Tutor training and learning resources in Mathematics and Statistics Learning Support

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Introduction

Welcome to the Tutor training and learning resources in Mathematics and Statistics Learning Support. This booklet is the result of the collaborative efforts of the EEA Grants project "Capacity Building in Mathematics and Statistics Learning Support in Norway and the Czech Republic" (MSLS Net). Within this project, we aimed to enhance the quality of mathematics and statistics learning support across partner institutions in both countries.

These institutions include two from Norway - University of Agder (UiA) and The Arctic University of Norway (UiT) - and three from the Czech Republic - Masaryk University (MU), Tomas Bata University in Zlín (TBU), and Brno University of Technology (BUT).

The booklet is structured into two parts, each offering valuable information and experiences with resources in Mathematics and Statistics Learning Support (MSLS) gained throughout the project.

The first part reports on training materials developed within the project and puts them into context of tutor training events.

The second part focuses on learning resources, especially on how to find, curate and use them for the benefit of students using a MSLS service.

We hope that this booklet will help others to organise successful training events and to work with learning resources efficiently.

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Training Materials for Tutors in Mathematics and Statistics Learning Support Service

Josef Rebenda, Zuzana Pátíková

In the context of Mathematics and Statistics Learning Support, a variety of training materials and resources are available to equip tutors with the necessary skills and knowledge. These resources include among others professional materials available from Sigma Network, a Tutor's Codex providing fundamental rules of tutors, and videos showcasing effective math teaching techniques. Leveraging these resources, tutors can be well-prepared to provide valuable support to students in mathematical subjects.

During the MSLS Net project, specific training materials were created to enhance tutor training. These materials include guides highlighting DOs and DON'Ts in mathematics and statistics learning support, interactive scenarios, guidelines for providing remote and online support via Discord, and video recordings with tips for new tutors.

DOs and DON'Ts emphasize evidence-based strategies while cautioning against common pitfalls. Interactive scenarios depicting various situations that can arise during student consultations provide tutors with opportunities to practice problem-solving, adaptability, and decision-making skills, fostering experiential learning. Guidelines for using Discord in MSLS contain basic information for tutors about support provision on Discord and a list of common scenarios. Videos with tips for tutors introduce useful suggestions how to do tutoring efficiently.

The training materials, including those created during the project, can be primarily utilised during organised training events such as workshops and seminars. These events bring tutors together, allowing them to enhance their skills, share experiences, and learn from one another. The training packages used to arrange these events are thoughtfully curated to provide a

structured and cohesive approach. They bring a few examples how a tutor training event might be organised. These packages incorporate theoretical concepts, practical exercises, and hands-on activities, catering to the diverse needs of both novice and experienced tutors in various forms of MSLS services.

