INSIGHT

Academic skills for architects

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Abstract

The book *INSIGHT* focuses on academic skills for architects, in particular for bachelor students. It has proven to be valuable for the BSc programme in Architecture, Urbanism, and Building Sciences (*Bouwkunde*): for the students as learning material, for the authors and editors due to the collegial process of development, and for teaching staff as a book to use as a reference. The basic four-part structure allows for new contributions based on changes in the curriculum: [part one] Architecture as a scientific discipline, [part two] General academic skills for architects, [part three] Specific architectural skills and research methods, and [part four] Academic skills in practice. The book has supported exchange among the throughlines (*leerlijnen*) within the curriculum and collaboration among colleagues. Challenges remain: keeping the book updated as an open learning resource, tracking curricular developments, and creating additional learning materials.

Keywords

Academic skills, methods, research, design, bachelor

COVER FIGURE Cover of the book INSIGHT, Academis skills for Architects, by Remon Rooij, Sake Zijlstra, and Willemijn Wilms Floet, 2022.

1 Introduction

Architecture (in Dutch: *Bouwkunde*) is a practical engineering science that focuses on studying socio-spatial-technical issues in the built environment. At TU Delft, the field of architecture builds on many subdisciplines, such as architectural design, urban design and planning, landscape architecture, building technology, geomatics, and management in the built environment. Thus, when developing learning materials about academic skills for architects (in Dutch: *bouwkundigen*), we are faced with some challenges. Within our field(s) and departments, there is a large variety of ideas and opinions on what an education in architecture entails and requires, and on the relationship between research and design.

This contribution presents the experiences in the development of the book *INSIGHT: Academic Skills for Architects* (in Dutch: *INZICHT – Academische Vaardigheden voor Bouwkundigen*; Hoekstra et al., 2022; 2024), which has been written by many colleagues from our community in Delft for the education of our bachelor students. This chapter aims to present the motivation for the book, its contents, and the development process, then to reflect on its usage, value, limitations, and potential next steps.

2 Faculty background

The Faculty of Architecture and the Built Environment renewed its BSc Bouwkunde curriculum in 2012–2013. The aim was to improve studyabililty (*studeerbaarheid*), efficiency (*doelmatigheid*), and the academic profile of the BSc and to accommodate changes in the profession (Van Ees, 2012). The effect of the curriculum renewal was evaluated in terms of study success (Mudde et al., 2017). The success rate 'propedeuse-in-1year' went slightly down in the first year, but the 'BSc-in-3year' went slightly up. Student and teacher satisfaction went up significantly. Another measure of that time was the introduction of a registration cap (numerus fixus), with a maximum of 400 first-year bachelor students.

The renewal introduced 24 bachelor modules consisting of 10 or 5 ECTS each. Students take no more than two modules at a time. Six throughlines (*leerlijnen*) were introduced to address the different main programme themes (Figure 1): Fundaments of Bouwkunde (*Grondslagen*; 20ECTS), Technology (*Techniek*; 25ECTS), Society, process, and practice (*Maatschappij, proces en praktijk*; 15ECTS), Design (*Ontwerpen*; 60ECTS), Representation, visualisation, and form (*Overdracht en vorm*; 15ECTS), and Academic skills (*Academische vaardigheden*; 15ECTS).

