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Qualities of instructional-learning episodes in different domains: the subjects Care and Technology

MONIQUE VOLMAN and GEERT TEN DAM

This paper focuses on the question, 'What kind of learning processes are intended in the subjects *Care* and *Technology* in the Dutch common curriculum?' Arguments for the introduction of the subjects in the common curriculum pointed out their practical nature. However, the concept 'practical' was used to refer to different dimensions: to 'learning domains' (cognitive, psychomotor, social-affective), and to 'learning outcomes' (knowledge-skills). We analyse these subjects in relation to these dimensions as well as the dimensions 'productive-reproductive learning', 'extent of metacognition', and 'near- or far-transfer'. The findings show that Care and Technology are not 'practical' subjects in either the learning-domain dimension or in the learning-outcome dimension. Like other subjects in secondary education, relatively little attention is paid to metacognition and far-transfer.

Introduction

When a common curriculum or 'basic education' was introduced in The Netherlands in 1993, the subjects *Care* and *Technology* became compulsory for all pupils in the first stage of secondary education.[1] Before the introduction of the common curriculum, these subjects were only included in the curriculum of lower vocational education (see also Eijkelhof *et al.* 1998).[2] The arguments for including Care and Technology in the first stage of secondary education referred to the type of learning objectives aspired to in these subjects, suggesting that they concentrate far more than the other subjects taught at this stage of education, which mostly have their origin in general secondary education, on psychomotor and social-affective objectives. Care and Technology were supposed to provide a counterbalance to the predominantly cognitive nature of basic education. According to some, this would be beneficial to those pupils who would have followed lower vocational education before the introduction of the common curriculum; the subjects Care and Technology match their interests and abilities well. Others emphasized the importance of the integration of 'head, heart and hands' for all pupils, and which would be realized in

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these subjects. All kinds of groups pointed out that developments in society place a demand on all pupils for the knowledge and skills in the fields of Technology and Care. Thus, the increasingly important role of technology in society was an argument used in support of the subject Technology (e.g. Advisory Council on Government Policy 1989), and a variety of factors, such as the individualization of society, the emancipation of women, and the increasing complexity of daily life, were put forward in favour of Care (see Ledoux *et al*. 1988 for a survey of the arguments).

The discussion on the development of Technology and Care from vocational education subjects to 'subjects for everyone' concentrated on the question of how practical and how theoretical both subjects actually are, or should be. It was suggested by some, in the discussion on the attainment targets of Technology, that this subject must be practically oriented and not primarily aimed at the acquisition of knowledge and understanding (see Streumer 1989). Others pointed out the danger that predominantly technical skills would be taught that would not be compatible with the abilities of the pupils who previously would have gone into general secondary education (see e.g. Advisory Council on Government Policy 1986). In the discussion preceding the introduction of the subject Care, the assumed practical orientation of the subject was the major cause of disagreement (see Ten Dam and Volman 1998). The practical nature of the subject was the main reason why it was considered by some to be of little value in either the personal development or school careers of pupils. On the one hand, it was emphasized that the function of education is to instill pupils with knowledge based on the academic disciplines and to teach them cognitive and metacognitive skills (e.g. Leune 1983); learning about 'care' would contribute little to this objective. On the other hand, the Education Inspectorate pointed out the danger of 'more attention being paid to the theory of Care than to practical skills' (Inspectorate 1994). This warning was based on the results of research on the introduction and development of the subject Care. Greater emphasis on non-cognitive skills was needed in the further development of the subject.[3]

In this paper, it is argued that the concepts of 'practical' and 'theoretical' have been used ambiguously in these discussions. Bearing in mind the differentiation made in educational theory between types of learning domains and types of learning outcomes, it becomes clear that 'practical' and 'theoretical' are being used in many different ways. Thus, 'practical' is not only being used in the sense of 'in relation to the psychomotor or social-affective domain' (as opposed to the cognitive domain) but also in the sense of 'skills-oriented' (as opposed to 'knowledge-oriented'). The first meaning refers to the learning outcomes in a specific learning domain (Bloom 1956, Krathwohl *et al*. 1964), the second to learning outcomes of a specific type (Gagné 1984, Glaser 1990). In the same way, 'theoretical' sometimes refers to the cognitive (as a learning domain) and sometimes to knowledge (as a type of learning outcome). In our opinion, it is important to make a clear distinction between these dimensions and the various positions on them that might be taken (see table 1).

The differentiation made between types of learning-domains and types of learning-outcomes is still too general to clarify the learning processes in

Table 1. The 'practical character' of learning objectives in two dimensions: learning domains and learning outcomes.

Learning outcomes	Learning domains	
	Practical	Non-practical
Practical	Skills learned in non-cognitive domains (e.g. learning carpentry or how to cook)	Skills learned in the cognitive domain (e.g. learning to read a map)
Non-practical	Knowledge acquired in non-cognitive domains (e.g. learning about communication)	Knowledge acquired in the cognitive domain (e.g. learning about nutrition)

school subjects. A more detailed picture of the diversity of learning processes which occur, or should occur, in education and the circumstances which are favourable or unfavourable to these processes has developed in recent years (see e.g. Anderson 1994, Anderson and Sosniak 1995, Elshout-Mohr *et al.* 1999). In addition to the established differentiation between 'productive' and 'reproductive' learning (e.g. Doyle 1983), increasing attention has been paid to the themes of metacognition and transfer as qualities that typify different learning processes (e.g. Wang *et al.* 1990, 1993, McKeough *et al.* 1995, Simons 1996, Perkins and Salomon 1996, Weinstein and Van Mater Stone 1996). Productive learning, learning aimed at transfer, and attention to metacognition are considered important in active, self-directed learning, an objective which has been actively pursued in the Netherlands since the mid-1990s, for all pupils in the first phase of secondary education (see also Roelofs and Terwel 1999).

