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Coaching as a professional engineering skill

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Abstract

The elective course 'Didactic Coaching Skills' in the MSc Architecture, Urbanism, and Building Sciences programme aims to provide a safe practice environment for master's students to improve their coaching skills while enhancing the educational quality of the bachelor's course in which the students practice. The experiences of the bachelor students, student tutors, bachelor tutors, coaches, and coordinators were collected and combined to evaluate the success of this elective after it ran for the third time in 2021. The findings show that both aims have been met. All stakeholders enjoy the participation of the master students in the bachelor course and value a more reflective teaching practice for the bachelor tutors and 'their' student tutors. The bachelor tutors and coordinators obtain new and valuable learning materials that the student tutors develop as part of their elective, which also leads to renewed interest in the classroom. Attention needs to be given to the divisions of roles and responsibilities between bachelor tutors and student tutors, especially regarding assessment and the potential for the perceived unequal treatment of student groups.

Keywords

Coaching, active learning, student tutors, teaching assistants

COVER FIGURE Feedback on sticky notes during the evaluation of the course, photo by Monique Arkesteijn edited by Tejon Kraan, 2024.

1 Introduction

In 2018, the Architecture, Urbanism, and Building Sciences (AUBS) MSc students voiced a desire to obtain more formal training in guiding others. In particular, students from the Management in the Built Environment (MBE) track felt this training was missing in the curriculum and mentioned their desire for more hands-on management skills: coaching, managing, leading groups, assessing, and giving feedback. They reminded the faculty that these skills are key in a professional working environment.

To respond to the student interest, an elective course was developed in 2019: the TU Delft SEC elective 'Didactic Coaching Skills' (AR0117) presents the practical opportunity for MSc students to tutor and coach BSc students in an actual course, BK3MA1: *'Maatschappij, Proces en Praktijk 1: Planning & Programma'* (in English: Society, Process, and Practice 1: Planning and Programme). The elective has run from 2019–2024. The third run in 2021–2022, was the moment and opportunity to evaluate the course systematically with the bachelor students and student tutors, bachelor tutors, bachelor course coordinators, and the course coordinators and coaches of the master elective. This evaluation aimed to understand how stakeholders see the values and attention points of such combined teaching and learning practices. The results of this evaluation are presented in this contribution. For the evaluations, short questionnaires were sent to the bachelor students, student tutors, and bachelor tutors. The authors of this paper are the course coordinators of the master elective and have given their input directly. Two more iterations of the master course have run since then – autumn 2022 and autumn 2023 – and a third will follow in autumn 2024. They are briefly addressed in a separate section as these were not evaluated similarly.

2 Coaching in higher education

Coaching is a complex and relative skill (Diggelen et al., 2019). Consequently, teaching master students to become better coaches is at least equally challenging. Research shows that educators who coach their students, become more reflective, articulate, exploratory, and metacognitive themselves (Lofthouse et al., 2010). So, in the connected courses AR0117–BK3MA1, the aim is exactly this: to have the student tutors become more reflective, but to grow the course coordinators and the coaches more reflective as well. In coaching, the formulation and the discussion of good review, coaching, or reflection questions contribute to the development of this self-awareness among coaches over time; these kinds of reflective discussions are referred to as 'coaching conversations' (Lofthouse et al., 2010). This kind of conversation is regularly applied in the workshop sessions with the student tutors.

Kamp (2020) suggests that academic staff quite often lack experience with these kinds of personal skills (in a professional setting) and fail to lead by example or to pay attention to these skills, e.g. by (not) providing feedback on them. To combat this issue, the AUBS curriculum includes opportunities for both students and staff to specifically practice these skills, for example, in teamwork, simulation, and roleplay pedagogies. When tutors focus on these personal skills in the design of their learning environment, students will receive feedback – with positive consequences for skill development (see Chen et al., 2019; Qu et al., 2020). However, in general, there is limited focus on the development of personal skills in academic curricula (Kamp, 2020); very often, the skills are not included in the learning objectives and are part of the so-called 'hidden curriculum' (Snyder, 1971).

