Pedagogical Guidelines for Telepresence Robots Users

Contents

1 Introduction 3
2 Guidelines for TPR-mediated student 4
2.1 Get to know how to manipulate a TPR 4
2.2 Be ready for session with a TPR 4
2.3 Privacy and Ethical 4
2.4 In lesson 5
3 Guidelines for Teachers 6
3.1 TPR-mediated student participating in lesson 6
3.1.1 How to adjust learning process 6
3.1.2 TPRs in Group work 6
3.1.3 Preparation of the learning process 7
3.1.4 Durning the lesson 8
3.1.5 After the lesson 8
3.2 Teaching via a TPR 8
3.2.1 Be ready to operate a TPR 8
3.2.2 How you can Represent you good 9
3.2.3 Choosing the best technical setup 9
4 Guidelines for Technical preparation for TPR integration to the learning process 10
4.1 Suitable Educational Environment for TPRs 10
4.1.1 Ensuring that TPRs can move independently 11
4.1.2 Ensuring seeing shared content and good audio communication 11
4.1.3 Recommendations for the environment preparation 12
4.2 Technical support 12
4.2.1 The Assistant Role Description 13
4.2.2 The Assistant preparation 13
4.2.3 Recommendations for conducting the lesson with the help of the Assistant 13
4.2.4 Recommendation for pretest 14
4.3 Inclusive, Ethical and Cybersecurity aspects of using the TPRs in learning. 14
4.3.1 Inclusive Learning with the TPRs 14
4.3.2 Ethical aspects 15
4.3.3 Cybersecurity aspects 16

4.3.4 Recommendation to inclusive, ensure ethical and cybersecurity use of TPRs in the learning process. 16

APPENDIX A. Suitable environment for operating TPRs 18

APPENDIX B Cognitive limitations 21

1 Introduction

The users of this pedagogical guideline can include teachers, learners, and technical assistants. The guideline is structured into three parts based on the potential users:

a) Aimed at students who will be using telepresence robots to participating in the learning process from a distance;
b) Aimed at teachers preparing a lesson where TPR-mediated students are participating or what they are conducting as TPR-mediated teachers.
c) Aimed at educational technologists and teachers, describing aspects related to preparing the classroom and the learning process, supporting the use of the robot during the lesson, and activities following the lesson.

2 Guidelines for TPR-mediated student

This section guides students who want to use TPRs to learn from remote participants or search for solutions to be part of a lesson when they cannot be part of a real lesson.

TPRs create an opportunity to join the class from discants, be actively included in the learning process, and have control over what they see, where they stand, and with whom they talk and collaborate.

2.1 Get to know how to manipulate a TPR

Before participating in a lesson as a TPR-mediated student, it is essential to practice operating with TPR. Suppose your proficiency level in manipulating TPR is low. In that case, you may need help concentrating on the topic during the lesson or collaborating with other students.

If this is your first time participating in a lesson with a TPR or using a new TPR model, schedule a time for practice. Ask the teacher or technical support for time to get to know the TPR and its function and to have a test drive. Practising pays off, and you will have more time in the lesson to focus on the lesson topic.

Checklist for do controlling do you have a basic level of operating a TPR in the remote location is the following:

- ☐ Move forward and backward
- ☐ Turn left and right
- ☐ Look up and down
- ☐ Zoom in and out
- ☐ Take a photo
- ☐ Adjust volume
- ☐ Mute microphone

2.2 Be ready for a session with a TPR

Before an actual learning session with a TPR, look over the following aspects:

- **The computer has a stable and high-quality internet connection**. Public Wi-Fi is generally unsuitable for connecting TPRs to the classroom because it is not secure and often lacks the necessary upload and download speeds. Using a wired internet or dedicated Wi-Fi network exclusively for TPRs is preferable.
- **Computers must have enough resources** to handle the TPR's communication and environments used in lessons. Before connecting the TPR, restart your computer before the session. Close all unnecessary applications that you do not need during the lesson. This helps you keep focus on the lesson and mediates you from another location to the classroom, where you have a social presence and sensory experiences remotely.
- To fully concentrate on the learning process in a remote classroom, you should **use headphones so you can hear what the teacher and other students are talking** about. Also, it helps to disconnect you from the surrounding sound. Bad sound quality can be exhausting, and if you do not hear what others are talking about, you can feel disconnected or left out.
- Your **video picture presents you well**. TPRs represent and mediate you from the remote side to another environment. Ensuring that other people can see your face and facial expressions is essential. Set the camera at your eye level. Leave only a little free space above your head. To light your face, sit in front of a light set or window to make your face visible to orders (view Figure 2).
- How do you take notes in a lesson? Do you use paper and pen or some app-based solution? If you use app-based solutions on a computer where you also have connections to a remote classroom, think about the computer layout that enables you to keep in touch with the classroom and simultaneously take notes.

Recommendation for additional reading:

- APPENDIX A. Cover aspects how to setup supportive environment for operating TPRs
- APPENDIX B. Gives recommendations how to lower the cognitive load what accompanies with using a TPR in the learning process.

2.3 Privacy and Ethical

Privacy and Ethical aspects of what to follow when using a TPR in the learning process are the following:

- Do not share a TPR link with the other person;

- Always inform other participants if you are taking a photo with TPRs because they do not see otherwise when you are taking the picture;
- Mute your microphone if you speak;
- Do not misuse the TPRs zoom function to take non-ethical closeups.