The question, 'What kind of learning processes are intended in the subjects Care and Technology?', is central to this paper. To answer this question we have analysed how these two subjects can be positioned in the five dimensions summarized below:

- attention to the cognitive, social-affective, and psychomotor domains;
- attention to productive or reproductive learning;
- attention to knowledge or skills;
- attention, or lack thereof, to metacognition; and
- attention to near- or far-transfer.

The analysis aims to provide insight into a specific innovation in the common curriculum, namely the introduction of two subjects that originally were only taught in vocational education. It shows in particular to what extent these subject may be considered 'practical', and how these subjects do or do not contribute to one of the objectives of the common curriculum, the development of self-directed learning.

Our research pertains to the level of the ideal curriculum and the formal curriculum (Goodlad *et al.* 1979), the attainment targets and teaching materials for both subjects. The differences between the subjects will be discussed, as well as the differences between both curriculum levels. We will start by giving a brief survey of the development of the subjects Care

and Technology. This is followed by a description of the instrument we used to analyse the attainment targets and teaching materials as well as the procedure followed in the analysis. In the next section, we present the results of our analysis on the attainment targets and teaching materials. Finally, we will summarize the research results and return to the relevance of the research to the further development of the subjects Care and Technology in the common curriculum, paying particular attention to metacognitive knowledge and skills.

Care and Technology: from vocational education to education for all

The origins of Care and Technology in lower vocational education

The subjects Care and Technology both emerged from vocational education in the mid-1980s. Before that period, several technical and care subjects had been taught in lower vocational education, but these were narrow, vocationally-oriented subjects which prepared pupils for work in a specific sector of the labour market or, in the case of Care, in the family. These technical subjects included woodwork, metalwork, electrical engineering, painting, etc.; the care subjects included taking care of the home, nutrition, clothing, health-care, and child-care and upbringing. In the course of the 1960s, when the generalization of Dutch lower vocational education began, the content of these specific vocationally-oriented subjects underwent a major change. Far greater emphasis was placed on their implications for general education and the vocationally-oriented element became less important. An attempt was made in the 1970s to integrate vocationally-oriented subjects, both the technical and the care subjects, in a new subject called 'Practical skills', but this was not a success.

Discussions on the common curriculum in the first stage of secondary education

From the middle of the 1970s, discussion on the further development of Care and Technology was increasingly related to the common curriculum that was then being planned. What subjects or areas of learning should be taught to all students in secondary education? In an important Dutch government memorandum dating from 1975 (the 'Contours memorandum'), a 'broadening of the curriculum' for all and the 'head, heart and hands' principle were emphasized. 'Head, heart and hands' implied the aspiration to foster the development of the intellectual, the emotional and social, and the manual talents of pupils, thereby clearly creating room for technical and care curricula.

Ten years later, it was finally decided to develop and introduce Technology and Care in the first stage of secondary education as two separate subjects (Ministry of Education and Science 1985). However, different policy approaches were followed in relation to the subjects. Technology

was considered to be sufficiently developed to begin an immediate, phased introduction. This was not considered to be the case with Care. A working party on the subject was set up and the Advisory Council on Government Policy was requested to make a recommendation on whether Care as a separate subject should be introduced. The recommendation was negative: as a consequence, Care was not included on the list of compulsory subjects proposed by the Advisory Council on Government Policy in 1986. In contrast, Technology was regarded by the Advisory Council as addressing an essential aspect of culture.

Nevertheless, plans had been developed on the content of the subject Care (National Care Platform 1987, National Institute for Curriculum Development 1987). A 'broad' subject was proposed: in addition to traditional themes from home economics like nutrition and clothing, topics in the field of sexuality, relationships, consumer affairs, the environment, leisure time and work in and outside of the home were also to be included. The inclusion of knowledge-oriented learning objectives as well as learning objectives in relation to skills and attitudes remained an essential characteristic of the proposed subject: there was to be a balance between 'head, heart and hands' (see Ledoux *et al.* 1988). Pupils were to acquire 'applicable knowledge' and learn 'practical skills' in Care, to develop their problem-solving abilities in everyday life. The subject was also regarded as inherently associated with values; Care is about 'being responsible for' and 'taking into account'.

The development of Technology had also progressed. A curriculum proposal had been developed which focused on 'technology as a cultural phenomenon' and 'the relationship between people and technology'. The objectives formulated in the curriculum proposal paid particular attention to skills; knowledge was regarded as a condition for the acquisition of skills rather than as an objective in itself. Pupils must learn how to make technical products, how to use the products of technology, and how to assess the applications of technology. The types of skills involved included learning how to carry out techniques routinely and how to solve technical problems systematically. Technology's alignment with values was explicitly made visible in the thematic presentation of the influence of technology on people and society: from what perspective are certain technical developments desirable or not desirable?