2.1 **Course design and content MSc elective Didactic Coaching Skills**

The elective course 'Didactic Coaching Skills for Architecture and the Built Environment' (AR0117, 5EC) is a 10-week MSc elective designed to have the MSc students tutor BSc students in a five-week second-year course on urban planning (BK3MA1). The elective contains four preparatory and supporting workshops, a midterm feedback session, and an evaluation session – six two-hour sessions in total. The four workshops cover the contents of the course to be taught: active teaching, preparing classes, roles of tutors, and feedback and assessment. The workshops are supplemented with a feedback session halfway through the tutoring with peer discussion and peer reflection on their tutoring experiences. Additionally, this midterm session kicks off the development of the final products: an individual reflection paper and teaching/learning materials for the bachelor course. The closing meeting at the end of week 10 provides the student tutors with personal feedback on these products.

The student tutors teach five sessions of the bachelor course BK3MA1 in the first five weeks of the quarter. The first session is an introduction and is prepared by the (principal) bachelor tutor. The next three tutoring sessions are prepared and hosted by the student tutors. The student tutors host the final session, which aims to provide individual feedback to the bachelor students.

2.2 **Course design and content of the BSc course Planning and Programme**

The course 'Society, Process, and Practice 1: Planning and Programme' (BK3MA1, 5 ECTS) is a five-week course that concludes with two tests: a multiple choice (MC) exam to assess the gained knowledge and a report containing a programme of requirements for an urban area. The MSc (elective) student tutors coach the BSc students in preparing the required materials in cooperation with the 'regular' bachelor tutors. The BSc course has roughly 400 participants and 20 bachelor tutors; each bachelor tutor guides 20 students who work in pairs. Some (around four) of the bachelor tutors have the opportunity to work with the student tutors. One bachelor tutor has two or three student tutors (see Figure 1).

The BK3MA1 course coordinators support their bachelor tutors with a toolbox of learning materials for active teaching for each weekly class. Bachelor tutors and student tutors meet and discuss with the bachelor students the development of their programme of requirements, which is based on desk research. The bachelor students are supported with weekly lectures and related assignments. These assignments have two objectives: gathering knowledge, which is tested in the MC test, and practise-related elements to be addressed in the programme of requirements. The development of the programme of requirements follows the weekly assignments, and each week, a new chapter is added to their reports. Bachelor students receive feedback from their bachelor tutor and student tutors on both the assignments and the chapters. Early in the fifth week, the bachelor students take the MC test and, in parallel, receive feedback on their full draft report.

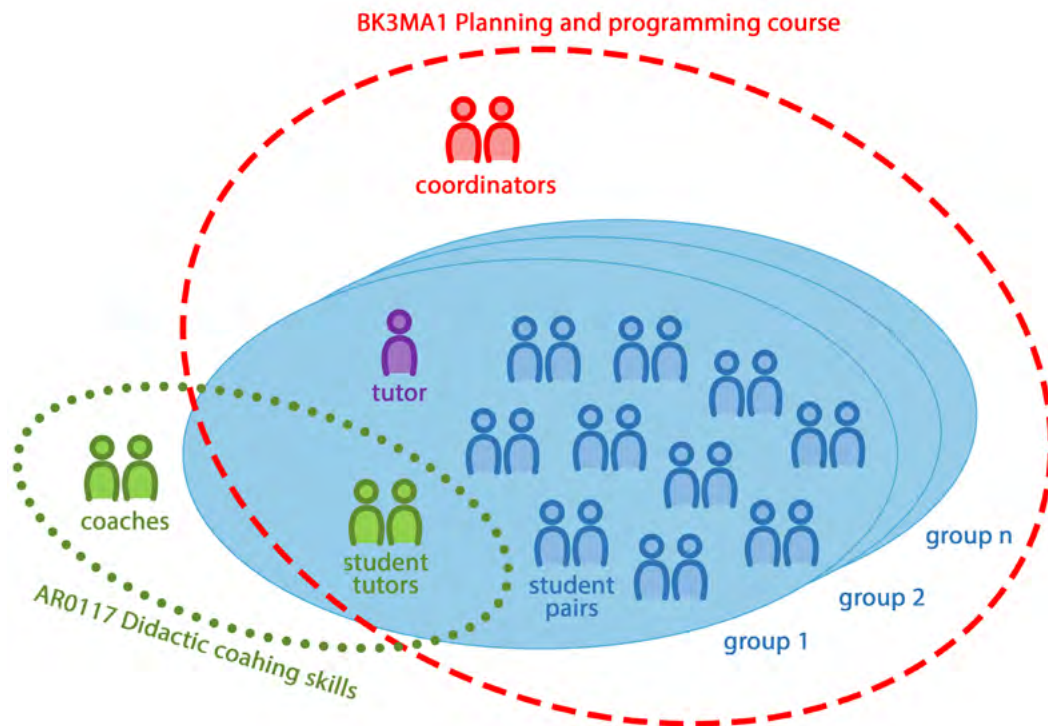


FIGURE 1 The organisation and relationships among bachelor students (pairs), student tutors, bachelor tutors, coaches (elective coordinators) and course coordinators in AR0117 and BK3MA1, by authors, 2024.

