already clear in the design that the 120 hours would be insufficient to allow teachers to master the content and didactics of *ANW*.[154] The report also revealed that once again the identity of *ANW*, as well as the lack of adequate assessment of philosophical and ethical issues, was experienced as problematic.[155] The already expressed concerns by Eijkelhof and Pieters are reflected in the results of the experimental course. If the identity of ANW is not clear among teachers following the training program, how could it be clear for students at all?

A student at the University of Twente, M. Bakhuis, carried out an evaluation of the course as part of her studies.[156] Advice based on the evaluation points out

[150] Pieters, 146.
[151] M Kapteijn, 'De experimentele omscholingscursus Algemene Natuurweten schappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997): 160, https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.
[152] Kapteijn, 161.
[153] Kapteijn, 162.
[154] Kapteijn, 161.
[155] Kapteijn, 165–66.
[156] Kapteijn, 167.

that the time pressure in the course was too high for an effective transfer of both professional and didactic knowledge[157]. Furthermore, it is clear from one of the logbooks that the duration of 120 hours was insufficient to go into depth about the many facets of *ANW*, including the historical, philosophical and ethical aspects.[158] The need for more well-thought examples of content and didactics is clear, as is the importance of practical didactic skills for *ANW* teachers. When considering our prior conclusion about the relation between didactics and identity, it comes to no surprise teachers express their uncertainty as well.

According to Kapteijn, this content will still come when the teaching material has been designed by developers, but given the pace at which everything had to be developed, she is not surprised that this was still lacking.[159] From the spring of 1998 this material will be available, but during the experimental training course it is clear that the technical language and the didactic language for *ANW* are very much in their infancy.[160] In 3.2 the teaching training program is more extensively, but it is obvious some key problems are known by Kapteijn. However, subsequently acting to make sure these problems are resolved is a step which seemed to be more difficult.

The critical reflection of these three authors on the development of *ANW* is helpful and elucidates its underdeveloped status. Although on paper the set goals are formulated, a lot of work in developing its essential didactical approach still has to be done. This was clearly known by these authors, expressing their worries about *ANW's* identity, still to be developed teaching methods and teacher training program. Nonetheless, this was all being developed parallel and on the go. The *Projectgroep ANW* was not lacking the knowledge to develop a well prepared subject, it was simply lacking the time to do so.

Critical views on *ANW* in the same magazine

In the same issue from the *Tijdschrift voor didactiek der Bètawetenschappen* K.Th. Boersma, from the biology department of the CDβ, expressed his concerns about the identity of *ANW* but also of its early introduction. "Of course, a new profession doesn't fall out of the sky."[161] Although publishers and educational institutions are busy making preparations, Boersma's concerns are not based on nothing, and he refers to another subject in secondary education that struggled

[157] Kapteijn, 168.
[158] Kapteijn, 170–71.
[159] Kapteijn, 174.
[160] Kapteijn, 175.
[161] K Th Boersma, 'De identiteit van het vak Algemene Natuurwetenschappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997): 149, https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.

with similar issues. A too quick introduction results in the absence of an identity of its own, clear demarcation and prioritization of content and ultimately overloading.[162] It is understandable that Boersma delves further into this 'identity of ANW'.

"Now that preparations are being made for the introduction of *ANW*, we can conclude that it is still unknown whether the examination programme can be carried out, and that it is unknown whether the intended learning effects can be achieved, even if there are teaching materials. This means that *ANW* will be introduced before the identity of the subject has been worked out to a considerable extent"[163] According to Boersma, *ANW* simply does not meet the requirements that you can set for a subject to develop its own identity, worryingly knowing that this will really start a year later in school year 98/99. Boersma also knows where the bottleneck lies in the formation of ANW's identity, namely the focus and approach of the teaching material.

"While the titles of the themes suggest a scientific content, the students are expected to recognize the process questions as a common thread."[164] In his *De mens, materie, modellen, machten van tien,* Pieters refers to four process questions (see Figure 20). According to Boersma, these questions are not sufficiently addressed in the experimental teaching material, and he is not surprised that students only see the content and not the underlying process question. According to Boersma, they mislead students in this way and he would like to see what the scientific-theoretical and ethical questions are used as an organizing principle.[165] He suggest, use the 10 questions from the question skeleton, don't tie it to one topic but show how this transcends the topics. Also consider insights from more recent epistemology and the sociology of science, such as the work of philosopher of science Latour, and do not focus only on the scientific method. Show that science is not completely objective, show the humanity behind science.[166]

One skill that is reflected in the reform of education is learning to learn. According to Boersma, this is only effective in the context of actual domain-specific knowledge. According to him, *ANW* has a unique position in this. For example, it is possible to reflect on the knowledge about learning of natural science, but also to reflect on the 'learning' of the students themselves.[167] Boersma's criticism of the current state of affairs is clear, the subject should focus more on reflecting on the natural sciences rather than the natural sciences

[162] Boersma, 149.
[163] Boersma, 151.
[164] Boersma, 152.
[165] Boersma, 153.
[166] Boersma, 154.
[167] Boersma, 156.

themselves. Looking at the work of Pieters and Eijkelhof, they will probably agree with this, they all share the concerns that without this clear focus *ANW* will not have a clear identity.[168]

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Concluding this section, much about the experimental troubles *ANW* had have been revealed. In the introduction two questions were raised, namely: Was the ideology behind *ANW*, formulated in the previous part, enacted? Is the *ANW* that started in 1998 and 1999 the *ANW* that was envisioned, and what did the *Projectgroep ANW* contributed to it? Two questions that can be answered with certainty, to which the answer is in any case causing a lot of concern for ANW.

The *Projectgroep ANW* played an important role in the experimental phase of *ANW*, designing experimental teaching materials, advising publishers and creating the teacher training programme. Insights from Eijkelhof, Pieters and Kapteijn help to understand the development of *ANW* from their perspective, but also elucidate the many shortcomings of *ANW* during its experimental phase. Eijkelhof directly points out the problem of a lacking identity and the fact that *ANW* is entirely new in its content, as well as its didactics. Pieters elaborates on these results, emphasizing on the fact that the content of *ANW* should be developed in coordination with the didactics. The identity of *ANW* is a combination of object and method. These challenges are then visible in Kapteijn's teacher trainer programme, which is being developed on the go. Additionally, the design of the training program made clear that its participants would not be sufficiently trained to master the content and didactics of *ANW.* Unsurprisingly, the discourse on ANW's identity and the work of the *Projectgroep* raises concerns among specialists. Boersma rightly stresses the need for a well-developed identity to avoid educational shortcomings, emphasizing deeper engagement with scientific processes and interdisciplinary perspectives. And although the worries are expressed on paper, the situation that enfolded is not reflected in practice.

It is clear the ideology behind *ANW* is formulated quite well. However, publishers were already well on there way developing educational methods, while the experimental phase was still running. As Eijkelhof and Kapteijn both expressed, the time they had for actual development was too short. Hence, *ANW* will start as an underdeveloped subject in 1998 and 1999, not living up to what was envisioned for the subject and its actual potential.

[168] Boersma, 156.

3.2. Discussion about ANW in the educational field

Two years before the previously discussed issue from TDβ, the starting signal was given to discuss *ANW* with a larger group of stakeholders. On 22 November 1995 there was a conference in Utrecht with 200 candidates about the subject.[169] It is noteworthy that at this point no concrete teaching or student material was developed yet. In preparation, NVON chairman Bert van Beek made an appeal in the NVOX: think along and continue the discussion. Guido Lissen, a motivated physics teacher, responded to this call and expressed his slight disappointment.[170] According to him, the goal of ANW should be to give students a lasting interest in the natural sciences, with for example the use of popular science literature. Instead of already deciding on certain topics, students should have the autonomy to choose and conclude their activity with e.g. a literature assignment. [171] Additionally, Helène Budé (chairman of the association of history teachers), criticized and shared her disappointment as well about the *ANW* subject and the *Vakontwikkelgroep ANW*. She finds it strange that there are no historians in the *Vakontwikkelgroep*, but also that there has been little consultation with the Human and Social Sciences (MMW) development group. *ANW* was supposed to be a subject that enriched the natural science with social, historical and philosophical perspectives, thus why was there no consultation with these professionals? Hence, she proposes imbedding *ANW* in the mono subjects if it was not living up to these expectation.[172]

Van Beek asked for a discussion, one he surely got. Hence, the NVON is positioning itself with their magazine (NVOX) as a platform for teachers and stakeholders to share their opinion. In order to give advice, the NVON starts recruiting interested teachers in the editorial board of the future *ANW* method.[173] Something that's been done in quite a haste, since the publishers are already working on *ANW* teaching methods. Van Beek also reacts to these developments with disappointment, because "in the worst case, this teaching method about a completely new subject, aimed at a completely new student population (the entire upper years of HAVO and VWO) should be on the market in early 1998 if the State Secretary remains with the introduction date of 1 August 1998." In Van Beek's opinion this is clearly too soon, and to listen

[169] Guido Linssen, 'Algemene Natuurwetenschappen (*ANW*): een voorstel', *NVOX*, January 1996, 16, NVON, https://nvon.nl/nvox/nvox-1996-1-geheel.
[170] Linssen, 16.
[171] Linssen, 18.
[172] Wil van den Dool, 'Op weg naar een methode voor Algemene Natuurwetenschappen', *NVOX*, January 1996, 29, NVON, https://nvon.nl/nvox/nvox-1996-1-geheel.
[173] Bert van Beek, 'Van de Voorzitter: Algemene natuurwetenschappen (*ANW*)', *NVOX*, February 1996, 70–71, NVON, https://nvon.nl/nvox/nvox-1996-2-geheel.

carefully to fruitful ideas that have been shared via conferences or publications time is essential. The question is whether, in the hasty process, sufficient attention can be given to proposals such as those made by Linssen in the January 1996 publication.

This brief example shows the discussion in the field about ANW. The field of tension about the development of *ANW* starts to include the opinion of teachers as well and up till 1998 plenty of teachers commented on its development. The most pressing problems addressed by teachers boil down to four categories: its identity, development of (teaching method) books, teacher training and lastly the size of the overall educational reform. In the 6th issue of 1997, the first three out of four of these categories are mentioned by the author Rob Knoppert, physics teacher and at the time education columnist for *NRC Handelsblad*. His concerns are clear: *ANW* will start with no clear exam, there are no textbooks, and a large part of the teachers will start as a layman amateur.[174] Additionally, these categories reflect what is later that year discussed by Eijkelhof, Pieters and Kapteijn(see 3.1). Therefore, relating the thoughts that were shared in the NVOX and newspapers by teachers and other stakeholders might give new insights. What were these thoughts and how were they heard by the groups in charge of the developments? Let's discuss the categories one by one.

Identity

The most pressing and discussed problem of *ANW* is about its identity. Knoppert is sympathetic to the subject, however, he does not understand the made choices concerning the covered topics in *ANW*. For example, there is no integration of disciplines, because there are clearly defined themes about biology (life and biosphere), chemistry (matter) and physics (solar system and universe). Two out of four themes are centred around biology. In the physics part, topics are discussed that do not occur in the prior educational program, but themes about electricity and energy are skipped.[175] Since the emphasis should be on reflection within *ANW* on the most essential parts of natural science, it is indeed strange that a subject that is not covered in the first three years of the havo/vwo program is central. Was this aspect of reflection not supposed to be part of the identity of *ANW*?

[174] Rob Knoppert, '*ANW* - is het wat?', *NVOX,* June 1997, 286, NVON, https://nvon.nl/nvox/nvox-1997-6-geheel.
[175] Knoppert, 288.

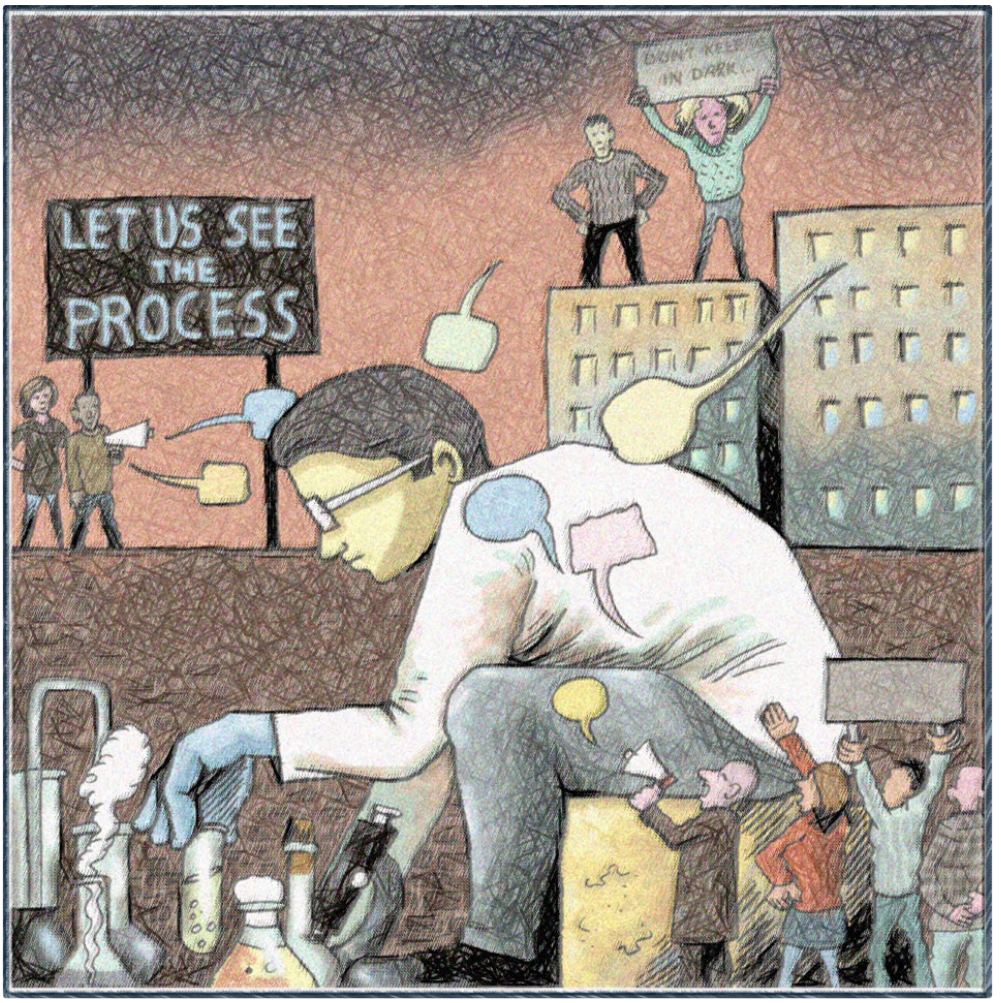

Figure 21. *One of the aims of ANW is the showcase the process of how science is done. However, teachers were confused about aim and of ANW. Should it be about scientific practice itself, or about its effect on society?*

During the final meeting of the *Projectgroep ANW* on 23 June 1997, presentations were also given by students that were part of the test groups Eijkelhof mentioned earlier. The students shared their experiences and gave recommendations to improve the subject. The author in the NVOX concluded on the basis of these student presentations that: "How well you like *ANW* clearly depends on what you make of it yourself."[176] The subject fails and becomes boring if you are not interested, but it generates enthusiasm and can quickly be tough if you put in the effort. Worryingly, only about 25% of the students recognised the programme's core aims that deal with the idea behind science, as one student said: "*ANW* is the study of problems around you. It brings physics,

[176] Kramers-Pals, 'Op weg naar een succesvolle invoering', 331.

chemistry and biology closer together... You look at one subject in different ways."[177] Students give the following advice: give the subject more status through tests and (central) exams, improve the coherence of the subjects, improve the clarity of the goals and the way of thinking.[178] These tips show the necessity for *ANW* to present itself with a distinct identity.

The discussion about the identity of the profession continues throughout 1998. Especially in the opinion column of the NVOX, teachers or educational specialists are given the change to share their thoughts about educational developments or previous NVOX articles. Fer Coenders, chemistry teacher and later teacher educator, explained how a subject gains its distinct identity, and how he thinks this should be done for *ANW*. For example, he acknowledges Rob Knoppert's article in the NVOX June publication of 1997 in which Knoppert remarks that the subject is determined by the examination programme, the teaching method, the exam and the teacher. However, in the case of *ANW* there is no central exam and, according to Coenders, the exam program is rather vague and requires further elaboration. Eijkelhof underscores this as well, stating it is necessary to work out two questions to define the exam program: 'what is educational?' and 'what is teachable'?[179] Due to these limitations, the teaching method and the teacher's contribution to the subject become more decisive. To make these aspects workable, time is necessary. Therefore, Coenders argues that some room for experimentation is needed in the coming years to translate the intention of the profession into concrete knowledge, skills and attitude.[180] This is how *ANW* gets a more distinct identity.

The balance between the use of the teaching method and the teacher's own interpretation is always present in education, but even more so when there is no central exam. This brings advantages and disadvantages, because there is more freedom for the teacher, although the subject can be taken less seriously by students.[181] It therefore depends on the quality of the teaching methods, and how much the teacher wants to deviate from it. In this way, the identity of the teacher in relation to the subject is formed, but to accomplish this experimentation is essential. Space that is certainly not extensively available in the period before the start of *ANW*.

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[177] Kramers-Pals, 332.

[178] Kramers-Pals, 332.

[179] Harrie Eijkelhof, 'De toekomst van het vak algemene natuurwetenschappen', *NVOX*, September 1997, 344, NVON, https://nvon.nl/nvox/nvox-1997-7-geheel.

[180] Fer Coenders, '*ANW* - ontwikkel het mee', *NVOX*, May 1998, 276, NVON, https://nvon.nl/nvox/nvox-1998-5-geheel.

[181] Coenders, 276.

Even at the start of the subject in September 1998, teachers were divided on the identity of the subject. The opinion column of Hans Dekker, teacher in physics, chemistry and *ANW,* shows how teachers differ in interpretation when it comes to how *ANW* should be given. Dekker reacts to an anonymous author in the April issue, who promotes methodologies like class discussion, roleplaying or an ethical debate.[182] "Certainly in the first few years, *ANW* will definitely not be a class discussion based subject."[183] Dekker's reasoning is based on the idea that science teachers are uncomfortable with these methodologies, but may also not see its necessity. Furthermore, the anonymous teacher argued for an *ANW* subject in which insights from various teachers of social studies, languages, geography, history and philosophy can contribute. Mr. Dekker disagrees again, arguing that the design of the subject is a task given to his colleagues in the natural science domain. These arguments show the different approach to *ANW*, due to its still vague identity.

These different perspective are highlighted when assessing the interpretation of the end terms of the subject. Contrary to the author of the April issue, Dekker believes that the scientific classroom experiments are certainly important and therefore disagrees with the idea that classroom discussions are becoming a greater part of the subject.[184] However, the NVOX editorial staff nuances Dekker's claim and explains that the interpretation of 'science classroom experiment as being the 'practical assignment' is limited. For example, this can take the form of: "conducting limited research into phenomena in nature or on technical products and conducting a (literature) study into social applications of natural science or technology."[185] Dekker's views are therefore an example of the narrow view some teachers might have of the subject. A view which only focuses on the content biology, chemistry and physics and how these fields are connected. This contrasts the view of the anonymous teacher, which was based on the reflective and analytical aspects that make the subject philosophical and scientific-historical in nature. Debates in the NVOX show the identity of *ANW* is certainly not obvious at the time the subject started to be given in schools. The lack of a distinct identity is an immense hurdle for the operated curriculum in the first layer of core objectives and end terms, to transcend to the second layer

[182] 'Invoering van *ANW* op school', *NVOX*, April 1998, 203–4, NVON, https://nvon.nl/nvox/nvox-1998-4-geheel.
[183] Hans Dekker, 'Invoering van *ANW* op school: Reactie', *NVOX*, September 1998, 418, NVON, https://nvon.nl/nvox/nvox-1998-7-geheel.
[184] Dekker, 418.
[185] Redactie NVOX, 'Naschrift bij Invoering *ANW* op school: reactie', *NVOX*, September 1998, 418, NVON, https://nvon.nl/nvox/nvox-1998-7-geheel.

of textbooks and teaching methods, let alone to the third layer of practical application in the lesson (method).

Teaching methods

During the experimental phase between '96 and '98, books were fully in development and teachers had a hard time in choosing a fitting teaching method to their liking. Knoppert mentioned that much of the information came too late for publishers. When results from experimental lessons were shared, publishers were well on their way in development.[186] This concern is also expressed by Piet Lijnse in *NRC Handelsblad*, professor physics didactics in Utrecht, stating that: "these kind of projects [experimental lessons] should have been finished… This step is skipped by policymakers. Especially for these kinds of renewals you need thorough subject didactical development projects."[187] How can this process run side by side? Especially since the teaching method is such a defining aspect in the success of the subject.

State Secretary Netelenbos expected these troubles and was in 1996 not yet happy with the state of the subject. Therefore, she extended the period the *ANW* subject could be developed against the wish of her own party members of the PvdA. They were afraid that postponement would lead to cancellation. Nonetheless, schools got the choice to start with *ANW* in 1999, instead of 1998 to make sure the program and teaching methods developed by publishers were more refined.[188] However, educational publisher still aimed to finish the teaching methods in begin 1998 since it was expected quite a lot of schools still wanted to start with *ANW* anyway. Splitting up this period made no sense for publishers; they were not going to reconsider their entire teaching method after only one year. In result of this delay, parties in the parliament started to propose a delay of the entire *Tweede Fase* and not only *ANW*. Confusingly, Netelenbos tried to convince the parliament in May 1997 to stick to August 1998 as the introduction date for the full *Tweede Fase,* excluding *ANW.* In the end, a compromise was reached, and schools could choose whether to start in august 1998 or august 1999.[189] Unsurprisingly, the extension Netelenbos had in mind did not work out as intended. It implied educational publishers had to write the teaching methods in merely two years, since they were still aiming at the starting

[186] Knoppert, '*ANW* - is het wat?', 287.
[187] Jacqueline Kuijpers, 'Nooit extreem; Schoolboekenuitgevers streven naar "haalbare vernieuwing"', *NRC Handelsblad*, 22 February 1997, 4, Lexis Nexis.
[188] 'Vak Natuurwetenschappen later ingevoerd', *De Stem*, 11 June 1996, sec. Binnenland, 3, Lexis Nexis.
[189] 'Compromis van coalitie over uitstel onderwijsvernieuwing krijgt veel kritiek', *de Volkskrant*, 24 May 1997, Lexis Nexis.

date of august 1998. Development time could have been longer, if the policymakers in The Hague were more decisive.[190]

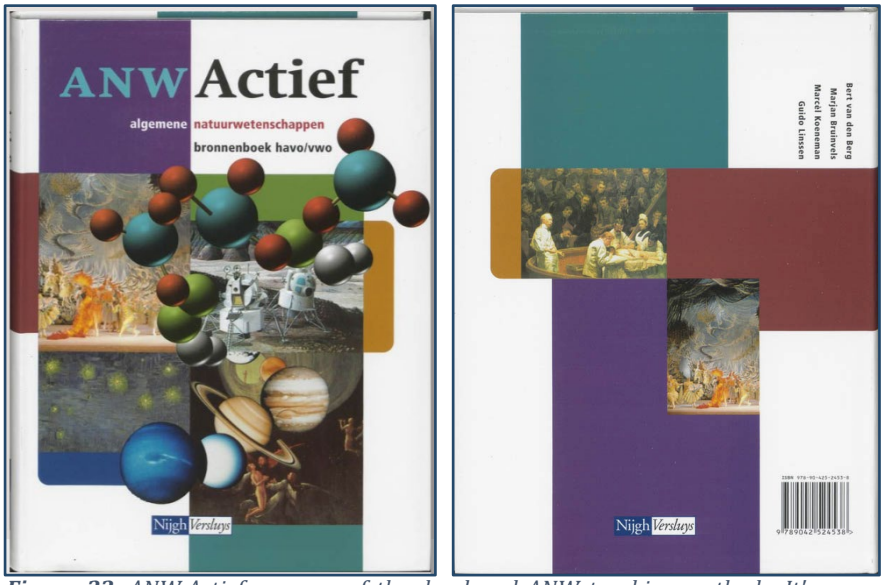

Figure 22. *ANW-Actief was one of the developed ANW teaching methods. It's cover highlights the different subjects discussed in the book.*

Besides the confusing policy surrounding the introduction of *ANW*, publishers themselves were contributing to the vagueness as well. Mieke Kapteijn, chair of the *Vakontwikkelgroep ANW*, shared that she had no insight at all into the shape of the upcoming *ANW* books. Due to commercial interests of publishers, this was kept secret.[191] The quite innovative ideology of Kapteijn, and the ideas of the *Vakontwikkelgroep,* was possibly not be fully incorporated in the new developed teaching method. Piet van Engelen, publisher biology and *ANW* at Malmberg, explained this: "You don't sell anything if you innovate to much, but if you innovate to little you don't sell as well. The market has to be willing to use it."[192] Developing a teaching method therefore means making comprises, since various stakeholders like the publishers, authors and the SLO have their say in the development. Even though Kapteijn and her *Vakontwikkelgroep* may be supplementing the ideas and end terms, the eventual development of teaching material is not under their control. In the end, the publisher wants to sell books and they have the most influence on their own product.