When both subjects were introduced, a change in social attitudes was a firm goal. At the end of the 1980s, concern was expressed about the relatively anti-technical or technically-sceptical attitude of the Dutch people, particularly Dutch youth. Technology was to contribute to bringing about a more positive attitude in pupils towards technology. Furthermore, girls were always treated as a special target group: an introduction to technology in the first stage of secondary education was intended to remove many of the barriers to technical careers facing girls (see e.g. Advisory Council on Government Policy 1986, Streumer 1989). On the other hand, the arguments for the introduction of Care were almost exclusively based on emancipatory considerations (see Ten Dam and Volman 1998). Its inclusion in basic education was seen as an expression of a social recognition of the knowledge and skills that were traditionally associated with

<center>Table 2. Attainment targets of the subject Care.</center>

Domains	Subdomains	Examples of attaintment targets
Health and well-being	• personal hygiene • contact with others • use of stimulants • promotion of health • time-management	'Pupils are able to apply elementary skills in personal hygiene and explain the importance of good posture and physical exercise'
		'Pupils are able to explain the social and emancipatory aspects of paid and unpaid labour'
Consumer behaviour	• position as a consumer • budget management • consumption and environment	'Pupils know the rights and obligations of consumers'
Basic necessities of life	• nutrition • clothing • housing	'Pupils are able to assess the composition, nutritional value, packaging information, quality and price of food'

women. At an individual level, it was expected that boys would learn to appreciate the domain of care and caring if they knew more about caring activities, and that this would eventually lead to a more equal division of labour in society. However, the aspect of attitudal development was not included in the attainment targets inasmuch as such a normative dimension to any school subjects would be in conflict with the freedom of Dutch schools to determine the religious or ideological content of instruction. What was ultimately included in the attainment targets (see below) was that pupils should be capable of reflecting on the existence of different attitudes towards care and technology in society and relate this to their own attitude (Ten Dam and Volman 1998).

Care in the first stage of secondary education

Care was included in the Dutch common curriculum at the very last moment. This last-minute achievement was partly due to the efforts of an action committee 'Care is a must', which was set up in 1990. But, as a result, attainment targets, which had been developed for the other subjects over a period of years, were formulated for Care in the greatest of haste. A curriculum proposal was published in 1993 and educational publishers presented their teaching materials for the subject just before the beginning of the school year in which the common curriculum was to be introduced.

Table 2 shows the domains and sub-domains in which the 23 attainment targets of the subject Care were organized. An example of an attainment target is given in each domain.

Table 3. Attainment targets of the subject Technology.

Domains	Subdomains	Examples of attainment targets
Technology and society	• daily life • the business community • occupations and environment	'Pupils are able to give a global description, based on their own observations, of a manufacturing company, indicating the type of industry, phases in the production line, working conditions and the division of labour between men and women'
Products of technology	• operational principles • technical systems • control technology • using technical products	'Pupils are able to explain mechanical movements and transmissions in a concrete situation'
Making a technical model	• preparation and planning • design • drawing and reading plans • working with and processing materials • product control	'Pupils are able to make the necessary measurements and transfer information from technical drawings to materials when making a technical model'

Technology in the first stage of secondary education

In that there was scarcely any dispute about whether Technology should be included in the curriculum, the progression from curriculum proposal to provisional objectives to attainment targets was straightforward. When the subject Technology was actually introduced it comprised 12 attainment targets in three domains (see table 3).

Method

With a view to answering the question 'What kind of learning processes are intended in the subjects Care and Technology?' we will analyse the attainment targets for the two subjects and the way in which these targets have been incorporated in teaching materials. We will also discuss the instrument and procedures used in this analysis.

Instrument

In the analysis, we used the concept of 'instructional-learning episodes', as defined by Elshout-Mohr et al. (1999),[4] namely units that can be distinguished in learning. Elshout-Mohr et al. developed a categorization system for units that can be distinguished in the teaching–learning process, based on five dimensions similar to those described in the introduction (see table 4).

Table 4.   Categorization of instructional-learning episodes in the cognitive domain.

Key word	Dimension 1	Dimension 2 Reproductive-productive	Dimension 3 Knowledge-skills	Dimension 4 Metacognition	Dimension 5 Transfer
C1—Facts	Cognitive	Reproductive	Knowledge	—	Near
C2—Under-standing	Cognitive	Productive	Knowledge	—	Near
C3—Insight	Cognitive	Productive	Knowledge	—	Far
C4—Routine	Cognitive	Reproductive	Skills	—	Near
C5—Systematic approach	Cognitive	Productive	Skills	—	Near
C6—Expertise	Cognitive	Productive	Skills	—	Far
C7—Reflection	Cognitive	Productive	Knowledge	Metacognitive	Far
C8—Process regulation	Cognitive	Productive	Skills	Metacognitive	Far

Source: Elshout-Mohr *et al.* (1999).

- *Dimension 1* refers to the domain that is central to the learning process in the episode in question; Elshout-Mohr *et al.* restrict themselves to the cognitive learning domain.
- *Dimension 2* refers to the difference between reproductive learning processes involving repetition, copying and routine on the one hand and productive learning processes involving insight and understanding on the other.
- *Dimension 3* refers to the difference between 'knowing about' (declarative knowledge) and 'knowing how' (skills, procedural knowledge, competence); this is the dimension which we described earlier as 'knowledge versus skills'.
- *Dimension 4* distinguishes whether the episode is or is not aimed at metacognitive knowledge and skills.
- *Dimension 5* distinguishes between a focus on near-transfer or on learning outcomes with a high transfer value. Different types of episodes can be differentiated on the basis of these dimensions (see table 4).

Table 5 presents the definition offered by Elshout-Mohr et *al.* (1999) for each episode. The essential characteristics of the eight episodes are indicated by means of a number of keywords, and a prototypical example from either the subject Care or the subject Technology is given for each episode, thus showing how, e.g. productive, metacognitive or transfer-oriented, learning may be reflected in attainment targets or in textbooks.