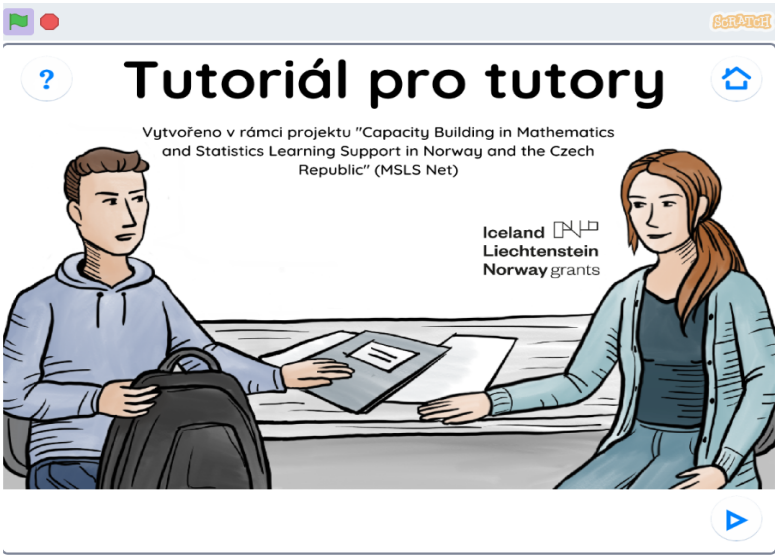
Training resources

DOs and DON’Ts

This PowerPoint presentation was prepared with the intention that it can be used as an optional part of the institutions’ training packages. It contains the main principles that a tutor should bear in mind before, during and after a consultation, including general advice in the form “don’t do that, do this instead”. The material is short and comprehensive, with four to seven bullet points on each of the five slides. It is convenient for a brief introductory or concluding session, depending on arrangements of the training event. The length of the session can be increased by adding more details and giving examples to each point.
The slides in English and Czech are available on the MSLS Net project website.

Interactive scenarios

This interactive material was intended for training new math support tutors, especially for thinking through and discussing various situations that may arise in consultations with students. There is a main question for each situation, three answers are offered for it. After choosing an answer, a reaction will appear. The goal is not only to choose the right answer. On the contrary, it is advisable to think about each of them and think about what and why it is good or bad and see what we think about it. Some questions are not even correct, or they don't have a wrong answer and that's okay. We recommend when working with the material to ask more questions, think about possible answers and different scenarios of the development of situations. This makes the material a good resource for discussion sessions.



The material is created in the SCRATCH environment and its Czech version is available on the TBU website and the link to it can be found in section Links as well as on the MSLS Net project website.

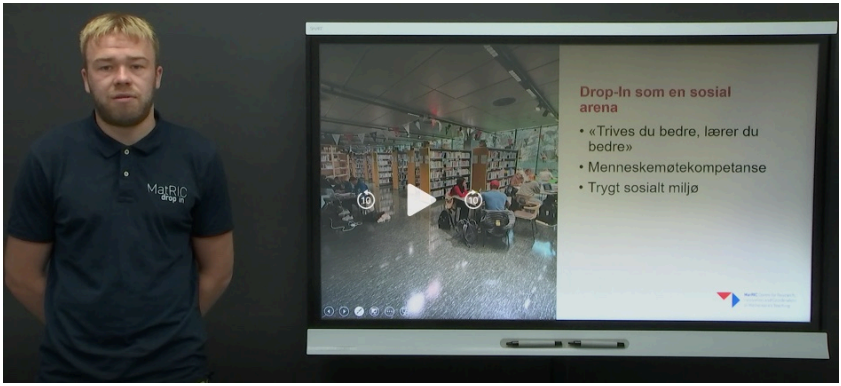
Codex of a tutor (Tutor Code)

The purpose of this leaflet was originally to inform potential users of the MSLS service – students – about what they can expect from the service and tutors. However, it has its value for tutors too as it reminds tutors about the main principles of being a tutor. The leaflet can be used at a training event, for example during a discussion or concluding session. It can also be printed and posted on a visible place in a drop-in.
It is worth noting that the leaflet, originally available in Czech only, was translated into English and inspired development of a similar leaflet in **sigma** Network. The leaflets are available on the MSLS Net project website.

Experience and tips

This collection of videos was recorded to bring valuable information about what it is like to be a tutor, a coordinator of MSLS service, and useful tips for effective tutoring. The resources are brief and focus on the most