3 Experiences and outcomes for the 2019–2021 cohorts

The elective was offered for the first time in September 2019 – with five student tutors, and the second year, which occurred during the Covid-19 pandemic, attracted three participants. In autumn 2021, nine participants finished the course. The participants in that year were divided among three bachelor tutors; at least two student tutors per bachelor tutor to share the work, observe, and learn from each other. To keep a close eye on all student tutors, a maximum of four student tutors per tutor is used. Since 2019, a total of four different bachelor tutors have been involved.

After finishing the 2021 MSc and BSc courses, the bachelor students and the student tutors were invited to share their experiences in a short online anonymous questionnaire, and one-third of bachelor students responded (22 of 69 students from three groups). The response rate of student tutors was eight out of nine. Below are the experiences of bachelor students and student tutors based on the three questions asked: 'How did you experience the course?', 'what should be kept?', 'what should be changed?'

3.1 Bachelor students' experiences

The bachelor students respond in positive terms to the evaluation questions. They mention the experience of having a student tutor to be pleasant and enjoyable, noting that they receive a fair amount of attention from the student tutors in terms of time and detail. They especially mention that they experience less distance between bachelor students and student tutors in comparison to typical student-teacher relations. The use of personal experiences in the course increases enthusiasm and helps personalise the tutoring experience. The bachelor students like adding a student tutor next to the regular bachelor tutor, and they appreciate the feedback being delivered in smaller groups and receiving more attention.

A significant number of the bachelor students do not mention any desired improvements. However, they critically note that the role and position of the bachelor tutors are less clear. Bachelor students question the clarity of the assessment, the quality of the feedback, and the alignment of the feedback and assessment: are student tutors and bachelor tutors weighing aspects equally? At the same time, some bachelor students want even more specific feedback, though they acknowledge that the feedback they receive is more specific than feedback other bachelor students receive in groups without student tutors. Nevertheless, bachelor students who submit critical assessments still note a positive learning experience overall.

Bachelor students were enthusiastic about their student tutors and stated that they felt special. Notably, only three of the 17 bachelor groups had student tutors. The bachelor students appreciated the 'levelled' feedback, the enthusiasm, the depth, and the time. They suggest to pay attention to the differences between groups with student tutors and without, the role of the bachelor tutor, and to the clarity of the assessment procedure.

3.2 Student tutors' experiences

The student tutors responded positively to the evaluation questions as well. They describe the course as fun and enjoyable. Student tutors mention they have learned a lot and experienced the course as a valuable and original elective in the curriculum with unprecedented individual feedback and opportunities for personal development. The most important aspect for the student tutors is the safe and supportive learning environment: the freedom to discuss and take control, the absence of anxiety, the feeling of a safety net, the preparatory meetings and workshops, and a limited group size where the student tutors get to know one another.

Student tutors feel taken seriously and have space to practice tutoring ideas and then critically reflect on them. The tutoring of the bachelor students in BK3MA1 demands considerable time, and some student tutors experience competition in their curriculum in prioritising learning activities. This issue might be caused by individual time investment in preparation for the course and tutoring sessions, as student tutors feel responsible for fully taking on a mentorship role. When the BK3MA1 course is finished, and the bachelor student work is graded, student tutors need to prepare their final products and feel they should have started earlier. They suggest reminders of the course requirements during the BK3MA1 tutoring, as it might help them focus and assist them in making more timely decisions on what to prioritise, as well as better preparing them to ask for intermediate feedback. Further, some student tutors feel that the BK3MA1 tutoring assignment should be emphasised in the elective description and title.