Elshout-Mohr *et al.* (1999) restrict themselves to 'cognitive learning', so there is no variation in the first dimension. In education, however, episodes can also be differentiated in terms of the presence of strong psychomotor or social-affective components. Such differentiations are relevant to the subjects Care and Technology in that psychomotor and social-affective objectives have always been used as arguments in favour of introducing the subjects (Ten Dam and Volman 1996, 1998). The instrument we used in our analysis differentiates between the cognitive learning

Table 5. Characteristics of cognitive instructional-learning episodes.

Episode	Definition	Keywords	Example
C1	Learning facts and encyclopaedic knowledge by paying attention	Learning by heart, repeating	T: Memorizing different wood joints
C2	Constructing conceptual knowledge by deep processing of new information	Understanding, able to implement ideas, make connections, able to give examples	C: Asking pupils to find three examples of voluntary aid in their own environment
C3	Constructing higher-order knowledge by alternating decontextualization (abstracting) and recontextualization	Fundamental principles abstract formulae	T: Understanding the principle of energy conversion using the examples of a combustion engine, an electric motor, dynamic, central heating installation and solar energy panel
C4	Developing autonomous routines by practising them	Objective is that it becomes automatic	C: Learning to read a bank statement
C5	Acquisition of cognitive skills by systematic practice	Working systematically, step-to-step, no obvious routine solution	C: Looking up information on nutritional values and recording them in bar charts
C6	Development of expertise by consulting experts	Participation in a culture of expertise	[no example found]
C7	Acquisition of metacognitive knowledge by making conscious decisions on cognitive activities, gaining experience and, in retrospect, systematic reflection	Reflection on own mental processes	C: Learning to understand and experiencing the purpose of making a plan for moving house
C8	Development of self-regulatory skills by planning, managing and, in retrospect, evaluating cognitive activities	Planning, monitoring, evaluating, and revising	T: Pupils learn to evaluate and improve their own work and method of working with the help of criteria

domain, the social-affective learning domain,[5] and the psychomotor learning domain.[6]

Thus, eight types of learning episodes can be differentiated on the basis of the five dimensions in the social-affective and the psychomotor domains.[7] Following the methodology of Elshout-Mohr *et al.* (1999), prototypes were formulated for the different episodes, a step which can be considered as the first validation of the translation of the cognitive types of episodes into the psychomotor and social-affective domains. The resulting instrument was submitted for further verification to one of the authors of the original category system and to an expert in each of the subjects. Like table 5, tables 6 and 7 present definitions, keywords and examples of instructional-learning episodes in the psychomotor and social-affective domains.

Table 6. Characteristics of psychomotor instructional learning episodes.

Episode	Definition	Keywords	Example
P1	Learning facts and encyclopaedic knowledge about psychomotor subjects by studying them	Lerning by heart, learning, repeating	T: Pupils memorize three ways of improving their own physical strength.
P2	Constructing conceptual knowledge about psychomotor subjects by in-depth processing of new information	Understanding, able to implement ideas, make connections, able to give examples	C: Pupils learn to understand what good posture is by lifting heavy objects.
P3	Constructing abstract knowledge and insight into psychomotor subjects by alternating decontextualization (abstracting) and recontextualization	Fundamental principles, abstract formulae	[no example found]
P4	Developing psycho-motor routines by repeating them so that they become automatic	Objective is that this becomes automatic	C: Pupils practise ironing and folding clothes.
P5	Development of psychomotor strategies by working systematically	Working systematically, step-by-step, no obvious routine solution	T: Pupils design and make a container which complies with specific criteria.
P6	Development of expertise in the psychomotor field by consulting experts	Consulting experts	[no example found]
P7	Acquisition of metacognitive knowledge by making conscious decisions, gaining experience and, in retrospect, systematic reflection on psychomotor activities	Reflection on own psychomotor activities	C: Pupils become aware of their own posture by comparing it with information in a book.
P8	Development of self-regulatory skills by planning, managing and, in retrospect, evaluating psycho-motor activities	Planning, monitoring, evaluating and revising	T: Pupils learn to control their actions by carrying out an assignment with incomplete instructions following a problem-solving model.

Thus, the psychomotor (P1–P8) and social-affective episodes (A1–A8) were developed in parallel to the cognitive instructional-learning episodes C1–C8. In episodes 1–3 and 7, which concern the dimension 'knowledge or skills', the object of the learning process is different: it is a question of learning about social-affective or psychomotor matters. The ability to verbalize the acquired knowledge is an indication that the learning process

Table 7. Characteristics of social-affective instructional learning episodes.

Episode	Definition	Keywords	Example
A1	Learning facts and encyclopaedic knowledge about social-affective subjects by studying them	Learning by heart, learning, repeating	T: Pupils memorize a few social consequences of tele-learning
A2	Constructing conceptaul knowledge about social-affective subjects by in-depth processing of new information	Understanding, able to implement ideas, make connections, able to give examples	C: Pupils learn to understand how advertising takes advantage of people's feelings
A3	Constructing abstract knowledge and insight into social-affective subjects by alternating decontextualization (abstracting) and recontextualization	Fundamental principles, abstract formulae	C: Pupils gain insight into the social nature of people
A4	Developing social-affective routines by repeating them so that they become automatic	Objective is that this becomes automatic	C: Pupils practice receiving non-verbal communication
A5	Development of social-affective strategies by working systematically	Working systematically, step-by-step, no obvious routine solution	C: Pupils prepare a conversation in which there is a difference of opinion between a customer and a sales person
A6	Development of expertise in the social-affective field by consulting with experts	Contact with experts	[no example found]
A7	Acquisition of metacognitive knowledge by making conscious decisions, gaining experience and, in retrospect, systematic reflection on social-affective activities	Reflection on own social-affective processes	C: Pupils become aware of how their opinions about certain groups and people may be based on prejudice
A8	Development of self-regulatory skills by planning, managing and, in retrospect, evaluating social-affective activities	Planning, monitoring, evaluating and revising	C: Pupils learn to recognize and deal with social and emotional changes in puberty

has occurred. The other four instructional-learning episodes (4, 5, 6 and 8) concern skills, learning a procedure in the social-affective and the psycho-motor domains. Agency in a task situation is indicative of learning in these episodes, *not* the ability to verbalize.