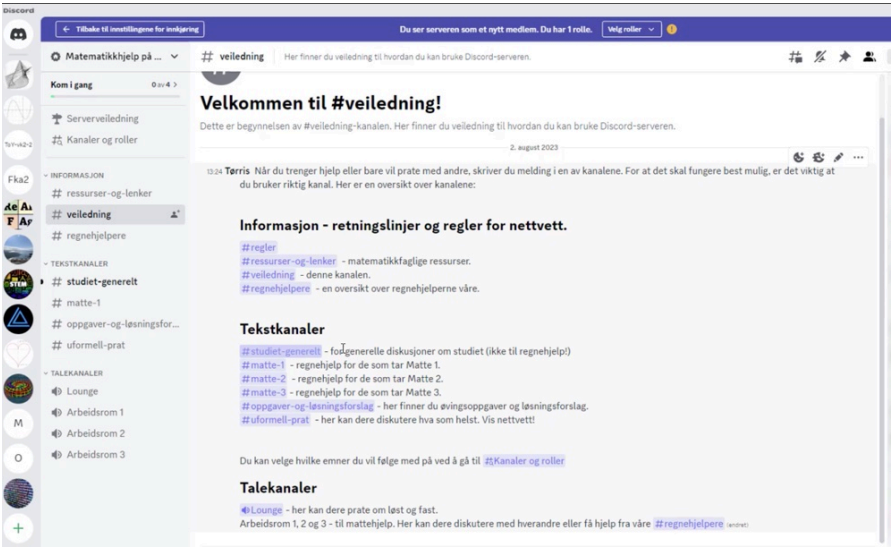
important aspects of a student-driven drop-in service, being a tutor in such drop-in, and coordinating the service with other faculty/university units. They can well be used independently, but also introduced to participants before a training event where a discussion session on the topic will be arranged.



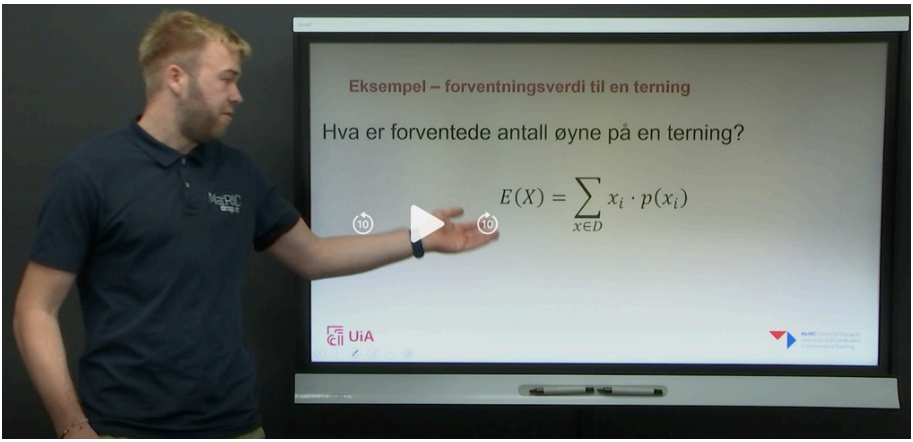
The videos are in Norwegian and are available on the MSLS Net YouTube channel. Link to the channel can be found in section Links as well as on the MSLS Net project website.

Support on Discord

The video was prepared to show how an online MSLS service can be set up and organised on Discord. The platform has been used as a communication channel by online gamers, but it also has potential in education. The recording contains information about how to create a Discord account, how a MSLS server might be organised, what rules its users should follow, and how a dialogue or a discussion might look like. It aims at both staff and students, assuming that it often will be students helping their fellows. This resource is useful for training in online support, especially if provided via Discord. It can be watched individually before a training event with a follow-up discussion during the event and would be of special relevance for online or hybrid training events.
The video was recorded in Norwegian and is available on the MSLS Net YouTube channel. Link to the channel as well as a synopsis (summary) in English can be found on the MSLS Net project website.



Use of videos



This resource in the form of videorecording was made to share experience learned by tutors during making videos for students. There is a list of aspects one should consider before starting any recording, followed by a practical example and general suggestions. The recording has broader potential of use, but in relation to training it could be used to give tutors an idea of how to choose resources that they might like to suggest to MSLS

users. It can be watched independently or offered before a training event and then discussed in a topical session arranged during the event.
The video was recorded in Norwegian and is available on the MSLS Net YouTube channel. Link to the channel as well as a synopsis (summary) in English can be found on the MSLS Net project website.

