



Delft University of Technology

## The Delft Fundamentals

### integration of disciplines, projects and analysis

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# The Delft fundamentals: integration of disciplines, projects and analysis

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As part of the renewal in 2013/2014 of the bachelor education curriculum in the Faculty of Architecture and the Built Environment, Delft University of Technology, a new study programme was prepared on the Fundamentals (in Dutch: *Grondslagen*) of spatial design. The teaching approach, visually presented by some examples and explained in this paper, consists of three closely related elements: (a) lectures and readings on basic concepts of architectural, urban and landscape architectural design, (b) a canon of 160 projects illustrating these concepts and (c) a typomorphological project analysis exercise. This new, integrated programme was the follow-up of three former, separate study programmes, *Basic Concepts of Architectural Design*, *Basic Concepts of Urban Design*, and *History of Architecture, Urbanism and Art*. The faculty had serious doubts about the educational quality of those study programmes, consisting of 11 small courses of only one or two EC. The curriculum renewal brought a fresh look at study contents, teaching approach and assessment strategies, based on the didactic principles of integrated learning.

## 1. Introduction

As part of the renewal in 2013/2014 of the bachelor education curriculum (The bachelor curriculum is the same for all students in the school; the master offers different tracks: architecture; architectural engineering+technology; management in the built environment; urbanism; landscape architecture.) in the Faculty of Architecture and the Built Environment, Delft University of Technology, the Faculty prepared a structure for integrating three former study programmes: *Basic Concepts of Architectural Design*, *Basic Concepts of Urban Design* and *History of Architecture, Urbanism and Art* into a new study programme called *Fundamentals* (*Grondslagen* in Dutch, abbreviated as GR). (The main structure of the Fundamentals study programme has been developed by a Steering Committee consisting of Henco Bekkering (chairman), Cor Wagenaar and Jurjen Zeinstra. The four courses have been further worked out by MaartenJan Hoekstra and Herman Prast (courses 1 and 2); Willemijn Wilms Floet and Leo van den Burg (course 3) and Klaske Havik, Cor Wagenaar and Fransje Hooimeijer (course 4)). The faculty had serious doubts about the educational quality of the three former study programmes, consisting of 11 small courses of only 1 or 2 European credits. Students surveys showed (QAD, 2011, 2012) that (a) they experienced a relatively large number of overlaps between the three programmes, (b) they lacked explicit links between the three programmes and (c) they experienced difficulties and

conflicts with their schedules for exams resulting in poor passing rates.

The educational concept behind the new, integrated study programme is four-fold.

- (a) The oncoming designers should build up a 'catalogue' of 'proven' design solutions as a field of reference for their own design work.
- (b) Knowledge and awareness of history and theory should come primarily from studying concrete projects instead of abstract texts.
- (c) Students should develop analytical skills following the Delft method of typo-morphological project analysis.
- (d) Students should be encouraged in integrated design thinking, where architecture, urbanism and landscape architecture reinforce each other.

A 'canon' of 160 projects from all periods in history, although with a focus on the nineteenth and twentieth century, was suggested by the Fundamentals Steering Committee and amended by staff throughout the faculty. This selection process encouraged staff from different departments to cooperate and made them discover that there were more similarities than differences between their learning objectives in the former study programmes; hence it stimulated the integrated teaching

approach of the new Fundamentals study programme. The projects are placed in their historical and theoretical contexts. The canon is supplemented by a list of basic concepts (*basisbegrippen* in Dutch) covering a wide range of theoretical notions and definitions that provide the students also with the basic terminology to interpret and describe projects; moreover, an important selection criterion was the capacity of a project to illustrate one or more basic concepts.

This paper explains the backgrounds of the study programme's transformation process, shows examples of canonical projects and the way they are presented, and presents the students and staff responses to this renewed study programme.

## 2. The bachelor curriculum

The three year, 180 European credits (EC) bachelor curriculum in architecture, urbanism and building sciences (in Dutch: *Bouwkunde*) of Delft University of Technology aims to educate students to become creative, professional, academic and context-sensitive designers in the built environment (Rooij, 2014). The obligatory part of the programme has six main study programmes (*leerlijnen* in Dutch)

- (a) Six design projects (10 EC each)
- (b) Five technology courses (five EC each)
- (c) Four fundamental courses (five EC each)
- (d) Three society, process and practice courses (five EC each)
- (e) Three academic skills courses (five EC each)
- (f) Three visualisation, representation and form courses (five EC each).