[190] 'Compromis van coalitie over uitstel onderwijsvernieuwing krijgt veel kritiek'.
[191] van Ammelrooy, 479.
[192] Kuijpers, 'Nooit extreem; Schoolboekenuitgevers streven naar "haalbare vernieuwing"', 4.

Considering the experimental projects of the *Projectgroep ANW* were still unfinished, publisher had to develop teaching methods without any experience in the newly proposed subject didactics. Instead of the more commonly used time span of four, publishers now had to rush. Hubert Biezeveld, Educational author at the publisher Wolters-Noordhoff, calls this "slave labour".[193] One can only imagine that the relationship between stakeholders of teaching materials and policymakers must have been tense. Nonetheless, in the beginning of 1998 first versions of the teaching material were accessible on the market. However, the quality and effectiveness of the teaching material still had to be proven in practice. Choosing the correct teaching method could prove difficult, and sometimes it meant choosing one of which you had no clue yet if it would work and if the teaching method would fit you as a teacher.[194]

In the may publication of 1998, an article of again an anonymous author was published in the NVOX. As the previous arguments illuminate, the debate about *ANW* might have been quite sensitive in the science teaching community. The title of the article *ANW gaan geven: "Bijna al je zekerheden worden ontnomen!"* is also quite troubling, claiming that 'all your certainties are stripped away'. To support fellow teachers, the author gives four recommendations to battle the feeling of uncertainty. Two of the advices focus on the teacher's practices, stating that you should view the start of *ANW* as a chance to innovate, but that you should also be reasonable about what you can and have to do in order to prepare the *ANW* lessons[195]. Other advice focused on the teaching method and the grading aspect of students. Both are related and ask for a critical view when choosing a teaching method. Is the teaching method motivating? Does it supplement students sufficiently, but also you as a teacher? Nonetheless, this person also acknowledges that sometimes you only find out if it was the correct choice after using it for a while.[196]

Consequently, in the March issue of 1999 the first critical review of the *ANW* teaching methods appeared. Unfortunately, as the May 1998 issue predicted, using the teaching method would show whether it is a suitable method. The author of the piece Laurens Houben, working at the MaasWaalCollege in Wijchen, does not mince his words when he talks about the teaching methods *Scala* (from Malmberg), *ANW* overal, *Galileo*, *Solar* (from Wolters-Noordhoff) and in a bit about *Via Delta* and *ANW Aktief*. According to him, there is "too much

[193] Kuijpers, 4.
[194] '*ANW* gaan geven: "Bijna al je zekerheden worden je ontnomen!"', *NVOX*, May 1998, 263, NVON, https://nvon.nl/nvox/nvox-1998-5-geheel.
[195] '*ANW* gaan geven: "Bijna al je zekerheden worden je ontnomen!"', 203.
[196] '*ANW* gaan geven: "Bijna al je zekerheden worden je ontnomen!"', 263.

nonsense, incomprehensible, confusing sentences and drivel".[197] Considering the subject was important for reflection on science, he criticized as well that the philosophy of science does not come to fruition. He argues that the focus is too much on the trick of the scientific method. Yet, the work of Karl Popper, Thomas Kuhn and Paul Feyerabend that turns science into a story with a vision is missing.[198] In Houben's opinion the changing views on science from falsification, paradigm thinking to anything goes is perfect to connect with tangible

Figure 23. *Teachers were not enthusiastic about the newly developed ANW methods.*

understandable examples for students.[199]

[197] Laurens Houben, '*ANW*-boeken', *NVOX*, Maart1999, 147, NVON, https://nvon.nl/nvox/nvox-1999-3-geheel.
[198] Houben, 148.
[199] Houben, 148.

Although this opinion is just one example, it does not create good prospects about the quality of *ANW* education. Especially for teachers who do not have the opportunity, time, knowledge or skills to deviate much from the *ANW* teaching methods and to make sure the ideology of the Nature of Science behind *ANW* is enacted. According to publishers, policymakers in The Hague are to blame. Since they were simply given to short of a timespan to develop the teaching methods.[200] However, the past section showcased the many different troubles that arose in the development process between policymakers and publishers. The lack of identity, confusing politics, market driven motivation, limited development time and an overall absence of transparency cause for a massive hurdle between the first and second layer of the operated curriculum (method).

Teacher training

As Kapteijn already mentioned, the scope and depth of the *ANW* training course is limited due to time constraints. Additionally, not all teacher that will start with teaching *ANW* will have followed the training course. However, this is only a problem if you make it one from a policy perspective. Policymakers simply stated: "For the time being, all biology, physics and chemistry teachers are considered competent to teach the new subject. From 2003 onwards, it will be necessary to demonstrate that you have obtained a qualification. *ANW* Training for this qualification will begin in an experimental form for 40 teachers in January 1997."[201]

In school year 97-98 about 600 teachers had the opportunity to follow the training course of 120 hours, in 98-99 this was about 400. This training is made available by the Ministry of OCW, which at first glance seemed considerable. However, this meant that small schools probably were able to train 1 qualified teacher, which is risky according to chairman of the NVON van Beek and he expects that commercial training will be offered.[202] Later publications mentioned training for 1.100 teachers, which was determined after a calculation of what was deemed necessary.[203] Facilitation is also granted to schools to fund this training. For example, a school can have 1 teacher trained if they have 90

[200] Esther Bakker, 'Docenten komen gefrustreerd van boekverkoop terug', *de Volkskrant*, 19 March 1998, 5, Lexis Nexis.
[201] Margriet Termeer, 'Algemene Natuurwetenschappen, een vak apart? Impressie van de openingslezing van de tweedaagse scheikunde 1996', *NVOX*, December 1996, 490, NVON, https://nvon.nl/nvox/nvox-1996-10-geheel.
[202] van Beek, 'Van de Voorzitter: Algemene natuurwetenschappen (*ANW*)', 482.
[203] Maarten Pieters, 'Omscholing Algemene Natuurwetenschappen', *NVOX*, April 1997, 168, NVON, https://nvon.nl/nvox/nvox-1997-4-geheel.

students in havo 4 and vwo 4, 2 teachers up to 210 students, 3 teachers up to 310, 4 teachers up to 400 and above 400 even 5 teachers.[204]

Most of the following data is extracted from the yearly educational report, *Staat van het Onderwijs 1998/1999,* as well as the report from the Ministry OCW *kerncijfers 2005-2009* and the interpretation of the numbers by the education organisation *VOS/ABB*. These reports tell us that the Netherlands counted in 1998 648 secondary schools in total, of which 492 schools offered havo and/or vwo type education that will all start in august 1999 with the *Tweede Fase*.[205] The 1999 report tells us that that in schoolyear 1997/1998 approximately 829.600 students followed secondary education, of which 38% followed either havo/vwo.[206] With the help of the report *kerncijfers 2005-2009*[207] and the interpretation of *VOS/ABB*[208]*,* it can be estimated that in the year 1997/1998 approximately 68.000 students were in havo 4 and vwo 4 and 71.000 the following year. This number indicates that every school has in average 144 students in havo and vwo 4, which is, assuming group size of 24/25 students, 6 groups. This meant that, based on the set requirements, the average school was able to sent 2 teachers to the training program. On average, this does not seem bad at all. However, the following example will explain why this calculated average is not enough.

Pim Backer, an enthusiastic upcoming *ANW* teacher, did not seem to worry about teaching *ANW*, since he did not view the subject as entirely different. He also disagreed with the strong claim by Knoppert that all *ANW* teachers would be 'layman amateurs'.[209] However, Backer's expectation of *ANW* might have been a problem on its own. Namely, Eijkelhof and Pieters do not speak of *ANW* as a

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[204] Pieters, 169.

[205] Inspectie van het onderwijs, 'Onderwijsverslag over het jaar 1998', Onderwijsverslag, Staat van het onderwijs (Utrecht, May 1999), 135, https://data.collectienederland.nl/page/aggregation/inspectie-van-het-onderwijs/dtz-2020.

[206] Inspectie van het onderwijs, 'Onderwijsverslag over het jaar 1999', Onderwijsverslag, Staat van het onderwijs (Utrecht, April 2000), 89, https://data.collectienederland.nl/page/aggregation/inspectie-van-het-onderwijs/dtz-2021.

[207] Ministerie van Onderwijs, Cultuur en Wetenschap, 'Kerncijfers 2005-2009' (Dordrecht: Ministerie van Onderwijs & Wetenschappen, n.d.), 10–11, https://open.overheid.nl/documenten/ronl-archief-7d2a974d-a7ee-43a8-995a-4aadf52db013/pdf.

[208] VOSABB, 'Verdeling leerlingen vwo, havo en vmbo in VO leerjaar 3', September 2012, https://www.vosabb.nl/wp-content/uploads/2012/09/Vwo_havo_vmbo_1990-2009.pdf.

[209] Pim Backer, 'Reactie op: *ANW* - is het wat?', *NVOX*, September 1997, 367, NVON, https://nvon.nl/nvox/nvox-1997-7-geheel.

completely different profession with its own identity and didactics for no reason. Yet, more problematic is Backer's remark about the distribution of *ANW* teachers within his school. "If my school is going to introduce *ANW* in havo-4 and vwo-4 in a common part, we are talking about 3 to 4 teaching hours per class. That would result in about two teachers for my school who do nothing more than teach *ANW* year-in-year-out only in the fourth grade. Seems to me to be lethal for both the subject and the teachers involved."[210] Although the school situation of Backer is unclear, two teachers that give full-time *ANW* can together teach 12 groups. This would indicate Backer's school has, assuming group size of 25, 300 students. Therefore 3 teachers can follow the training. Even though the calculation works, and the training covers the necessary number of teachers to give *ANW*, one could argue if that is desirable? In the end, every *ANW* teacher also teaches physics/chemistry or biology. The subject becomes enriched when different perspectives join in, showing the reasoning behind the opinion of Backer. When considering this aspect and assuming every teacher will be giving *ANW* part-time, it becomes evident that a big amount of *ANW* teachers cannot follow the training course before its introduction in 1999.

Additionally, teachers that do follow the training express the high workload. Marting Huizing, teacher Biology, shared in *NRC Handelsblad* that: "All in all, it is still a lot of work, because we are only allowed two hours a week to do our homework, study the content of the subject and make a work plan for the coming school year. Thorough preparation takes much more time. In addition, a number of learning methods are not expected until the summer, so I will have to give up some of my summer holiday".[211] This is of course a great sacrifice, because anyone who works in education (or is closely involved in it) knows how sacred the holidays are. It comes to no surprise that in the fifth issue of the NVOX in 1998, months before the introduction of *ANW*, the earlier discussed anonymous author who gives advice on the design of the *ANW* subject claims you'll need "courage to start giving *ANW*".[212] Hence, the ANW training program is: not sufficiently preparing teachers by design; not training enough to accommodate the need; and making it undesirable for teachers to follow due to high workload. Consequently, this explains the lacking transfer from the first and second layer to the third layer of the operated curriculum (method).

[210] Pim Backer, Reactie op: *ANW* - is het wat?', *NVOX,* September 1997, 368, NVON, https://nvon.nl/nvox/nvox-1997-7-geheel.
[211] Danielle Pinedo, 'De leraar', *NRC Handelsblad*, 26 March 1998, 33, Lexis Nexis.
[212] '*ANW* gaan geven: "Bijna al je zekerheden worden je ontnomen!"', 263.

Extensive renewal

The last point of discussion is that the curriculum renewal ended up being an extensive package of changes. The last category of critique will cover the immense size of the curriculum change that made proper development and introduction more difficult in the given time. Although State secretary Netelenbos granted schools the option to start teaching with *ANW* in 1999 instead of 1998, schools ended up still planning to start with *ANW* due to otherwise scheduling issues.[213] As discussed in aspect two**,** compromises in the parliament gave schools the option to fully start with the *Tweede Fase* in august 1999.[214] With this possibility, contrary to the ministry's expectations, many more schools eventually waited to start with the *Tweede Fase.* This was due to the immense size of the renewal, but also since publishers were lagging behind in 1998 to finish various teaching methods (not only *ANW*).[215] All in all it is an immensely confusing political decision, for both schools and publishers. Although the year in which the *Tweede Fase* started brought enthusiasm, it also got a load of critique.[216]

According to Hans Morélis, educational developer at SLO, this was understandable. There was a lot coming at schools and which was all forcing many change. The examination programmes changed, new methods had to be chosen, students had to choose profiles, new subjects such as *ANW* started, the structure of the sub-subjects was introduced, and the lesson distribution was determined by means of a different methodology of study hours (as a result of which the lesson table was long uncertain and teachers therefore did not know how much they teached), and on top of that the *Studiehuis* was introduced as well (in which teachers function more in a coaching role)[217]. A coaching role which asked the teacher to differentiate more between students with for example a social or nature profile. A task which was especially necessary in a subject like *ANW*, another aspect of which chemistry teacher Coenders expressed his doubts if that would succeed.[218] Hence, Morélis supports the reader by ending with a list of recommendations. A list in which it is emphasized to prepare well for the start as a joint BiNaSk department and to coordinate with the management at an early stage what is needed.[219]

[213] van Ammelrooy, 479.
[214] 'Compromis van coalitie over uitstel onderwijsvernieuwing krijgt veel kritiek'.
[215] 'Compromis van coalitie over uitstel onderwijsvernieuwing krijgt veel kritiek'.
[216] Hans Morélis, 'Op weg naar het Studiehuis', *NVOX*, February 1998, 59, NVON, https://nvon.nl/nvox/nvox-1998-2-geheel.
[217] Morélis, 59–60.
[218] Coenders, '*ANW* - ontwikkel het mee', 277.
[219] Morélis, 'Op weg naar het Studiehuis', 62.

The introduction of *ANW*, together with all the other changes, would result in a significant increase in the workload for teachers. As an anonymous author from the April issue in the 1998 NVOX proposes, *ANW* teachers should broaden their horizons, by mobilizing diverse colleagues from subjects such as social studies, languages, geography, history and philosophy to shape the lessons. However, this extra element is forcing schools to reorganize the structure of the departments as well. It is all quite a lot, and although the anonymous author wants to help teachers with these tips, he is also aware teachers might not be able to start experimenting with *ANW* at all.[220]

This expectation is indeed not far off the truth, since only a small number of schools started with the *Tweede Fase* in 1998 and presumably even less schools experimented extensively with *ANW*. This assumption is based on the fact that, Heleen Driessen, chair *ANW* editorial at the NVOX, put out a call for teachers to present their good practices in the NVOX[221]. Embarrassingly, no schools replied throughout 1999, since no publication about good practices were done in that entire year in the NVOX. It is clear that teachers had a lot on their mind, and sharing a good practice about *ANW* was not one of them. All these previously mentioned changes combine into a huge renewal, and to make this renewal succeed Nel Ginjaar-Maas already expected that a 'culture shift' was inevitable and necessary. To make the written curriculum renewal enacted on all three layers of the operated curriculum, drastic changes had to be made. According to Ginjaar-Maas, these changes should not happen over night, but first slowly and than increasingly like a snowball effect. [222]

Positive sound

It might be good to end this chapter on a positive note for one, its clear that *ANW* was a popular topic in the NVOX during the end of the 1990s, since the magazine was full of publications about the subject. The goal of Knoppert, sparking a discussion about the topic among teachers, surely succeeded. The response of Pim Backer in the 7th issue of 1997 is an example of the enthusiasm that was also present among some teachers. Even though Backer admits the subject to be yet vague, he expressed he wants to make something beautiful out of it.[223] This enthusiasm is regularly felt in publications from teachers that share *ANW*-like practices as preparation. Sadly, throughout the many publications in the NVOX

[220] 'Invoering van *ANW* op school', 203.
[221] Heleen Driessen, 'De praktijk van ANW', *NVOX*, February 1999, 83–84, NVON, https://nvon.nl/nvox/nvox-1999-2-geheel.
[222] Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 'Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens', 5.
[223] Backer, 'Reactie op: *ANW* - is het wat?', 367.

from 1996 till 1998, this sense of uncertainty clouded the positivity that could have been more present.

Eijkelhof himself also responded briefly to criticism about the identity of *ANW* and specifically to Knoppert's comment: "A profession that is still in its infancy cannot yet have a clear identity. However, that says nothing about the importance and possibilities of *ANW*."[224] Eijkelhof also made the difference between *ANW* and the mono-subjects explicit: it is general in character, interdisciplinary and has a focus on "the third, contemplative dimension: the attention to the history, the nature, the development".[225] Something that the mono subjects did not have time for to cover, hence the need for *ANW* and the potential that the subject brings. Additionally, Eijkelhof immediately explained why *ANW* did not work by incorporating it into the mono subjects. According to him, the focus on the first and second dimensions, theory and practice, is underestimated.[226] There is simply no room in the programme for this third dimension, because of full examination programmes, but also because of classical traditions and the monodisciplinary training of teachers.[227] You don't change education overnight, traditions and habits change and so does the focus on whether something is right or wrong and that you come to school to learn theoretical or practical knowledge.

Figure 24. *Students from the Oranje Nassau College in Zoetermeer showcasing their work in the form of a poster presentation.*

[224] Eijkelhof, 'De toekomst van het vak algemene natuurwetenschappen', 344.
[225] Eijkelhof, 344.
[226] Eijkelhof, 345.
[227] Eijkelhof, 344.

Some schools, such as the Oranje Nassau College in Zoetermeer, were taking the initiative to practice *ANW*-like topics and working methods on a project basis before the actual start in August 1998. Ineke Henze-Rietveld and Jacob Kappe already started in September 1997, before *ANW* student material was available (Figure 24).[228] This lack of material hints to the fact that a well executed preparation to teach *ANW*, demanded the schools and teachers to initiate it themselves. Lieke Heimel, upcoming *ANW* teacher from the OSG Schoonoord, shared their experiences with preparatory lessons as well, mentioning the "lessons passed with mutual satisfaction!"[229] For Henze-Rietveld and Kappe, the preparatory project had been fruitful. They concluded that *ANW* brought many novelties and that it is not easy for teachers to distance themselves from the mono subjects. The interaction between teachers worked well to get this process going, but it certainly required extra time to realize it.[230] However, this conclusion shows schools could prepare sufficiently for the upcoming introduction of *ANW,* if they invested in it themselves. Even though the many quarrels *ANW* brought with it, some teachers were still enthusiastic to start.

Throughout the schoolyear 1998-1999 one school, Cobbenhagencollege in Tilburg, shared their implementation plan concerning *ANW* in the NVOX, presenting their interpretation and way of enacting the written curriculum in the classroom. Interesting in their approach was the dispersion of lesson hours throughout the 4th, 5th and even 6th year. With this approach they gave themselves more time to develop their own view on the subject, but also reduced uncertainties within the school.[231] Another school, again Henze-Rietveld and Kappe from the Oranje Nassau College in Zoetermeer, shared a good-practice of their first real *ANW*-project about the sun (Figure 25). They concluded that students in the fourth year were quite capable in working in groups on the set project tasks, although it is important to support them with sufficient prior knowledge. Additionally, the collaboration of various teachers is essential, also with expert from outside the school[232]. Nonetheless, these examples show that

[228] Ineke Henze-Rietveld and Jacob Kappe, 'Voorbereiding *ANW*: project "El Niño"', *NVOX*, May 1998, 240, NVON, https://nvon.nl/nvox/nvox-1998-5-geheel.
[229] Lieke Heimel, 'Kennismakingsles ANW', *NVOX*, June 1998, 338, NVON, https://nvon.nl/nvox/nvox-1998-6-geheel.
[230] Henze-Rietveld and Kappe, 'Voorbereiding *ANW*: project "El Niño"', 243.
[231] Leon Spaan and Roger Lafèbre, 'Implementatieplan voor het vak Algemene natuurwetenschappen', *NVOX*, October 1998, 440, NVON, https://nvon.nl/nvox/nvox-1998-8-geheel.
[232] Ineke Henze-Rietveld and Jacob Kappe, 'Voorbereiding *ANW*: project "De zon als centrum van ons zonnestelsel"', *NVOX*, December 1998, 567, NVON, https://nvon.nl/nvox/nvox-1998-10-geheel.

a successful start in either 1998, or a well thought off preparation is certainly possible if teachers were motivated to put the effort into it.

Figure 25. *Student of the Oranje Nassau College in Zoetermeer working in a 'black box' room to study the effect of the sun on the growth on plants.*

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Concluding this section, much about the early troubles *ANW* had been revealed. This section set out to show the view of teachers and other stakeholders, but also to determine who had a say it in its development. The *Projectgroep ANW* played an important role in the experimental phase of *ANW*, designing experimental teaching materials, advising publishers and creating the teacher training program. Insights from Eijkelhof, Pieters and Kapteijn helped to understand the development of *ANW* from their perspective. How the work of the *Projectgroep ANW* was received becomes evident in all the various publications in the NVOX or newspapers, where teachers or other stakeholders shared their thoughts. Thoughts that can be categorized in roughly four areas': Identity of *ANW*, the development of the *ANW* teaching methods by publishers, *ANW* teacher training and the overall size and complexity of the educational reform.

From these four categories we can conclude that *ANW* was not ready to be successfully introduced in 1998, or possibly in 1999 as well. The discourse on ANW's identity and the work of the *Projectgroep* itself already reveals critical challenges. Knoppert's concerns about practical issues like examination clarity and teacher readiness are valid, prompting necessary discussions. Reacting on Knoppert's article, Coenders showcased the success of *ANW* will depend heavily on the contribution of the teacher, as well as the still to be published teaching method. Exactly in these two aspects, shortcomings can be clearly pointed out.

The lack of a clear identity results in tension within the community. In the NVOX debates enfolded about the interpretation of *ANW*, showing a different view on primarily its didactics and focus. Anonymous authors, possibly due to the sensitive topic, wrote in the NVOX to share their opinions and thoughts about *ANW*. Besides the identity crisis and tension in the community, teaching methods were being developed parallel to the still ongoing experimental research from the *Projectgroep ANW.* Therefore, the influence of the *Projectgroep* on the eventual teaching methods can be surely debated. Combined with indeterminate and confusing politics, the market driven motivation by publishers and the overall absence of transparency among parties made it difficult for the ideology behind *ANW* to come to fruition. When considering the time constraints, overall size of the entire *Tweede Fase* renewal it is hard to imagine that parties listened in depth to the feedback that was given from the field. The view of teachers is clear, but did anyone listen?