Student tutors value the experience of ‘being on the other side’: switching places from university student to tutor. They discover the ‘complexity’ of the roles of tutors – supervising and assessing – as well as their own styles and habits. The reflection papers reflect their interests and learnings. Table 1 provides an overview of all reflection topics the student tutors have studied (2019–2023). The class organisation, roles and styles, communication, and feedback are key topics. The reflections show that the student tutors experience a shift in perspective, which makes them rethink their own study behaviour.

YEAR	TOPIC	YEAR	TOPIC	YEAR	TOPIC
2021	Halo-effect in assessment	2022	Debating	2023	Feedback
2021	Class presence	2022	Connection	2023	Feedback
2021	Class layout	2022	Motivation	2023	Feedback
2021	Tutor's role	2022	Introversion	2023	Feedback adaption
2021	Guidance-independence balance	2022	Feedback	2023	Feedback
2021	Effective communication	2022	Steering and letting go	2023	Expectation management
2021	Effective communication	2022	Keeping attention	2023	Relationships
2021	Challenging	2022	Roles	2023	Coaching
2020	Peer-review	2022	Activation / Attention	2023	Situational leadership
2020	Power of online feedback	2022	Feedback / being corrective	2023	Motivating
2020	Teacher's role / style	2022	Signalling dysfunctional groups	2023	Communication
2019	Instruction versus coaching	2022	Roles	2023	Non-verbal communication
2019	Linking to previous knowledge			2023	Active teaching
2019	Supporting critical reading			2023	Active teaching
2019	Power of written feedback			2023	Adaption
2019	Teaching styles			2023	Interaction / adaption

TABLE 1 Overview of reflection paper topics submitted by student tutors (by year)

The student tutors say that attention needs to go to the group size of the master elective's course; they believe that a maximum of 10–15 students in the elective is desirable and that it is necessary to have a clear role division in the classroom between bachelor tutor and student tutor. Additionally, it is said that the workload distribution does not represent the assessment scheme of the master's course; most time is spent on tutoring, but the reflection paper and the learning materials they develop are most important in the assessment.

3.3 Bachelor tutors' experiences

The bachelor tutors (four individual tutors since 2019) report different approaches to ‘making use of’ and engaging the student tutors. At one end of the spectrum, student tutors were asked to assist with some specific tasks while the bachelor tutor continued providing feedback and performing all tutoring tasks. At the other end of the spectrum, the student tutors took the lead, even in the final grading. For all groups, the bachelor tutors prepare the classes together with the student tutors and discuss aspects to be addressed in the feedback on chapters and assignments. Bachelor tutors prepare the lesson plans with student tutors and try to evaluate the tutoring sessions directly after each class. All in all, the role of the bachelor tutor varies from tutoring bachelor students with help from the student tutors to allowing the

student tutors to coach bachelor students. Independent of the way the bachelor tutor engaged the student tutors, this approach leads to self-reflection among the bachelor tutors, raising awareness of (un)conscious tutoring habits and pitfalls.

The student tutors are a welcome set of extra hands, lowering the teaching load and demanding energy from the bachelor tutor. In particular, it takes quite some time to organise the collaboration between tutor and student tutors, which entails preparation, evaluation, adjusting teaching plans, alignment of feedback, and assessment. The three bachelor tutors in 2021 gave student tutors control over the lesson plans and acted as a safety net during the classes. Bachelor tutors suggest that the student tutors should perhaps share their tutoring experiences along the way. Scheduling a meeting halfway through the course (when the student tutors have their peer reflection meeting) could serve as a solution. The presence of student tutors positively stimulates bachelor tutors to reflect on and reconsider their class design, planned class activities, and interaction strategies.

3.4 Bachelor course coordinators' experiences

The BK3MA1 course coordinators value the interaction between the two courses: the learning activities and teaching materials designed by the student tutors support the bachelor tutors in the BSc course. By adding new, amended, or improved activities and materials, the course evolves. The learning activities and teaching materials designed by the student tutors vary in quality: some can be used immediately, but others need work and are less challenging for the bachelor students. Most of the materials focus more on the (learning) process than the disciplinary, qualitative content of the course. However, all developed teaching materials add to the available toolbox that bachelor tutors can use in their classes. The coordinators suggest challenging student tutors to (further) develop disciplinary and content-focused teaching materials.

Coordinators find the interaction valuable, but some aspects could be strengthened further – for example, by more actively promoting teaching materials that focus on content, sharing them among all bachelor tutors, and emphasising the creation of teaching materials.

