Doctoral Education competences model

Scientific Knowledge

Research Management

Academic Thinking

Engineering

Discipline related skills

Research skills

Academic Attitude

Design

Transferable skills

Research Data Management

Effective Communication

Self Management & Autonomy

Working with others

Teaching, Supervising & Coaching

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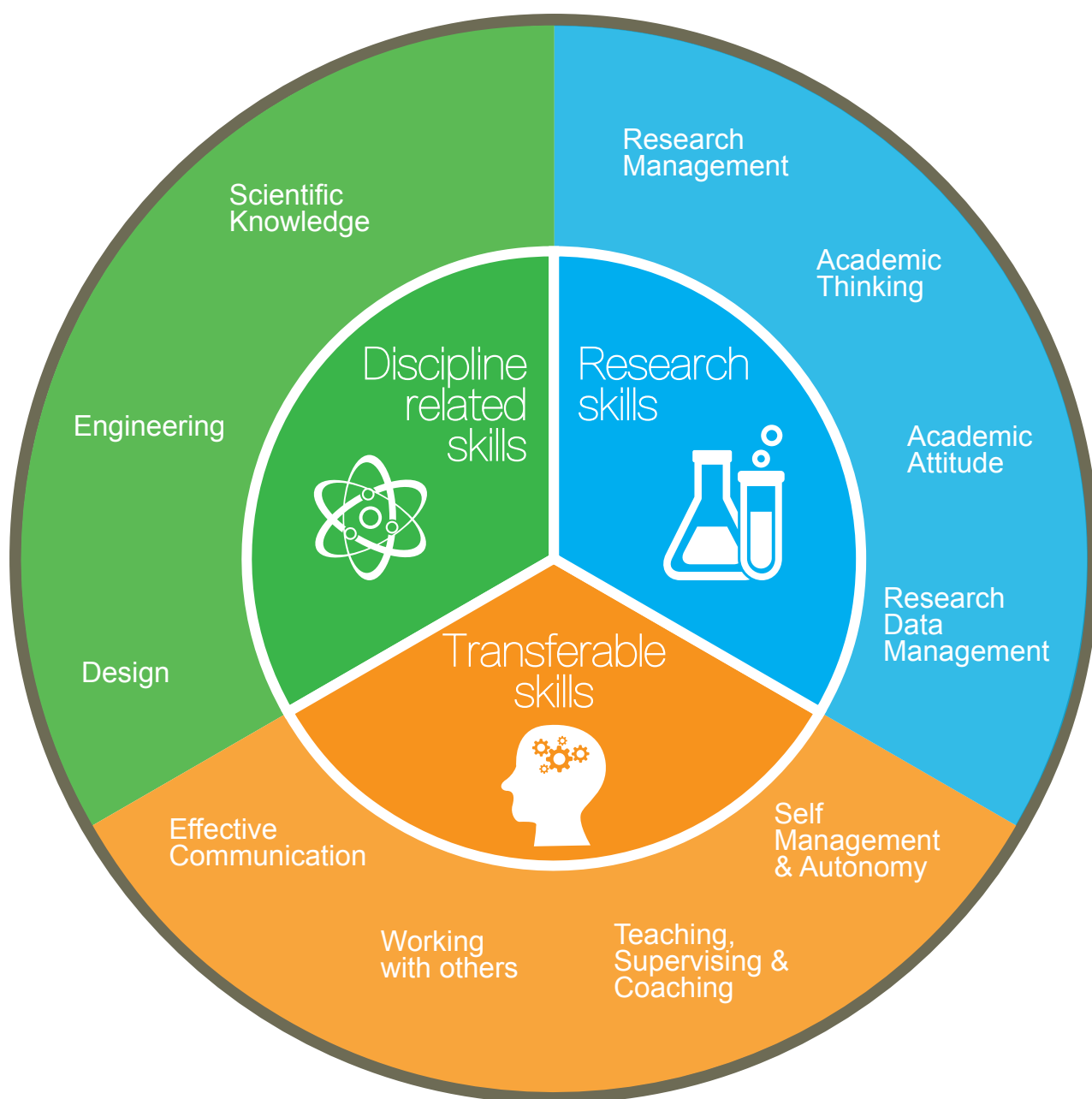
Discipline related skills: Has the breadth and depth of knowledge required in the field of doctoral research.