For each study programme a coherent set of learning objectives was developed with a variety of didactic formats – design ateliers, seminars, lectures and self-study – and examination formats – exams, assignments, papers, reports and presentations – for individual students and small groups.

Figure 1 shows the relationship between the six fields in the curriculum. The *Design* study programme is based on: (i) a thorough understanding of the fundamental concepts of architectural, urban and landscape design, (ii) a thorough understanding of the technological aspects thereof and (iii) a thorough understanding of the processes in the built environment and the role of both design and the designer in society. The study programmes *Academic Skills* and *Visualisation, Representation, and Form* teach students the basic skills for communicating in the academic design environment and the outside world.

## 3. The fundamentals study programme

The 20 EC Fundamentals study programme teaches students the fundamental concepts of architectural, urban and

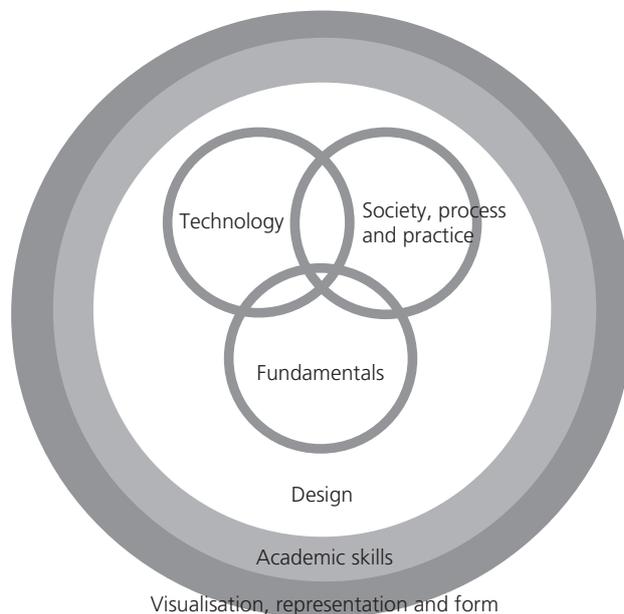


Figure 1. Architecture and Built Environment bachelor curriculum: the six study fields positioned in relation to each other

landscape design in their historical and cultural context. Four thematic courses of five EC are taught during the first two years of the bachelor curriculum

- (a) GR1 House, garden and landscape
- (b) GR2 Public space and public building
- (c) GR3 Dwelling, building and environment
- (d) GR4 The European metropolis.

These courses introduce the notions of space, use/function, construction/structure, materiality, context, typology, morphology and representation. These concepts play a central role in the faculty's design education: they help to design, to reflect on and to discuss architectural, urban and landscape projects. The awareness that these concepts change in time is considered essential: they have a history and their meaning develops over time. Within a certain period of time, these concepts are also embedded in a specific cultural context. Students will discover that the meaning of these concepts, within a particular frame of time and place, also depends on the theoretical position of the designer or scholar. The fundamental concepts of the design disciplines in the built environment are presented in relation to each other: there are no separate courses on architecture, urban design and landscape architecture anymore in the curriculum. Every Fundamentals course consists of lectures on the basic notions and the canonical projects on the one hand, and of an analytical assignment with canonical projects on the other.

#### 4. Canon and excursion

One of the structuring devices of the new study programme is an extensive list of 160 projects: buildings, urban and rural ensembles and parks (see the illustrations with this paper for how these are presented in the canon documentation). Lists of this kind have become quite popular and although there is nothing ecclesiastical about them, they are usually referred to as a 'canon'. The projects cover all historical periods with a clear emphasis on Western culture and the nineteenth and twentieth centuries. They are presented from the perspectives of their historical development, their meaning today, and their possibilities for the future. Whereas design tutors teach students how to analyse the canonical projects, parallel history lectures provide them with the context as well as with the role of these projects in the chronological evolution of architectural and urban typologies.

As might be expected in a design school, the principal reason for selecting the projects is that they demonstrate specific design solutions and strategies. The selection is based on a number of criteria. First of all, the projects should have gained a certain fame, and, more importantly, they should have proven to be useful as references in the design teaching of the school. There is a preference for projects that are not only realised, but also open for visiting, and it is also considered important to include Dutch projects. Finally, the availability of enough publishable drawings and photographs to document a project properly proved to be a very pragmatic but essential criterion. Most projects are representative for types and trends, allowing students to use them as references when analysing comparable projects. The composition of the canon, although a time-consuming process, showed a remarkable degree of consensus among the teaching staff. It proves the existence of something like a Delft School. Other schools should have a canon of their own.