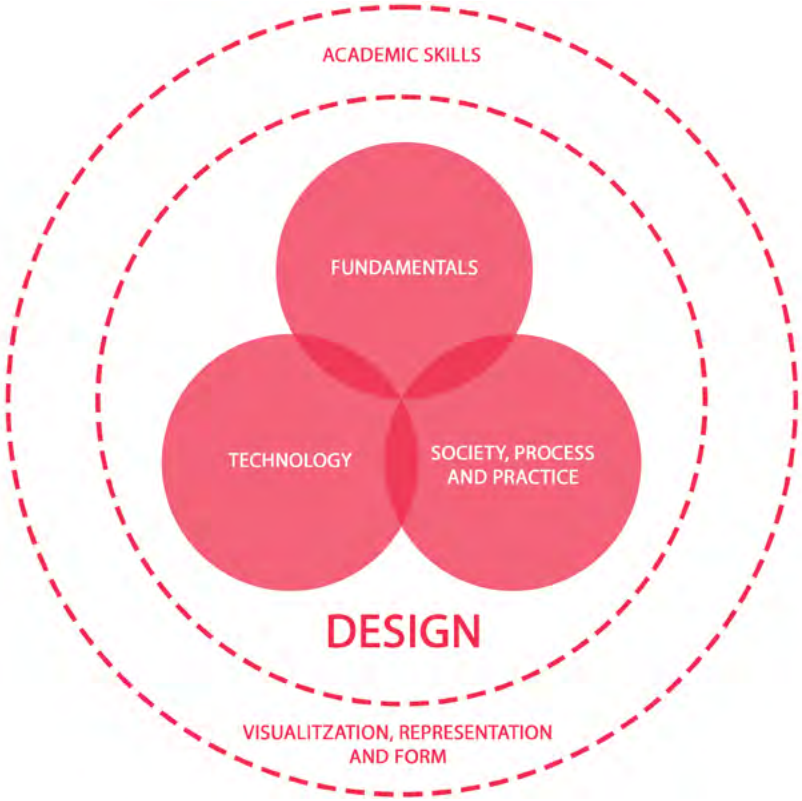

FIGURE 1 The 2013-2024 curriculum concept with 6 throughlines: Academic Skills (AC); Visualisation, Representation and Form (OV); Fundamentals (GR); Technology (TE); Society, Process and Practice (MA); and Design (ON), by author adapted from information of the Faculty of Architecture and the Built Environment, 2024.

FIGURE 2 The curriculum organisation of the 6 throughlines in 24 modules (150EC in total), and the 30 EC minor elective programme composing the bachelor Bouwkunde degree programme of the Faculty of Architecture and the Built Environment at TU Delft, by author adapted from information of the Faculty of Architecture and the Built Environment, 2024.

The 2012–2013 Bouwkunde bachelor renewal brought many curriculum changes to our students and teachers (Mudde et al., 2017; Rooij, 2016). With the new 15ECTS throughline on academic skills, three 5ECTS modules specifically address architecture as a scientific discipline. However, the teaching and learning of all those academic skills occur logically in all six throughlines and throughout the curriculum.

Students graduating from the BSc Bouwkunde can directly continue in one of our MSc degree programmes, and most students continue on to one of the tracks of the Architecture, Urbanism, and Building Sciences degree programme (see Zijlstra (this issue-#) for more details about the relation between the BSc and MSc curricula). The Bouwkunde bachelor curriculum is taught in Dutch. The MSc curricula are taught in English and attract a large number of international students each year. Consequently, an English version of the book would contribute to clarifying the desired academic skills to study in the MSc tracks.

3 The what and why of *INSIGHT*

The 2018 programme visitation and (re)accreditation directed attention to the academic and research skills of our bachelor students, in particular in connection to design (Qanu, 2018). The committee advised giving research and research methodology a more prominent and clear position in the curriculum and the intended learning outcomes (Qanu, 2018). Within the faculty, the introduction of a book on academic skills for architects was seen as one way of embedding and drawing more attention to research skills in the curriculum. The initiative for the book came from the faculty's bachelor's degree programme leader at that time.

The book *INSIGHT* clarifies the pivotal academic skills for architects, in particular novices, beginners, and advanced beginners (Lawson & Dorst, 2009). It serves as a starting point to find references for further reading and sets the bar: this is what is expected from Bouwkunde BSc students in terms of academic skills. However, this book is not only meant as a handbook for Bouwkunde BSc students – it is also intended to help Bouwkunde BSc tutors further academicise the design-oriented curriculum. More specifically, it helps tutors understand what academic skills students have acquired in other throughlines or modules. In this sense, the book might bring tutors closer together as colleagues. Additionally, it sets the bar for our national and international students who enter one of our master programmes or one of our bridging programmes.

The book consists of four parts. First, it sets the scene by presenting architecture as a scientific field within the engineering sciences, and second, it presents general academic skills for architects and conventions of scientific approaches to work. Second, it elaborately focuses on architecture-specific academic skills and research methods, and it presents and discusses the relationship between scientific research and academic design. Third, the book shares insights into academic reflection approaches relevant to architects, with specific emphasis on design thinking and design processes, design implementation and stakeholders (practice, feasibility, entrepreneurship), and moral sensitivity and values for the built environment.

3.1 Part one: Architecture as a scientific discipline

Architecture at Delft is a design-oriented discipline within the engineering sciences. In the Bouwkunde BSc community, academic skills focus to a large extent on assessing design situations, informing design decisions, underpinning design proposals, positioning oneself as a designer, and critically reflecting on design, both process and product. The core knowledge question of the engineering sciences is 'Does it work?' (my design, my prototype, my plan, my model), whereas empirical sciences deal with the core knowledge question 'Is it true?' (Klaasen, 2004). Therefore, engineering sciences also make use of a variety of less traditional academic skills and research methods. All of this is introduced and discussed in the first part of the book, which consists of five chapters focusing on Bouwkunde at Delft.

