

Who should use this handbook?

The handbook is relevant for anyone who provides knowledge

For target groups that differ in many aspects, such as their ...

- talents and previous knowledge,
- expectations and experiences with teaching and lecturers,
- interaction with each other and with lectures and trainers.

The handbook provides guiding questions for your lectures, seminars, workshops.

It illustrates how you can identify and methodically consider possible relevant diversity aspects of your participants.

You will find concrete examples for different teaching formats as well as recommendations from lecturers at the TU Graz.

For those of you who work at Graz University of Technology, all documents including videos with recommendations of colleagues lecturing at TU Graz are available in the Teachcenter.

EN

Diversity in Teaching.

How to make it work

A Handbook for Teachers in Technology & the Natural Sciences

Why is diversity relevant in teaching? The interaction with participants and their diversity of perspectives enriches every lecture, workshop or presentation you give.

If you deal with diversity in teaching, you can prepare content for different target groups in a comprehensible way and engage participants with for example different personalities, different previous knowledge, or cultural backgrounds.

What is diversity? Diversity stands for variety and the conscious perception of differences and commonalities.

Some of these differences and similarities are inherent, e.g. gender, ethnic origin, sexual orientation, physique, or age. Some differences are acquired, e.g. skills, knowledge, understanding of technology. Other differences are contextual, such as mobility needs in the home or work environment, social and economic background, lifestyle, family care responsibilities, expectations regarding a technical product.

EN

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**A Handbook for
Teachers in Technology
& the Natural Sciences**

Imprint

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What contribution does this handbook make *to your teaching?*

Teaching at the university means creating good **learning conditions** and **diverse opportunities for participation** for all students, regardless of their gender, educational background, or nationality. This makes an important contribution to promoting **equal opportunities** for all students and to supporting their talents. At first glance, it can seem as though teachers will need to do more work – for example, when content is adapted and new methods are used. However, not only students, but also teachers benefit from **flexible learning formats** and **productive exchange** with each other.

The handbook contains **guiding questions** that encourage reflection and **specific suggestions** on how the diversity of students can enrich your teaching (e.g., the design and selection of content, methods and materials, the communication between teacher and students, or ways of dealing with given framework conditions). “**Typical teaching situations**” are also presented. **Teachers share their experiences in videos**, and quotes appear in the brochure with smart links that guide you to further information. In addition, you can also sign up for the **TeachCenter course** “Diversity in Teaching”.
<https://tc.tugraz.at/main/course/view.php?id=1904>

How can this handbook be used?

The following topical areas are covered in this handbook:

Teachers & Students		<i>Diversity of culture and experiences of those involved</i>	10-17
Communication		<i>Using a variety of teaching styles can make the teacher's job easier and teach the students about communication and fair cooperation</i>	18-27
Methods & Materials		<i>Using different methods and materials makes it possible for students with different learning styles to understand content</i>	28-35
Framework Conditions		<i>Information and technical infrastructure for your course</i>	36-43
Research & Teaching Content		<i>Results from science and research, which could be interesting for your students for reasons of diversity</i>	44-49

Contact persons and support

▸ Office for Gender Equality and Equal Opportunity

<https://www.tugraz.at/en/tu-graz/organisational-structure/service-departments-and-staff-units/office-for-gender-equality-and-equal-opportunity/>
Provides information about equal opportunities, equality, and diversity, as well as individual counselling services for researchers and lecturers at TU Graz regarding diversity integration and gender aspects.

▸ Accessible Learning

<https://www.tugraz.at/en/studying-and-teaching/studying-at-tu-graz/prospective-students/accessible-learning/>
Provides support for students and teachers on issues related to the inclusion of students with a disability or a chronic illness.

▸ Vice Rector for Academic Affairs

vr-lehre@tugraz.at
Contact if you have specific questions about the statutes on study law, general questions about teaching, or questions about the Teaching Handbook

▸ Educational Technologies and Services (LLT)

<https://www.tugraz.at/en/oe/lehr-und-lerntechnologien/home/>
Here, you can get more information about technologies such as the TeachCenter, iMooX, and TUBE. You can also get advice about how to use media for educational purposes, avoid violating the copyright law, and using open educational resources (OER), as well as all forms of virtual and media-supported teaching.