The 160 canonical projects are collected in four 10 cm thick, lavishly illustrated A4-sized loose-leaf folders, and also in digital form (PDF). Both formats have their own advantages: while the hard copy documentation in the folders can be conveniently taken out to be used as a consistently scaled underlayment for analytical drawings, the interactive PDF can easily be navigated and investigated by clickable contents, pages and registers (for instance on time period, designer, style or type of object).

If educational practice indicates that some of the selected items should be replaced by other ones, this can easily be done. Each folder contains the documentation of 20 architecture projects and 20 urban or landscape projects in chronological order. Each project documentation follows a fixed template consisting of a fact sheet, a brief introductory text, a characteristic photograph, a site plan and other relevant drawings – many of them

newly drawn – with scale bar, north arrow and a legend, and finally a photographic documentation including a Google Earth view. The size of the sheets is A4, except for larger drawings that are presented on folded A3.

The canon is supplemented by a list of basic concepts (*basisbegrippen* in Dutch). These cover a wide range of theoretical notions and definitions to provide the students with the basic tools to describe and interpret realised projects as well as their own design projects. The first two courses, GR1 and GR2, teach students the meaning and use of the terms space, use/function, construction/structure, materiality and context; the third and fourth, GR3 and GR4, explain terms such as typology, urban morphology and representation. Students should be able to apply these terms in analytical assignments, explaining these aspects of the projects.

Canon, basic concepts and historical context are the pillars of the Fundamentals study programme. They also help to structure one of its most remarkable (and successful) components: a mandatory excursion in GR4 to a European metropolitan city (e.g. Berlin, Budapest, Paris, Prague in the first years, now Turin, Copenhagen, Athens, Budapest and Prague; the list of cities is likely to change again in the next years). The students have to prepare their visit themselves, relating their work to the learning objectives of the course. On location, they have one week to analyse the city. Departing from the metaphor of the metropolis as a person, they have to use all available means to get to know the city's personality. Supported by lectures and guided tours, actual fieldwork is the main requirement during their stay. They are expected to put into practice what they have learned, using the basic concepts as analytical tools, and the canon as a source of reference projects. They have to produce reports that contain texts, photographs and analytical drawings. Part of the work is individual; other parts are prepared in small groups. The excursion provides knowledge and above all inspiration for the final year of the bachelor curriculum.

#### 5. Project analysis: unravelling the disciplinary knowledge embedded in concrete projects

Initiating the Fundamentals study programme in the bachelor is also intended to explore alternative ways to transfer knowledge about concepts that are essential for architecture, urbanism and landscape architecture. The 160 canonical projects form a backbone for the teaching of history and theory to designers. They are not presented as illustrations with a text or referential images in a timeline, but as projects that students have to 'read': understanding drawings and their mutual relationships (plans, sections, elevations) and figuring out viewpoint and direction of photographs. In this way, the

'knowledge' contained within the projects is unravelled, and projects are no longer just important moments in a historical development, but also a rich source of disciplinary knowledge that designers can build on. In the courses, students are practicing drawing techniques as a means to acquire in-depth knowledge of these projects. After studying the canonical projects of one course, students are expected to be able to draw these in rough lines by heart.

Project analysis has a long and rich tradition in Delft. (For an overview of the tradition of project analysis (*plananalyse* in Dutch) at the TU Delft Faculty of Architecture and the Built Environment the following publications in English are useful: Bernard Leupen, *Design and Analysis*, (Leupen, 1997); Clemens Steenbergen, Henk Muhl, Wouter Reh, *Architectural Design and Composition* (Steenbergen *et al.*, 2002)). It started in the late 1960s, following the typological and morphological analyses that had spread from France and Italy, and was developed into a specific Delft method of *project analysis* (*plananalyse* in Dutch, Leupen, 1997). In the years before the renewal of the bachelor curriculum, project analysis was integrated in a design course in the second year where it formed quite an obstacle for many students. Project analysis now serves as a tool, from the first semester on, to make students familiar in a thorough way with the canonical projects and to let them acquire a deeper knowledge of how the basic concepts introduced in the series of Fundamentals lectures play their roles in specific, concrete projects. To stress the importance of an analytical approach, and to introduce at the same time early in the programme a number of drawing techniques, part of the presentation of the canonical projects is done with analytical drawings. In seminar groups of around 20, students are gradually made familiar with the tool of project analysis by systematically analysing a number of projects. The students are instructed to draw by hand using markers and fine liners. This way they develop a technique of 'analytical sketching' that is a valuable tool in their first design courses. In GR1 and GR2 students analyse one canonical project as a team for the course-specific notions, resulting in analytical portfolios. In GR3 they analyse one canonical project individually, resulting in an analytical model. All the results are presented in the larger seminar group, so students are able to study and compare more canonical projects than just their own.