D.1 Scientific Knowledge
acquires and internalises existing scientific knowledge in the field of the PhD project.

D.2 Engineering
acquires and internalises the engineering skills to execute the PhD project.

D.3 Design
acquires and internalises the design skills to execute the PhD project.

Research skills: Has the ability (research skills) to conduct scientific research.

R.1 Research Management
formulates and designs the research strategy including the planning and carrying out of the project and evaluation/validation.
- **a. Designing:** understands and defines the sequence of steps to be taken in the 4 year PhD project.
- **b. Project-management:** objectively monitors the progress in each step and to achieve defined goals.
- **c. Problem solving:** objectively takes decisions and finds solutions regarding termination of research steps and moving forward.
- **d. Valorisation:** understands the processes for funding and evaluation of research; contributes towards the formulation of research proposals in line with the department plan.

R.2 Academic Thinking
evaluates the value of a statement or a fact, to question matters and to make clear reasoned judgements. Is able to actively and creatively look for improvement.
- **a. Conceptual thinking**: applies creative, conceptual and inductive reasoning to identify patterns and correlations, which are not self-evident, and to deduce from them specific suggestions and original and practicable solutions.
- **b. Analytical thinking**: understands problems / situations by gradually examining them and by systematically studying and identifying causes, key factors and constituent parts.
- **c. Synthetic skills**: smoothly combines data and integrates a complex multitude of data into a coherent whole. Is able to present alternatives and to develop them into a convincing conclusion.
- **d. Critical thinking**: evaluates the value of a statement or a fact and questions matters. Is able to actively and creatively look for room for improvement.
- **e.** Creativity & Innovation: proposes novel ideas and integrates different perspectives in a creative way. Is able to recognise the need for renewal and to go beyond the status quo.

R.3 Academic Attitude
makes choices that reflect integrity and responsible behaviour. Within the TU Delft, scientific integrity implies that the researcher commits to the principles of conduct stated within the TU Delft scientific code of ethics.
- **a. Societal context**: positions the project in a dynamic societal context.
- **b. Ethics**: spots and answers ethical dilemmas in the project.

R.4 Research Data Management
evaluate, design and develop efficient workflows to improve research data and software quality that ensures its re-usability and supports research reproducibility and transparency.
- **a. Valorisation:** understand the value and the importance of producing Research Data and software following the FAIR principles (Findable, Accessible, Interoperable and Re-usable) and considering relevant policies and regulations.
- **b. Planning:** formulate and design a strategy to follow the FAIR principles when working with data/ software during the PhD project.
- **c. Research data and code skills:** acquire the knowledge on tools and workflows on how to produce FAIR data/reproducible software.

Transferable skills: Focuses on personal and professional development, facilitating growth now and in your future career.

T.1 Effective communication
passes on ideas and opinions to diverse audiences in a clear language. Is able to prepare and give clear and fluent presentations in a confident manner.
- **a. Presenting**: effective in a variety of formal presentation settings, both inside and outside the university; prepares in advance, commands attention, can manage group process during the presentation and can manage questions and objections.
- **b. Writing skills**: writes clearly and succinctly in a variety of communication settings and styles; can get messages across that have the desired effect.
- **c. Storytelling**: develops and creates stories that build a coherent picture of events.
- **d. Language skills**: ability to communicate effectively in reading, writing, listening and speaking in the English language (and other languages needed to carry out your work).
- **e. Listening**: demonstrates attentive and active listening; listens to what someone has said and understands the meaning / value, to engage in discussion.
- **f. Online presence**: effective in using social platforms.