Training packages

Material containing training packages suggestions was developed to collect different ideas about how the structure of a training event might be arranged. A training event would typically be a combination of presentations, brainstorming and/or discussion sessions, group work and role play sessions. Elements of such training packages can include introduction to the MSLS concept, good and bad practice, problem solving, statistics support, remote/online support, and other types of sessions. The program can vary depending on the needs of a particular MSLS service and institutional constraints and affordances. It should also take into account whether participants are new or experienced tutors. The training packages can be useful for planning training events.
The material in English is available on the MSLS Net project website.

Learning resources

There is a dedicated chapter about learning resources for students in this booklet. However, such resources can also be a valuable resource for tutor training. For example, they can be introduced to tutors during a session about learning resources or presented to tutors before a training event with a follow-up discussion during the event.

Links

MSLS Net project website: https://msls-net.ceitec.cz/en/

MSLS Net YouTube channel:
https://www.youtube.com/channel/UCGxyaQrMryiuftpQ5g8Ag2w

Interactive scenarios: https://fai.utb.cz/tutorum

Learning Resources in Mathematics and Statistics Learning Support

Tørris Koløen Bakke

All Mathematics and statistics support centres (MSC) use some kinds of learning resources for the students, both physical and online. The physical resources can be both printed materials and computers with access to computer assisted systems or programming environments (e.g. GeoGebra, Python, MATLAB etc). Printed materials can be textbooks from the university courses, fact sheets, example exercises with solutions and so on. These can also be available online as pdf documents. Other online resources can be dedicated pages from the university's Virtual Learning Environment (VLE) or external web resources.

The materials can be valuable both for self-study and as a part of an organised support session. Fact sheets and videos focused on single subjects can be valuable for students who struggle with finding the information they need in a large textbook. If a student doesn't understand the tutors' explanations or the tutor is struggling to explain, it can be useful to point to a video or fact sheet, or maybe go through it together. The tutor can also point to videos and exercises which can be of help to the student after the support session.

Finding and creating materials

Before starting to create learning materials one should investigate existing materials. There is an almost endless number of websites with videos, exercises, handouts etc. It is difficult for the students to navigate through this, so an important part of the support service is to collect relevant material and/or point students to relevant and high-quality sites. This is just as important as creating new materials.

In a support centre one can meet students at very different levels. Sometimes it can be difficult to find videos and texts that explain things at the right level,

and then it can be beneficial to make one's own videos and texts specifically suited to the different university courses.

There is an overwhelming amount of math videos online, and it can be difficult to put together suitable materials. We provide some advice on how to work with available video material.

- Content: Videos should preferably focus on single subjects, although longer videos describing larger concepts can be useful for some students. Examples and problem solutions are well suited for video, as many students prefer step-by-step videos with oral explanations before printed solution sheets.
- Duration: Videos focusing on a single subject should not be too long, length around 5-10 minutes might be OK. Longer videos can be good for describing concepts and connections, but then they should be divided into chapters. Some students are perfectly fine to pause and increase/decrease the speed, while others can be put off just by noting the duration of the video. It may then be helpful to have some guidance from the tutor on how to use the video. Short videos (< 2 min) can be useful as "video fact sheets".
- Format: Videos can come in many formats. Animations, presentations, writing on digital whiteboards, filming of lecturer writing on blackboard etc. What works best can differ from student to student. In a study comparing different formats, the tutors at UiA discovered that the students preferred videos where the speaker/lecturer was visible. The results are described in the video "Bruk av video" ("Use of video"). Link to the video can be found at MSLS Net project website (see the section Links of this booklet) together with an English summary.
- Use experience of your tutors! Let the tutors make videos, tutors have hands-on experience of what is needed in the MSC, and they can also get immediate feedback from the students.

Physical and online resources

The most common printed resources are textbooks and handouts. The textbooks should include books used in the relevant courses at the university but can also include other books recommended by staff. Handouts can come in different formats, short and to the point explanations of single subjects, fact sheets, examples with solutions etc. It is often useful to have exercises and solutions connected to each handout. The handouts are usually available in printed format or possible to print out in the MSC, but they are also often available online. In physical MSC's it is also common to have posters with facts and formulas.