The Delft method of project analysis dictates three successive steps. In the first step, an 'inventarisation' is made that visualises how the particular concept appears in the plans, sections and other images of a given project, presented in clear and comprehensive drawings. In the second step, students try to detect the 'arrangement' that underlies the surveyed elements. Both the regular 'order' and the exceptions to this order need to be uncovered and drawn. The third step consists of a relevant and verifiable (drawn) 'interpretation' of the previous

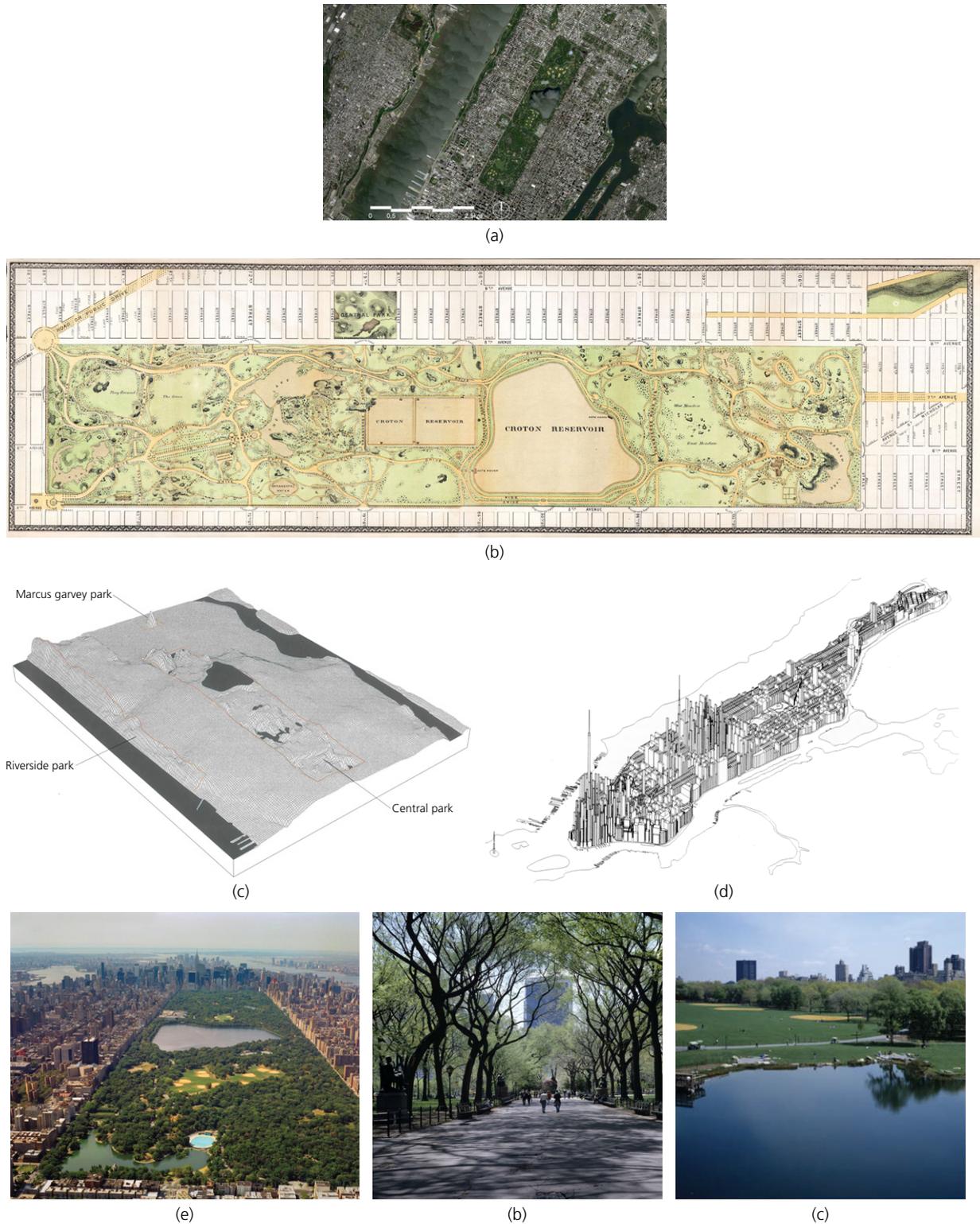
steps. Finally, the students have to understand and present the broader context of the project and their analysis.