Besides the criticism, it is important to mention the optimism and enthusiasm about *ANW* among teachers, like Backer, Heimel, Henze-Rietveld and Kappe who can only be seen as the examples of other enthusiastic teachers. Before the start in 1999, 1100 teachers were trained via the offered program Kapteijn described, and even 200 extra on their own expenses.[233] These 1300 teachers put the extra effort into their profession and as Backer stated: "try to make something beautiful out of it"[234]. If all of these teachers followed the training with intrinsic motivation is difficult to determine, but they all put in the extra effort. Nonetheless, concerns about the amount of teacher training positions, while considering the part-time nature of *ANW*, highlight again the shortcomings of the time that is granted to the experiment. Some schools were simply allowed to train one teacher, this surely brings uncertainty along. Some schools were successful in preparing for the introduction of *ANW*, but all the discussed perspectives combined showcase enough troubles ahead. Troubles that will manifest itself in even more drama, in which *ANW* is starring as main protagonist.

[233] Frederiek Weeda, 'Woede over schrappen nieuw vak; "24 miljoen voor niets"', *NRC Handelsblad*, 17 December 1999, 3, Lexis Nexis.
[234] Backer, 'Reactie op: *ANW* - is het wat?', 367.

3.3. The 'murder' on *ANW* by Adelmund in 2000

"It is with joy that we announce the birth of a new school subject. It was born in the school year 1998. It has been given the baptismal name Algemene Natuurwetenschappen, but we call it ANW. It's a special profession and that's it. However, a year in the incubator has not been able to hide the fact that the newcomer is still going through worrying times. Some children like him, but unfortunately there are also those who find him very boring and demanding. As for me, I suffer from postpartum depression from time to time. Then I just shout something, or I spontaneously start crying. However, with all of your help, I would like to make a sincere effort to make the profession a pillar of our society, which, as you all know, is increasingly determined by scientific knowledge. Be kind to the little ANW, be patient with him and with me.

Zoetermeer, January 2000
Karin Adelmund, designated by the government as the mother of ANW"[235]

This imaginary birth card shows the bizarre two months *ANW* had in December 1999 and January 2000, starring State Secretary Karin Adelmund as the antagonist in this educational renewal drama. However, the story starts in August 1999 when the *Tweede Fase*, and thus *ANW* become mandatory for all schools to start with. Schoolyear 1998/1999 can be seen as an experimental start, since only 125 schools began with the *Tweede Fase.* The remainder of schools therefore started in schoolyear 1999/2000, a total of 492 schools.[236] In the last section a sum of worries was expressed about *ANW,* building up to the early introduction in 1998. Since this section was focussed on *ANW,* no excessive worries were expressed about the possible high workload. However, throughout schoolyear 1998/1999 the newspaper *Trouw* already covered this aspect, stating that anybody who has affinity with students expected the program to be to overloaded.[237] And since this first year the program is quite experimental, State Secretary Adelmund frequently changed the rules, which caused for confusing situations.[238] Hence, was the introduction in this early period successful? Did the State Secretary learn from these complaints to make sure the start in august 1999 would be more successful? One has to remember that

[235] Wiel Hoekstra, 'Het nieuwe schoolvak Algemene Natuurwetenschappen', *De Academische Boekengids*, August 2000, 14.
[236] Inspectie van het onderwijs, 'Onderwijsverslag over het jaar 1998', 135.
[237] Peter Flaton, 'Schrappen "zachte sector" uit tweede fase is commentaar waard', *Trouw*, 17 November 1998, 10, Lexis Nexis.
[238] Esther Hageman, 'Soms heb ik het echt te druk - Tweede Fase voortgezet onderwijs', *Trouw*, 2 December 1998, Lexis Nexis.

schools, which prepared themselves excessively well, were able to start in august 1998. The start in august 1999 was mandatory for all schools, which was the real test for the *Tweede Fase.* Therefore, its not unsurprising a peak of controversy around *ANW* and the *Tweede Fase* was reached in December 1999 and Januari 2000.

Student protests

In November 1999 seven students from the Aquamarijn College in Vlaardingen started a protest against the heavy study load in the *Studiehuis*. Via the internet and a self made website by one of the students Marc Gebuis, the group spread their complaints and mobilized 6000 students for a national strike on the 6th of December 1999.[239] According to the students, the study load is way to high, exceeding the proposed 40 hours even touching 45 hours as students Roy Baars from Haarlem[240] and Peter Paul Lipinkhof from Eindhoven claim.[241] Especially the two new subjects CKV and *ANW* get a lot of complaints, and students say that they are: "Absolutely useless, while you have to spent a lot of time on it".[242] The 15 year old organizer Gebuis is also critical about the two subjects, mentioning that some mandatory subjects have to be made optional. *ANW* and CKV are than first to consider. In response, State secretary Adelmund promised to do research about the study load of the *Tweede Fase* and the *Studiehuis,* although without making yet any promises to students.[243]

Throughout the educational sector opinions about the study load, but also about the value of *ANW* can be heard. School principal of the Rietveld Lyceum in Doetinchem Elly Reinders remarked that a lot of students complain about *ANW*, nonetheless she claimed the subject should stay since it is part of students their general development.[244] Also A. Storm, *ANW* Teacher at the secondary school in Vlaardingen, expressed that it would be a shame to make *ANW* optional since its showed the relevance of the sciences in daily life.[245] Lastly, school principal of the Lindenholt College in Nijmegen Wim Nelissen remarked that changing the mandatory status of *ANW* and or CKV simply cannot be done, even though he states he is not a fan of the subjects: "it's too late for that now. The teachers of

[239] Geert van Asbeck and Frederiek Weeda, 'Internet ingezet tegen studiehuis', *NRC Handelsblad*, 20 November 1999, 1, Lexis Nexis.
[240] van Asbeck and Weeda, 2.
[241] 'Wij passen er voor als proefkonijnen te dienen', *Eindhovens Dagblad*, 23 November 1999, Lexis Nexis.
[242] 'Wij passen er voor als proefkonijnen te dienen'.
[243] 'Adelmund: Snel onderzoek naar werkdruk scholieren', *De Gelderlander*, 24 November 1999, Lexis Nexis.
[244] 'Doetinchemse scholieren tegen studiehuis', *De Gelderlander*, 25 November 1999, Lexis Nexis.
[245] van Asbeck and Weeda, 'Internet ingezet tegen studiehuis', 2.

CKV and *ANW* have worked hard to obtain their teaching qualification on time. You can't do that to those people"[246]. Although teachers and principals support students' complaints about the study load, they do not share their thoughts about changing the mandatory status of *ANW* and CKV. The field of tension that first only included the presence of policymakers, publishers, councils and teachers now started to include students as well. Making a choice about the future of ANW became a complex ethical problem, inflated due to its effect it had on all the stakeholders like students and teachers.

Figure 26. *Student protest at the malieveld against the high study load in the Tweede Fase.*

On the 6th of December a staggering twenty thousand students, a lot more than was first expected, protested against the heavy study load in the *Tweede Fase* at the *Malieveld* in The Hague. Although the protests started of peacefully, it became more grim and violent in the afternoon. Thousands of students walked towards the *Binnenhof*, since no response came from any politicians. Banners with statements like "I'm jealous at my dad, since he only works 40 hours"[247] show the tension and emotions among students. When eventually politicians do reach the podium, they are met with eggs, empty cans or tangerines.[248] It is clear

[246] Margreet Vermeulen, 'Vakken schrappen, dat zou helpen', *de Volkskrant*, 14 December 1999, 3, Lexis Nexis.
[247] Margreet Vermeulen, 'Dat is wennen, eieren gooiende kinderen', *de Volkskrant*, 7 December 1999, 1, Lexis Nexis.
[248] Vermeulen, 1.

that frustration among students reached on this day a new height. A frustration shared by teachers as well, as Hanneke Houtes, teacher at the Lindenholt College, remarks: "Students quickly work fifty hours, and we as well."[249]

Adelmund decreases the study load

Less than two weeks after the protests of the students, State Secretary Adelmund meets the students. The new programme she proposed will be temporarily reduced for a period of three school years (including the one in 1999/2000). After these three school years, the program will be reconsidered, and measures can be reversed. Adelmund's proposal gives schools the choice to take away *ANW* as a compulsory subject at havo and also a second foreign language such as French or German. In vwo, *ANW* will continue to exist, but the number of hours will be drastically cut.[250] A day later, apparently without consultation with educational organizations, the proposal is approved in the *Tweede Kamer*.[251] According to the *Volkskrant*, the *Tweede Kamer* is satisfied with the greater freedom they now give to schools.[252] However, what does this freedom really mean?

Figure 27. *NVOX reviewing the actions from State Secretary Adelmund and calling it a murder on ANW.*

[249] Vermeulen, 'Vakken schrappen, dat zou helpen', 2.
[250] 'Adelmund: Snel onderzoek naar werkdruk scholieren'.
[251] Weeda, 'Woede over schrappen nieuw vak; "24 miljoen voor niets"', 3.
[252] 'Kroonjuweel *ANW* schittert niet meer', *de Volkskrant*, 17 December 1999, 7, Lexis Nexis.

Kees Kooij, *ANW* teacher at the Pantarijn in Wageningen, calls the freedom schools get a false choice. "Schools compete with each other. Parents will not choose an idealistic school that works on the broad general development of their child. They would rather have a school that uses those hours for extra training in the final exam subjects. Because that's what we're all judged on."[253] The newly trained *ANW* teacher Paul Oliemans cycled to school crying the day after Adelmund's announcement, the enormous disappointment prevails among *ANW* teachers.[254] Disappointment that turns into a dissenting voice, because *ANW* teachers feel cheated. Not only within the sphere of publishers, as Biezeveld mentioned earlier, but also in the sphere of teachers this aspect of 'slave labour' is expressed. M. Foppen, chemistry and *ANW* teacher, is upset, but also offended. "I feel like we're kind of slaves. I put a lot of free time into it. They say 'thanks' and you can get lost."[255] The frustration among teachers is very visible (Figure 28), understandable considering that after three months the subject that you have spent years preparing for is abolished. Michel van Baal, who is not a teacher himself, expressed his sympathy for teachers in a short article in the *Volkskrant*, calling the State Secretary's action a knife in the back. He is not surprised there is a teacher shortage, if you are treated like this.[256]

GEEN WEG TERUG

COMMENTAAR

Adelmund en de scholieren

Algemeen Dagblad

Les voor Adelmund

Verzet groeit tegen wijzigen studiehuis

Door onze redacteur SHEILA KAMERMAN

Woede over schrappen nieuw vak

NRC 17-12-'99 p. 3

Door onze redacteur FREDERIEK WEEDA

ROTTERDAM, 17 DEC. Middelbare scholen hebben ruim 24 miljoen gulden voor niets besteed aan omscholing van leraren voor het nieuwe vak Algemene Natuurwetenschappen (ANW). Dit zeggen leraren en de 'vakontwikkelgroep'.

'Ik heb het gevoel dat we slaven zijn'

Ook bij het projectbureau dat voor de scholing van anw-docenten zorgde, kwamen de plannen van Adelmund gisteren hard aan.

M. Foppen, docente scheikunde en anw, is evenals haar collega's van Frans en Duits 'verbijsterd'. „Ik ben van slag en beledigd. Niemand weet dat dit ging

Alg. Dagbl. 16/12-1

Leraren verbijsterd over verlichten studie

Door Marieke Dubbelman

Scholen over studiehuis: paniekreactie

Staatssecretaris Adelmund geeft scholen de optie om de studie-eisen in VWO en Havo aan te passen. De leiding van de school zit nu klem tussen leerlingen en leraren.

Door onze redacteur FREDERIEK WEEDA

DOKKUM, 16 DEC. Hij weigert geleerlingen in Den Haag tegen de 'te zware' examenprogramma's in de tweede fase. Zij beschouwen onder andere de vakken ANW en kunstzinnige vorming als tijdverspilling. De verlichting geldt voor drie jaar; scholen mogen kiezen of ze hem doorvoeren.

Die keuze-optie is fnuikend, zegt L. Kroos, rector van de Lage Waard in Papendrecht. „Scholen worden tegen elkaar uitgespeeld. Want als wij de verlichting niet

Figure 28. *Teachers express their anger in a variety of newspapers throughout the Netherlands. A summary of these articles are presented in the February number of the 2000 NVOX*

253 'Kroonjuweel *ANW* schittert niet meer', 7.

254 'Kroonjuweel *ANW* schittert niet meer', 7.

255 In Dutch the quote is as follows: "Ik heb het gevoel dat we een soort slaven zijn. Ik heb er heel vrije tijd ingestoken. Ze zeggen 'bedankt' en je kunt opdonderen"; Marieke Dubbelman, 'Leraren verbijsterd over verlichten studie', *Algemeen Dagblad*, 16 December 1999, 12, Lexis Nexis.

256 Michel van Baal, 'Docent', *de Volkskrant*, 17 December 1999, 13, Lexis Nexis.

Eijkelhof, the professor of physics didactics who was mentioned earlier, was also shocked and did not expect it. According to him, Adelmund's panicked action also resulted in a loss of image of the subject, but it is forgotten that it is still young and developing.[257] Even if *ANW* returns after three years, it remains to be seen how it will still be looked at. Also, in the *NRC Handelsblad* Eijkelhof expressed his sympathy towards teachers and he understands their anger well: "These teachers have put a lot of time into this profession, they are the forerunners of the innovation, the most enthusiastic teachers. And now they are being left out in the cold. If we want young people in this country to become enthusiastic about science subjects, then *ANW* is necessary."[258] According to Eijkelhof, it is the destruction of human capital.[259]

In addition to the anger of teachers, Adelmund also gets negative reactions from school leaders and universities. R. Meijerinnk, chair of the *Vereniging van Universiteiten* (Association of Universities), supports the protest of school leaders and labour union and expressed it is ridiculous. They also expressed not to be inclined to cooperate, since non of these plans are created out of cooperation.[260] Adelmund gives school leaders a diabolical dilemma that the school leader themselves have to solve. G. Timmerman, headmaster of havo and vwo at the Dockinga College, will not drop *ANW*, it is an unworkable measure. "Should I fire my *ANW* teachers? They have just completed a course or been appointed. I'm now caught between two fires: my students know that Ms. Adelmund doesn't want those subjects, but I won't let my teachers down."[261] According to L. Kroos, head teacher of the Lage Waard in Papendrecht, schools are being played off against each other. If one school abolishes it, then so must the other. It's simply competition. Kroos and his teachers look to the future with a cynical eye. "My students now come to school cheerfully: 'we don't have to follow your lessons anymore!'"[262] Simply the reputation of *ANW* is irreversibly damaged and the tension between student and teacher only grew.

Just before the Christmas break, Adelmund agreed with school boards, counsils and teacher labour unions that they could recommend other measures to decrease the heavy study load before the 7th of January 2000.[263] F. van Rooij,

[257] Dubbelman, 'Leraren verbijsterd over verlichten studie', 12.
[258] Weeda, 'Woede over schrappen nieuw vak; "24 miljoen voor niets"', 3.
[259] Weeda, 3.
[260] Sheila Kamerman, 'Verzet groeit tegen wijzigen studiehuis; Universiteiten sturen brandbrief', *NRC Handelsblad*, 23 December 1999, 1, Lexis Nexis.
[261] Frederiek Weeda, 'Scholen over studiehuis: paniekreactie', *NRC Handelsblad*, 16 December 1999, 1, Lexis Nexis.
[262] Weeda, 1.
[263] 'School mag alternatieven aandragen; Overleg over studiehuis', *NRC Handelsblad*, 22 December 1999, sec. Binnenland, 2, Lexis Nexis.

director of educational labour union CNV, expected the state secretary to look at the alternative plans seriously and emphasized that it is a shame earlier plans were not discussed with any educational stakeholders, especially schools.[264] In Januari discussions about the measures to reduce study load continued, but this this remark in December showed the door is again a little bit open concerning the future of *ANW*.

Change of plans

The Christmas period is over, but there is still no clarity about *ANW*.[265] Although the *Tweede Kamer* expressed support for the measures, there seems to be little support in the education field. Former state secretary and former chairman of the steering committee Nel Ginjaar-Maas said in a response in *Trouw* that Adelmund has to confess: "I was wrong".[266] She expected that a turnaround is still possible, a good lesson for the State Secretary who, according to Ginjaar-Maas, knew nothing about education. Ginjaar-Maas her confidence in *ANW* remained and with some humour waves away the comments of students who say they don't want *ANW* 'because maths is already compulsory': "Those are very different subjects. Pupils who say that should absolutely be given *ANW*."[267]

Despite the support from old acquaintances, the NVON is afraid that teachers will become demotivated. In the January 2000 magazine of the NVOX the point of view of the NVON is shared. It is clear that they argued for the profession to remain, but also to insist on not reducing its size. According to Heleen Driessen, that reason speaks for itself: "Making study load manageable by reducing *ANW* extends far beyond the profession itself. It is again another intervention in the original principles of the *Tweede Fase*. *ANW*, in particular, should not be scaled down in size, because where else can you find new subject content, innovative didactics, development of skills, experience with PTA [Program of Tests and Assessment], practical assignments and tests within an educational program that is integrated within the time frame of a school year."[268] Clarification is needed, and fast. Give perspective is therefore the call, but State Secretary Adelmund is not yet able to respond.[269]

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[264] 'Nieuw plan voor studiehuis', *Trouw*, 23 December 1999, sec. Binnenland, 4, Lexis Nexis.
[265] 'Veel scholen negeren eis van docenten; Geen besluit studiehuis', *NRC Handelsblad*, 10 January 2000, sec. Binnenland, 3, Lexis Nexis.
[266] Edwin Kreulen, 'Geen draagvlak voor Adelmunds plannen', *NRC Handelsblad*, 7 January 2000, sec. Binnenland, 9, Lexis Nexis.
[267] Kreulen, 9.
[268] Heleen Driessen, 'De moord op ANW', *NVOX*, January 2000, 39, NVON, https://nvon.nl/nvox/nvox-2000-1-geheel.
[269] 'Veel scholen negeren eis van docenten; Geen besluit studiehuis', 3.

In any case, reactions from teachers are given a platform by the NVOX, in which it becomes clear how little sympathy there is in favour for the changes. Teachers are surprised: "OUCH! I don't know about you, but I was shocked intensely...",[270] but also anger at the acts of the politicians: "But no, WE DICTATE [politicians], you [teachers] execute...".[271] Reactions with fear: "Friday I have my havo 4 class again. Of the 23 students, 3 always react negatively to the subject. How can I motivate them now?"[272] But also reactions that combine the sentiment we have discussed earlier throughout this chapter: "Moreover, I find a lot of young enthusiastic scientists under *ANW*. I am very happy to meet these teachers often, because that gives the citizen courage! And it was precisely that group that stabbed Adelmund in the back yesterday. Exactly the group that needs education the most. Do you think it's strange that 'no one wants to go into education, and that many people in education are sceptical about innovations?"[273] The critical voice towards politics is very clear and it shows the the feeling of powerlessness among teachers during these educational innovations. It is a signal of failed political policy without support from the field.

Fortunately, Adelmund's response at the end of the week was positive for *ANW* teachers. Before Christmas the hope was still hard to find among *ANW* teachers, but the situation made a turnaround in the new year. After consultation with educational organisations, State Secretary Adelmund announced that the plans will be amended. Both foreign languages and *ANW* will be retained for both HAVO and VWO. However, schools are allowed to determine the intensity of these subjects themselves, and measures are also taken to lower the level requirements.[274] These actions may be soothing, but it did not recover trust so easily.

Although the *ANW* teacher can be happy with the reversal of the intervention, the status of the *Tweede Fase* and in particular the *Studiehuis* was shakier than ever. In particular, the position of *ANW* and its image in the entire educational renewal has been severely damaged. According to the reporters of the *Volkskrant*, in general the students find the *ANW* subject quite interesting, but

[270] Heleen Driessen, 'Samen sterk dankzij het *ANW*-mailinglist-netwerk', *NVOX*, January 2000, 41, NVON, https://nvon.nl/nvox/nvox-2000-1-geheel.
[271] Driessen, 41.
[272] Driessen, 42.
[273] Driessen, 42.
[274] 'Geschrapte vakken terug in studiehuis', *De Leeuwarder Courant*, 14 January 2000, 1, Lexis Nexis.

"politics depreciates the subject."[275] For example, they interviewed teacher Roelse of the Lindenholt College in Nijmegen, in which the teacher criticizes the State Secretary. According to him, *ANW* van Adelmund did not get a chance and the State Secretary ensured that students are played off against him. "Some troublemakers complain about a hard week and keep invoking the too high study load of the *Studiehuis* is the reason, while they don't do anything."[276] Some time is needed to get this experimental subject off the ground, without direct intervention. At the end of January, the final decision was made and the *Tweede Kamer unanimously* approved Adelmund's new proposals. *ANW* will remain for the time being. Furthermore, Adelmund expressed regret for the chaos, "all criticism can be on my back."[277] According to her, however, the situation has been mis portrayed by the media and she emphasized that she is not actually to blame.[278]

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For now, *ANW* has survived the murder attempt and is slowly regaining its status after the changes. Fortunately, because both in the NVOX and in the media support is expressed for the ideology of the subject. This seemed a counter-reaction towards politicians who started to depreciate the subject. It is the sentiment of relevancy, not among students but teachers and other stakeholders, what kept *ANW* alive. Simon Rozendaal, a reporter for the weekly magazine Elsevier, is an example who expressed the necessity of the subject. According to him, the Dutch people know very little about the natural sciences: Newspapers talk about the poison CO2 and the difference between micro- and milligrams is unclear. Reporters don't know what a baseline measurement is and politicians don't understand the meaning of 'a small risk' and assume it is terrible and should be zero.[279] Also Piet Borst, former director of the Dutch Cancer Institute, speaks out about the subject: "I think it's a fantastic and much-needed subject. There is so much scientific nonsense being proclaimed. I recently heard someone shout that they didn't want DNA in their food. For people like that, *ANW* comes at just the right time."[280]

[275] Eva Nyst and Job Stigter, 'Een wankel studiehuis met een keuken vol anw', *de Volkskrant*, 15 January 2000, sec. Wetenschap, 7, Lexis Nexis.
[276] Nyst and Stigter, 7.
[277] 'Adelmund betuigt spijt', *Dagblad van het noorden*, 27 January 2000, 1, Lexis Nexis.
[278] 'Adelmund betuigt spijt', 1.
[279] 'Scholen snakken naar Haagse visie; ingreep van Adelmund valt verkeerd', *de Volkskrant*, 11 January 2002, sec. Binnenland, 1–2, Lexis Nexis.
[280] 'Scholen snakken naar Haagse visie; ingreep van Adelmund valt verkeerd', 2.

Hence, according to the chairman of the NVON, Rob Eijkenaar, *ANW* has perspective again. He said that a large part of their proposals have been adopted by Adelmund and that it has been agreed that schools will be given three years to develop *ANW* to its desired level.[281] This will be an important feat to reach, since the *ANW* community now needs to prove their subject is here to stay. If any doubts about the relevance and educational value of *ANW* remain after these years, a new renewal may change the status of *ANW* again. Considering *ANW* is a few points behind after the damage it received in the first year, this will be a difficult task. Nonetheless, commitment to the mandatory status of *ANW* with a duration of at least three years has been given. In the next chapter we will discuss the development of *ANW* in these subsequent years and finally give an answer to the second research question of this thesis.

[281] Rob Eijkenaar, '*ANW*-soap', *NVOX*, February 2000, 89, NVON, https://nvon.nl/nvox/nvox-2000-2-geheel.

Chapter 4. ANW developed and failed

The introduction of *ANW* was controversial. An effect that was the result of a variety of factors, including its tumultuous period of conception and experimentation. Nonetheless, *ANW* is there. It is not finished, and a phase of refinement is now ahead. From 2000 till 2002 its status was at mandatory for all schools. Projects in this period ran to improve the subject and its community started to grow. However, after 2002 changes were proposed with a new memorandum. Not only the *ANW* teachers but the entire departments of the natural (beta) sciences were roused. Changes which ultimately led to the gradual demise of *ANW* till 2007. In this chapter we will focus on these developments in three sections. Firstly, about the growing position of *ANW,* secondly about the changes that led to the *'Nieuwe' Tweede Fase* in 2007 and thirdly about the political and societal changing landscape. These developments, and the events from chapter 3, lead to an answer on the second proposed research question: Which factors were responsible for the gradual demise of *ANW* in upper general secondary education in the Netherlands from its early development till 2007?