Most of the above materials are also available online. The most widely used online resources are videos. As mentioned above, there are many websites with good videos, but many universities find it useful to make videos tailored specifically for their students. Online exercises are also a useful resource. There are many systems for making randomized self-tests, where students can repeat an exercise on a subject with slightly different questions each time. Most VLEs include this functionality, and there are very good systems developed specifically for mathematics, e.g. NUMBAS and STACK (see the section Links of this booklet).

A challenge with online resources is how to make them available, where to store them and how to organize them. Storing videos in the university's media storage system is convenient but can be very cumbersome when the university changes the system provider. Storing the videos externally, for example on YouTube, is therefore often a preferred solution. Materials should also be easy to find for the students. Many universities have a specific website for the MSC, while others have the resources available in their VLE. In Canvas it is possible to make a blueprint module which can be imported in all relevant courses.

Examples of organization and materials produced by our partner universities can be found at MSLS Net project website (see the section Links of this booklet). Some of them has been made during this project, while other materials have been collected from previously made resources.

Problem solvers and artificial intelligence – challenge or useful resources?

The growth and development of problem-solving apps and online resources like ChatGPT, Wolfram Alpha, Photomath, Symbolab etc. can be a challenge, especially for online MSC's. To an increasing degree, students prefer to ask an app for help instead of seeking advice from the teacher or the MSC. The answers can be useful when solving a single problem, but often the students are just copying the algorithm and/or the solution without understanding what is going on. The step-by-step solutions from some apps can help the understanding, but quite often the method differs from what the students have learned in their course, or the solution is found using a higher level of mathematics than taught in the course. In some cases, solutions provided by an artificial intelligence (AI) like ChatGPT can be totally wrong. This kind of help is exactly the opposite of what one is trying to do in a MSC, so, what to do? The students must learn how to use these resources in a critical way, and that is a job for the whole education system, not just the MSCs. But the MSC can play an important role in this process by using resources in a critical way during the support sessions. By consulting the apps or AIs **together with the tutor**, students can get better insights and learn how to use the resources to achieve better understanding of mathematics.

Students and staff

It may seem obvious, but one should never forget the most fundamental resource: fellow students and staff at the MSC. Friendly and competent tutors willing to guide the students is a must for any MSC, but it is just as important to facilitate collaboration and discussions **between** the students visiting the support centre. A welcoming environment with possibilities to work in small groups or just sit down and talk to other students, maybe offer tea or coffee etc., encouraging the visitors to speak to each other, all these are useful resources for the students. Social aspect is also important for online support centres – having channels where students can chat about mathematics and maybe also off-topic themes can be helpful to build an online community for the students. Choosing a platform familiar to the students, for example Discord, can be a good way to establish an online support community.

Summary of key points

- Learning resources for students can come in many different forms – handouts, posters, textbooks, videos, self-tests, peers, and many other.
- There is a large number of existing resources available online which should be examined before making your own. Helping students to find relevant resources is just as important as making new materials.
- AI and problem-solving apps can be a challenge. They should be considered as helpful resources (with a critical view!), not as competitors to the MSC.
- The most important resource is staff and students. MSC's – whether physical or online – should facilitate collaboration and discussions, both between tutor(s) and student(s) and between students themselves.

Links

Learning resources collections:

MSLS Net resources: https://msls-net.ceitec.cz/en/text/detail/130 – materials produced by the MSLS project partner universities.

Mathcentre: https://mathcentre.ac.uk – a comprehensive collection of useful resources related to mathematics learning support.

Statstutor: https://www.statstutor.ac.uk - collection of resources specifically related to statistics learning support.

MatRIC TV: https://www.uia.no/senter-og-nettverk/matric/matric-tv - collection of learning videos in Norwegian.

Systems for online tests and assessments in mathematics:

NUMBAS: https://www.numbas.org.uk/

STACK: https://stack-assessment.org/