By teaching this relatively rigid method of project analysis in the first year of the bachelor, students build a sound foundation from which they can explore other analytical methods and approaches in later years. Besides, this analytical tool is helpful during the design courses, in order to structure and analyse their own design and its context.

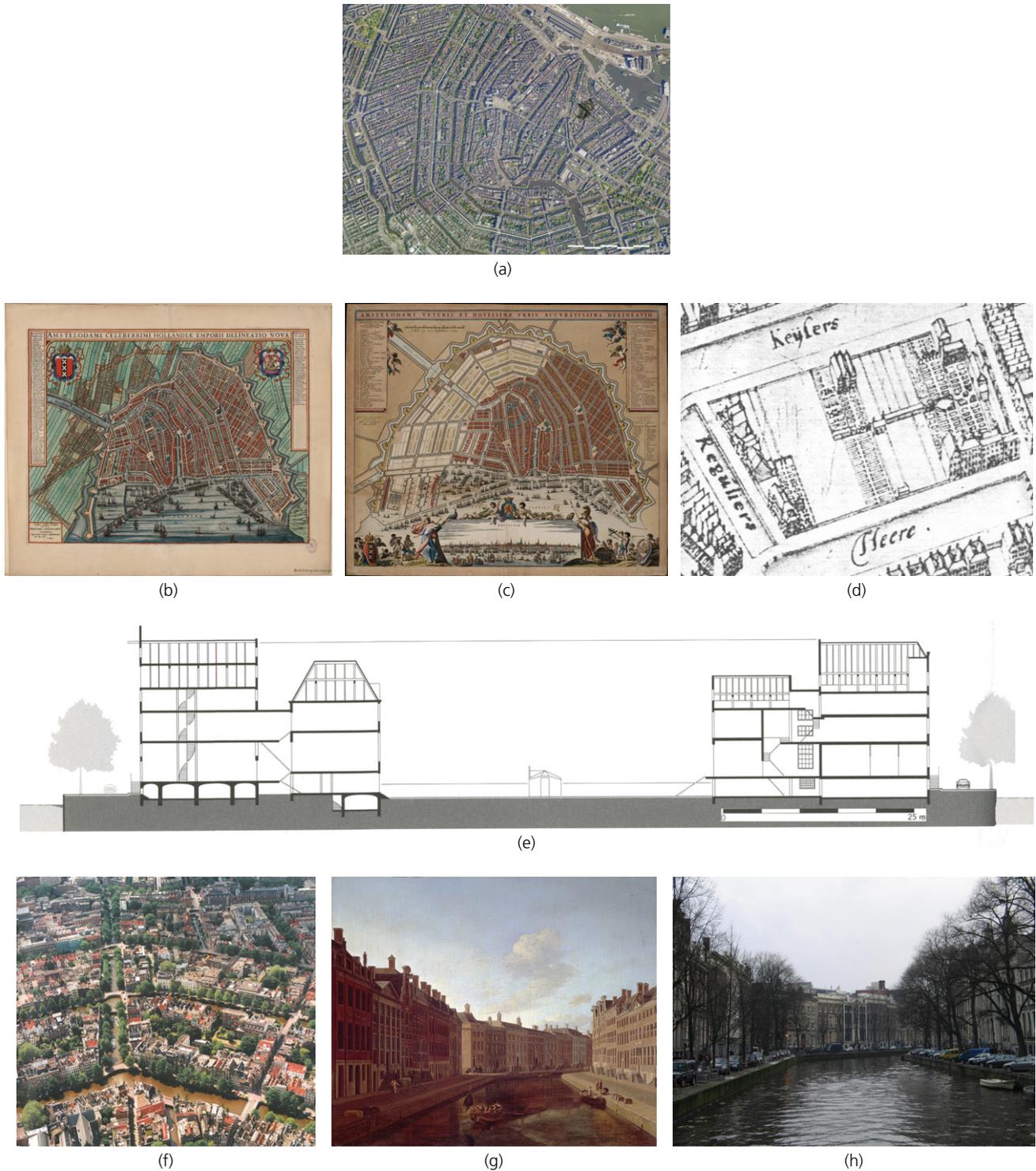
## 6. Conclusions: fundamentals in education practice and student satisfaction

The integration of the Fundamentals courses on the level of lecturers and analysis tutors started as a precarious process, as most contributors initially tended to stress their own discipline. However, the introduction of the 160 canonical projects worked as a catalyst for co-operation. By building thematic and chronological lines around them, respectively, based on the basic concepts (*basisbegrippen*) and on historical periods, these projects became the common ground, as they marked the strong overall vision for the Fundamentals programme as a whole. The open discussion of the projects, to be included, also helped to create consensus and commitment. Although lectures are given by teachers from different departments and disciplines, all of them are based on the canonical projects that prove to be very useful to relate the basic concepts to the analysis assignments.