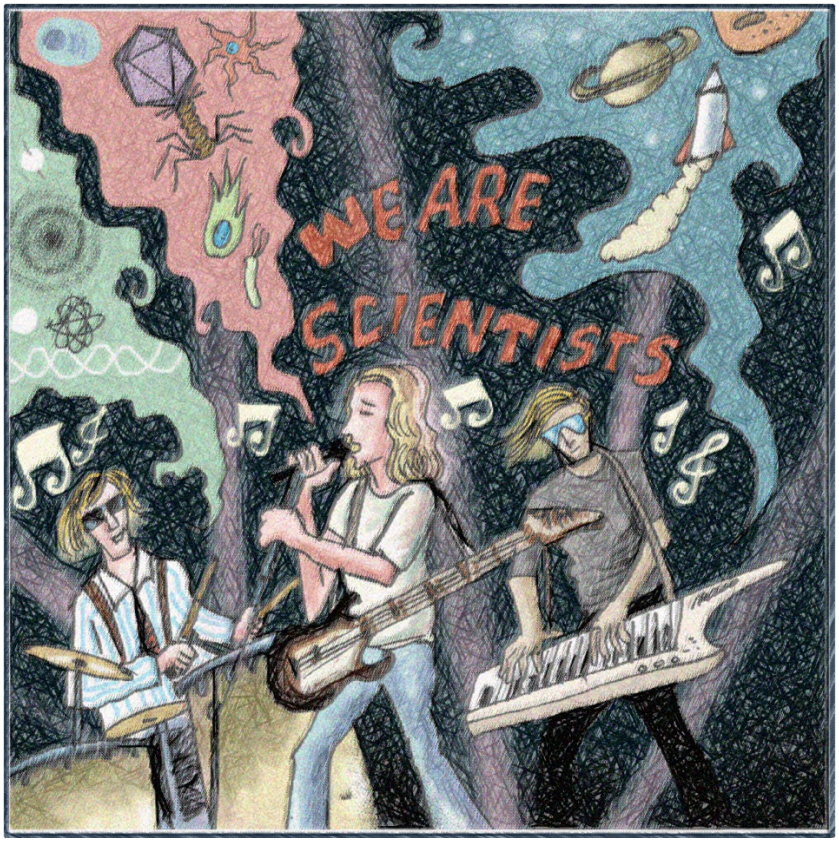


Figure 29. *ANW continued to develop itself in the early 2000s. With national and regional events ANW grew in its community size, but also projects about the didactical basis of how ANW should be taught were ran. ANW got a louder voice!*

4.1. *ANW* is growing

After the rough start of *ANW* in 1999, the subject begins in schoolyear 2000 with its second or for some schools third year. The *ANW* community is growing, publications in the NVOX are regular every month and instead of quarrel about the existence of the subject, publications discuss the actual content, didactics, and nature of *ANW*. In this section, development of the subject till 2002 is discussed to further understand how the position of *ANW* changed. Was *ANW* a respected subject after these years of development? Or did it become clear in these developments that *ANW* was doomed at the beginning?

To start of with, the article '*The true nature of ANW*' of Agnes Legierse in the fourth issue of the NVOX 2000, highlights the still general unawareness of the identity or nature of *ANW.* She emphasized that the subject does not integrate physics, chemistry and biology in one subject as a natural science course, but that it is a subject which reviews and thinks about the natural sciences.[282] As previous coordinator and trainer of the ANW retraining program in Nijmegen and in during these developments Biology and ANW curriculum developer at SLO, Legierse is heavily invested and assumably wishing a success of ANW. Nonetheless, she reflects critically on *ANW* pointing out the subject still needs to further develop itself in content as well as didactics. [283] Although the public discussions concerning *ANW* the past year were helpful to gather attention for the subject, many stakeholders had no clue of the true nature of *ANW*. According to Legierse, this is a shame and can be attributed to the fact that, besides the training, there is no commission or think-tank further developing and guiding the process.[284]

Individual institutions like the ICLON (Teacher training centrum in Leiden) organised a conference day aimed for *ANW* teachers with the theme 'universe'. A theme which is grand in scale and can combine a variety of topics from different disciplines. The fact that this conference is organised indicates the interest in *ANW* in the field. However, many examples discussed during the conference seem to focus more on the content than the didactical approach that fits the ANW ideology.[285] An effect which may be the result of the lack of guidance from a central point of development as Legierse suggests.

[282] Agnes Legierse, 'De ware aard van ANW', *NVOX*, April 2000, 177, NVON, https://nvon.nl/nvox/nvox-2000-4-geheel.
[283] Legierse, 178.
[284] Legierse, 178.
[285] Arjen Wielemaker, 'Conferentie "Heelal"; ANW leeft!', *NVOX*, April 2000, 208–9, NVON, https://nvon.nl/nvox/nvox-2000-4-geheel.

The emphasis on the didactics and methodologies is clearly discussed by the teachers Jacob Kappe and Ineke Henze from the Oranje Nassau College in Zoetermeer. In earlier NVOX issues their work was presented as well, and now after three years of experimenting with *ANW* they share their conclusions. These can be summarized in a few important aspects: 1) prepare well and discuss with others to be able to transcend the mono subject; 2) Guide, control and assist project based learning methodologies to support motivation; 3) focus on the skills, methodologies and didactics instead of the content of the scientific topic; 4) be aware of the importance of the role of the teacher in the success of the subject, and do not depend on the books.[286] Especially this last recommendation is mentioned later in section *good practices* again, exposing that *ANW* can be a demanding subject to teach correctly.

The requested time and support to further develop *ANW,* that all of the parties in the previous paragraph in one way or another expressed, is also heard by the ministry of Education, Culture and Sciences (OC&W). The three years *ANW* was granted to develop itself, would be supplemented with an extra project which consisted of three sub-projects: promoting a network among ANW teachers, documenting good ANW teaching practices, and developing specific teaching methodologies for ANW. To achieve this, the project included regional conferences, research on best practices, and the development of teaching modules which solely focused on the didactics of ANW. The chair of the workgroup *ANW* from the NVOX, Heleen Driessen, therefore expressed it is now important *ANW* teachers start to actively participate in regional networks and to share their experiences to learn from each other.[287] In contrast to the negative attitude towards *ANW* in the end of 1999, the Ministry in 2000 ensured funding for these activities to help ANW become a mature school subject over time. A miraculous shift and essential in the longevity of the subject. However, the support from OC&W does come with a deadline. At the end of this 'maturity project' in 2002, after approximately 2,5 years, ANW had to be developed towards its full potential.

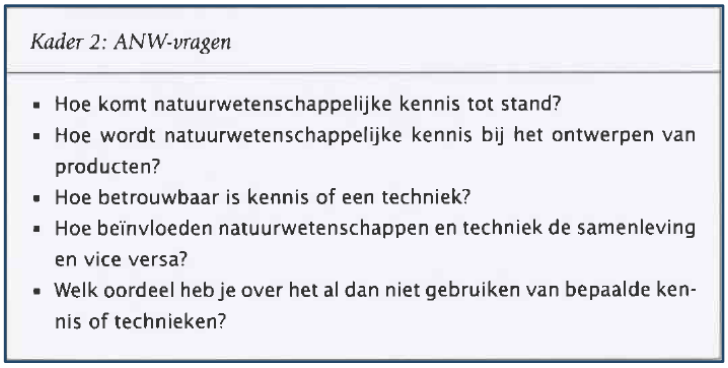
Good practices

The project about these 'Good practices' quickly developed and at the end of 2001 this research was almost finished. According to Kapteijn, who was member of the Project group Good Practices, it was scheduled that these good practices

[286] Jacob Kappe and Ineke Henze, 'ANW: van experiment naar praktijk', *NVOX*, October 2000, 407–11, NVON, https://nvon.nl/nvox/nvox-2000-4-geheel.
[287] Heleen Driessen, 'OC&W ondersteunt de praktijk van ANW', *NVOX*, November 2000, 499–500, NVON, https://nvon.nl/nvox/nvox-2000-9-geheel.

of 8 to 10 schools would be published as a book in the beginning of 2002.[288] Additionally, many of the results of the research also found its way in the NVOX. The November and December issue of 2001, and the January issue of 2002 present together already four case studies. In the march issue Kapteijn summarizes the project and shared examples and conclusions from all the case studies. For further information Kapteijn referred to the book 'Good Practice ANW', which was published simultaneously with the article.

The many concerns that have already been expressed about ANW are also reflected in Kapteijn's publication in the NVOX, but this time with a concrete example of how this should be dealt with in practice. The article is full of tools and examples of how ANW can be made a success. Kapteijn also touches upon the enormous diversity of school situations and that actually every school interprets ANW in a slightly different way. For example, departments sometimes consist of one to seven teachers, there may or may not be a separate ANW classroom and/or media library, budgets and the number of teaching hours differ, and the subject is sometimes spread out in periods, blocks, or even over entire years. However, analysing the described good practices show an interesting relation. What all these school situations have in common is the slow abandonment of the textbooks as a leading actor. Each school must look for his/her identity for *ANW* and make it fit within the frameworks that the school outlines. To do this, the *ANW* remain, according to Kapteijn, relevant.


Kader 2: ANW-vragen

- Hoe komt natuurwetenschappelijke kennis tot stand?
- Hoe wordt natuurwetenschappelijke kennis bij het ontwerpen van producten?
- Hoe betrouwbaar is kennis of een techniek?
- Hoe beïnvloeden natuurwetenschappen en techniek de samenleving en vice versa?
- Welk oordeel heb je over het al dan niet gebruiken van bepaalde kennis of technieken?

Figure 30. *ANW-questions which were still relevant in ensuring the identity for ANW.*

After reading the 'Good Practices', it is quickly evident that ANW is very dependent on the interpretation of the teacher(s), and that it is essential an active field and community is there to give these teachers the necessary support. This sub-project reached the set goals of the OC&W and can be viewed as quite successful. Nonetheless, the richness of the methodologies and activities that

[288] Mieke Kapteijn, 'Portretten van ANW-onderwijs', *NVOX*, November 2001, 478, NVON, https://nvon.nl/nvox/nvox-2001-9-geheel.

can be pursued in *ANW* can also have an overwhelming effect on new ANW teachers. Additionally, teaching *ANW* following the 'good practices' seems very demanding. If teachers have to figure out the identity and program of the subject within their own school setting, than this has to originate from an extensive intrinsic motivation. Considering many *ANW* teachers also teach in the mono-subjects, this demand might simply go over their heads. Eventually support from peers became limited as well, since the ANW community in 2002/2003 started to stagnate.[289]

ANW Network

As the sub-project 'Good practices' showed, an active network might be important. In the yearly report 2001 from the ANW department of the NVON a description of their network activity is given. Besides the already yearly national ANW conferences and ANW mailing list, the funding from OC&W helped to supplement activities in the seven regional circles.[290] In this manner, ANW teachers, stakeholders or participants with another motivation could connect on diverse levels. Sharing knowledge about ANW became more accessible. Although the activities are not specified entirely, the growing optimism and movement surrounding the ANW community is obvious, and this trend continues in the subsequent year. The yearly report from 2002, published in the march issue of the NVOX 2003, also highlights the growing community and regional activities thanks to the supplementation of OC&W. National conferences, as well as regional circles and a national mailing list are all network activities in which is heavily invested by the ANW department of the NVON.[291] ANW is not only growing as a subject, but also as a community.

However, the yearly report from 2003, published in the march issue of the NVOX 2004, starts to show a turnaround. On the political level the attitude towards ANW changed. This change seems to be related to the motivation of ANW-teachers in the field. Enthusiasm for the regional meetings in the middle and the north of the Netherlands started to decline, thus the financial support from the OC&W for network activities as well.[292] Although a request was put forward to extend the funding of meetings about the quality and assessment of ANW, OC&W

[289] SLO, 'Vakdossier 2003 Algemene Natuurwetenschappen', Vakdossier (Enschede: Stichting leerplanontwikkeling (SLO), December 2003), 14, Den Haag, Koninklijke Bibliotheek.
[290] Heleen Driessen, 'Jaarverslag sectie ANW 2001', *NVOX*, March 2002, 4–5, NVON, https://nvon.nl/nvox/nvox-2002-3-geheel.
[291] Heleen Driessen, 'Jaarverslag sectie ANW 2002', *NVOX*, March 2003, 4–5, NVON, https://nvon.nl/nvox/nvox-2003-3-geheel.
[292] Heleen Driessen, 'Jaarverslag sectie ANW 2003', *NVOX*, March 2004, 3, NVON, https://nvon.nl/nvox/nvox-2004-3-geheel.

did not even take the request into consideration. In addition to these problems, the ANW website and mailing list struggled to find a webmaster to control various network activities. The ANW community was quickly losing the accessibility it gained in the previous two years.[293] Although the ANW community grew in 2001 and 2002, its point of stagnation and decline started in 2003. Either by the lack of support from OC&W or the societal interest in the subject. Since determining the cause of this decline is not possible in one paragraph, the section 4.3 will go into more depth explaining the intricate political and societal changes in the early 2000s.

ANW didactics

Although the sub-project on 'Good practices' was completed at the beginning of 2002, the didactic sub-project was a lot more difficult. Simply the size was underestimated in advance and the stated duration too short. In the NVOX issue of May 2002 it becomes clear that in the period from September to December 2002 the first version of the didactic manual was ready and could be read by critical colleagues. However, this testing phase was quite overdue. Considering the scope of the project that OC&W assigned would run till the end of 2002, it is hard to imagine the sub-project made any impact on the political decision made about the future of *ANW.*

What was known in 2002 about the guide, is that it would cover five topics: Current affairs in ANW, Biosphere, history in ANW, Identity of ANW and Matter. Each module would provide useful tips to draw attention to these parts of ANW.[294] Even though the first version of the didactical sub project was presented quite late, the success of these readings was underscored by the yearly report of 2002 by the ANW department of the NVON. They expressed it was a topic of discussion among the regional circles.[295] Due to the early discussion from September till December, the project sparked interest and discussion among participants. However, political attitude towards ANW does not seem to be influenced by these developments. The five modules were finished till the final editing phase, but not published in 2003. The project did not receive new funding from OC&W, yet the department of the NVON did not stop supporting the project.[296] Eventually Henny Kramers-Pals, editing member of the NVOX, did

[293] Driessen, 4.
[294] Redactie NVOX, 'Vakdidactische handleiding ANW op de rails', *NVOX*, May 2002, 256, NVON, https://nvon.nl/nvox/nvox-2002-5-geheel.
[295] Driessen, 'Jaarverslag sectie ANW 2002', 3.
[296] Driessen, 'Jaarverslag sectie ANW 2003', 4.

the final editing of the ANW didactics manual and published it on an interactive website of the university of Twente in 2004.[297]

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When studying the developments of *ANW* in retrospect, one can sense the false hope OC&W gave to teachers and developers of *ANW*. Although the status of *ANW* was saved after the detrimental decision of Adelmund in December 1999, the thoughts about decreasing the size and status of *ANW* never left the state secretary. Although the proposed projects did not all finished in time and also not with staggering success, it could be argued decisions about the future of *ANW* were already set in stone. Even before the end of the 'maturity project' of *ANW* the memorandum *Continuïteit en Vernieuwing in de Tweede Fase havo/vwo* (continuity and renewal in the second phase) was presented to the *Tweede Kamer* in January 2002. Since the 2002 parliament elections were coming up, Adelmund might have felt the need to end her term as State Secretary with a new memorandum. In a letter to the *Tweede Kamer* from Adelmund it was said that in preparation of the suggestions extensive discussions were held with school board members, teachers, parents, students and universities (of applied sciences), and that broad support for the changes was expressed.[298] If this group also included ANW or natural science stakeholders is not specified.

The growing status of *ANW* was therefore only temporary. Even though the sub-projects about the 'good practices', community growth and didactics all highlighted some successes of what could be achieved with *ANW*, they did not seem to impact political decision making at all. Hence, the next section discussed the proposed changes in this memorandum. The *Tweede Fase* was getting a renewal, and ANW was not going to be spared.

4.2. The road to the '*Nieuwe' Tweede Fase*

Between 2002 and 2007 changes were again proposed about the shape and size of the subject, especially in havo. Throughout these years, the status of *ANW* started to crumble again. A development which started with the memorandum *Continuïteit en Vernieuwing in de Tweede Fase havo/vwo* and continued till the point the renewal of the *Nieuwe Tweede Fase* was introduced. Many changes that were made in this havo/vwo renewal are still present today, and this paragraph

[297] Heleen Driessen, 'Jaarverslag sectie ANW 2004', *NVOX*, March 2005, 3, NVON, https://nvon.nl/nvox/nvox-2005-3-geheel.
[298] K.Y.I.J. Adelmund, 'Continuïteit en vernieuwing in de tweede fase havo/vwo', Pub. L. No. 28 000 VIII, 2001–2002 nr. 98 (2002), 1, https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3ak9g0kyce.

is therefore the last major jump in the written curriculum we will discuss. In chronological order we will assess governmental documents, but also articles in the NVOX and various newspapers.

Memorandum C*ontinuïteit en Vernieuwing*

In the memorandum *Continuïteit en Vernieuwing* (Continuity and Renewal), sent to the *Tweede Kamer* in January 2002, State Secretary Adelmund expressed her concerns about the high workload for teachers in the *Tweede Fase*. Not only students but also teachers were in need of space to reflect, deepen and innovate. The State Secretary's main objective was to simplify and slim down the system, in order to give the teacher the space to develop the skills programme that was so central to the renewal of the *Tweede Fase.*[299] The State Secretary did not dismiss the *Studiehuis* but emphasised it as an educational development that deserved space and time.[300] From the beginning of the memorandum, the State Secretary's goal became clear, but were the actions all in the service of this stated goal?

In summary, the memorandum explored three principles that dealt with continuity, feasibility and organizability. Structural bottlenecks must be solved in order to provide space, and continuity, for positive developments in innovation.[301] Profile systems must be better aligned, and simplification should ensure that programmes become more feasible. For schools, the programme must be organisable, for which it is necessary to tackle structural problems that schools cannot solve themselves.[302] Although the memorandum went into various details, the biggest headache seemed to be about the fragmentation of education due to the structure of sub-subjects (*deelvakken*). In the memorandum this system is revised and replaced, which benefits all the three previously mentioned principles.[303] The profiles were, according to Adelmund, still broadly supported in the educational sector.[304] The role of the profiles will therefore not be changed, but by changing the *deelvakken* structure the educational system loses flexibility in distributing study hours. Where it used to be possible to choose a limited part of a subject, you now choose the subject entirely or not. In addition, (profile) subjects must be standardised in size, except for a few large subjects such as Dutch and Mathematics. This all means:

[299] Adelmund, 2.
[300] Adelmund, 3.
[301] Adelmund, 4.
[302] Adelmund, 5.
[303] Adelmund, 3.
[304] Adelmund, 6.

More completed subjects, room for in-depth study and fewer different groups for teachers.[305]

Although this sounds positive, this change had drastic consequences for the distribution of study hours. As a result of standardisation, some subjects gained hours, others lost them. The size of the free space also increased, and the size of the common part was reduced. Study hours simply had to come from somewhere, thus an impact on the common part was inevitable. Therefore, the State Secretary was focusing on the integration of *ANW* and history/social studies in the profile part.[306] This was simply a necessary choice, because the simplification of the system no longer allowed for the presence of the current size of the common part.

At havo, the blow hit *ANW* hardest. "It is proposed that *ANW* should no longer be compulsory for nature profiles and *Geschiedenis/Maatschappijleer*, not for culture and society and economy and society profiles. In this way, the overload is tackled and yet the desired breadth of education is maintained in havo."[307] The idea that *ANW* would be redundant for students with a nature profile has been around for some time within schools and policymakers. Curriculum developers and teachers have often shared critical opinions about this proposal. In the following paragraph we will discuss the reactions on the State Secretary's proposed amendments. Taking into account the ongoing developments and studies by *ANW*, discussed in the previous paragraph, one could only guess these would not be positive.

Response on Continuïteit en Vernieuwing

Remarkably, there is silence in the NVOX about Adelmund's proposals in January *Continuity and Renewal.* It was only in the April issue of the magazine that the package of plans was critically discussed in an opinion piece by physics teacher Roel Timmermans. This physics teacher reacted frustrated about the lack of information: "I have not read in the NVOX or AOB education magazine what the changes for the Physics subject at havo, vwo will mean in concrete terms (why not NVON, AOB?)."[308] The NVON seems to have a passive attitude in this regard. With the NVOX, of all things, support can be gauged among readers, something that is not done adequately. Support that is clearly lacking among teachers such

[305] Adelmund, 8.
[306] Adelmund, 6.
[307] Adelmund, 11.
[308] Roel Timmermans, 'Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt':, *NVOX*, April 2002, 28, NVON, https://nvon.nl/nvox/nvox-2002-4-geheel.

as Timmermans, who are shocked by the proposals and conclude that little can be adjusted to these agreements since many institutions already agreed.[309]

Bijv.: voorstel VWO				
	NG		NT	
	nieuw	oud	nieuw	oud
Na	400	360	400	560
Sk	-	400	400	520
Bi	400	480	-	-
Wi-B	600	600	600	760
totaal	1400	1840	1400	1840

Figure 31. *Proposed changes of studyhours, based on the plans in the memorandum Continuïteit en Vernieuwing.*

For Timmermans, the adjustments, outlined here above, resulted in a reduction of the depth of physics education. NG profiles lost the obligation of chemistry, who could nonetheless study medicine afterwards. Although in the free space there was an option for a more general beta subject, Timmermans argued this does not fill the depth that would be missing.[310] Theo van Welie, previously involved as a member of the ANW Development Group, responded to Timmermans' opinion with a partial explanation. "A few days after the announcement of Adelmund's plans, a number of teachers discussed this in the television program Rondom Tien [Talk show about politics and news]. Language teachers, social studies teachers and historians had the upper hand: the French and German teachers in particular cackled that it was a sweet delight. BiNaSk [beta] and ANW had little to cackle: simply they were not invited. But we already know that: we're not very well positioned in the market."[311] On further investigation in the online archive of *Beeld & Geluid,* Van Welie discussed the episode on the 7th of February 2002. In the description of this episode is becomes clear that indeed no beta teachers were present, but two Dutch, one history and one French teacher.[312] Van Welie is therefore critical of the NVON and wonders why they behave silent. After all, it is the natural sciences where the big blows fall.[313] This case shows that lobbying for study hours is a practice that pits trade unions against each other, teachers become in this way each others competitors.

[309] Timmermans, 188.
[310] Timmermans, 188.
[311] Theo van Welie, 'Reactie op: Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt':, *NVOX*, April 2002, 189, NVON, https://nvon.nl/nvox/nvox-2002-4-geheel.
[312] 'Rondom Tien' (NCRV, 7 February 2002), Hilversum, Beeld & Geluid, https://zoeken.beeldengeluid.nl/program/urn:vme:default:program:2101608060046547131?ac=dgtl%2Canlg&q=Rondom+tien.
[313] van Welie, 'Reactie op: Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt':, 189.