3.2 Part two: General academic skills for architects

The second part of the book *INSIGHT* (12 chapters) presents several overarching themes, concepts, and approaches that are important and meaningful for architects, among which are setting up a research project, behaving ethically as an academic, looking for (and using) information, academic reading and writing, oral presentations, and using texts and images in research. These topics are relevant for many disciplines and students, but within the domain of architecture, there is always a relation to spatiality, visualisation, and the (design of the) built environment.

3.3 Part three: Specific architectural skills and research methods

The third part of the book *INSIGHT* (13 chapters) presents several more architecture-specific themes, concepts, and approaches that come from or are tailored to the field of architecture and design, including historical analysis, morphological plan analysis, technical analysis, urban data research, observation techniques, and architectural positions.

3.4 Part four: Academic skills in practice

The fourth part of the book *INSIGHT* (12 chapters) views the field of architecture from societal, entrepreneurial, and reflective perspectives. It presents themes, concepts, and approaches that contextualise design, design thinking, and design processes. It focuses on product development, market and market research, actors and stakeholders, and professional identity and entrepreneurship; these themes add a managerial and governance perspective. The contributions on heritage as commons and ethics in architecture add a value-based perspective. Finally, design processes and approaches are looked at from the points of view of academic design reflection, generic elements in the design process, and evaluating design (alternatives).

4 Approach to the book development

The book *INSIGHT* was developed in steps between 2018–2024, several years after the start of the renewed bachelor in September 2012. About 50 colleagues, mostly, but not solely, from the Bouwkunde faculty, contributed to the 400-page document that was published openly – also in phases – via TU Delft OPEN. The process of development was valuable on its own.

The initial goals for the book were shared with and supported by a small number of enthusiasts in the faculty, who decided to become the editors together. These five editors represent (not accidentally) the four departments of the faculty: Architecture, Urbanism, Architectural Engineering & Technology, and Management in the Built Environment. They editors had (at the time of the initiation) key roles in the faculty: coordinator of the BSc programme and module coordinators of different throughlines. Over time running up to the 2024 edition, one of the editors retired and the other progressed careers: as director of education, scientific director of the 4TU Centre for Engineering Education, master-track coordinator, and education leader of the Delft-Rotterdam Convergence programme. The editors established a table of contents and invited authors from among their faculty colleagues. Some critical friends were invited to provide feedback on the contents at several moments in the development. Similarly, a sounding board of students was invited to review the content and progress in several instances. Per book section, the editors and authors assembled regularly, discussed chapter ideas, peer-reviewed contributions, and monitored progress. It facilitated many fruitful collegial discussions and partnerships in co-authoring and trickled down into something 'concrete': a chapter that fits into the book but could also be read independently.

4.1 Writing, editing, and the publication process

Authors were invited to write about their speciality and given some basic guidelines for a contribution:

- contains approximately 2,000 words;
- is written in Dutch (will be translated later);
- is illustrated or uses examples;
- mentions pitfalls as well;
- references some core publications for further studies (preferably used in MSc tracks);
- has no more than seven subsections;
- the final section is a 'reflection';
- cites using APA style

From the outset, the ambition of the editors was *not* so much to develop a book but a digital and freely available learning tool. The TU Delft Library supports the development of open-source learning materials like books, and it has a digital (open) book platform for editing and online reading, as well as a website and print-on-demand (POD) service. The editors worked on publishing the book on the library platform. Authors, teachers, students, and other critical friends were invited to respond and provide feedback on the template, and usage of the (open) book.

Most of the authors were personally invited by the editors to contribute to the book. Once the word spread among the faculty, volunteers offered chapters (and still do). Some authors struggled with one or more of the guidelines, but ongoing evaluations allowed for revision and additions over time. The editors

had the challenging task of having authors follow these guidelines, guarding the coherence of contents across chapters, and having authors stick to the original idea of the contribution, especially when 'new', unanticipated chapters were proposed. The editors had an active role in providing the links between chapters and persuading authors to edit their chapters for focus and length, as well as to align or explicitly disagree with other chapters. The index plays an essential role in this alignment; compiling it was a considerable effort, and it was only included in later editions.

4.2 Challenges and concerns

It was challenging to comply with the 'open' book principles. Getting the (re-used) texts within the (Creative Commons) licences requires authors to be aware of the copyright agreements. A similar check is required for the images used. The TU library supports the checks, but authors and editors need to decide and provide the original sources. The TU library acquires images from the 'open' fund. Actual publishing is supported with the online tool pressbooks. The editors pasted all contributions in the pressbooks environment. This approach allows insight and control over the edits but demands extra effort. Layout, pdf-exporting, and preparing the POD file all occurred within the pressbooks environment. However, aligning the layout across the different outputs (online, PDF, POD-print) is complex, and suboptimal layout issues can be found in each output.