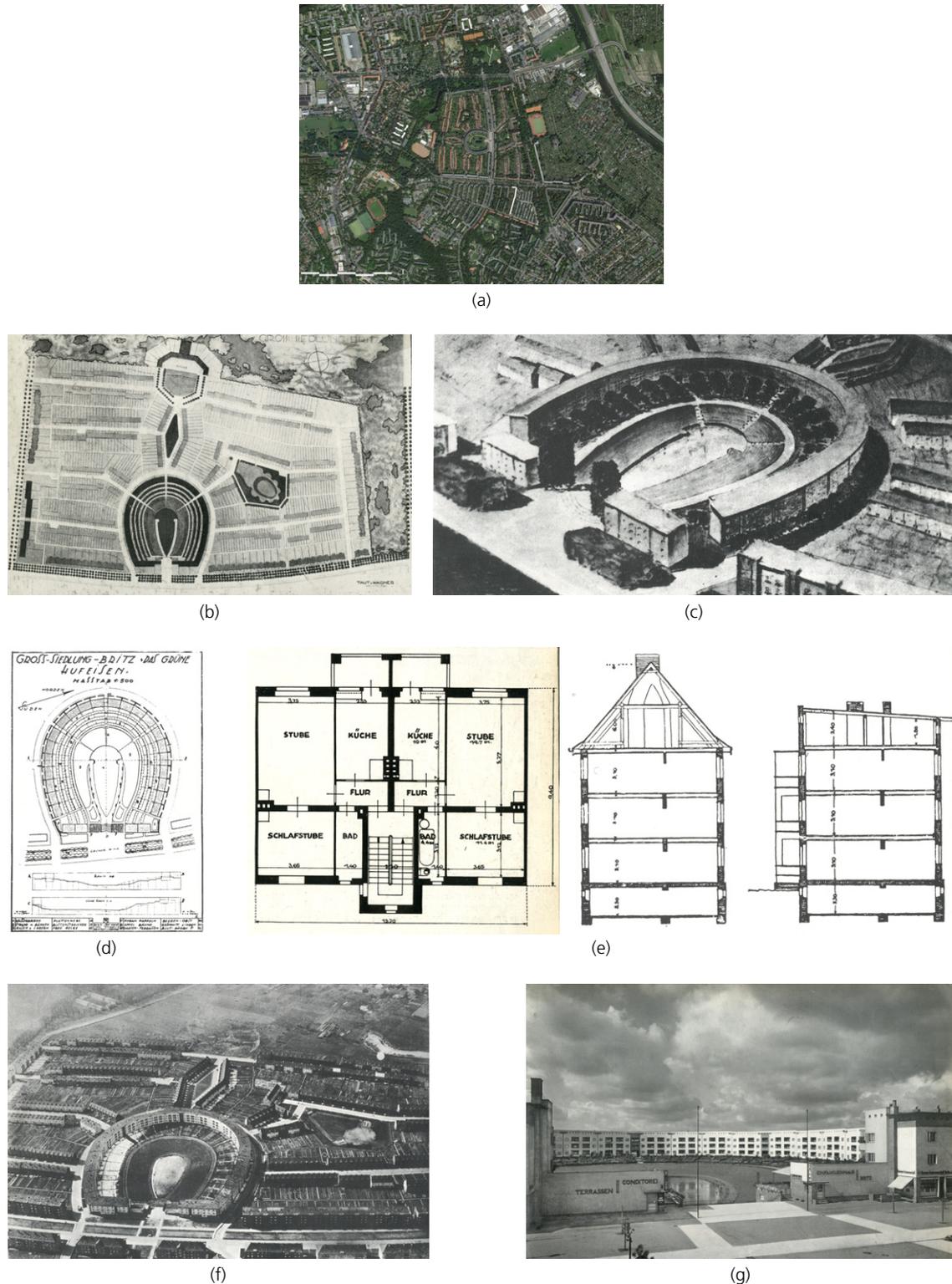
The success of the integrative character of the Fundamentals courses is also proven by the appreciation of students. (In the author's Faculty's education quality assessment strategy, all bachelor courses have been intensively evaluated since September 2013, as there have been profound changes in the curriculum structure and contents since the academic year 2013/2014). The average grade that several hundreds of students gave for the three former separate study programmes, was 6,5 on a scale of 1–10 (QAD, 2010, 2011, 2012). (10 = excellent, 9 = very good, 8 = good, 7 = above sufficient, 6 = sufficient, 5 = insufficient, <4 = heavily insufficient). The average score for the Fundamentals courses for the academic year 2014/2015 is 7,1 ( $n = 313$ ) (QAD, 2015). Fundamentals 4, the European metropolis excursion course, scores 7,5 ( $n = 98$ ), which makes it the highest scoring course of the Bachelor curriculum on this evaluation criterion (*ibidem*). Students were also asked 'if they have learned a lot during the course' on a scale from 1 to 5 (1 = very little, 2 = little, 3 = sufficient, 4 = much, 5 = very much). The average score for the Fundamentals courses for the academic year 2014/2015 is 3,9 ( $n = 313$ ) (*ibidem*). Fundamentals 1 ( $n = 79$ ) and 2 ( $n = 102$ ) in the first year, with scores of 4,0 and 4,2, respectively, are the best scoring courses of all bachelor courses on this evaluation criterion (*ibidem*).