Chairman of the NVON, Frits Gravenberch, also responded to Timmermans' opinion piece, expressing that he regrets that nothing has been mentioned about the actions of the NVON and other science federations.[314] In the same issue in the NVOX, the board of the NVON also briefly discussed the fact that they are trying to exert as much pressure as possible on the political decision-making around the *Tweede Fase.* For example, the NVON stated that it is positive about the attempts to make science subjects more attractive and teachable, but that this should not be a reason to sacrifice total teaching time.[315] Although it is reassuring for Timmermans to know that the NVON is actually committed, it is remarkable that this process takes place without informing the readers and teachers. It arouses concern among teachers, by leaving them clueless. In contrast, prominent figures in professional organisations who have more insight into developments seem to be more relaxed. For example, an article in the *Onderwijsblad* of 23 March 2002 was also published in the NVOX, in which it becomes clear that Gravenberch did not expect that scientific hours would be cut.[316]

The NVON finally voiced their standpoints in the June issue of the NVOX about the *Continuïteit en Vernieuwing* memorandum. This was done in the form of a a letter, which was compiled after the discussion in April in a mini conference (to which Mr. Timmermans was also invited on behalf of the chairman). The letter was addressed to the newly elected Balkenende I cabinet, in which it was made clear that the number of teaching hours that were currently allocated to the subjects of physics, chemistry and biology was insufficient to guarantee quality. The coherence of the subjects was also at stake, along with the overall character of the two nature profiles. Finally, the NVON also criticized the removal of ANW for half of the students in the Second Phase, since the subject was important in general education.[317]Gravenberch's optimistic attitude in April was no longer reflected in the letter to the new cabinet. However, was this defence from the NVON not too late?

Criticism can be heard not only from the NVON's side, but also from the side of schools that have now endured the start-up troubles of the *Tweede Fase.* For

[314] Frits Gravenberch, 'Reactie op: Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt':, *NVOX*, April 2002, 189, NVON, https://nvon.nl/nvox/nvox-2002-4-geheel.
[315] Redactie NVOX, 'From the board table', *NVOX,* April 2002, 189, NVON, https://nvon.nl/nvox/nvox-2002-4-geheel.
[316] Onderwijsblad, 'Docenten natuurkunde vrezen slechte kwaliteit. Uit: Het onderwijsblad 6, 23 maart 2002', *NVOX*, April 2002, 211, NVON, https://nvon.nl/nvox/nvox-2002-4-geheel.
[317] Redactie NVOX, 'NVON stuurt brief over Tweede Fase naar onderhandelaars', *NVOX*, June 2002, 359, NVON, https://nvon.nl/nvox/nvox-2002-6-geheel.

example, Rector Joost van den Rijn of the Lek en Linge in Culemborg argued that the government should be ashamed of itself: "If you reverse an educational innovation after only two to three years, it has not been well thought out."[318] Van den Rijn did not see the need, since their students don't experience it as overloaded at Lek and Linge. It is clear from this situation that implementation simply takes time. Van den Rijn therefore expressed that it is bitter once you have everything in place to have to reverse a lot. It creates a wave of cynicism, especially among *ANW* teachers. "Think of those teachers who have trained. For nothing. That's so bad for the atmosphere."[319] The rector thinks it is the worst thing that the intervention is so badly thought out, there seems to be a lack of a clear vision. "Adelmund talked to everyone. Also, with us. She mainly looked at what is feasible. Not what's good for education."[320]

Harrie Eijkelhof, who is also a professor of physics didactics at Utrecht University, also voiced criticism, calling it 'mopping'. In the *onderbouw* (first 3 years of havo/vwo), a subject called 'science' was now being considered again, while in the upper years this was disappearing in the form of ANW. "Those demoralized ANW teachers are apparently expected to happily get to work with 'science'"[321] A few weeks later, Eijkelhof expressed himself again in the *Financieele Dagblad*, this time with more extensive argumentations and concerns. The standardisation of the number of hours in profile subjects mainly hurts the science corner, but also the short-sighted view of the role of ANW for science students.[322] However, it was not easy to be in Adelmund's shoes either. Contrary to earlier noises, *Het Parool* talked about the overload of work experienced by schools and the devastating conclusions of the *Onderwijsinspectie* in November 2001 in a report on the *Tweede Fase*.[323] By assessing all these perspectives it was clear that there are many conflicting voices, countless interests, and passionate, but by now also demoralized, teachers that made the decision making in educational developments exceptionally difficult.

[318] 'Scholen snakken naar Haagse visie; ingreep van Adelmund valt verkeerd', 3.
[319] 'Scholen snakken naar Haagse visie; ingreep van Adelmund valt verkeerd', 3.
[320] 'Scholen snakken naar Haagse visie; ingeep van Adelmund valt verkeerd', 3.
[321] Paul Kleis Jager, 'Onrust in onderwijs zal blijven groeien; Verplichte vakken; De betaleerlingen moeten zich straks weer beperken tot alleen rekenen', *Trouw*, 15 January 2002, sec. Nederland, 3, Lexis Nexis.
[322] Harrie Eijkelhof, 'Leerling wordt beperkt in keuze voor betavakken', *Het Financieele Dagblad*, 26 January 2002, sec. Nederland, Lexis Nexis.
[323] Mayke Calis, 'Roemloos einde Tweede Fase', *Het Parool*, 18 January 2002, sec. Nederland, 4, Lexis Nexis.

Memorandum *Ruimte laten en keuzes bieden*

At the beginning of 2003, the Minister of Education, Culture and Science, Maria van der Hoeven, presented the proposals that built on the *Continuïteit en Vernieuwing* memorandum. The memorandum, *Ruimte laten en keuzes bieden in de Tweede Fase van het havo en vwo*, did justice to its name when it came to the content. For example, in the new proposal, two 'real' electives have been chosen, with the standardised size. This did have an effect on the rest of the curriculum. It is therefore emphasized that maintaining the size of the common part restricted the student's freedom of choice.[324] *Ruimte laten en keuzes bieden* can therefore be seen as a further concrete elaboration of the earlier *memorandum*, of which many elements are included.

De uren:		
havo	N&G	N&T
na	-	400
sk	320	320
bio	400	-
vwo		
na	-	480
sk	440	440
bio	480	-

Figure 32. *Changing studyhours, based on the proposals of the Memorandum Ruimte laten en keuzes bieden.*

However, there are small adjustments when it comes to *ANW* in the *Ruimte laten en keuzes bieden memorandum*. Initially, *ANW* was dropped entirely in the HAVO program and in the VWO program for the N&G and N&T profiles. In the new memorandum, this was not the case and ANW remained mandatory for both the culture and economy profiles for havo and vwo.[325] However, the number of hours, although less than in *Continuïteit en Vernieuwing,* continued to decrease significantly for the science subjects. For example, physics and chemistry lost 80 hours in vwo (Figure 32), and additionally it is also expected that parts of ANW will be integrated into the subjects. Regional circle coordinator Van Woerkum expressed his thoughts on the adjustment in a report by the SLO. These were mainly about the embedding of ANW in the profile subjects. "The hours for each subject are also decreasing, due to the disappearance of the sub-subjects. Then a teacher is not going to make room for ANW. Also, not every teacher feels

[324] Ministerie van Onderwijs, Cultuur en Wetenschap, 'Ruimte laten en keuzes bieden in de tweede fase havo en vwo' (Ministerie van Onderwijs & Wetenschappen, January 2023), 8.
[325] SLO, 'Vakdossier 2003 Algemene Natuurwetenschappen', 21.

qualified to do this."[326] With the declining community, motivation and the lack of ANW training, Van Woerkum is very pessimistic.[327]

In the *Vakdossier 2003* it is clearly stated that many education councils and unions (AOB, CNV, VVO, VBKO and VOS/ABB, NIBI, Beta Federatie, NPN and of course the NVON) deeply regret the minister's proposals to scrap *ANW*. They also criticise the idea of embedding *ANW* in the profile subjects, since only two of the three relevant mono subjects for *ANW* appear mandatory in the N&T and N&G profiles.[328] However, the proposals in the memorandum are reducing almost all science subjects in size. As a result, competition for study hours among beta's was also starting to increase and the year 2003 is dominated by physics, chemistry and biology teachers who defend their profession tooth and nail. According to Rob Knoppert, this struggle for study hours was getting out of hand. Teachers regularly told strange fairy tales about the importance of their profession, without critically reflecting on why study hours were cut in the first place. He emphasized that the trend was shifting away from the focus on natural sciences and that ignoring this was "an insult to talented alphas."[329] In the end, a debate among teachers and stakeholders about study hours is inevitable and should happen to keep the educational field adaptable. However, the tension it gained in this period reached unhealthy levels.

Not only in the NVOX, but also in various newspapers there was plenty of criticism of the proposed plans. Although it is extremely interesting to give attention to these articles, it was apparent that the same reasoning was repeatedly used to keep *ANW* in the common part. Reasoning that in the past saved *ANW* and allowed it to maintain its position, became a known rhetoric. In the article *De klagende leerlingen krijgen hun zin* in *NRC Handelsblad*, the finger is pressed on the sore spot of the discussion, which showed what changed now compared to three years ago. Although almost all trade unions, employers' organizations, universities, associations and councils with some affinity with the science subjects called the changes a 'squandering of science education' and simply found it 'disastrous'. Nevertheless, there appeared to be support in politics for the proposed adjustments by Minister Van der Hoeven. Opinions of lecturers in the field were not difficult to find, since on the website set up for this purpose bozebetas.nl "Barse biologen, nare natuurkundigen, sissende

[326] SLO, 23.
[327] SLO, 24.
[328] SLO, 25.
[329] Rob Knoppert, 'Notawee twee', *NVOX*, April 2003, 153, NVON, https://nvon.nl/nvox/nvox-2003-4-geheel.

scheikundigen, woeste wiskundigen en aangebrande ANW'ers"[330] vent their irritation. However, whether these protestshad an effect is disputed in *NRC Handelsblad* article. "In politics, hardly any party is enthusiastic about the original *Tweede Fase"* anymore*[331]."* The old ideals set by former education minister Ritzen about the better connection between secondary school and higher education have been replaced by a fashion of more freedom of choice.[332]

Since the political fashion also influenced the minister Van der Hoeven, the eventual outcome of all the protests from teachers was only moderately effective. One of the results was a more defined elective subject in the profile room *(profielkeuzevak),* instead of a completely free to choose subject. ANW also remained a compulsory subject in the general part of vwo, but with a very limited size of 120 study hours instead of earlier 200. However, for havo ANW could not be saved, and the subject became optional.[333] Finally, after a year of fierce discussion, the minister presented the final proposal on 4 December 2003. On these proposals a disappointed reaction is clearly heard throughout the NVOX and newspapers from science teachers. "In her final proposal, the minister has set aside all participation from the science world."[334], from R. Brouwer in an opinion piece in the NVOX. Trade unions and other stakeholders like the NVON were also dissatisfied, but they were now deprived of a say in further plans. This became evident in a statement from the board of the NVON in the NVOX, which mentioned the minister only will negotiates further in the *Tweede Kamer*.[335] In response to the societal unrest, all parties in the *Tweede Kamer* regretted the developments and asked the minister to reconsider the proposal.[336] This is an unusual development compared to the beginning of 2003, when the minister gained political support. These capricious statements in the *Tweede Kamer* showed the disunity about the subject, as well as their indecisiveness. Therefore, it was understandable the minister asked the political parties to look at alternatives themselves, since the minister stated she did not see any other option herself.[337]

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[330] Wilco Boom, 'Verzet tegen verval beta-onderwijs', *Algemeen Dagblad*, 20 February 2003, 5, Lexis Nexis.
[331] Guus Valk, 'De klagende leerlingen krijgen hun zin', *NRC Handelsblad*, 11 January 2003, 4, Lexis Nexis.
[332] Valk, 4.
[333] 26
[334] R. Brouwer, 'Natuurkundeleraren accepteren de herziening van de tweede fase niet', *NVOX*, January 2004, 56, NVON, https://nvon.nl/nvox/nvox-2004-1-geheel.
[335] Redactie NVOX, 'Van de bestuurstafel: NVON ontevreden over het compromisvoorstel voor de Tweede Fase', *NVOX*, January 2004, 47, NVON, https://nvon.nl/nvox/nvox-2004-1-geheel.
[336] SLO, 'Vakdossier 2003 Algemene Natuurwetenschappen', 26.
[337] SLO, 27.

Tweede Fase vernieuwt

After the discussion year of 2003 and the proposal that was on the table at the end of 2003, Minister van der Hoeven's plans changed little. The concession made at the end of 2003 was the last victory of the protesting science teachers and stakeholders. Part 1 of *Regelgeving voor de nieuwe Tweede Fase* briefly explained the development of the legislation. The *profielkeuzevak* was discussed several times as the allowance to guarantee the presence of sufficient 'beta' in the beta profiles.[338] The drawback of this *profielkeuzevak* was the lesser freedom of choice students had to choose a subject which oriented more on a different profile.[339] The origin of the *profielkeuzevak* clearly came from a compromise between the two opposing parties and visions. The *Onderwijsraad* was involved in this process, mentioning it was one of their most important achievements.[340] It is remarkable how positively this development was portrayed in the report, when compared to the dissatisfaction expressed in the previous paragraph.

In order to gain clarity about the impact of the renewed *Tweede Fase*, the *Zakboek Tweede Fase* is a useful publication of the *Tweede Fase Adviespunt*. The tables in this report display the differences in study hours due to the renewal. In Figure 33, the various tables and information in the *Zakboek* is summarized in one large table. [341] I've constructed the table with the subjects clustered in alpha, beta and gamma, but also in total to compare between the common, profile and free part. The colours indicate whether one subject gets extra hours, or hours are deducted. Since in the 'old' model there were still sub-subjects, these are indicated with (1,2) and the hours presented in the comparison are based on these sub-subjects combined. Notable changes that can be seen from the tables are discussed below. In any case, it is clear that both havo and vwo are reduced in study load what the main aim of the renewal was.

***Havo*.**

In general, it is clear that students are getting a larger profile (in which one *profielkeuzevak* is incorporated), at the expense of the common part. Removing *ANW* and the reducing the size of *Maatschappijleer* saves 200 slu. Furthermore, profile subjects are more aligned with each other. As a result, hours are divided and the size of mathematics and physics is decreased. The languages and gamma subjects (except economy) increase in size. As a result, havo becomes less general, and the choice of the profile part has more impact. Science students (NT

[338] Tweede Fase Adviespunt, *Regelgeving voor de vernieuwde tweede fase* (Den Haag: Tweede Fase Adviespunt, 2007), 25.
[339] Tweede Fase Adviespunt, 26.
[340] Tweede Fase Adviespunt, 33.
[341] Tweede Fase Adviespunt, *Zakboek Tweede Fase* (Den Haag: Tweede Fase Adviespunt, 2007).

or NG) may receive broader subject-specific science education with possible the new subject NLT. In any case, it is a loss of depth in the natural sciences, and for alpha or gamma students that will not receive general scientific education.

Vwo.
The common part did not lose many hours, although the content is changed considerably. For example, 160 slu will be added to the foreign modern language, but 80 slu of ANW, 80 slu of history and 40 slu of *maatschappijleer* disappears. The profile part increases (with a *profielkeuzevak*) and the free part seems to increase, although these hours come from the 'entire free part'. It is clear that students can choose more. The beta profile subjects decrease in size, in favour of a possible extra subject in the profile section. As a result, natural science education becomes less in-depth and broad, at the cost of education in especially foreign modern languages and the possibility of more freedom of choice.

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In conclusion, it can be said that, looking back to 1999, there was little difference between the proposals for ANW then and now. The position of ANW was weak. However, the reasoning behind the proposals was different. Firstly, with ANW more and more developed, it's experimental status cannot be taken into account as much as in 1999. Also, in 2002 the overall political opinion about the *Tweede Fase* had shifted. Instead of a focus on structure and general knowledge, the focus on freedom of choice became more prevalent. Combining that with the need to simplify the educational systems, ensured an untenable place for ANW in the curriculum. Thirdly, the NVON seemed to not adequately act and expected in first months after the published *Continuïteit en Vernieuwing* that the proposed ideas would not be enacted. This in contrast with organisations that represent e.g. the languages, who were successful in lobbying more study hours for their subject. Lastly, compared to three years earlier, ANW teachers did not take mass action. In the fierce protests that followed, the reaction to the reduction of hours in the mono science subjects and the N&G profile without physics overshadowed ANW's position in fierce protests.[342] In the *Vakdossier 2003* it was therefore concluded that the ideas of ANW were still widely supported, but not in the form of a subject on its own. "The question is to what extent the characteristic *eindtermen* of the subject, the so-called ANW questions, will be able to sink into other subjects. It is also questionable which subjects will be able to adopt the focus on skills at HAVO."[343] Either way, the beta's have, in all their struggles to maintain enough hours for the mono subjects, lost *ANW* in the process.

[342] SLO, 'Vakdossier 2003 Algemene Natuurwetenschappen', 35.
[343] SLO, 35.

		slu havo			slu vwo		
	Vak (1,2 was deelvak)	**Oud**	**Nieuw**	**+/-**	**Oud**	**Nieuw**	**+/-**
ALPHA Languages, philosophy and art	Nederlands	400	400	0	480	480	0
	Engels	360	360	0	400	400	0
	Duits (1,2)	360	400	40	480	480	0
	Frans (1,2)	360	400	40	480	480	0
	Grieks			0	480	600	120
	Latijn			0	480	600	120
	Filosofie	360	320	-40	320	480	160
	Moderne vreemde talen*[1]	360	400	40	480	480	0
	CKV	120	120	0	200	160	-40
	Tekenen	360	320	-40	480	480	0
BETA Natural Sciences, Mathematics and Computer Science	ANW	160	120	-40	200	120	-80
	Natuurkunde (1,2)	440	400	-40	560	480	-80
	Natuur leven en techniek (NLT) **nieuw**	0	320	320	0	440	440
	biologie (1,2)	320	400	80	480	480	0
	Scheikunde (1,2)	280	320	40	520	440	-80
	Wiskunde A (1,2)	280	320	40	600	520	-80
	Wiskunde B (1,2)	440	360	-80	760	600	-160
	Wiskunde C	0	0	0	0	480	480
	Informatica	240	320	80	280	440	160
GAMMA Social sciences and economics	Aardrijkskunde	200	320	120	360	440	80
	Geschiedenis (ook 80 in vwo gd*[2])	240	320	80	360	440	80
	Economie (1,2)	440	400	-40	480	480	0
	Maatschappijleer (gd*[2])	160	120	-40	120	120	0
	Maatschappijleer/-wetenschappen	200	320	120	360	440	80
	Management en organisatie	280	320	40	360	440	80
Shift of slu and focus	Gemeenschappelijk deel	1480	1120	-360	1960	1920	-40
	Profieldeel (incl. profielwerkstuk 80 slu)	1160	1440	280	1840	1960	120
	(Verplichte) Vrije deel met verlichting	120	320	200	120	440	320
	(Verplichte) Vrije deel zonder verlichting	320	320	0	480	440	-40
	Geheel (schoolbepaald) 'vrij deel'*[2]	440	320	-120	880	480	-400
Total	met tijdelijke verlichting	3200	3200	0	4800	4800	0
	zonder tijdelijke verlichting	3400	3200	-200	5160	4800	-360

Figure 33. *Full picture of the changed study hours when the Vernieuwde Tweede Fase was introduced.*

*[1] The abolition of the sub-subjects has an effect on the languages in the general part. For example, students choose a modern foreign language, instead of two sub-languages. This results in an increases size of alfa education by 160 slu.

*[2] gd stands for *gemeenschappelijke deel*, the general part. These subjects were partly there given as well.

*[3] The 'free part' is entirely free for the school first, then the students to decide. Activities outside the timetable, such as internships, are included.

4.3. The influence of societal and political interaction on ANW

As this thesis has shown, since the 1990s, education has entered a time of innovation upon innovation, resulting in a great deal of unrest. Although the *Vernieuwde Tweede Fase* was approaching, several national educational organizations sounded the alarm at the end of 2006 and the beginning of 2007. This resulted in parliamentary questions in January 2007.[344] In response to the debate that followed and also increasing social unrest about the quality of education, a proposal was presented in April 2007 to investigate the educational innovations in secondary education in the Netherlands. The Dijsselbloem Commission of Inquiry was set up to carry out this task. On 17 April 2007, the *Tweede Kamer* approved the establishment of the temporary Committee on Parliamentary Research into Educational Innovations. The committee consisted of members of parliament from almost all parties and presented its final report *Tijd voor onderwijs* on 13 February 2008.[345] The report focused on the educational innovations in the 1990s, such as basic education, the *Tweede Fase* (including the *Studiehuis*) and pre-vocational secondary education.

The report is critical, concluding that the government has neglected its core task of monitoring and maintaining the quality of education. According to the committee, the unrest has only increased and the government has lost support and trust in both society and the educational field.[346] In this thesis many perspectives are already discussed (focused primarily around ANW), but not yet from the perspective of a commission that critically reflect on its government's action. Interestingly, some of the claims I already made in this thesis about *ANW* and the *Tweede Fase* are mentioned in the report as well, like: the lack of proper pilots and experiments, and the gathering of broad support in political and union circles but forgetting the support from the schools and its teachers.[347] Some claims enrich the arguments we have already discussed, like the apparent tunnel vision among responsible ministers who were not sufficiently open to criticism and placed political support above support from the educational sector. [348] However, the extensive *Tijd voor onderwijs* report also had a broad scope, not

[344] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', Parlementair onderzoek onderwijsvernieuwingen, 13 February 2008, 5, https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3k9m1a1dnv.
[345] Commissie-Dijsselbloem, 'Tijd Voor Onderwijs' (Tweede Kamer der Staten-Generaal, 13 February 2008), 1, https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3k9mbivyy6.
[346] Commissie-Dijsselbloem, 187.
[347] Commissie-Dijsselbloem, 188.
[348] Commissie-Dijsselbloem, 188.

focusing on specifically the development of *ANW*. I will use this report therefore as both a source, but also a secondary literature to discuss political and societal developments. Aspects which I have not highlighted enough, but already referred to in chapters 1.1, 1.2, 2.2 and 4.1.

In the sub-study *Vijftien jaar onderwijsvernieuwingen in Nederland*, by *the Sociaal en Cultureel Planbureau* (SCP), an extensive study is made of social, but also political actors and contexts that have influenced implemented policy in a broad sense. In this section, we discuss these findings and see how the interaction of society and politics has also influenced ANW.

Societal developments

In these fifteen years, society, and therefore also education, changed. According to the report of the *Sociaal en Cultureel Planbureau*, an important development in society is the aspect of *Individualization*. Mottos such as 'Tailor-made education' (Figure 34) and 'the student first' are very well known in the field of education. However, I would argue that the educational field responds to this aspect of *individualization* as well. Reducing class sizes, exploring different pedagogical-didactic approaches and placing the independence of the student more central are all attributing to this societal trend. Just think of the *Studiehuis.*

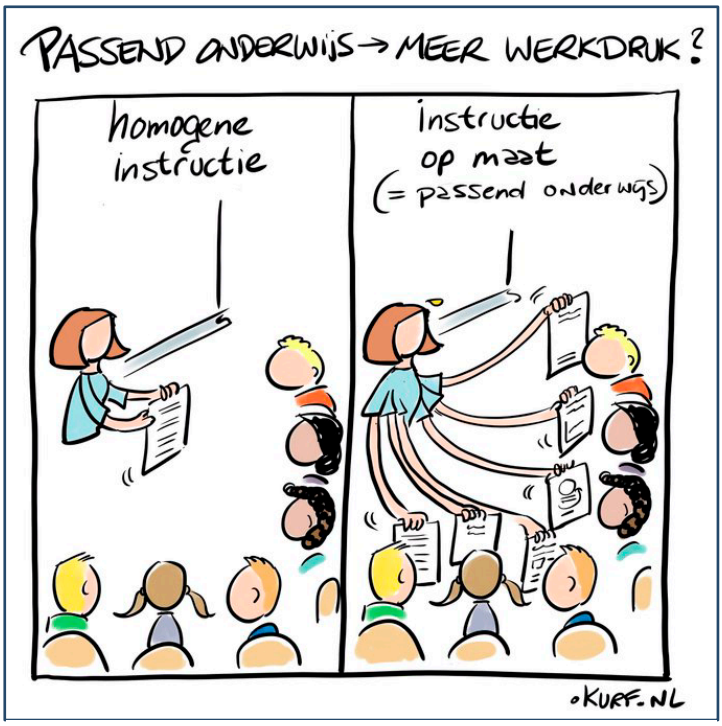

Figure 34. *Individualization of education caused a trend towards more tailored education towards individual students.*

To a certain extent, education itself was a driving force behind this *individualization.*[349] This was an effect that was probably considered desirable, considering it was stimulated by the educational renewal. However, in addition to *individualization,* society also started to *informalize*. "These differences [between teachers and students] have become smaller and more personal, determined less by class, race/ethnicity, religion, gender and affluence and more by personal preferences."[350] On the one hand, this development could be seen as positive supporting equality. On the other hand, this 'equalisation' of society also had consequences for education. Today, teachers do not stand above, but next to the student. Parents, partly due to higher levels of education, are also becoming more vocal towards teachers and are taking more of a negotiating position. As a result, *informalisation* lowers the social control of the teacher.[351] Although the SCP did not directly draw this relationship, I would argue that these developments also had an effect on the actual content of education. For example, due to the *informalization* and *individualization* of society, the subject of citizenship education and norms and values in society is more prominent in the written curriculum.[352] This clearly emerged in the *Tweede Fase,* with *ANW* as a prime example, but also in the last few years when assessing the recommendations from curriculum.nu.