3.5 Master course coordinators' and coaches' experiences

The AR0117 coaches value the course, interaction, and cooperation: the workshops and follow-up sessions allow for reflecting, sharing experiences, and providing references to more in-depth readings. The workshops use (peer-)review to monitor the progress of the final products. The coaches appreciate the in-depth questions student tutors ask and the openness in the workshops. The coaches contribute equally and openly during the workshops, creating a sense of security in the classroom (students explicitly mentioned). Student tutors endeavour to share their vulnerabilities and actively try to act upon feedback. Coaches (intend to) teach as they preach by designing participatory classes in which there is a lot of room for the student tutors to set the agenda and steer the discussion. The coaches also facilitate and moderate the Q&As between student tutors and reflect on those interactions. The coaches observe slight tendencies of mirroring behaviour among student tutors: they emulate habits from the tutor (and coaches) with whom they work, a behaviour that could be explicitly addressed in one of the workshops.

Turning the tables, showing personal vulnerability, and setting a safe and open stage for teaching and learning make a valuable experience for both student tutors and coaches. Discussing mirroring behaviour and crafting a safe space require continuous attention, as these are deemed crucial for the success of the course.

4 Experience and outcome 2022–2023 and outlook 2024

The following runs, 2022 and 2023, saw increased numbers of participants: 13 and 16 master students, respectively. In 2024, 30 students enrolled in the master's elective. Word of the student tutor experiences has spread (primarily) among MBE-track students. The general approach to the course has remained the same, including the learning objectives and assessment. Accordingly, the number of bachelor tutors involved grew to five in 2023, adding one tutor each run. Although evaluations have not been undertaken as systematically as in 2021, the tutors and coordinators have voiced similar remarks as in the past. Notably, the attempt to create learning materials that are more focused on content has not yet delivered the desired outcomes. Moreover, given the increasing number of bachelor tutors involved, the desire for peer feedback and supervision among the bachelor tutors has grown as well. Since 2022, a systematic intervision protocol for the student tutors is used during a midterm (week 5) workshop.

The bachelor students continue to appreciate the attention, feedback, and lessened distance they experience when there is a student tutor around, and critical remarks about the roles and assessment were voiced less loudly (note, however, students were not explicitly asked about this issue).

The 2022 and 2023 student tutors also asked for a fairer assessment strategy (both formative and summative) that adequately acknowledges their extensive coaching efforts and time commitment because, through 2023, the assessment focused on the reflections and learning materials. For 2024, the assessment of the student tutors' coaching skills is changed to include a peer assessment and an assessment by the bachelor tutors accordingly. The weights are changed accordingly.

5 Conclusion

Operating the two related courses, AR0117 and BK3MA1, leads to a productive interaction, facilitating cross-pollination among bachelor students, student tutors, bachelor tutors, coaches, and coordinators. This cooperation introduces a diversified mix of learning activities. All people involved, from students to coordinators, experience the mix and interaction positively. The coaching skills are practised not only by student tutors but also by coaches and bachelor tutors. The attention to the teaching and learning environment and the reflective dialogues among all involved improve teaching quality, positively influencing the learning experience and outcomes for both the bachelor students and the student tutors.

An important point of attention is the time and energy the student tutors spend on tutoring and developing their final projects. The assessment and grading of the bachelor students also require further review: the bachelor tutors are responsible for grading, but their grades are discussed and compared to the grades given by the student tutors. This process could be better communicated to the bachelor students to avoid uncertainty.

Further improvement and development of the elective could be achieved through exchanges with additional courses, as few comparable courses exist in the TU Delft curricula. At the Faculty of Architecture and the Built Environment, '*van Gezel tot Meester*' is a 20 EC course (AR0897) for design students who work together

with a design tutor in a BSc design course. This course focuses on design didactics based on Van Dooren's (2020) design process approach. The Faculty of Industrial Design Engineering has a 5 EC course, 'Design Didactics', which uses a similar basic course design (workshops, tutoring, and reflection). Specialised courses are offered as part of the MSc Science Education and Communication ('*Docentenopleiding*'), consisting of a 6 EC course on education sciences (SL3462) and advanced courses on didactics focused on one of four specialisations: physics, chemistry, mathematics, and technology.

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