Analysis

The analysis of the attainment targets and teaching materials was carried out by three assessors.[8] It was assumed that attainment targets and episodes in textbooks refer to, or are meant to, invoke certain types of instructional learning episodes. The analysis of the attainment targets was performed as follows: each verb in an attainment target was coded as referring to a type of episode (for example, pupils are able to ... manage, explain, give examples, demonstrate, etc.). An attainment target can refer to more than one type of learning episode. Per attainment target, 100 points could be scored as a proportion of the number of episode types occurring in the attainment target. This resulted in a total score for each type of episode. The total score divided by the number of attainment targets produces a percentage that is an indication of the attention paid to the different types of episodes in the attainment targets of the subject.

Two text books were analysed for each subject. We chose the market leaders. Here we will refer to them as 'Care book 1', 'Care book 2', 'Technology book 1', and 'Technology book 2'.[9] The Care textbooks are aimed at all levels of basic education, whereas the Technology textbooks make a differentiation between the different levels of basic education.[10]

In the analysis of the teaching materials, the questions/assignments in the textbooks and the accompanying subject matter were chosen as the unit of analysis. This choice was based on the assumption that the questions and assignments would have a determining effect on the processing of the subject matter by pupils. The instructional-learning episodes were worked out for each question/assignment. For each chapter, 100 points were divided between the questions and assignments in the chapter and 100 points allocated to the final assignment. This meant that the final assignments, which were mostly much longer and more time-consuming, were weighted equally with all the other questions and assignments in the chapter together. The results per chapter were then converted into means for the entire textbook.

Results

Table 8 shows how often the different types of learning episodes occurred in the attainment targets and teaching materials for Care and Technology. Our approach in this discussion of the results is based on the differentiation between the cognitive, social-affective, and psychomotor learning domains. The reproductive-productive learning dimension, knowledge-skills dimension, metacognition dimension, and near/far transfer dimension are, in the first instance, only discussed *within* the learning domains. We will then

Table 8. Distribution of attention to the different instructional-learning episodes in the attainment targets and teaching materials for the subjects Care and Technology (in percentages).

	Attainment targets Care	Care book 1	Care book 2	Attainment targets Technology	Technology book 1	Technology book 2
C0*	—	1.4	0.8	—	0.4	0.2
C1	40.7	16.3	10.4	3.8	22.4	20.3
C2	9.5	22.7	25.8	42.6	21.0	25.0
C3	—	—	—	2.8	0.8	—
C4	0.9	2.1	0.2	4.4	2.1	4.2
C5	28.0	20.7	20.1	17.5	26.3	2.3
C6	—	—	—	—	—	—
C7	—	0.7	0.1	—	—	—
C8	—	—	—	8.3	—	—
Total	**79.0**	**62.9**	**57.4**	**79.4**	**73.0**	**52.0**
A0	—	1.6	4.9	—	—	—
A1	4.3	4.4	1.0	—	0.1	0.1
A2	2.9	11.9	15.2	—	0.1	0.1
A3	—	—	0.2	—	—	—
A4	—	0.2	0.1	—	—	—
A5	1.4	13.9	0.6	—	—	—
A6	—	—	—	—	—	—
A7	—	3.5	12.3	—	—	—
A8	1.4	0.6	0.1	—	—	—
Total	**10.0**	**36.1**	**34.4**	**0**	**0.2**	**0.2**
P0	—	—	—	—	—	—
P1	2.2	0.4	0.1	—	0.6	—
P2	—	0.4	0.9	—	—	0.1
P3	—	—	0.1	—	—	—
P4	6.5	0.1	0.6	6.0	10.5	45.2
P5	2.2	0.1	1.9	11.8	15.6	2.4
P6	—	—	—	—	—	—
P7	—	—	4.6	—	—	0.1
P8	—	—	—	2.8	—	—
Total	**10.9**	**1.0**	**8.2**	**20.8**	**26.8**	**47.8**
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**

*We have introduced a so-called 0 episode for all the domains in the analysis of the course materials. It is reserved for questions and assignments which are not part of the learning process itself. For example, sometimes they activate existing knowledge. If this knowledge is not used in the same question or assignment, we have given it a code 0. An example in the cognitive domain is the question: 'What do you have for breakfast on a weekday and at the weekend?' In the psychomotor domain, an example would be: 'How do you hold a hammer?'

summarize the scores for these dimensions for all of the domains together (see table 9).

The ideal curriculum: the attainment targets

It is noticeable that the emphasis in the attainment targets is in the cognitive domain. When Care and Technology were introduced, the emphasis was on their 'practical', i.e. 'non-cognitive', character. This is not reflected in the attainment targets. Only 20% of the attention in the

Table 9.   Scores on the dimensions in the attainment targets and teaching
materials for Care and Technology (in percentages).