▸ Languages, Key Competencies and In-House Training (SSIW)

<https://www.tugraz.at/en/tu-graz/organisational-structure/service-departments-and-staff-units/languages-key-competencies-and-in-house-training/>
At this service department, you can receive further training on didactics, attend workshops on “Teaching in English”, and get training to improve “intercultural competence”.

1 Teachers & Students



Suggestions to adapt your methods to fit the student diversity

Practical example:

A lecturer begins a course with “As you already know ...”. Subsequently, the lecturer uses technical terms and definitions, assuming that these are part of an essential foundation. As a result, it becomes clear that some participants could not follow the content.

Take note of the prior knowledge that students bring with them

Depending on the type of school, the subject specialisations differ, and the basic education may have been completed some time ago (e.g. when entering the degree programme as a second education).

Provide students with opportunities to review and acquire basic knowledge

Draw their attention to basic textbooks with content that you consider to be essential prerequisite knowledge, and use introductory tests from universities or questions that you have devised.

Get an overview of your participants

You can gather information about the students, for example, by referring to their matriculation numbers or checking the statistics from TU Graz [1]:

- Stage in the degree programme
- Age of the participants
- International students

Be careful with first names, as they are not always indicative of the gender in a cultural context. For example, the first name *Andrea* is male in Italian.

2 Communication



Suggestions to promote interaction in the course

Practical example

A teacher who wants to encourage women to participate in the course asks a person in the full lecture hall “And what do you say to this as a woman?” The response of the person being asked is embarrassed silence, and the other students start to mumble and giggle.

Avoid singling out individuals

Singling out people on the basis of a group affiliation (gender, migration background, age, etc.), e.g. by saying “What do you say to this as a woman/ man, person from country XY, ...”?), is inappropriate and can lead to disruptions in the course.

Be aware that not all students can understand you easily and equally

This may be due to language barriers or the individual’s special needs. You can support these students by speaking in short, complete sentences or by introducing strategic pauses into your speech. For students who lip-read, it is important that your face can be seen clearly (e.g. lighting).

Encourage active participation in large courses

The electronic system *feedbackr* – or alternatively a voting system with coloured cards – can be helpful here, as it can be used to get the students’ attention if it is used several times during the course session. The system encourages the students to work through the content immediately and gives the teacher feedback regarding what has been understood and where further clarification is still needed.

“I had a feedbackr channel open the whole semester where they [the students] could ask questions or submit feedback. I actually always talked about these at the beginning of the lecture to bring everyone up to speed and then we would discuss them.”

www.tugraz.at/go/Kernbichler_feedbackr

Have students think about and discuss questions together

- ▶ In a buzz group or think-pair-share conversation activity, the students talk briefly in pairs. They write down their answers, present them briefly upon request, or hand them in (anonymously) [4].
- ▶ Using the fishbowl strategy, a small group sits in a circle in the middle of the room and discusses a topic while the other participants sit in a large circle around this smaller circle and listen. The outer participants can contribute to the discussion by moving to sit briefly on a free chair in the inner circle.

Discuss the communication rules

These may include: setting time limits for contributions, not interrupting, taking comments seriously, or setting limits on the use of humour.

Invite people who otherwise do not contribute actively very much

Participants can be addressed by issuing a clear and friendly invitation along the lines of “Would you like to say something about this?” or “I ask you to please present the results” [5].

Choosing participants randomly can help to ensure that everyone has a chance to contribute. TU Graz uses its own system for this purpose during exercises [6].

Give preference to requests to speak from participants who are speaking for the first time

In this way, you can involve the maximum number of students.