According to the SCP, *informalization* and *individualization* also contributed to the *intensification* of society and education. Since one's own world of experience is central, there is a stronger orientation towards one's own feelings and meaning. This can be seen in the trend of concept-context education[353], or partially in the emergence of realistic math education.[354] Added to this is the growing use of information and communication technology.[355] The *informalisation* and *individualisation* also show that the Netherlands, relative to other European countries, scores low on power distance and scores high on autonomy and independent values.[356] Social change is clearly present and the

[349] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 22.
[350] Sociaal en Cultureel Planbureau, 22.
[351] Sociaal en Cultureel Planbureau, 23.
[352] Sociaal en Cultureel Planbureau, 22.
[353] Koos Kortland, Ad Mooldijk, and Hans Poorthuis, 'Leren in context', *Handboek Natuurkundedidactiek* (blog), n.d., https://natuurkundedidactiek.nl/home/2-7-1-leren-in-context/.
[354] 'Realistic Mathematics Education', *Freudenthal Institute* (blog), n.d., https://www.uu.nl/en/research/freudenthal-institute/realistic-mathematics-education.
[355] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 23.
[356] Sociaal en Cultureel Planbureau, 15.

ANW subject reflects these developments in the core objectives and attainment targets that have been determined in the design of the *Tweede Fase*. So far, *ANW* seems to move along with societal developments.

However, a downside can be recognized in this trend as well. Due to these societal developments, the SCP claims Dutch society is becoming increasingly meritocratic. "In such a society, social opportunities no longer depend on the social environment into which one is born, but are mainly determined by personal capacities (intelligence) and merits (motivation and commitment)."[357] Although this sounds positive on first glance, the report later refers to the author Michael Young and hist book *The rise of Meritcoracy* (1958). They state that this societal change also has a dark side and that "the aversion to school, in the form of disruptive behaviour, truancy and dropping out of school by some pupils, can probably not be seen in isolation from the existing status hierarchy in talents and school types."[358] Further elaboration of how this affects the *Tweede* and *ANW* is missing, hence let's discuss the effect of meritocracy in more detail.

Michael Sandel, professor in political philosophy at Harvard, recently published *The Tyranny of* Merit, exploring the meritocratic society of today. His definition of this society is similar to the one in the SCP report, stating the society is all about personal capacities and merits but also about personal failure.[359] A meritocratic society means that assessment becomes more important, since achieving success in e.g. education becomes one of the leading defining factors in the meritocratic system. A separation of winners and losers, a separation of low and highly educated.[360] The growing number of homework institutes, shadow education, with the associated price tag is a result.[361] However, this trend rubs against the ideals set out in the *Tweede Fase* but also against the subjects that were considered so important inherently in its development. The solid general education, of which *ANW*, MMW and CKV were initially the crown jewels, also symbolized the idealism behind the *Tweede Fase*. These subjects do not align with the meritocratic ideals, since this increases the competitivity within education. This results in a suppression of subjects without a central final exam, these subjects become less important. *ANW* is a prime example. Consequently, a changing society influences the political landscape as well. A society which becomes more *individualistic* and *meritocratic* naturally aligns

[357] Sociaal en Cultureel Planbureau, 23–24.
[358] Sociaal en Cultureel Planbureau, 34.
[359] Michael Sandel, *The Tyranny of Merit* (New Yotk: Farrar, Straus and Giroux, 2020), 13.
[360] Sandel, 11.
[361] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 112.

more with a liberal political landscape. From the early 1990s this gradual shift is visible, explored in the following sections.

Political developments

Societal and political developments influence each other. Using the SCP report as a source, I will investigate this changing political landscape and its effect on *ANW* throughout the period of conception, experimentation, introduction and development. "Without wanting to disparage the smaller political parties, roughly three central value systems have dominated in the Netherlands since the Second World War: social democracy, Christian democracy, and liberalism."[362] These three value systems were also central to the four coalitions that ruled during the period of the development and implementation of the *Tweede Fase*:
1989 – 1994 Christian Democratic and Social Democratic (Lubbers III)
1994 – 2002 Social Democratic and Liberal (Kok I & II)
2002 – 2006 Christian Democratic and Liberal[363] (Balkenende I)
The shift of coalitions in the introduction period has had an effect on the value systems, but also on the ministers who were responsible for educational developments. In this section, we take a close look at the change in politics and the influence on the *Second Phase* and *ANW.*

The SCP's findings on the coalition agreements express how value systems are shifting. In the first coalition period that we are looking at (Lubbers III), the government is very directional with a detailed elaboration of the intended developments. Commitment to a strong basic education was central,[364] which stemmed from the drive to offer all children, including children from disadvantaged backgrounds, the same opportunities on the social ladder. An ideology that goes hand in hand with the idea of the malleability of society, a strong social democratic ideology in which *ANW* was conceived. An ideology which was actually quite meritocratic as well, basing success on your merit and not your background. However, in the course of the late 90s and early 2000s this meritocracy starts to shift and the strong social democratic ideology about malleability to decline.[365]

Although this social democratic agenda still seemed to be present in the second next Kok I cabinet, the wish for broad accessibility was not achieved and there was also a growing understanding that "equal educational provision for children with unequal abilities was counterproductive."[366] This effect underscored the

[362] Sociaal en Cultureel Planbureau, 183.
[363] Sociaal en Cultureel Planbureau, 183.
[364] Sociaal en Cultureel Planbureau, 188.
[365] Sociaal en Cultureel Planbureau, 193.
[366] Sociaal en Cultureel Planbureau, 193.

rhetoric of rising: "Succes is a sign of virtue. My affluence is my due".[367] As Sandel argues, meritocratic assumptions like these have taken hold of our democratic society. The more we view our success as completely our own, the more we accept failure must be our own as well.[368] Although the ideology starts with the right intention, every student in the new *Tweede Fase* does not start with an equal playing ground. Instead of counteracting this effect the political landscaped moved towards even a more liberal approach. Interestingly enough, this was noticed by Sandel as well stating: "Beginning in the 1990s and continuing to the present, more and more of my students seem drawn to the conviction that their success is their own doing, a product of their effort, something they have earned. Among the students I teach, this meritocratic faith has intensified."[369] It is therefore not a surprising shift to a more liberal landscape, the meritocratic ideals seem to be reinforcing themselves.

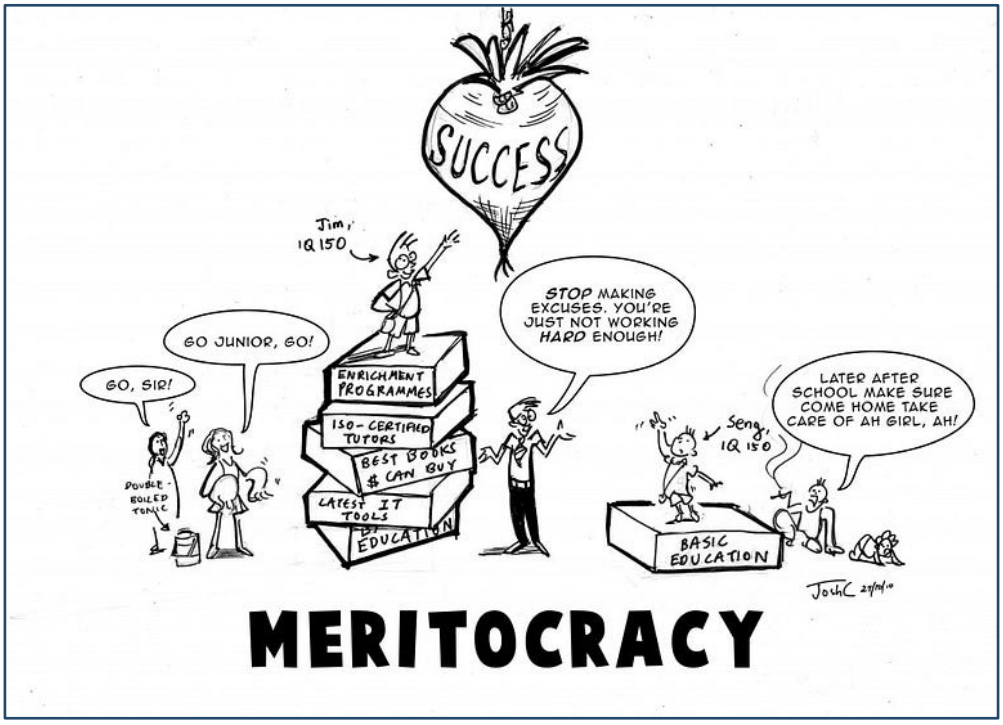

Figure 35. *How Meritocracy becomes imbedded in our educational system and only highlight inequality instead of battling it.*

After the introduction of the *Tweede Fase*, we see this indeed happening in the political landscape. A shift to a more liberal angle seems to be taking place in Cabinet Kok II, with less agreements on paper between parties about the

[367] Sandel, *The Tyranny of Merit*, 59.
[368] Sandel, 59.
[369] Sandel, 60.

concrete implementation of education.[370] However, this shift did not come from nowhere and educational policy has actually been moving towards a more liberal side since the early 90s. J. Wallage, former State Secretary of OCW initiated this transfer of responsibility from the government to local school boards. This shift had impact on financial and educational aspects of the school, since in order for schools to take on this responsibility they started to fuse. Bigger school organisations emerged which were able to decide much for themselves. [371] Governmental influence decreased and market mechanisms also entered the educational landscape, like the commercial homework institutes mentioned earlier.

Another aspect to take into consideration, is that Karin Adelmund took over the position from Tineke Netelenbos. Although Adelmund had the same social democratic background as Netelenbos, personal background must be taken into consideration when determining the influence on implemented policy. As the SCP also mentioned, "there is sometimes a certain urge to score in order to get a lot done".[372] Adelmund, with her low affinity with education when she took office, seems to have experienced strong pressure in her position to take action. At least the actions of the State Secretary at the end of 1999 will not be forgotten easily.

In the fourth cabinet of this period (Balkenende I), there is a large loss of seats for the Social Democrats. The government distances itself even more from interfering with the activities in the classroom and gave schools more (financial) space to give substance as they see fit.[373] The instrument of interference in educational development had changed from subsidisation and control, to a more market-based civil society role.[374] This development can be seen in an example of the reluctance of the Ministry of OC&W to support further didactic research into, for example, ANW. On the one hand, it could be argued that this development gave schools and teachers the space to make certain policies their own and workable. It increased mobility, letting schools and teacher play on their strengths and not their weaknesses. On the other hand, it can be argued that this change is again an example of the strengthening of meritocratic

[370] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 188.
[371] 'Hoe schoolbestuurders zakendoen met bekenden en zichzelf', *Nieuwsuur* (Youtube, 8 July 2024), https://www.youtube.com/watch?v=sql1fe5AUJs&t=1312s.
[372] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 193.
[373] Sociaal en Cultureel Planbureau, 188.
[374] Sociaal en Cultureel Planbureau, 183.

principles. Since, meritocracy is not about equality but about exactly this aspect of mobility.[375]

Concluding this section, it is remarkable how in the first two cabinets ideological drive, malleability, equality and the urge to innovate were so central, which in the last two cabinet terms shifted to a more administrative (detached) relationship, autonomy, market forces and feasibility. The societal change and political change clearly go hand in hand, a society with more meritocratic ideals explains the political shift towards a more liberal approach to education. Although I understand this relationship is more complicated with possibly many more factors, for the sake of conciseness I will be content with this argumentation. What is evident is that in both periods, the government made serious mistakes. Although these mistakes are different on the surface, in nature they relate and deal with this dark side of the meritocratic society. We will discuss this in more detail in the next section.

Failing government

Summarizing the differences between the cabinet periods can be done with for each two key concepts:1) ideological drive and malleability; 2) autonomy and feasibility. Although these aspects were characteristic and could have a positive effect to some extent, the mistakes that were made during these cabinet periods were also related to these aspects. In the sub-investigation of SCP, a large part of an article from *NRC Handelsblad* of 25 October 2003 by Guus Valk was reproduced verbatim.[376] This article contained concrete examples of how the ideological drive and urge to innovate worked against the development process of the *Tweede Fase*.

"The steering committee set up working groups, one for each subject, in which professors and lecturers were allowed to make proposals about what the subject should look like in the future"[377] Although this proposal sounds good, the article mentioned that it caused each working group to argue for simply more hours for his/her subject. The ideological drive of each working group resulted in a battle for hours, and the growth of one profession must be at the expense of another. In the end, it ensured that the maximum study load went up from 1500 to 1600 hours, because State Secretary Netelenbos thought that was the minimum.[378] A completely wrong assessment, but optimism about the new interpretation reigned supreme in the *Tweede Kamer*. The government did not share critical

[375] Sandel, *The Tyranny of Merit*, 122.
[376] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 208.
[377] Sociaal en Cultureel Planbureau, 208.
[378] Sociaal en Cultureel Planbureau, 209.

reports about the excessive workload by the *Onderwijsinspectie* with the *Tweede Kamer.*[379] All ideals were introduced with tunnel vision, at the same time. What the examination programme should look like had been discussed in detail, but as member of parliament Lambrechts mentioned: "How the teachers and students had to carry it all out remained underexposed all this time."[380] The ideological drive and the idea of a malleable society was followed blindly.

Although this ideology originated from the wish to let everyone experience sufficient general education, the results became unfortunately the opposite. The mistake was made, because too many aspects were considered as malleable and caused the overall workload to spike. Especially the combination with the *Studiehuis* showed problems, underlining the dark side of the meritocratic society. The Socialist Party, part of the opposition in the *Tweede Kamer*, did share their critique on the *Studiehuis* that clearly relates to the inequality caused by meritocracy: "The *Tweede Fase* threatens to have a Darwinian effect; Through natural selection, the weakest students drop out. Students who are not yet ready for the required self-employment, or those who cannot count on sufficient support at home, will be the first to drop out. For that reason, Jaap van der Aa called the introduction of the *Studiehuis* 'irresponsible' in this newspaper. He fears that many Turkish, Moroccan, Surinamese and Antillean students will fail in the new educational concept."[381] As stated earlier, although these meritocratic ideas seem to support equality it is supporting mobility. It is not a remedy, only a justification of inequality.[382]

After 2002, with the change in the political landscape, autonomy and feasibility became more central to the value system of the parties. It is clear that these values stem not only from the Balkenende I cabinet, but also from the Kok II cabinet. Just before the resignation of the cabinet, State Secretary Adelmund published the adjustment proposals of *Continuïteit en Vernieuwing.*[383] The proposal that eventually emerged in 2003, *Ruimte laten en keuzes bieden,* was aimed at removing bottlenecks, increasing freedom of choice for schools, teachers and giving more initiative to the schools.[384] However, as discussed in 4.2, the intervention had a drastic effect on the science subjects and ANW. "The

[379] Sociaal en Cultureel Planbureau, 210.
[380] Sociaal en Cultureel Planbureau, 210.
[381] SP, 'ONMIDDELLIJKE SLUITING VAN STUDIEHUIS DRINGEND GEWENST', 6 December 1999, https://www.sp.nl/opinie/1999/onmiddellijke-sluiting-van-studiehuis-dringend-gewenst.
[382] Sandel, *The Tyranny of Merit*, 122.
[383] Sociaal en Cultureel Planbureau, 'Vijftien jaar onderwijsvernieuwing in Nederland', 104.
[384] Sociaal en Cultureel Planbureau, 105.

proposals may make the nature profiles more attractive and more feasible, but that will be at the expense of depth and content," according to the *Onderwijsraad*.[385] In this change the concept feasible was the leading actor, and although this was important, it entailed that it should have reached a set of standardized (meritocratic) aims that were set the years before. These aims were defined by the questions like: what gathers merit (in the form of grades), and what not? Since the mono subjects were more important in the meritocratic standard, due to the grading system behind it, ANW was lost in this struggle for study hours. These developments display how the educational system functions as a grade driven meritocratic sorting machine.[386]

∞

Over the past fifteen years, society, and with it education, has undergone significant changes. *Individualization* and *informalization* were important trends. For example, this led to pedagogical-didactic changes such as the *Studiehuis* and the more equal relationship between student, teacher and parent. However, these societal changes made society more meritocratic. In addition, politics moved along with this and had a major influence on educational innovations. Different coalitions influenced education policy between 1989 and 2006, each with their own value systems. The Social Democratic and Christian Democratic coalitions focused on equality and opportunity and therefore expressed an ideological drive and malleability, while later coalitions took a more liberal approach with a focus on autonomy and feasibility. This resulted in a shift from detailed control to more freedom for schools. For ANW, the social and political shifts caused problems.

The ideological drive and malleability of the early cabinets led to overloaded innovations such as the *Tweede Fase* with the *Studiehuis*. In a society that was becoming increasingly meritocratic, social democratic policies failed partly because of their own implementation. The overloaded program created more inequality, a typical reinforcing meritocratic effect. Why ANW became under pressure, can therefore be explained. Firstly, competitiveness among subjects for study hours grew. Subsequently, since *ANW* had not the same status as mono subjects, when discussing exam grades. It was not living up to the set meritocratic standard. Eventually, all these aspects together have led to profound changes in secondary education. The government had made mistakes by steering too much on the one hand and distancing itself too much on the other, but above all by not responding correctly to the social trends that were at play.

[385] Sociaal en Cultureel Planbureau, 106.
[386] Sandel, *The Tyranny of Merit*, 156.

4.4. Answer to the second question

With the conclusions from chapter three and four, an answer to the second proposed research question can be given:

Which factors were responsible for the gradual demise of ANW in upper general secondary education in the Netherlands from its early development till 2007?

After its conception, *ANW* went through a tumultuous period. These different periods all highlight factors that were responsible for this gradual demise of *ANW* and indicate that it was not because of a single problem but an arena of actors. Different perspectives that sometimes strengthen each others argument, or sometimes contradict. Looking at the curricula at three distinct levels helped to construct a quite complete arena of actors. Yet, there is always room for improvement and one of the more obvious ones is the limited use of sources from the perspectives of teachers. The NVOX is a very useful source, but is only represented a part of the natural science teacher community. Nonetheless, by taking a critical look at all the conclusions throughout the thesis, we can say that the following five factors were responsible for the demise of *ANW*:

1) Time constraints in the experimental phase

Due to mainly time constraints in the experimental phase multiple developments did not enfold as planned. The subject had a vague identity, teachers were insufficiently trained, teaching methods underdeveloped, and the entire field had not yet developed any fitting didactics. The experimental phase should have been a bridge between conception and introduction. It should have helped to transition from this first layer in my methodology, to the second and third one. However, this bridge was sadly full of holes, and the ideology in the conceptional phase was not enacted in the introduction.

2) Publicity damage in society

After the decision of State Secretary Adelmund in December 1999, ANW was given a redundant status. Something which was apparent in the view students, teachers but also policy makers had when considered the memoranda in 2002 and 2003. A view which was supplemented by the action of the State Secretary, by pitting actors like students and teachers against each other. Before *ANW* became developed, the motivation of teachers and students was damaged. *ANW* was clearly a few point behind, if it successfully wanted to be enacted in this third layer of the curriculum.

3) Political indecisiveness

Although ANW received support from OC&W in 2000-2002, the memorandum *Continuïteit en Vernieuwing* shows something different. Before the end of this 'maturity' period, reduction in *ANW* education was proposed. There seemed to be a political indecisiveness of what should be done with *ANW*, partly because making a choice about the future of *ANW* became deeply ethical of nature as well.

4) Mixed community of teachers

ANW was not a 'main' mono discipline, thus its community consisted of teachers of various existing departments. The *ANW* community was unstable and had not yet an established status and voice. Considering the extra effort it took to teach *ANW*, entering the *ANW* community was not accessible as well. When teachers were pitted against each other in a struggle for study hours in the 2002 and 2003 proposals, *ANW* got the short end of the stick. At last, the mono disciplines were more important.

5) Failing meritocratic society and politics

Underneath the four problems above, was a society that was gradually changing as well. Since the 1990s, the meritocratic ideals have become increasingly rooted in our society. The study house, the overloaded program, competitiveness between subjects, and the decreasing influence of the government on actual enactment have contributed to the dark side of a meritocratic society. In turn, the political landscape moved towards the liberal side that further enhanced these ideals. All of these developments weakened *ANW's* position.

These five factors bring the research part of this thesis to an end. The Rise and Fall of *ANW* can be seen as a case study of how not to implement a new subject in secondary education. Nevertheless, *ANW* is still given on some schools and other reimagined the subject and called it *Wetenschapsoriëntatie* (science orientation). Nature of Science education is certainly not gone, although how it will manifest itself in Dutch secondary education remains to be seen. What can be concluded from the answer to this second research question, is that it was not the conception and ideology behind *ANW* and NoS that was problematic. Although it will be difficult to implement this ideology in a meaningful way in the context of secondary education, I believe it is well worth it.

Epilogue

After this historical analysis of the development of *ANW*, I hope the positive and negative associations with the subject are illuminated. In this epilogue, I set out to further discuss the results of this thesis and look to the future. To me, history is not only an interesting story but also a means to improve. Hence, I set out to discuss the meaning of the results in this thesis and to propose follow-up research questions to improve Nature of Science education in secondary schools. The factors that were part of its conception, experimentation, introduction and development helped to understand its demise and the position of Nature of Science education in the Dutch educational system. I will proceed to compere these results with the contemporary developments in the educational field. This includes the most recent developments in the curriculum by SLO, the advice from Maarten Pieters in a brief interview, as well as contemporary literature like the Journal of Research in Science Teaching (JRST).

The *startnotitie natuurwetenschappelijke vakken* published in 2021 by the SLO is the most recent report about the exam program. In this report, the development agenda of the SLO was discussed. The report touches upon a few societal developments: scientific citizenship, digital literacy, technology and engineering, diversity and opportunities, and interaction and coordination between disciplines. [387] These signals, coming from society, make it clear that SLO wants to aim for an increased focus on Nature of Science (and technology), but also wants to support interdisciplinarity and equal opportunities. This shared ideology and societal awareness is hopeful, although I still see some hurdles to overcome.