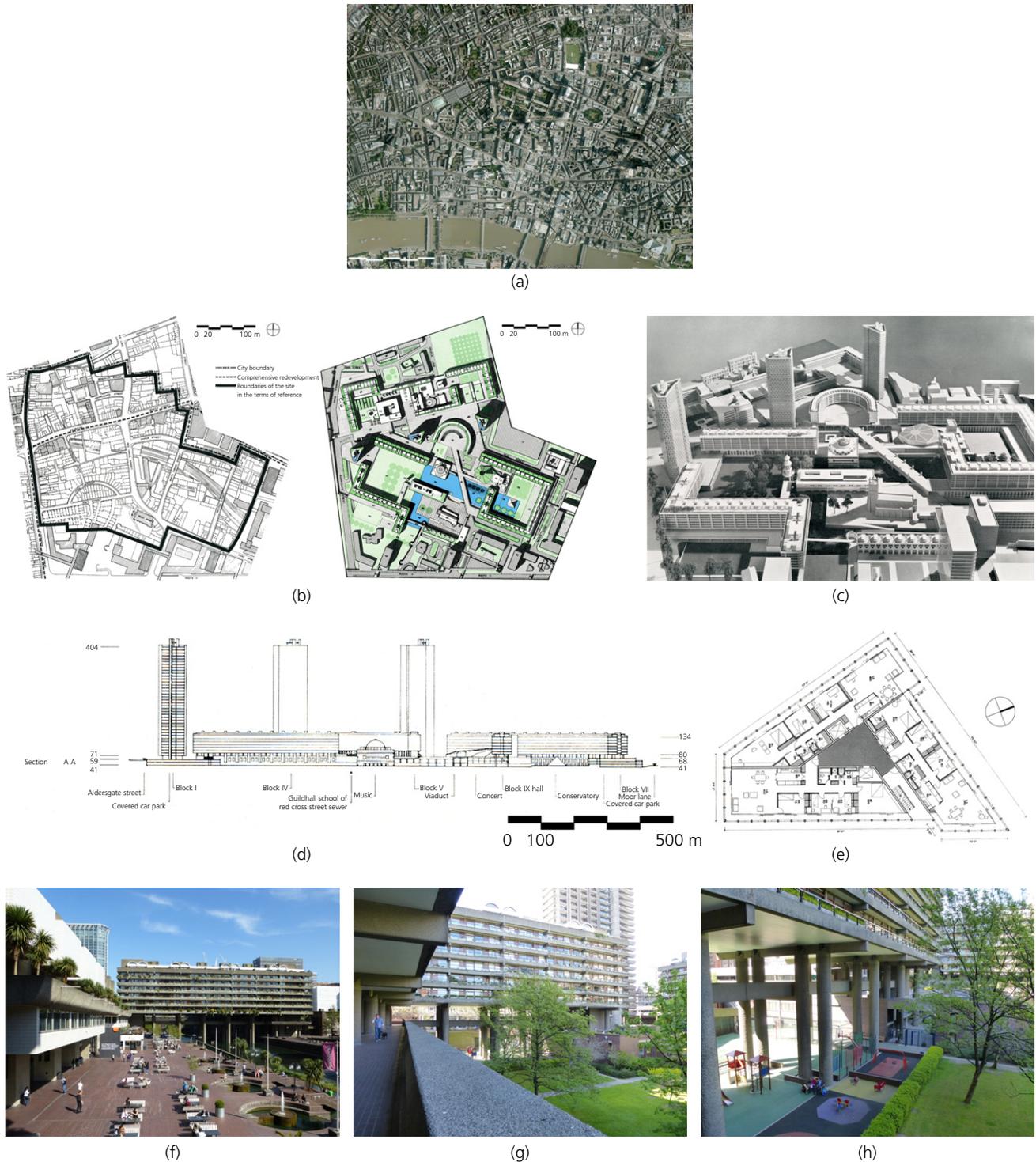
**Figure 2.** GR1\*15. Central Park. Design: Frederick Law Olmstead & Calvert Vaux; Period: 1857; Location: New York, USA; Type: Public Space, Park; Style: Picturesque Landscape Style. (a) Google Earth, (b) Design 1857, (c) Territory Analysis, (d) Manhattan Analysis, (e) Bird's-Eye View, (f) The Mall, (g) Jacqueline Kennedy Onassis Reservoir