Note that students who like to contribute a lot prevent others from contributing

If a few students strongly dominate discussions, then you can encourage other participants to share their perspectives by deliberately inviting other students. For example, you can do this by introducing a transition like “Thank you for your contribution! We will now move on to...” or “This is an interesting aspect! Who can add another perspective to the discussion?”



“I would ask, for example, “What would you like your next homework to be?” There are 4 different answers, and the students can then democratically vote, for example, on what their next homework should be.”

www.tugraz.at/go/Pirker_Hausaufgabe

Ask each participant in turn to practice a short transition statement

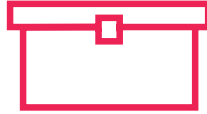
The participants are asked one by one to make a short statement, for example, about how the course session will proceed (“What is still unclear?”, “What should we discuss next?”). Individual statements are neither commented upon nor discussed. In larger courses, you can specifically ask students seated in selected rows or areas of the classroom to provide feedback or use *feedbackr*.

Contribute to a positive environment by using humour appropriately

Humour can be used strategically to attract and keep the students’ attention. However, use it carefully and be clear about the limits: Not-hurtful humour associated with the learning material is allowed. Humour that involves sarcastic or derogatory comments does not belong in the classroom [7].



3 Methods & Materials



Suggestions for how to design methods and materials

Practical example:

A teacher is surprised when she sees the poor examination results from her course. She has already made the content available in the form of a detailed script at the beginning of the semester and regularly asks the students in the lecture whether they have understood everything. She notices that the students are not particularly attentive and sometimes seem bored.

Make sure to use a variety of methods and materials

- Supplement your presentations with oral and written contributions from the students or short games.
- Supplement presence teaching with online teaching phases. “Blended learning” concepts are particularly worthwhile to use if the form and content remain the same over a period of several semesters [12], [13].
- If possible, provide all supporting documents before the course sessions begin.

“How do you learn to work together when you actually are familiar with and use completely different tools [...] and completely different working methods.”

www.tugraz.at/go/Pirker_Interdisziplinarität

Use the flipped (or inverted) classroom

In this method, students prepare for a teaching unit independently (by referring to videos, books, scripts, or online courses [14]). In the presence-teaching phase, students carry out group work, perform in-depth tasks, and discuss the results of these tasks. It is worth investing extra effort when preparing such a class for the first time, as the same content does not have to be presented every semester and, instead, the teacher can focus on consolidating the content:

- It is essential to provide clearly structured content and clear timelines to get good results.
- Support students during the self-regulated learning phases by encouraging them to communicate with one another and to keep in touch with you [15].

Extend this concept by using Just in Time Teaching (JiTT)

The students work on the material in a self-regulated learning phase and also work on questions before the course sessions. The teachers view the results shortly beforehand and adjust the content of the unit (“just-in-time”). This makes it possible for teachers to respond specifically to challenges or common mistakes made by the students. [16].

Note how groups are composed according to personal characteristics

- When students form groups on their own, make sure to support the integration of people who are new, such as exchange students [17].
- Students have a natural tendency to form homogeneous groups, as common characteristics simplify the interactions among the group members (e.g. gender or experiences).
- You can increase the self-confidence of people who have similar experiences and knowledge by having them work on tasks in homogeneous groups. In this case, make sure to introduce sufficient time for reflection, so that stereotypes are reduced rather than reinforced.
- Ensure that roles such as the person who gives a presentation, takes the minutes of a meeting, or leads the group are rotated, so that each group member has the chance to gain different perspectives.

Learn how to use the strengths of heterogeneous groups

Mixed, heterogeneous groups are considered as more productive and innovative, but they can also be problematic due to communication difficulties, lower stability, and even higher stress.

Mixed teams must first develop and agree upon a working and conflict culture.

As a teacher, therefore, you should guide group processes and design the tasks so that the students can develop different points of view.