In the section about equal opportunities and diversity, some problems are explicitly addressed: "In terms of cultural-ethnic diversity, students with a non-Western background are still underrepresented in both the science profiles and in the companies and organizations where these students can ultimately work."[388] In the SLO report, a possible solution to this problem is given by using role models or more interesting and fitting contexts.[389] However, I find this a narrow and lacking solution to a much broader societal issue. Although this is

[387] Jeroen Sijbers and Erik Woldhuis, 'Startnotitie natuuwetenschappelijke vakken', Startnotitie (Amersfoort: SLO, 2021), 6–9, https://www.slo.nl/thema/meer/actualisatie-kerndoelen-examenprogramma/actualisatie-examenprogramma/.
[388] Sijbers and Woldhuis, 8.
[389] Sijbers and Woldhuis, 8.

partly covered in their plans concerning *Burgerschap* (citizenship)[390], scientific citizenship should also find its place within the natural science curriculum. Aspects of *Individualization* and *Meritocracy* are left out in the report, societal trends that simply cannot be ignored when designing a meaningful educational curriculum. Especially in the hierarchical structure of our educational system with the levels of vmbo, havo and vwo, I would argue it is essential to think about how the aspect of the '*common good*' is enacted and supplemented via the curriculum. To explain this claim, I will quote Sandel's argument: "It [common life] does not require perfect equality. But it does require that citizens from different walks of life encounter one another in common spaces and public places. For this is how we learn to negotiate and abide our differences. And this is how we come to care for the common good."[391] Although I would like to continue sharing my thoughts on this subject, further research is necessary. This brings me to the first research question that I propose for future research, namely:

> *How can citizenship be implemented in natural science education, to counteract the growing individualistic and meritocratic society and to support the common good?*

In this implementation process, I would of course recommend not making the same mistakes as with *ANW.* Let us at least learn from mistakes that were made in the past, which I discussed with Maarten Pieters. After finishing the first draft of this thesis, I reached out to him to discuss my findings about *ANW* and asked for his thoughts on the subject. Pieters quickly mentioned that the story of *ANW* is not entirely surprising. Within the field of educational development and renewals, this is known to happen, since education is always changing along with society. Hence, that is why the outcome of this thesis can still be relevant for understanding educational developments today. He agreed that, even though you set out with a very reasonable conception of a subject and well-grounded ideology, a subject can still fail in its introduction.

It does not mean you cannot prepare better for the introduction of a new subject, and as an example Pieters mentioned some differences with the subject NLT. Take for example the teacher training program of ANW, of which according to him many teachers followed the training without a lot of intrinsic motivation. Additionally, *ANW* and NLT were framed and promoted very differently. By conducting a comparative study you could find out which proposed factors had more influence than others. A study is certainly doable, since according to

[390] Luuk Kampman, Matthijs Driebergen, and Anette van der Laan, 'Startnotitie-kerndoelen-burgerschap.pdf', Startnotitie (Amersfoort: SLO, October 2022), https://www.slo.nl/@21497/startnotitie-kerndoelen-burgerschap/.
[391] Sandel, *The Tyranny of Merit*, 227.

Pieters, Eijkelhof learned from what went wrong with *ANW* and it can be assumed he used this knowledge to make NLT more of a success. Hence, this interview brought me to think of two other research questions that I propose for future research, namely:

> *How do NLT and ANW differ from each other, besides their ideology and conception, and why did NLT become more of a success than ANW?*
> *What has to be included in a model, and how should the model look, for it to help with the complex task of introducing a new subject in secondary education?*

During my talk with Pieters, we pondered on this question of moving from ideology and conception to actual introduction and enactment. One of the factors that was limited in the experimentation and development phase was time, but this is not the only issue. Considering teachers also had to teach *ANW* as an 'extra' subject, it was also simply challenging and maybe not favourable for teachers to do. Therefore, embedding this ideology of *ANW* in the mono-subject is a logical step to make. When *ANW* was removed as a mandatory subject in 2015 for vwo, SLO published a series of reports called *'Wetenschapsoriëntatie bij … (bv. Natuurkunde)'* (science orientation within … (e.g. physics).[392] These reports included helpful tips to include little parts of *ANW* in every subject, but it would be naïve to think that it would be sufficient in replacing a course on its own.

After 2015, some schools continued with a solid program around science orientation. Various publications in the NVOX show the good practices in schools, like in the Gymnasium Apeldoorn.[393] However, instead of a nationally enrolled educational concept, it has become a program that schools offer to give themselves a distinct profile. Hence, schools can market themselves in a certain way, both towards teachers and students. Students pick a school in their surroundings which fits their interests, but teachers also pick a school where they can teach the subjects they like. This development brings me to the second to last research question that I propose for future research, namely:

> *Is the development of schools with each a distinctive profile a positive development, and how does it deal with maintaining equal opportunity within education for all students?*

[392] Jos Paus Maarten Pieters, 'Wetenschapsoriëntatie bij natuurkunde in de tweede fase vwo', Wetenschapsoriëntatie bij (SLO, 2015), https://www.slo.nl/@4423/natuurkunde-tweede/.
[393] Ton Brink, 'De overgang van anw naar wetenschapsoriëntatie', *NVOX*, February 2018, 102–3.

On a national level, end terms, core goals and the exam program are the tools the ministry of OCW to influence the written and eventually enacted curriculum. As we've discussed multiple times, NoS is present in this written curriculum. Thus, even schools that do not market themselves as a 'science orientation school' have to do something with NoS. Just including it in the written curriculum, does not change what's been done in the lessons. As this thesis has shown, active involvement and teacher training about working didactics is essential, especially about the NoS teaching practices. This claim is also made by Kampourakis, in his article *The "General Aspects" conceptualization as pragmatic and Effective Means to Introducing Students to Nature of Science* stating:

"Another study, which examined teachers' NoS instructional practices 2-5 years after completing an intensive secondary science education program with a strong focus on NoS, concluded that although it is possible for teachers to eventually teach about NoS effectively, this seems to require particular attention to NoS in their training programs."[394]

Effectively providing NoS education on a national scale therefore requires a considerable effort. A starting point can be the conceptualization of the "general aspects" of NoS, as displayed in Figure 36. This paves the way for a more sophisticated understanding of NoS,[395] in which teachers need to be trained as well. There are many interesting articles on the practice of NoS education in, for example, the JRST (from which Kampourakis' article comes), but also in the book series Science: Philosophy, History and Education.[396] Nevertheless, a clearer choice has to be made. If we want NoS elements in our enacted curriculum, active involvement and training is necessary. This brings me to my final research question, with three sub-questions, that I propose for future research, namely:

> *What requirements should a training program focusing on NoS in secondary education meet, in order to effectively train teachers on this subject on a national scale?*
>
> ➔ *Who should be the target audience of this training program?*
>
> ➔ *How does this relate to the plans surrounding 'burgerschap'?*
>
> ➔ *Is this requirement to teach effectively NoS-education viable, or is this simply not possible on a national level?*

[394] Kostas Kampourakis, 'The "General Aspects" Conceptualization as a Pragmatic and Effective Means to Introducing Students to Nature of Science: THE GENERAL ASPECTS CONCEPTUALIZATION OF NOS', *Journal of Research in Science Teaching* 53, no. 5 (May 2016): 668, https://doi.org/10.1002/tea.21305.
[395] Kampourakis, 679.
[396] Michael P. Clough, *Science: Philosophy, History and Education*, 8 vols (Springer International Publishing, n.d.), https://www-springer-com.proxy.library.uu.nl/series/13387/books.

This research began roughly with one simple question: 'Why isn't *ANW* around anymore? Although I can say this can be answered, many more questions have been formulated since then. I'm eager to continue searching for answers on the questions I proposed or to see others include these in their research.

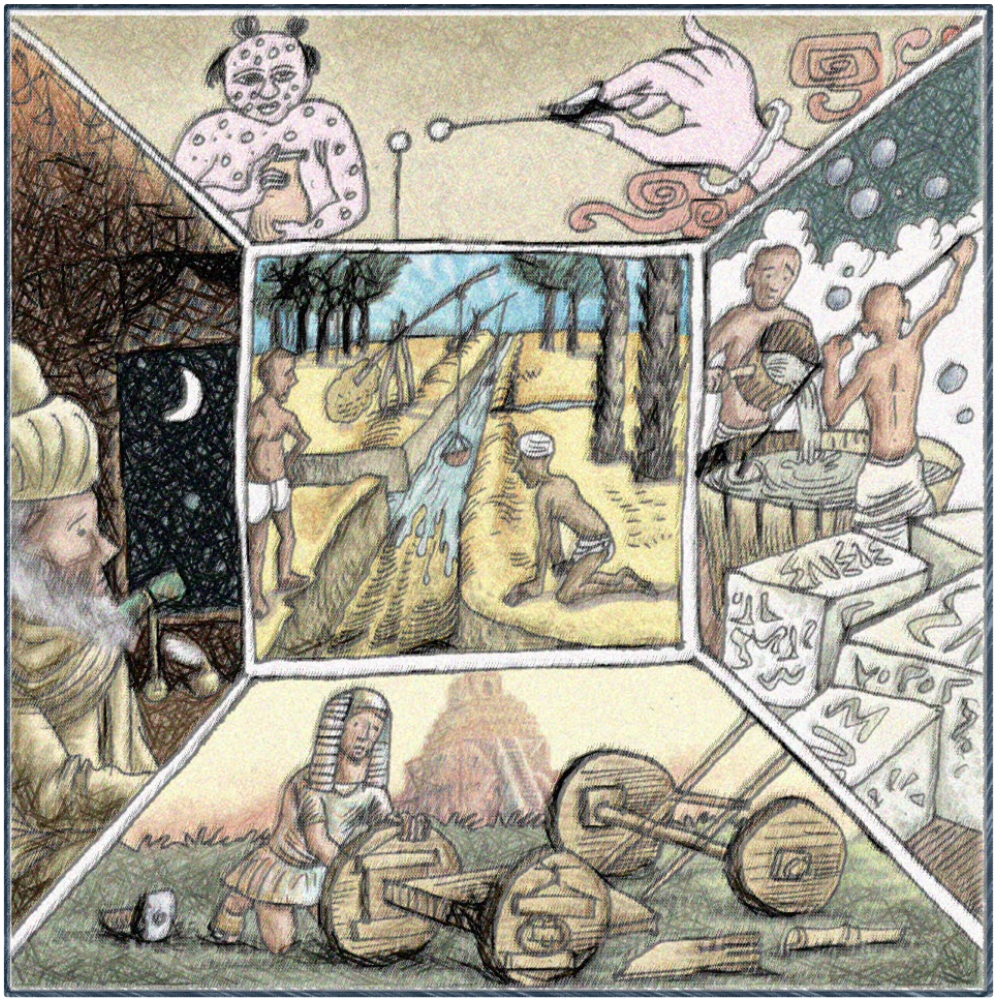

Figure 36. *Knowledge does not exclusively originate from "the west". Nonetheless, this narrative was quite dominant in the ANW teaching methods.*

Bibliography

Figures

Cover: Roth, Harold. House at the Crossroads Oil landscape. Painting. n.d. https://www.haroldroth.com/products/house-at-the-crossroads-landscape-painting

1. Flammarion, Camille. L'Atmosphere. 1888. Houtgravure. Météorologie Populaire, 1888. https://www.pinterest.es/pin/373517362827084284/
2. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 11. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
3. Erlings, Brigit. HU ontwikkelt in beeld: Chatbotbot maakt huiswerkbegeleiding beschikbaar voor iedereen. Video, Hogeschool Utrecht, 7 March 2019. https://www.huontwikkelt.nl/hu-ontwikkelt-in-beeld-chatbot-maakt-huiswerkbegeleiding-beschikbaar-voor-iedereen/
4. Universiteitsmuseum Utrecht. Foto's testgroep primair onderwijs onderzoekstour. Pictures, University Museum Utrecht, May 2023. https://umu.nl/umu-onderzoekstour-havo-vwo/
5. Wetenschapsreflex. Wat is NOS? De tien NOS-vingers. Illustration. 2016. http://wetenschapsreflex.be/content/wat-nos-0
6. Pieters, Maarten. Between Written and Enacted: Curriculum Development as Propagation of Memes: An Ecological-Evolutionary Perspective on Fifty Years of Curriculum Development for Upper Secondary Physics Education in the Netherlands'. Illustration. Utrecht University, 2022. 20. Https://doi.org/10.33540/1243
7. Own design.
8. Own design.
9. NVOX. Tijdschrift voor natuurwetenschap op school nummer 5. Cover. NVOX, May 1998. https://nvon.nl/nvox/nvox-1998-5-geheel
10. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 12. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
11. Voets, Jan, Minister-president cals poserend voor een schoolbord waarop een mamoet is getekend. Picture. Anefo, n.d. Found via the website: https://historiek.net/mammoetwet-1968-betekenis-definitie/84129/
12. Trouw, Voortgezet onderwijs volgens het ontwerp mammoetwet. Illustration. Trouw (Delpher), 4 April 1962. Found via the website: https://historiek.net/mammoetwet-1968-betekenis-definitie/84129/
13. Raad voor het Jeugdbeleid, Reactie op de nota: tweede fase vervolgonderwijs: 'bovenbouw bijgesteld', nummer: 202-82. Illustration. 3 March 1983.
14. Van de Lisdonk, Ad. Studiehuis en tweede fase stierven een zachte dood. Illustration (Fokke & Sukke). 23 November 2007. Found via the website: https://www.promptus.nl/studiehuis-en-tweede-fase-stierven-een-zachte-dood/

15. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 8. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
16. Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs. Tweede Fase: Scharnier tussen basisvorming en hoger onderwijs, een uitwerking op hoofdlijnen van de nota's profiel van de tweede fase van het voortgezet onderwijs. Cover. Ministerie van Onderwijs & Wetenschappen, January 1994, Den Haag, Nationaal Archief.
17. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 37. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
18. De Haan, Marc. Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens. Photo. *2e Fase Berichten*. 2 February 1994. Den Haag. Nationaal Archief.
19. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 6. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
20. Pieters, Maarten. De mens, materie, modellen, machten van tien: overwegingen bij een leerplan Algemene Natuurwetenschappen. Illustration. Tijdschrift voor didactiek der β-wetenschappen, 1997. 134. https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen
21. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 13. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
22. Van den Berg, Bert, ANW Actief Havo/vwo Bronnenboek: algemene natuurwetenschappen. Cover. ThiemeMeulenhoff, 2003. https://boekenbalie.nl/anw-actief-havo-vwo-bronnenboek/9789042524538
23. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 18. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
24. Willigen, Henk. Voorbereiding ANW: project "El Niño". Photo. NVOX, May 1998, 240, NVON, https://nvon.nl/nvox/nvox-1998-5-geheel
25. Willigen, Henk. Voorbereiding ANW: project "De zon als centrum van ons zonnestelsel". Photo. NVOX, December 1998, 565, NVON, https://nvon.nl/nvox/nvox-1998-10-geheel
26. Martirosova, Lilit. Ondernkbaar dat er gestaakt werd, al helemaal door scholieren. Photo. EenVandaag, 13 september 2018. https://eenvandaag.avrotros.nl/item/ondenkbaar-dat-er-gestaakt-werd-al-helemaal-door-scholieren/#:~:text=Scholieren%20die%20staken%20voor%20de,onderwijsvernieuwingen%20af%20naar%20Den%20Haag.

27. NVOX. Tijdschrift voor natuurwetenschap op school nummer 1. Cover. NVOX, January 2000. https://nvon.nl/nvox/nvox-2000-1-geheel
28. NVOX. Tijdschrift voor natuurwetenschap op school nummer 2. Cover. NVOX, February 2000. https://nvon.nl/nvox/nvox-2000-2-geheel
29. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 29. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication
30. Kapterijn, Mieke. 'Good Practice' onderzoek bij ANW: Aanpak en conclusies. Table. NVOX, March 2002. 112. https://nvon.nl/nvox/nvox-2002-3-geheel
31. Timmermans, Roel. Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt. Table. NVOX, April 2002. 188. https://nvon.nl/nvox/nvox-2002-4-geheel
32. Knoppert, Rob. Notawee. Table. NVOX, February 2003. 57. https://nvon.nl/nvox/nvox-2003-2-geheel
33. Own design, based on data from: Tweede Fase Adviespunt, Zakboek Tweede Fase. Tables. Den Haag: Tweede Fase Adviespunt, 2007. https://www.onderwijsconsument.nl/wordpress/wp-content/uploads/zakboek2efase2007.pdf
34. Körver, John. Passend onderwijs -> Meer werkdruk?. Illustration. Kurf.nl, 10 july 2019. https://x.com/johnkurf/status/1148854721874157568
35. Lyman, Josh. Between Meritocracy and Mental Health Sits Gratitude and Inclusion. Illustration. Medium, 17 July 2018. https://antheaindiraong.medium.com/between-meritocracy-and-mental-health-is-gratitude-and-inclusion-e79fd410a0cb
36. Kankaria, Siddharth & Manna, Argha. An Inclusive History of Science Communication. Illustration. Lifeology. 22 Januari 2024. 22. https://app.us.lifeology.io/viewer/lifeology/scicomm/a-brief-history-of-science-communication

Literature

Actualisatie kerndoelen en examenprogramma's. 'Veelgestelde Vragen'. SLO, 2 February 2023. https://www.slo.nl/thema/meer/actualisatie-kerndoelen-examenprogramma/actualisatie-kerndoelen/veelgestelde-vragen/.

Adelmund, K.Y.I.J. Continuïteit en vernieuwing in de tweede fase havo/vwo, Pub. L. No. 28 000 VIII, 2001–2002 nr. 98 (2002). https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3ak9g0kyce.

'Advies Nota profiel tweede fase voortgezet onderwijs'. Advies. Den Haag: Onderwijsraad, 7 August 1991. Den Haag. Nationaal Archief.

'Advies vervolgnota profiel van de tweede fase van het voortgezet onderwijs'. Advies. Den Haag: Vereniging van Hogescholen, 8 October 1992. Den Haag. Nationaal Archief.

Ammelrooy, Anneke van. 'Nieuw prachtvak laat niet langer op zich wachten'. *NVOX*, December 1996. NVON. https://nvon.nl/nvox/nvox-1996-10-geheel.

Asbeck, Geert van, and Frederiek Weeda. 'Internet ingezet tegen studiehuis'. *NRC Handelsblad*, 20 November 1999. Lexis Nexis.

Baal, Michel van. 'Docent'. *de Volkskrant*, 17 December 1999. Lexis Nexis.

Backer, Pim. 'Reactie op: ANW - is het wat?' *NVOX*, September 1997. NVON. https://nvon.nl/nvox/nvox-1997-7-geheel.

Bakker, Esther. 'Docenten komen gefrustreerd van boekverkoop terug'. *de Volkskrant*, 19 March 1998. Lexis Nexis.

Beek, Bert van. 'Van de Voorzitter: Algemene natuurwetenschappen (ANW)'. *NVOX*, February 1996. NVON. https://nvon.nl/nvox/nvox-1996-2-geheel.

Boekholt, P.Th.F.M., and E.P. de Booy. *Geschiedenis van de School in Nederland*. Assen: Van Gorcum, 1987. https://www.dbnl.org/tekst/boek009gesc01_01/index.php.

Boersma, K Th. 'De identiteit van het vak Algemene Natuurwetenschappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997). https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.

Boom, Wilco. 'Verzet tegen verval beta-onderwijs'. *Algemeen Dagblad*, 20 February 2003. Lexis Nexis.

Brink, Ton. 'De overgang van anw naar wetenschapsoriëntatie'. *NVOX*, February 2018.

Bronneman-Helmers, Ria, Lex Herweijer, and Ria Vogels. *Voortgezet onderwijs in de jaren negentig*. Den Haag: SCP, Sociaal en Cultureel Planbureau, 2002.

Brouwer, R. 'Natuurkundeleraren accepteren de herziening van de tweede fase niet'. *NVOX*, January 2004. NVON. https://nvon.nl/nvox/nvox-2004-1-geheel.

Calis, Mayke. 'Roemloos einde Tweede Fase'. *Het Parool*, 18 January 2002, sec. Nederland. Lexis Nexis.

Carpaij, Theresia Cornelia. *Anders kijken naar het studiehuis: een analysemodel voor onderwijsvernieuwing*. Apeldoorn: Garant, 2010.

Centraal Bureau voor de Statistiek. 'Tweede Fase Nieuwe Stijl'. Cbs.nl. *Leerlingen in Het Vwo Kiezen Steeds Vaker Natuurprofiel* (blog), n.d. https://www.cbs.nl/nl-nl/nieuws/2010/36/leerlingen-in-het-vwo-kiezen-steeds-vaker-natuurprofiel/tweede-fase-nieuwe-stijl.

Cito. 'Over Cito', n.d. https://cito.nl/over-cito/.

Clough, Michael P. *Science: Philosophy, History and Education*. 8 vols. Springer International Publishing, n.d. https://www-springer-com.proxy.library.uu.nl/series/13387/books.

Coenders, Fer. 'ANW - ontwikkel het mee'. *NVOX*, May 1998. NVON. https://nvon.nl/nvox/nvox-1998-5-geheel.

'Commentaar op de Nota "Profiel van de tweede fase voortgezet onderwijs"'. Advies. Dordrecht: Onafhankelijke Onderwijs Vakorganisatie, June 1991. Den Haag. Nationaal Archief.

Commissie-Dijsselbloem. 'Tijd Voor Onderwijs'. Tweede Kamer der Staten-Generaal, 13 February 2008. https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3k9mbivyy6.

'Curriculum.Nu'. Curriculum.nu, 2019. https://curriculum.nu/.

Dagblad van het noorden. 'Adelmund betuigt spijt'. 27 January 2000. Lexis Nexis.

De Gelderlander. 'Adelmund: Snel onderzoek naar werkdruk scholieren'. 24 November 1999. Lexis Nexis.

De Gelderlander. 'Doetinchemse scholieren tegen studiehuis'. 25 November 1999. Lexis Nexis.

De Leeuwarder Courant. 'Geschrapte vakken terug in studiehuis'. 14 January 2000. Lexis Nexis.

De Stem. 'Vak Natuurwetenschappen later ingevoerd'. 11 June 1996, sec. Binnenland. Lexis Nexis.

'De tweede fase vernieuwt'. Advies. Den Haag: Onderwijsraad, February 1995. Den Haag. Nationaal Archief.

de Volkskrant. 'Compromis van coalitie over uitstel onderwijsvernieuwing krijgt veel kritiek'. 24 May 1997. Lexis Nexis.

de Volkskrant. 'Kroonjuweel anw schittert niet meer'. 17 December 1999. Lexis Nexis.

de Volkskrant. 'Scholen snakken naar Haagse visie; ingeep van Adelmund valt verkeerd'. 11 January 2002, sec. Binnenland. Lexis Nexis.

Deci, Edward L., and Richard M. Ryan. *Intrinsic Motivation and Self-Determination in Human Behavior*. Boston, MA: Springer US, 1985. https://doi.org/10.1007/978-1-4899-2271-7.

Deetman, W.J. 'Nota ter voorbereiding van een wet inzake de opzet en inhoud van een nieuw stelsel van vervolgonderwijs'. Nota. Ministerie O&W, 9 September 1982. Den Haag. Nationaal Archief.

Dekker, Hans. 'Invoering van ANW op school: Reactie'. *NVOX*, September 1998. NVON. https://nvon.nl/nvox/nvox-1998-7-geheel.

Dijkstra, S. 'Commentaar op de nota "Profiel van de tweede fase voortgezet onderwijs"'. Advies. Hengelo, May 1991. Den Haag. Nationaal Archief.

Dijsselbloem, J.R.V.A. Parlementair Onderzoek Onderwijsvernieuwingen: Tijd voor onderwijs, Pub. L. No. 31 007, 2007–2008 Nr. 6 (2008).

Dool, Wil van den. 'Op weg naar een methode voor Algemene Natuurwetenschappen'. *NVOX*, January 1996. NVON. https://nvon.nl/nvox/nvox-1996-1-geheel.

Dresscher, W.T.G. 'Problemen verwacht met deelvakken'. *NGL Blad*, December 1991. Den Haag. Nationaal Archief.

Driessen, Heleen. 'De moord op ANW'. *NVOX*, January 2000. NVON. https://nvon.nl/nvox/nvox-2000-1-geheel.