	Attainment targets Care	Care book 1	Care book 2	Attainment targets Technology	Technology book 1	Technology book 2
Reproductive	54.6	26.5	18.1	14.2	36.1	70
Productive	45.4	73.5	81.9	85.8	63.9	30
Knowledge	59.6	63.6	76.2	49.2	44.6	45.9
Skills	40.4	36.4	23.8	50.8	55.4	54.1
Non-metacognitive	98.6	95.2	82.9	88.9	100	99.9
Metacognitive	1.4	4.8	17.1	11.1	0	0.1
Near-transfer	98.6	95.2	82.6	86.1	99.2	99.9
Far-transfer	1.4	4.8	17.4	13.9	0.8	0.1

attainment targets for Technology and a mere 10% of those for Care relate
to the psychomotor domain. The social-affective domain is only included in
Care.

Within the domains, there is a striking difference between Technology
and Care in the cognitive domain; the attainment targets for Technology
are formulated more in terms of productive knowledge (understanding, C2)
and those of Care in terms of reproductive knowledge (factual knowledge,
C1). Reflective knowledge about one's own cognitive performance (C7) is
not included in the attainment targets of either subject. Moreover, the
attainment targets suggest scarcely any learning that is aimed at under-
standing complex principles (C3). Insofar as 'practical' refers to 'skills', the
qualification 'practical' does seem to be applicable to the cognitive domain.

Productive cognitive skills (C5) have an important place in both
subjects. These include, for example, making technical drawings and
presenting nutritional values in bar charts. There is far less place, however,
for learning cognitive routines (C4). Learning to develop expertise by
contacting experts (C6) did not occur.[11] The development of self-regula-
tion skills (C8) is included in the attainment skills of Technology but not in
those of Care.

The social-affective domain is not included in the attainment targets of
Technology. In Care, it is associated with knowledge, about social-affective
and social processes and phenomena, e.g. 'pupils are able to explain the
importance of the relationship between parents and children and between
friends'.

In the psychomotor domain, which receives twice as much attention in
the attainment targets of Technology than in those of Care, the acquisition
of psychomotor routines (P4) and, particularly in Technology, learning to
carry out psychomotor skills systematically (P5) dominate. The fact that
psychomotor knowledge (P1–P3 and P7) is scarcely or not included in the
attainment targets of either subject indicates that psychomotor skills are
mainly learned by 'doing' rather than learning 'about'.

Looking at the domains as a whole, it is striking that there is a
fairly strong emphasis on memorizing in the attainment targets for Care
(see table 9). This emphasis on reproduction is most evident in the

acquisition of knowledge, rather than the acquisition of skills (see table 8), and there is clear attention to the productive aspect in the area of skills. In Technology, however, there is an emphasis on the productive dimension of learning in the attainment targets for both knowledge and skills. In relation to the knowledge-skills dimension in Care, the accent is on knowledge, whereas in Technology there is an equal distribution of attention to the acquisition of knowledge and skills. Lastly, virtually no attention is paid in the attainment targets for Care to metacognitive knowledge/skills or far-transfer. Technology scores slightly better in this respect.

The formal curriculum: teaching materials

The translation from attainment targets to teaching materials appears to have resulted in a slight shift in emphasis. In both Care textbooks, there was a shift from the cognitive to the social-affective domain. In one of the Technology textbooks, there was a shift from the cognitive to the psycho-motor domain (see table 8).

Although both of the textbooks for Care place less emphasis on the cognitive domain than the attainment targets would suggest, one of the textbooks (Care book 1) is more cognitively-oriented than the other. There is also a shift within the cognitive domain; a substantial part of the subject matter is aimed at understanding (C2), and not factual knowledge (C1), as suggested by the attainment targets. On this point, the two textbooks also differ somewhat: Care book 1 has more questions and assignments aimed at the reproduction of factual knowledge. The textbooks follow the same approach to the acquisition of skills as the attainment targets. Attention is clearly paid to productive cognitive skills.

In Technology, the teaching materials are aimed at the cognitive learning domain more or less to the same extent as suggested in the attainment targets. Here too, though, there is a difference between the two textbooks. There is a far greater emphasis on learning factual knowl-edge than on learning to understand in the teaching materials than the attainment targets require. This is true of both textbooks. Thus, Tech-nology book 1 is more theoretical than Technology book 2, given its greater attention to the cognitive learning domain. However, on the whole, the learning episodes in the cognitive domain in Technology book 1 are aimed at learning cognitive skills and in that sense are 'practical'. Two sorts of learning episodes that occur in the attainment targets are not found in the teaching materials, namely C3 and C8. Both of these episodes involve far-transfer.

In the social-affective domain, the teaching materials for Care pay most attention to 'understanding' (A2) and 'knowledge of one's own social-affective processes and reactions' (A7). An example of this is found in a chapter dealing with the changes pupils undergo in puberty. Pupils are asked several times in this chapter to think about how they feel and react in certain situations (A7). This is followed by a class discussion in which exchange and integration occurs (A2). However, the textbooks differ in the emphasis placed on A2 and A7. The differences between

the textbooks in relation to the realization of attainment targets in the social-affective domain are striking. In one textbook (Care book 2) there are mainly episodes aimed at the acquisition of knowledge and understanding. The other textbook (Care book 1) also pays a great deal of attention to skills in this domain, far more than is prescribed in the attainment targets. The A0 episode occurred regularly in the teaching materials. An example is the question, 'Do you like a living room to be dark or light?' While such questions can be a step towards acquiring insight and understanding, they were often not used in this way.