There were (and are) serious concerns about the distribution and version management, especially for the static outputs such as PDF and POD. Readers will need to pay attention to the version they are using. The most secure choice is to use the online tool, which is the most up-to-date version. For those who prefer to read offline, the PDF must be reviewed for version updates. Also, a POD version will become outdated when some chapters are re-edited, or new chapters are added. There is no warning signal or incentive to replace the printed version. Nevertheless, some readers prefer printed versions, and the student reviewers were very concerned with updated versions, expressing a desire for a clear version indicator on the cover.

The sheer size of the *INSIGHT* book, 42 chapters (2024 edition), makes it impressive and maybe even paralysing to students. The student reviewers requested clear and different entrances to the book, with separate tables of contents, e.g. on 'topics', 'courses', and entrances based on the index. The delivery and design of the website also need specific attention, as 'look-and-feel' and 'first impressions' matter a lot when deciding to access, use and download the book. Difficulty accessing the text could kill all readers' intentions to use it, especially considering the large number of chapters.

5 Usage, value, and limitations of the *INSIGHT* book

At the time of its first official publication (2022), the book contained 41 chapters from 48 authors, and the development took 38 months. The first use of the book in education was in September 2020, when the text contained 21 chapters. A year later, the third version consisted of 29 chapters. For the 2022 publication, only two chapters from the original set-up were missing. A first version of the index was compiled, and internal digital links were included in the 2022 version. However, the definitions of the index terms still (2024) need to be made, and the authors' agreement on the terms needs to be reached.

Many people (1,000+) downloaded the 2021 or 2022 version of the book or separate chapters from individual PURE environments of authors and book editors or the TU Delft Library directly: https://textbooks.open.tudelft.nl/textbooks/catalog/book/48. You can call this a positive surprise as the book is not part of the obligatory literature of *any* Bouwkunde bachelor course. It seems that the book has intrinsic value and quality. The launch of the 2024 edition attracted already about 100 downloads in the first month (September 2024): https://textbooks.open.tudelft.nl/textbooks/catalog/book/99 .

The book is 'thick', but it is not complete, as it will never be complete. The TU OPEN publishing format allows to be flexible: the book can be adapted and expanded continuously. Further, our curriculum is a dynamic landscape, as is the field of higher (engineering) education. We are continuously challenged by new (societal) questions, new technologies, and new student and teacher needs that ask for a reconsideration of professional and academic skills. For example, the use of AI in design education or ChatGTP in academic writing assignments could be useful for new chapters. The 2024–2025 curriculum renewal will most probably also result in new contributions. The Technology throughline will focus more on systems thinking, which is not addressed in the book currently.

Being flexible with the book and being able to add endlessly seem nice. However, the other side of this coin could be that students and teachers will seek more concise readings and more practical teaching and learning materials. A project that has started in academic year of 2024 is the development of so-called 'methods sheets' for the bachelor design module Area (Re)Development. A method sheet (see Figures 3) presents – on a double-sided A4 sheet – concepts, planning methods, research methods, design methods, and academic skills in a communicative way. In the run of 2024-2025, the first series of method sheets will be published and openly accessible via the TU Delft Library (Rocco, Qu, Rooij, forthcoming).