T.2 Working with others
Works well with academic staff, peers and supervisor; sets a tone of cooperation within the work group and across groups; coordinates own work with others; values working relationships; when appropriate facilitates discussion before decision-making process is complete.
- **a. Networking**: builds and retains formal and informal relationships, thus creating a network of contacts with people who are (or could be) interesting or useful for achieving one's goals.
- **b. Collaboration**: cooperates with people (including supervisor) from diverse backgrounds to reach common goals.
- **c. Negotiation**: negotiates skilfully in tough situations with both internal and external partners; can win concessions without damaging relationships; can be direct as well as being diplomatic; gains trust quickly of other parties to the negotiations; has a good sense of timing.
- **d. Leadership**: clearly formulates goals and priorities when directing others.

T.3 Teaching, supervising & coaching
inspires students to develop knowledge and skills.
- **a. Teaching**: supports (groups) of students; gives & reviews assignments and exams; gives (work) lectures; develops course materials.
- **b. Supervising students/coaching**: guides, transfers knowledge and motivates appointed students/supervisees.

T.4 Self-management
manages time effectively and maintains a healthy work-life balance with an assertive, creative and confident attitude as well as being able to deal with change, stress and procrastination.
- **a. Autonomy**: Able to be independent in one's own thoughts and actions and willing to take responsibility for one's own actions and accomplishments, to correct failures and improve achievements
- **b. Time management**: adequately estimates available time, means and guidelines, and uses that information to make and carry out an adequate, effective and realistic planning to achieve the goals set out.
- **c. Flexibility**: adjusts own behaviour and thinking according to the context so as to attain the desired goal. Able to adapt and function efficiently under changing circumstances and with different groups or people.
- **d. Perseverance**: pursues everything with energy, drive and a determination to finish; seldom gives up before finishing; especially in the face of resistance or setbacks.
- **e. Dealing with risk and uncertainty**: decides and acts without having the total picture; isn't upset when things are up in the air; can comfortably handle risk and uncertainty.
- **f. Entrepreneurship**: action-driven and pro-active. Notices and anticipates opportunities and threats.
- **g. Personal development**: personally committed to display an ongoing commitment to learning and self-improvement. Thinks about the next career step and takes action to prepare for applying for jobs inside or outside academia.

Doctoral Education Programme, description of the 3 categories

In order to obtain your PhD degree at TU Delft, following doctoral education is mandatory. At the defence ceremony, the DE certificate and supplement are awarded to the PhD candidate.

To obtain a TU Delft Doctoral Education Certificate, a PhD candidate's educational programme should comprise of three elements: Research Skills, Discipline related skills and transferable skills. A minimum of 15 GS credits should be obtained per category. Per category, competences have been selected that suit the profile of a PhD candidate at TU Delft.

The definitions of these competences and underlying skills can be found in the definitions document. The DE certificate includes a supplement, which states all DE activities and courses that have been done by the PhD candidate as registered in DMA.
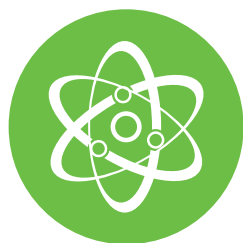
Discipline related skills
Has the breadth and depth of knowledge required in the field of doctoral research.

These skills represent added value and/or greater breadth regarding the scientific Knowledge, Engineering and Design involved in the doctoral research (relating to the substance of the discipline and field). They depend on the relevant field of research and are therefore determined per faculty.

Research skills
Has the ability (research skills) to conduct scientific research.

Skills to improve the basic quality of the research, aimed at the PhD candidate in his/her role as researcher and include the competences Research management skills, Academic thinking and Academic attitude. Learning on-the-job activities belonging to this category are: scientific presenting and interacting, writing and publishing and teaching and supervision. An overview of all activities and the allocated number of credits per activity is shown on the GS website. These skills are also partly dependent on the type of research and are consequently determined per faculty and/or supervisory team.

Transferable skills
Focuses on personal and professional development, which facilitates your growth now and in the future career.

Skills concern the development of the PhD candidate's personal skills. These skills are important to daily-life PhD activities and to prepare PhD candidates for their future careers. The main competences you can further develop as a PhD candidate are Autonomy & Self-management, Working with others, Teaching, Supervising & coaching, Effective Communication. The Transferable skills courses are largely coordinated and facilitated by the University GS.

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