The teaching materials analysed for Technology were not aimed at targets in the social-affective domain. In both textbooks, episodes A1 and A2 only occur sporadically.

In the teaching materials for Care, far less attention is paid to the psychomotor domain than is suggested by the attainment targets. Both textbooks pay virtually no attention to the acquisition of routine skills (P4), even though this is required by the attainment targets. Reflection on psychomotor agency, however, is given greater emphasis in one of the textbooks. This instructional-learning episode is evident in learning tasks in which the acquisition of psychomotor skills is an important element (P4 or P5). As part of the learning tasks, students are asked to write a report on what they have done and to evaluate their own approach to the task (P7).

The instructional-learning episodes in the psychomotor domain are realized to very different degrees in the teaching materials for Technology. In Technology book 2, twice as much attention is paid to this domain when compared to book 1. Indeed, Technology book 2 has an extremely high score for the psychomotor routines (P4) and a much higher average score for this type of episode than the attainment targets require. P5 (acquisition of skills by systematic practice) is strongly represented in Technology book 1. An important difference between the textbooks is the extent to which the psychomotor skills are dealt with in a productive or reproductive manner. Lastly, P8, which is mentioned in the attainment targets, is not included in either of the textbooks.

Summarizing the results on the reproductive/productive learning, knowledge-skills, metacognition and near/far transfer dimensions for the learning domains as a whole (table 9), our first conclusion is that the teaching materials for Care present a very different picture on the reproductive/productive dimension when compared to the attainment targets. In the attainment targets, Care is strongly oriented towards the reproduction of knowledge whereas the textbooks focus more on understanding. The acquisition of productive skills receives less attention in the textbooks than in the attainment targets. In general, the emphasis in Care has shifted from reproduction to production, whereas in Technology the reverse has occurred. Far less attention is paid to the productive aspect in Technology book 1 than in the attainment targets and in Technology book 2 the emphasis has even shifted to the reproduction of knowledge and skills.

Looking at the scores of the teaching materials for the knowledge-skills dimension, we find that both textbooks for Care have increased the emphasis on the acquisition of knowledge when compared to the attainment

targets. On the other hand, the balance between knowledge and skills in the attainment targets for Technology has been more or less maintained in the teaching materials.

Finally, one of the textbooks of Care gives considerably more attention to metacognitive knowledge and skills and far-transfer than the attainment targets indicate. In Technology, the limited attention paid to metacognitive knowledge and skills and far-transfer in the ideal curriculum has disappeared altogether from the formal curriculum: neither of the textbooks realize the objectives of the subject as laid down in the attainment targets.

Conclusion and discussion

In the introduction, we pointed out that important arguments both for and against the introduction of Care and Technology in the Dutch common curriculum highlighted the practical nature of these subjects. This practicality was seen as particularly important for less able students, who would have followed vocational education before the introduction of the common curriculum. In this paper, we have critically examined the supposedly practical nature of both subjects, differentiating between practical in the sense of 'in other domains than the cognitively-oriented' (learning domain) and practical in the sense of 'aimed at learning skills' (learning outcome). For the learning domain dimension, we concluded, on the basis of the attainment targets, that Technology and Care are not very practically oriented. The cognitive domain has a central position in both subjects and there are far fewer attainment targets in the psychomotor domain, while the social-affective domain only receives some attention in Care. In the learning outcome dimension 'knowledge versus skills' (which is present in all the domains), Care and Technology likewise do not stand out as strongly practically-oriented subjects. The greater part of the attainment targets for both subjects are geared to the acquisition of knowledge. This is even the case in the social-affective domain in Care, where the emphasis is on 'knowing' about social-affective phenomena rather than 'being able' to act adequately when social-affective skills are required. It is only in the objectives in the psychomotor domain that we see both subjects being strongly oriented to the development of skills, but this emerges in the teaching materials rather than the attainment targets. Assuming that a practical approach is particularly suited to the needs of pupils who would previously have followed vocational education (an assumption which is, of course, open to question), Care and Technology have *not* been structured in a way which makes them suitable for such pupils.

The introduction of a common curriculum in The Netherlands meant a change in *what* is to be learned in the first stage of secondary education, but did not challenge the *structure* of the school system. This implies that the common curriculum is offered by a range of schools (or departments within larger schools offering different types of secondary education): pre-vocational schools, schools for general secondary education, and schools preparing pupils for university entrance. Eijkelhof *et al.* (1998) show that pre-vocational schools emphasize practical activities in Technology by

setting, for example, more construction assignments than other types of secondary schools. Thus, the origins of a particular school or department are reflected in the way the common curriculum is being taught. As the common curriculum is the last stage in education in which all Dutch pupils follow the same curriculum, we are concerned that special curricula for the less able, especially in an area like Technology, seem to have come into existence again. In our opinion, this is an unacceptable deviation from the principle of the common curriculum.

Now that Care and Technology have become part of the common curriculum, one may expect them to contribute, as with all other subjects in this stage of education, to the development of active and self-directed learning for all pupils in the first stage of secondary education. Therefore, in discussions on the future development of Care and Technology, more attention should be paid to the other dimensions of the subjects rather than the 'practical'. Productive instead of reproductive learning, learning aimed at transfer and attention to metacognition deserve sustained attention, as aspects of learning which are important in active self-directed learning (Weinstein and Van Mater Stone 1996). Needless to say, some are of the opinion that productive learning aimed at transfer and metacognition is too ambitious for pupils who would previously have followed lower vocational education, i.e. the less able pupils. We feel that it would make more sense to ask *how* to achieve this objective with these pupils.