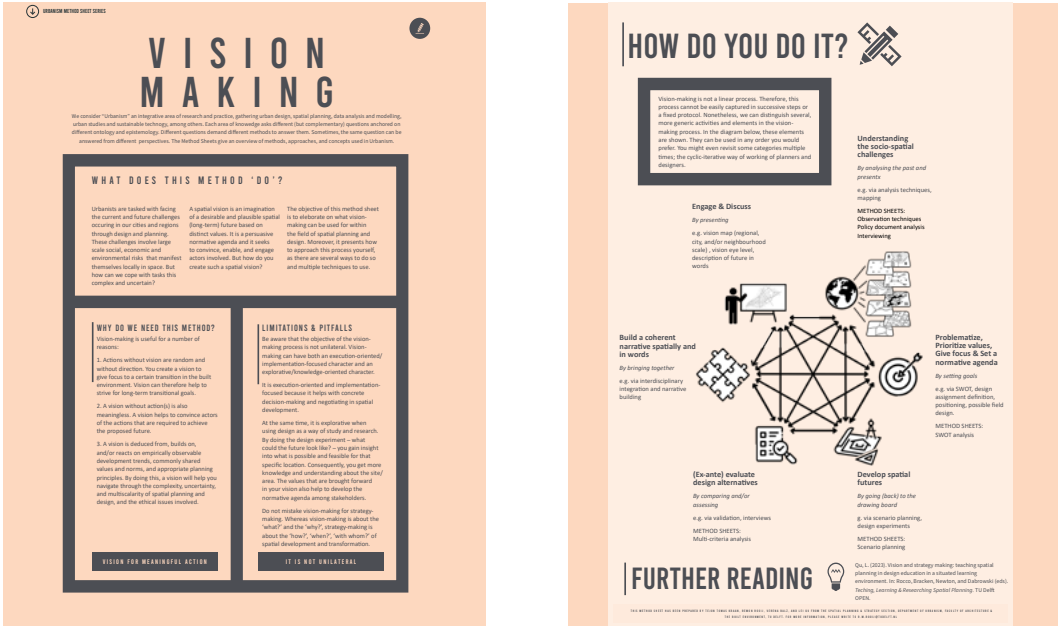

FIGURE 3 An example of the method sheet 'Vision Making'. It focuses on the sections 'What does this method do?', 'Why do we need this method?', 'Limitations and pitfalls', 'How do you do it?', and 'Further reading', by Rocco, Qu, Rooij, forthcoming.

6 Final words

Has the book met its goals? Currently, its publication and use will allow for future evaluations. The editors have experienced raised awareness of academic skills. However, they might be biased by working on the book with enthusiastic authors. The editors consider the book a success when it is regarded as an educational innovation. Evaluation steps should include asking students, tutors, course coordinators, and authors about their experiences. Finally, the main attention needs to remain on the primary goal: serving as a reference text of academic skills for architects, also when new curriculum changes happen, such as the BSc Bouwkunde 2024-2025 renewal.

For the editors, providing continuity is a challenge. Creating an open book that can be improved and updated gradually and that allows new contributions demands continuous energy, editing, and cuts. Additional challenges in terms of technical issues (for example, the platform used changed its membership structure) and time investment are the further development of the book as a digital learning tool with interactive elements, exercises, appendices, further reading, and examples. The web interface needs further work, including the look and feel, as well as the navigation process. These adaptations will become urgent when the BSc renewal in 2024–2025 will be fully implemented. Translating the book is essential to allow international access. Finally, editorship over time is a point of attention as most editors have or will move on in their career paths.

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References

Ees, C. van (2012). *BSc 2013: Beschrijving van de leerlijnen*, Delft: faculteit Bouwkunde.

Hoekstra, M. J., Lousberg, L., Rooij, R., Wilm Floet, W., Zijlstra, S. (Eds.) (2022). *INZICHT: Academische vaardigheden voor bouwkundigen*. Delft: TU Delft OPEN Access. https://textbooks.open.tudelft.nl/textbooks/catalog/book/48

Hoekstra, M. J., Lousberg, L., Rooij, R., Wilm Floet, W., Zijlstra, S. (Eds.) (2024). *INZICHT: Academische vaardigheden voor bouwkundigen*. Delft: TU Delft OPEN Access. https://textbooks.open.tudelft.nl/textbooks/catalog/book/99

Klaasen, I. T. (2004). *Knowledge-based design* [Doctoral dissertation, TU Delft]. Delft University Press.

Lawson, B., & Dorst, K. (2009). *Design expertise*. Architectural Press Elsevier.

Mudde, R., Pessers-van Reeuwijk, G., Rooij, R., Verbeek, L., & Wolff, R. (2017). *Onderwijssucces: Van structuur naar cultuur: eindrapportage van de evaluatie commissie project studiesucces TU Delft*. Delft University of Technology.

Qanu (2018). *Bouwkunde, Faculty of Architecture and the Built Environment, Delft University of Technology*. Accreditation report. Utrecht: Qanu.

Rocco, R., Qu, L., & Rooij, R. (Eds.) (forthcoming in 2025-2026). *Method sheets for urbanism*. Delft: TU Delft OPEN Access.

Rooij, R. (2016). *Zelfevaluatie bachelorvernieuwing Bouwkunde TU Delft***.** In het kader van het TU Delft 'Koersen op Studiesucces' programma. Delft: O&S Bouwkunde.

Zijlstra, S. (this issue-#13) Choosing MSc tracks at the faculty of Architecture.

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Front: Graduate students adding tiles with their names in the Alumni Wall of Fame, TU Delft (Photo: Frank van der Hoeven)
Back: Students working into the evening in the modelshop at Bouwkunde, TU Delft (Photo by Frank van der Hoeven)

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