"Colour blindness can be easily addressed by making very minor changes, if you just think about [and choose] the colour choice of a menu in the game or the environment in the game a bit more carefully."

www.tugraz.at/go/Pirker_Gaming

Design scripts and presentations in appealing and accessible ways

- Use left-aligned text and an easily readable font (e.g. Calibri or Verdana) [18].
- Use clearly structured, numbered chapters and meaningful captions to describe the contents of graphs, figures, and tables in the text
- Make sure that the videos are subtitled wherever possible
- Ensure that slides and presentations are easily readable and that the text and figures are high-contrast, so that they can be seen even in the back rows. Avoid red-green transitions for people with red-green visual impairments.



Provide students with a written syllabus in advance

Students can more easily decide to participate if they are given the following information:

- Learning objectives and content
- Required prior knowledge and effort
- Procedure and methods
- Expected performance items and assessment criteria

Familiarise students with the assessment criteria

If students present many arguments during the course, this should be reflected in the examination by including open questions and discussions. If you award only one grade for group work, still make sure that the individual contributions made are clearly visible when performing the assessment.

Offer different forms of examination

- Active contributions can be complemented by submitting written reports or a reflection.
- Exam forms can be adapted for students with particular needs, such as replacing the written exam with an oral exam, by providing more time, or by allowing breaks or the use of technical aids [21].
- Communicate with the students to let them know the conditions under which you are willing to consider certain challenges (e.g. care responsibilities, illnesses).

“Students with chronic illnesses and disabilities really need a place they can turn to at TU Graz.”

www.tugraz.at/go/KrottmayerMandl_Servicestelle

Address the specific challenges presented by digital teaching

In a virtual environment, the possibilities to perceive the needs of other people are severely limited, e.g. in terms of body language and voice. This can quickly lead to stress, reduced attention spans, and misunderstandings.

Therefore, plan enough time,

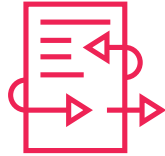
- for students with different working styles to adjust to the digital environment.
- for frequent, short screen breaks to keep the students' attention.
- for more frequent, smaller interim reviews of material.
- for students to meet in virtual group rooms and for you to answer questions in chat rooms.
- for making recordings and documents in the preparation and follow-up phases.

Respect the students' privacy and do not oblige them to activate the camera during online meetings. Instead, make the participants aware that they can show only their name or a virtual background.

Make students aware of supportive materials and services

- Materials that contain rules for preparing citations when writing seminar papers, guidelines for gender-sensitive writing, corporate wording, etc.
- Contact persons and support services at TU Graz.

5 Research & Teaching Content



Suggestions for how to integrate research and teaching content

Practical example

As part of a course, students developed a software programme that should be easy for end users to use. In the final presentation, the students mention “the user”, but then enthusiastically digress by describing the technical details and intricacies of their programme.

Analyse the diversity of target groups in applied research

The personal background shapes the approach we take to carry out tasks and solve problems. Therefore, we also tend to develop products using the “I-Methodology” and unintentionally neglect the interests and abilities of other people [24].

- Ask questions about the potential users, how they differ, and what requirements might arise from these considerations.
- Draw attention to the methods that can be used to integrate the users’ perspectives into the development process, for example, by carrying out “usability tests” or applying “participatory design” methods [25], [26].

“In the development phase, you can take into account who the players really are and the fact that the players can also be completely diverse.”

www.tugraz.at/go/Pirker_Beruecksichtigung

Encourage critical reflection at an early stage

Have students test hypotheses about the learning topic in small groups to show that you can get different results by taking different approaches. Reflect on diversity and gender aspects by referring to specific studies. Draw the students’ attention to which research designs yielded which results and ask them if it would also be possible to interpret the results in alternative ways.

Discuss the social relevance of your research

If possible, refer to and illustrate practical applications.

- You can look at technical solutions from economic, ecological, historical, social, or ethical perspectives. For example, regarding the toxicity levels of chemicals, the different exposures of women and men, children and adults, or people in certain occupations are hardly taken into account.
- Practical examples should reflect different aspects of daily life and consciously contradict stereotypical ideas. Note what experiences and contextual knowledge are required to understand the example.
- In fundamental subjects, attention can be drawn to who will subsequently use the results or how the research will be funded.

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