Although the apparent emergence of different curricula within the common curriculum worries us, we do think that different ways of achieving the attainment targets and developing active, self-directed learning may be more or less appropriate for different groups of pupils. And, inasmuch as Care and Technology are considered to be particularly suitable for less able pupils, they might offer a favourable starting point for the development of independent learning for such pupils. Furthermore, in addition to their assumed practical nature, it is perhaps the thematic presentation of the subject material, the connection with everyday life and existing knowledge and skills, and their relevance to a future job that makes Care and Technology attractive to less able pupils. Motivation and prior knowledge and skills are important requirements for the development of metacognition, and hence for self-directed learning (Pintrich and De Groot 1990, Simons 1996, Weinstein and Van Mater Stone 1996).

Unfortunately, when we consider the extent to which instructional learning episodes aimed at productive learning, far-transfer and metacognition (the three other dimensions that we have considered in our analysis) feature in the attainment targets and teaching materials of both subjects, the result is disappointing. The emphasis in the attainment targets of the subject Care is on reproducing knowledge. Learning processes aimed at productive knowledge are certainly possible in this subject, which is evident in the shift towards this in the translation of attainment targets to teaching materials. Moreover, our analysis shows that little attention is paid to metacognition and far transfer in the ideal and formal curriculum of Care and Technology.

It is little consolation that research on other subjects in secondary education shows that this does not only apply to Care and Technology

(Elshout-Mohr *et al.* 1999). Assuming that less able pupils have an affinity with the subjects Care and Technology, it is imperative to find ways of furthering the acquisition of metacognitive knowledge and skills, especially in these subjects.

Acknowledgement

Notes

1. The subject Technology is well known in many countries, Care, however, is less common. The Dutch subject Care is based on the traditional subjects home economics and health education, which have been modernized and expanded to include topics such as relationships, the environment, leisure and (un)paid work.
2. Until 1993, Dutch children were either tracked into lower vocational education or general secondary education on leaving primary school, at the age of 12. In the lower vocational education, pupils immediately chose between technical, care, economic-administrative and agricultural courses. General secondary education was divided into three levels.
3. The *Draft Revision of the Attainment Targets of Basic Education* (SLO 1996) has recently been published. An attempt was made to make Care more of a 'doing subject'; the attainment targets pay more attention to practical skills. As this draft revision is still in the discussion phase, in this paper we will refer to the 'old' attainment targets.
4. The concept of 'instructional-learning episodes' was originally developed by Elshout-Mohr and Van Hout-Wolters (1995).
5. We have used the term 'social-affective' in this paper for the learning domain comprising knowledge and skills pertaining to an individual's affective and social functioning, the interactions between people and the influence of society on these, and the values that play a role in this.
6. The dimensions of Elshout-Mohr *et al.* (1999) for categorizing learning processes in the cognitive domain are also referred to in the literature on the social-affective and psychomotor learning domains. Several authors make a differentiation in the first instance between learning (knowledge) about psychomotor or social-affective phenomena and learning psychomotor or social-affective skills (e.g. Klausmeier and Ripple 1971, Paul 1992, Oser 1996). See Van der Sanden (1996) for the productive versus reproductive learning dimension in relation to the psychomotor domain. This differentiation was not evident in the social-affective domain, where mainly productive rather than reproductive objectives and learning processes are described (e.g. Oser 1996). As in the cognitive domain, increasing attention is paid to the metacognition and transfer themes in both the psychomotor and social-affective domains (e.g. Snik and Zevenbergen 1995, Van der Sanden 1996).
7. We have interpreted the possibility of specifying psychomotor and social-affective episodes in the attainment targets and course material in terms of the knowledge-skills, productive-reproductive, focus on metacognition and transfer dimensions, as empirical support for our expansion of the category system. A second step should be an analysis of the learning and instruction activities in the different domains. However, this does not fall within the scope of this paper. It should be pointed out that social-affective and psychomotor episodes always have a cognitive aspect; in school subjects, the cognitive aspect is the most important. Hence, it is perhaps more appropriate to talk of episodes with a strong psychomotor or social-affective component than psychomotor or social-affective episodes.

8. All sections to be assessed were allocated to two assessors, so that each chapter or attainment target was rated twice. The inter-rater reliability of the assessment of the attainment targets for Care was 0.70 and for Technology 0.74. For the assessment of the Care methods, the inter-rater reliability was 0.84 (Lifestyle, referred to as Care book 1) and 0.80 (Contact, Care book 2) and for the Technology methods 0.76 (Technological, Technology book 1) and 0.73 (T-kit, Technology book 2). Kappa coefficients were calculated to determine inter-rater reliabilities. All scores were used in the calculations for the attainment targets. For the course material, a sample was used, i.e. two chapters for each method. When scores differed, a decision was made on the basis of consensus.

9. Care book 1 (1993) comprises one integrated theory and workbook. The attainment targets are dealt with in 10 chapters. Care book 2 (1993) also comprises one theory-cum-workbook and has 11 chapters. Technology book 1 (1995) is in two volumes. Both parts have six chapters and an accompanying workbook. Like Technology book 1, Tech-nology book 2 is in two parts, each with an accompanying workbook. There are nine chapters in both parts. All textbooks for Care and Technology in the first stage of secondary education were newly designed, inasmuch as these subjects had been totally restructured in order to become part of the common curriculum.

10. Only marginal variations between the different levels of basic education were apparent. As a result, this has not been discussed in this paper.

11. It is doubtful where 'developing expertise by consulting experts' occurs in any other subject in basic education.

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