———. 'De praktijk van ANW'. *NVOX*, February 1999. NVON. https://nvon.nl/nvox/nvox-1999-2-geheel.

———. 'Jaarverslag sectie ANW 2001'. *NVOX*, March 2002. NVON. https://nvon.nl/nvox/nvox-2002-3-geheel.

———. 'Jaarverslag sectie ANW 2002'. *NVOX*, March 2003. NVON. https://nvon.nl/nvox/nvox-2003-3-geheel.

———. 'Jaarverslag sectie ANW 2003'. *NVOX*, March 2004. NVON. https://nvon.nl/nvox/nvox-2004-3-geheel.

———. 'Jaarverslag sectie ANW 2004'. *NVOX*, March 2005. NVON. https://nvon.nl/nvox/nvox-2005-3-geheel.

———. 'OC&W ondersteunt de praktijk van ANW'. *NVOX*, November 2000. NVON. https://nvon.nl/nvox/nvox-2000-9-geheel.

———. 'Samen sterk dankzij het ANW-mailinglist-netwerk'. *NVOX*, January 2000. NVON. https://nvon.nl/nvox/nvox-2000-1-geheel.

Dubbelman, Marieke. 'Leraren verbijsterd over verlichten studie'. *Algemeen Dagblad*, 16 December 1999. Lexis Nexis.

Eijkelhof, H M C, R J Genseberger, O de Jong, and A Teekens-Veldkamp. 'Ervaringen met experimenteel lesmateriaal voor het vak Algemene Natuurwetenschappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997). https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.

Eijkelhof, Harrie. 'De toekomst van het vak algemene natuurwetenschappen'. *NVOX*, September 1997. NVON. https://nvon.nl/nvox/nvox-1997-7-geheel.

———. 'Leerling wordt beperkt in keuze voor betavakken'. *Het Financieele Dagblad*, 26 January 2002, sec. Nederland. Lexis Nexis.

Eijkenaar, Rob. 'ANW-soap'. *NVOX*, February 2000. NVON. https://nvon.nl/nvox/nvox-2000-2-geheel.

Eindhovens Dagblad. 'Wij passen er voor als proefkonijnen te dienen'. 23 November 1999. Lexis Nexis.

'Enkele kritische kanttekeningen bij de NOTA PROFIEL VAN DE TWEEDE FASE VOORTGEZET ONDERWIJS'. Advies. Amergongen: Stichting

Samenwerkingsverband Organisatie voor Onderwijsvernieuwing, November 1991. Den Haag. Nationaal Archief.

Flaton, Peter. 'Schrappen "zachte sector" uit tweede fase is commentaar waard'. *Trouw*, 17 November 1998. Lexis Nexis.

Freudenthal Institute. 'Realistic Mathematics Education', n.d. https://www.uu.nl/en/research/freudenthal-institute/realistic-mathematics-education.

Gravenberch, Frits. 'Reactie op: Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt': *NVOX*, April 2002. NVON. https://nvon.nl/nvox/nvox-2002-4-geheel.

Hageman, Esther. 'Soms heb ik het echt te druk - Tweede Fase voortgezet onderwijs'. *Trouw*, 2 December 1998. Lexis Nexis.

Heimel, Lieke. 'Kennismakingsles ANW'. *NVOX*, June 1998. NVON. https://nvon.nl/nvox/nvox-1998-6-geheel.

Henze-Rietveld, Ineke, and Jacob Kappe. 'Voorbereiding ANW: project "De zon als centrum van ons zonnestelsel"'. *NVOX*, December 1998. NVON. https://nvon.nl/nvox/nvox-1998-10-geheel.

———. 'Voorbereiding ANW: project "El Niño"'. *NVOX*, May 1998. NVON. https://nvon.nl/nvox/nvox-1998-5-geheel.

Het Financieele Dagblad. 'RITZEN TEVREDEN MET MINISTERIE NA REORGANISATIE'. 25 May 1994. Lexis Nexus.

'Hoe schoolbestuurders zakendoen met bekenden en zichzelf'. *Nieuwsuur*. Youtube, 8 July 2024. https://www.youtube.com/watch?v=sql1fe5AUJs&t=1312s.

Hoekstra, Wiel. 'Het nieuwe schoolvak Algemene Natuurwetenschappen'. *De Academische Boekengids*, August 2000.

Hooff, Anton van. 'Brede vorming'. *NRC Handelsblad*, 6 March 1997. Lexis Nexus.

Houben, Laurens. 'ANW-boeken'. *NVOX*, Maart1999. NVON. https://nvon.nl/nvox/nvox-1999-3-geheel.

Inspectie van het onderwijs. 'Onderwijsverslag over het jaar 1998'. Onderwijsverslag. Staat van het onderwijs. Utrecht, May 1999. https://data.collectienederland.nl/page/aggregation/inspectie-van-het-onderwijs/dtz-2020.

———. 'Onderwijsverslag over het jaar 1999'. Onderwijsverslag. Staat van het onderwijs. Utrecht, April 2000. https://data.collectienederland.nl/page/aggregation/inspectie-van-het-onderwijs/dtz-2021.

Kamerman, Sheila. 'Verzer groeit tegen wijzigen studiehuis; Universiteiten sturen brandbrief'. *NRC Handelsblad*, 23 December 1999. Lexis Nexis.

Kamerman, Sheila, and Frederik Weeda. 'Eilandenrijk met een imagoprobleem; HET BOLWERK - ONDERWIJS'. *NRC Handelsblad*, 17 November 1998. Lexis Nexus.

Kampman, Luuk, Matthijs Driebergen, and Anette van der Laan. 'Startnotitie-kerndoelen-burgerschap.pdf'. Startnotitie. Amersfoort: SLO, October

2022. https://www.slo.nl/@21497/startnotitie-kerndoelen-burgerschap/.

Kampourakis, Kostas. 'The "General Aspects" Conceptualization as a Pragmatic and Effective Means to Introducing Students to Nature of Science: THE GENERAL ASPECTS CONCEPTUALIZATION OF NOS'. *Journal of Research in Science Teaching* 53, no. 5 (May 2016): 667–82. https://doi.org/10.1002/tea.21305.

Kappe, Jacob, and Ineke Henze. 'ANW: van experiment naar praktijk'. *NVOX*, October 2000. NVON. https://nvon.nl/nvox/nvox-2000-4-geheel.

Kapteijn, M. 'De experimentele omscholingscursus Algemene Natuurweten schappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997). https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.

Kapteijn, Mieke. 'Portretten van ANW-onderwijs'. *NVOX*, November 2001. NVON. https://nvon.nl/nvox/nvox-2001-9-geheel.

Kleis Jager, Paul. 'Onrust in onderwijs zal blijven groeien; Verplichte vakken; De betaleerlingen moeten zich straks weer beperken tot alleen rekenen'. *Trouw*, 15 January 2002, sec. Nederland. Lexis Nexis.

Knoppert, Rob. 'ANW - is het wat?' *NVOX*, June 1997. NVON. https://nvon.nl/nvox/nvox-1997-6-geheel.

———. 'Notawee twee'. *NVOX*, April 2003. NVON. https://nvon.nl/nvox/nvox-2003-4-geheel.

Kortland, Koos, Ad Mooldijk, and Hans Poorthuis. 'Leren in context'. *Handboek Natuurkundedidactiek* (blog), n.d. https://natuurkundedidactiek.nl/home/2-7-1-leren-in-context/.

Kramers-Pals, Henny. 'Op weg naar een succesvolle invoering'. *NVOX*, September 1997. NVON. https://nvon.nl/nvox/nvox-1997-7-geheel.

Kreulen, Edwin. 'Geen draagvlak voor Adelmunds plannen'. *NRC Handelsblad*, 7 January 2000, sec. Binnenland. Lexis Nexis.

Kuijpers, Jacqueline. 'Nooit extreem; Schoolboekenuitgevers streven naar "haalbare vernieuwing"'. *NRC Handelsblad*, 22 February 1997. Lexis Nexis.

Lederman, Norman G. 'Nature of Science: Past, Present, and Future'. *Handbook of Research in Science Education* Ch. 28 (2007): 831–80.

Lederman, Norman G., and Judith S. Lederman. 'Teaching and Learning Nature of Scientific Knowledge: Is It Déjà vu All over Again?' *Disciplinary and Interdisciplinary Science Education Research* 1, no. 1 (December 2019): 6. https://doi.org/10.1186/s43031-019-0002-0.

Legierse, Agnes. 'De ware aard van ANW'. *NVOX*, April 2000. NVON. https://nvon.nl/nvox/nvox-2000-4-geheel.

Legierse, Agnes, and Lambert Heijnen. 'Handreiking Algemene Natuurwetenschappen (ANW) in Het Schoolexamen van de Vakken Natuurkunde, Scheikunde En Biologie - Havo'. Enschede: Stichting leerplanontwikkeling (SLO), 2006.

Linssen, Guido. 'Algemene Natuurwetenschappen (ANW): een voorstel'. *NVOX*, January 1996. NVON. https://nvon.nl/nvox/nvox-1996-1-geheel.

Lisdonk, Ad van de. 'Studiehuis En Tweede Fase Stierven Een Zachte Dood'. Promptus, 23 November 2007. https://www.promptus.nl/studiehuis-en-tweede-fase-stierven-een-zachte-dood/.

Ministerie van Onderwijs, Cultuur en Wetenschap. 'Geschiedenis'. Rijksoverheid.nl, n.d. https://www.rijksoverheid.nl/ministeries/ministerie-van-onderwijs-cultuur-en-wetenschap/organisatie/geschiedenis.

———. 'Kerncijfers 2005-2009'. Dordrecht: Ministerie van Onderwijs & Wetenschappen, n.d. https://open.overheid.nl/documenten/ronl-archief-7d2a974d-a7ee-43a8-995a-4aadf52db013/pdf.

———. 'Ruimte laten en keuzes bieden in de tweede fase havo en vwo'. Ministerie van Onderwijs & Wetenschappen, January 2023.

Morélis, Hans. 'Op weg naar het Studiehuis'. *NVOX*, February 1998. NVON. https://nvon.nl/nvox/nvox-1998-2-geheel.

NGL Blad. 'NGL-commentaar op hoofdlijnen'. 24 February 1994. Den Haag. Nationaal Archief.

'Notulen c.q. verslag van de gezamenlijke vergadering van de afdelingen secundair onderwijs en de Centrale commissie EFSO'. Notulen. Den Haag: Commissie EFSO, 7 June 1991. Den Haag. Nationaal Archief.

NRC Handelsblad. 'School mag alternatieven aandragen; Overleg over studiehuis'. 22 December 1999, sec. Binnenland. Lexis Nexis.

NRC Handelsblad. 'Veel scholen negeren eis van docenten; Geen besluit studiehuis'. 10 January 2000, sec. Binnenland. Lexis Nexis.

'Nu zorgen voor morgen: op weg naar een samenhangend geheel van onderwijsvoorzieningen'. Advies. De Inspectorale werkgroep commentaar onderwijsnota's, June 1983. Den Haag. Nationaal Archief.

NVOX. 'ANW gaan geven: "Bijna al je zekerheden worden je ontnomen!"' May 1998. NVON. https://nvon.nl/nvox/nvox-1998-5-geheel.

NVOX. 'Invoering van ANW op school'. April 1998. NVON. https://nvon.nl/nvox/nvox-1998-4-geheel.

Nyst, Eva, and Job Stigter. 'Een wankel studiehuis met een keuken vol anw'. *de Volkskrant*, 15 January 2000, sec. Wetenschap. Lexis Nexis.

Onderwijsblad. 'Docenten natuurkunde vrezen slechte kwaliteit. Uit: Het odnerwijsblad 6, 23 maart 2002'. *NVOX*, April 2002. NVON. https://nvon.nl/nvox/nvox-2002-4-geheel.

Onderwijsmuseum. *Een Korte Geschiedenis van Het Onderwijs*. Dordrecht, 2016. onderwijsmuseum.nl.

'OOVO-93.022 OOVO-Bijeenkomst'. Besluit. Onderwijsraad, March 1993. Den Haag. Nationaal Archief.

Pieters, Jos Paus Maarten. 'Wetenschapsoriëntatie bij natuurkunde in de tweede fase vwo'. Wetenschapsoriëntatie bij. SLO, 2015. https://www.slo.nl/@4423/natuurkunde-tweede/.

Pieters, M. 'De mens, materie, modellen, machten van tien: overwegingen bij een leerplan Algemene Natuurwetenschappen', Tijdschrift voor didactiek der β-wetenschappen, 2 (1997). https://elbd.sites.uu.nl/2017/05/25/tijdschrift-voor-didactiek-der-%ce%b2-wetenschappen/.

Pieters, Maarten. 'Omscholing Algemene Natuurwetenschappen'. *NVOX*, April 1997. NVON. https://nvon.nl/nvox/nvox-1997-4-geheel.

Pieters, Maarten Lodewijk Maria. 'Between Written and Enacted: Curriculum Development as Propagation of Memes: An Ecological-Evolutionary Perspective on Fifty Years of Curriculum Development for Upper Secondary Physics Education in the Netherlands'. Utrecht University, 2022. https://doi.org/10.33540/1243.

Pinedo, Danielle. 'De leraar'. *NRC Handelsblad*, 26 March 1998. Lexis Nexis.

'Profiel tweede fase voortgezet onderwijs'. Advies. Sociaal-economische raad, July 1991. Den Haag. Nationaal Archief.

'Profiel van de tweede fase voortgezet onderwijs'. Ministerie van Onderwijs & Wetenschappen, 1991. Den Haag. Nationaal Archief.

Profiel van de tweede fase voortgezet onderwijs, Pub. L. No. 22645, 1 (1992).

Redactie NVOX. 'Naschrift bij Inovering ANW op school: reactie'. *NVOX*, September 1998. NVON. https://nvon.nl/nvox/nvox-1998-7-geheel.

———. 'NVON stuurt brief over Tweede Fase naar onderhandelaars'. *NVOX*, June 2002. NVON. https://nvon.nl/nvox/nvox-2002-6-geheel.

———. 'Vakdidactische handleiding ANW op de rails'. *NVOX*, May 2002. NVON. https://nvon.nl/nvox/nvox-2002-5-geheel.

———. 'Van de bestuurstafel'. *NVOX*, April 2002. NVON. https://nvon.nl/nvox/nvox-2002-4-geheel.

———. 'Van de bestuurstafel: NVON ontevreden over het compromisvoorstel voor de Tweede Fase'. *NVOX*, January 2004. NVON. https://nvon.nl/nvox/nvox-2004-1-geheel.

'Rondom Tien'. NCRV, 7 February 2002. Hilversum. Beeld & Geluid. https://zoeken.beeldengeluid.nl/program/urn:vme:default:program:210160806004654713 1?ac=dgtl%2Canlg&q=Rondom+tien.

'Samen bouwen aan het primair en voortgezet onderwijs van morgen'. Curriculum.nu, 10 October 2019. https://curriculum.nu/download/Voorstellen-op-hoofdlijnen-Curriculum.nu.pdf.

Sandel, Michael. *The Tyranny of Merit*. New Yotk: Farrar, Straus and Giroux, 2020.

Schiethart, D.P., and J. Verbraeken. 'DE DELFTSE HUISKAMERGESPREKKEN BIJ JO RITZEN'. *Het Financieele Dagblad*, 12 May 1998. Lexis Nexus.

'Schoolstrijd 1848-1920 (Tweede Fase) Een Chronoligsch Overzicht'. Onderwijsgeschiedenis, n.d. https://www.onderwijsgeschiedenis.nl/tijdvakken/schoolstrijkd-van-1848-1920.

Schrijver, Jelle De, Lotte Boven, and Laura Vervacke. 'MAG JE AAN ALLES TWIJFELEN? KRITISCH DENKEN OVER WETENSCHAP', 2022.

Sijbers, Jeroen, and Erik Woldhuis. 'Startnotitie natuuwetenschappelijke vakken'. Startnotitie. Amersfoort: SLO, 2021. https://www.slo.nl/thema/meer/actualisatie-kerndoelen-examenprogramma/actualisatie-examenprogramma/.

SLO. 'Actualisatie van de Kerndoelen'. *SLO* (blog), 13 March 2024. https://www.slo.nl/thema/meer/actualisatie-kerndoelen-examenprogramma/actualisatie-kerndoelen/.

———. 'Vakdossier 2003 Algemene Natuurwetenschappen'. Vakdossier. Enschede: Stichting leerplanontwikkeling (SLO), December 2003. Den Haag. Koninklijke Bibliotheek.

Sociaal en Cultureel Planbureau. 'Vijftien jaar onderwijsvernieuwing in Nederland'. Parlementair onderzoek onderwijsvernieuwingen, 13 February 2008. https://www.parlementairemonitor.nl/9353000/1/j9vvij5epmj1ey0/vi3k9m1a1dnv.

SP. 'ONMIDDELLIJKE SLUITING VAN STUDIEHUIS DRINGEND GEWENST', 6 December 1999. https://www.sp.nl/opinie/1999/onmiddellijke-sluiting-van-studiehuis-dringend-gewenst.

Spaan, Leon, and Roger Lafèbre. 'Implementatieplan voor het vak Algemene natuurwetenschappen'. *NVOX*, October 1998. NVON. https://nvon.nl/nvox/nvox-1998-8-geheel.

Stuurgroep Profiel Tweede Fase. 'Advies Examenprogramma's havo en vwo: Algemene Natuurwetenschappen'. Publicatie. Enschede: SLO, 1995. Den Haag. Nationaal Archief.

Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs. 'De studielast van leerlingen'. *2e Fase Berichten*, 16 February 1994. Den Haag. Nationaal Archief.

———. 'Ginjaar-Maas: Twee beta-profielen zijn goed voor meisjes en jongens',. *2e Fase Berichten*, 2 February 1994. Den Haag. Nationaal Archief.

———. 'Tweede Fase Examen in het studiehuis'. Publicatie. Ministerie van Onderwijs & Wetenschappen, December 1995.

———. 'Tweede Fase: Scharnier tussen basisvorming en hoger onderwijs, een uitwerking op hoofdlijnen van de nota's profiel van de tweede fase van het voortgezet onderwijs'. Publicatie. Ministerie van Onderwijs & Wetenschappen, January 1994. Den Haag. Nationaal Archief.

———. 'Tweede Fase vernieuwt: Scharnier tussen basisvorming en hoger onderwijs deel 2'. Publicatie. Ministerie van Onderwijs & Wetenschappen, October 1994. Den Haag. Nationaal Archief.

Termeer, Margriet. 'Algemene Natuurwetenschappen, een vak apart? Impressie van de openingslezing van de tweedaagse scheikunde 1996'. *NVOX*, December 1996. NVON. https://nvon.nl/nvox/nvox-1996-10-geheel.

Timmermans, Roel. 'Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt': *NVOX*, April 2002. NVON. https://nvon.nl/nvox/nvox-2002-4-geheel.

Trouw. 'Nieuw plan voor studiehuis'. 23 December 1999, sec. Binnenland. Lexis Nexis.

Tweede Fase Adviespunt. *Regelgeving voor de vernieuwde tweede fase*. Den Haag: Tweede Fase Adviespunt, 2007.

———. *Zakboek Tweede Fase*. Den Haag: Tweede Fase Adviespunt, 2007.

'Tweede fase vervolgonderwijs: "bovenbouw bijgesteld"'. Advies. Raad voor het Jeugdbeleid, 3 March 1983. Den Haag. Nationaal Archief.

Valk, Guus. 'De klagende leerlingen krijgen hun zin'. *NRC Handelsblad*, 11 January 2003. Lexis Nexis.

Vaststelling van de begroting van de uitgaven en de ontvangsten van het Ministerie van Onderwijs, Cultuur en Wetenschappen (VIII) voor het jaar 1995, Pub. L. No. 23 900 VIII, 1994–1995 nr. 104 (1995).

Verboord, Marc. 'Literatuuronderwijs van Mammoetwet naar Tweede Fase':, 2004.

vereniging NLT. 'Feiten En Cijfers'. Verenigingnlt.nl. *Over Ons* (blog), n.d. https://www.verenigingnlt.nl/over/feiten-cijfers/.

'Vergadering van de afdeling 2A van de Onderwijsraad'. Notulen. Onderwijsraad (Afdeling 2A), 4 March 1994. Den Haag. Nationaal Archief.

Vermeulen, Margreet. 'Dat is wennen, eieren gooiende kinderen'. *de Volkskrant*, 7 December 1999. Lexis Nexis.

———. 'Vakken schrappen, dat zou helpen'. *de Volkskrant*, 14 December 1999. Lexis Nexis.

Verrips, Pieter. 'Toen En Nu'. Vrijheid van onderwijs. *1848* (blog), n.d. https://vrijheidvanonderwijs.nl/historie.php?ID=2.

'Vervolgnota "Profiel van de tweede fase voortgezet onderwijs" en Beleidsbrief "Het Voorbereidend Beroepsonderwijs"'. Advies. Onderwijsraad, 16 November 1992. Den Haag. Nationaal Archief.

Visser 't Hooft, J.C., and L. Markensteyn. 'Rapportering van de adviseurs tweede fase voortgezet onderwijs'. Advies, January 1993. Den Haag. Nationaal Archief.

VOSABB. 'Verdeling leerlingen vwo, havo en vmbo in VO leerjaar 3', September 2012. https://www.vosabb.nl/wp-content/uploads/2012/09/Vwo_havo_vmbo_1990-2009.pdf.

Wallage, J. Vervolgnota 'Profiel van de tweede fase voortgezet onderwijs', Pub. L. No. 079–534465, 1992 Nota (1992).

Weeda, Frederiek. 'Scholen over studiehuis: paniekreactie'. *NRC Handelsblad*, 16 December 1999. Lexis Nexis.

———. 'Woede over schrappen nieuw vak; "24 miljoen voor niets"'. *NRC Handelsblad*, 17 December 1999. Lexis Nexis.

Welie, Theo van. 'De Beagle is weer gestrand'. *NVOX*, June 1996. NVON. https://nvon.nl/nvox/nvox-1996-6-geheel.

———. 'Reactie op: Aan iedereen die het Natuurkunde-onderwijs in Nederland een warm hart toedraagt': *NVOX*, April 2002. NVON. https://nvon.nl/nvox/nvox-2002-4-geheel.

Wielemaker, Arjen. 'Conferentie "Helaal"; ANW leeft!' *NVOX*, April 2000. NVON. https://nvon.nl/nvox/nvox-2000-4-geheel.

Wijziging van de Wet op het voortgezet onderwijs, de Wet op het hoger onderwijs en wetenschappelijk onderzoek en de Wet educatie en beroepsonderwijs in verband met verbetering van de aansluiting van het voorbereidend wetenschappelijk onderwijs en het hoger algemeen voortgezet onderwijs op het hoger onderwijs (profielen voortgezet onderwijs), Pub. L. No. 25168 nr. 3, 1996–1997 (1996). zoek.officielebekendmakingen.nl/kst-25168-3.html.

Zunderdorp, R. 'Het regeringsbeleid gaat aan versplintering ten onder'. *NRC Handelsblad*, 20 July 1994. Lexis Nexus.

It is 1998, the educational renewal Tweede Fase is introduced in Dutch secondary education. This led to many changes for havo and vwo students in their last two or three years. In this educational renewal, Algemene Natuurwetenschappen, called ANW, was introduced. Instead of explaining the content of science, it discussed the role of science in society, It focused on the Nature of Science, by including philosophical, historical and societal perspectives. ANW was revolutionary, called the crown-jewel of the Tweede Fase!

It is 1999, the introduction of the Tweede Fase does not go as planned. Twenty-thousand students protest at the end of the year against the high work load. To meet the angry students and reduce workload, it is posed to make ANW optional. A tug of war between stakeholders begins and eventually ANW loses its mandatory status on havo in 2007 and on vwo in 2015.

This thesis covers the development of this cross-disciplinary subject ANW. What it promised and how it failed.

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