**Figure 3.** GR2\*03. Keizersgracht. Design: Daniel Stalpaert and others; Period: 1613–1663; Location: Amsterdam, NL; Type: Public Space, Canal; Style: Dutch Classicism. (a) Google Earth, (b) Design 1649, (c) Design 1663, (d) Detail, (e) Section, (f) Bird's-Eye View, (g) Herengracht, painted by G.A. Berckheyde, (h) Herengracht 2010



**Figure 4.** GR3\*12. Hufeisensiedlung. Design: Bruno Taut & Martin Wagner; Period: 1925–1933; Location: Berlin, DE; Type: Monumental City Plan; Style: International Style. (a) Google Earth, (b) Design 1925, (c) Impression 1925, (d) Green Plan, (e) Dwelling Design, (f) Bird's-Eye View 1933, (g) Inside the 'Horseshoe' 1930



**Figure 5.** GR3\*26. Barbican. Design: Chamberlin, Powell & Bonn; Period: 1960–1982; Location: London, GB; Type: Monumental City Plan; Style: Brutalism. (a) Google Earth, (b) Development Area 1959 and Design 1960, (c) Model, (d) Section, (e) Dwelling Design, (f) Lakeside Terrace, (g) Gallery, (h) Playground



**Figure 6.** GR4\*35. Kop van Zuid. Design: Riek Bakker, Teun Koolhaas & Jaap van den Bout; Period: 1991–present; Location: Rotterdam, NL; Type: Composite City Plan; Style: Neo-traditionalism, supermodernism. (a) Google Earth, (b) Masterplan 1994, (c) Model, (d) City Context, (e) Public Space Design, (f) Sections, (g) Bird's-Eye View, (h) Erasmus Bridge and Wilhelminapier

These numbers are confirmed in panel discussions with students and in staff evaluations, which are also undertaken to improve the understanding and assessment of the educational quality of the programme. Apparently, the new courses are appreciated much better. The assumption is that the respectful regrouping of the old subjects played an important role in this. The changes have resulted in a lower number of more coherent and substantial courses with clear learning objectives, didactic approaches, examination formats and high-quality study materials.

The percentages of students passing their examinations can be called highly satisfactory. About 75–85% of the students who actively participate in the course pass their examinations in one academic year, which (also) includes one resit opportunity. (It is hard for the author's Faculty's administrative systems to come up with exact numbers of the percentages of passing, because students at the author's faculty are allowed to enrol without showing up. Unfortunately, this blurs the statistics on passing performance significantly. This number therefore is an estimation of the course coordinators of the Fundamentals study programme). There are no conflicting deadlines anymore between the Fundamentals courses and the other courses that run parallel in the curriculum. All course coordinators are instructed by the Faculty's education management to tune their schedules with the course coordinators from the other study programme in the same quarter of the semester. In this way, students can and/or will actually spend the amount of time planned for the courses and for exam preparation. Although the preparation and implementation of the

Fundamentals study programme has been quite an effort, involving a large number of staff, the improvements now seem to meet the expectations.

The examples of urban design and landscape architectural projects presented on the next pages are taken from the canon folders of the courses GR1, GR2, GR3 and GR4, respectively (Figures 2–6).

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