2.4 In lesson

Always connect the TPR 5-10 minutes before the lesson starts, to ensure you can see, hear, and speak. If you must share content via a TPR screen or in class, test that part out. See Appendix B, section 3. Presenting content on the TPRs screen with detailed recommendations on sharing content into the classroom screen.

If you know other participants, **you can ask somebody to support** you. In the lesson, peers can take pictures from paper materials and share them with you or help communicate with the teacher in an emergency. The communications line with your peer should be some text-based IM apps.

When you must read from paper, use TPR functionality to take a photo. The Photo can be of much better quality and be readable than the TPR live-view camera.

Reading from a computer screen or paper can be tricky. Sometimes, light reflections can disturb the view. If visibility **is not good, try changing the distance between the screen and paper and the view angle**.

3 Guidelines for Teachers

In this section, you find guides for two TPR use cases: (1) the student participates in the lesson with a TPR, and (2) the teacher conducts the lesson while being mediated with a TPR.

When starting to use new technology like TPRs, it is always easier to do it with technical assistant or learning designer support. If you are alone with it, please read Chapter 4, which gives technical recommendations on adjusting the learning environment so that the student can join the lesson as a TPR mediate student. What areas are also essential to cover?

Use TPRs in lessons where it open remote student's opportunities to have more inclusive learning experience. For example, active learning, group work, lab work and so on.

3.1 TPR-mediated student participating in lesson

3.1.1 How to adjust learning process

Using TPRs in traditional lectures, which last 90 minutes or more and involve little interaction with students, may not be as effective and can be replaced by video conferencing or lecture capture. The TPRs should only be involved in the classroom if it can enrich the learning process. The TPR's ability to move independently helps eliminate obstacles in hybrid learning, where online students cannot participate in class activities.

The most useful is TPRs in the learning process, where it is used as an active learning method. While teaching via telepresence, robots start lessons with mini-lectures. Interactive mini-lectures are an excellent way to introduce new material in the learning process. These lectures should be concise, typically lasting 10-20 minutes, and should focus on a specific topic that defines or sets the context for the lesson. After the mini-lecture, plan an engaging activity (e.g., group work, pair work, experiments) that allows students to explore the topic more deeply and apply their knowledge. Conclude the topic by summarising the activities and highlighting the key takeaways. For longer lessons, incorporating multiple mini-lectures can maintain engagement and provide a structured learning experience.

To enhance interaction during mini-lectures, incorporate discussions and interactive questions. Utilising online surveys or interactive question tools (e.g., Slido, MS Forms, Poll Everywhere) can add questions directly to the presentation, encouraging student participation and engagement. This approach is particularly beneficial when teaching via TPRs, as it helps to reduce the cognitive load on the TPRs operator by fostering a dynamic and interactive learning environment.

Additionally, consider the following tips to maximise the effectiveness of mini-lectures and interactive teaching:

- **Use Visual Aids**: Integrate slides, videos, and other visual aids to make the mini-lecture more engaging and easier to follow;
- **Frequent Check-ins**: Regularly check in with students to ensure they understand the material and feel comfortable participating in activities;
- **Active Learning Techniques**: Encourage students to ask questions, participate in discussions, and engage in problem-solving activities;
- **Feedback and Reflection:** Provide immediate feedback on activities and encourage students to reflect on what they have learned, promoting deeper understanding and retention of the material;
- **Adaptability**: Be flexible and ready to adjust the pace or content of the mini-lecture based on student responses and engagement levels.

By incorporating these strategies, mini-lectures can become a powerful tool in creating an interactive and effective learning environment, especially when using telepresence technology.

3.1.2 TPRs in Group work

In group or pair work, where listening and speaking with others is essential, it is crucial to create an environment that effectively engages the TPR. Ensuring that the TPR can hear and interact with other group members is vital for meaningful participation. Explore the recommendations below to improve the participation and effectiveness of group work when implementing TPRs:

- **Utilise Separate Physical Rooms**: If possible, assign different groups to separate physical rooms. This setup minimises background noise and allows the TPR to focus on its group's discussion without interference from other groups;
- **Spread Groups within One Room:** If separate rooms are not feasible, spread the groups across a single room, leaving significant gaps between them. This spacing helps TPRs operators hear and participate in their group discussions more effectively;

- **Position the TPR Optimally:** In smaller rooms or when there are many groups, move the TPR as close as possible to its group members. This proximity helps the TPR operator listen more effectively and engage in the conversation;
- **Use Audio Enhancement Tools**: Consider using microphones or other audio enhancement tools to ensure clear communication between group members and the TPR. These tools can help overcome any limitations in the TPR's audio capabilities;
- **Minimise Background Noise**: Encourage all participants to minimise background noise and speak clearly. This practice is particularly important in ensuring that the TPR can hear and contribute effectively to group discussions.

By following these recommendations, you can support development of an inclusive and engaging environment for TPRs during group or pair work, facilitating better communication and collaboration among all participants.

3.1.3 Preparation of the learning process

But before we can integrate TPRs into learning process some adjustment or redesign learning process is adequate. Effective lesson planning is crucial for integrating TPRs into the classroom. The following recommendations will help create a conducive learning environment and prepare engaging content for TPRs users:

1. Prepare the Learning Environment:
   - Ensure that TPR-mediated student can move independently, that's the main advances of using TPRs instead of video conferencing system to include remote students to our learning process. Without possibility to move independently we could use instead video conferencing system;
   - Ensure the classroom setup accommodates both in-person and TPR-mediated participation. Think through where to locate a TPR so it can (see, hear and speak) participate in learning process. But also keep in mind that TPR should block the view of in-person student to the screen or board.

Recommendation for additional reading:
Section 4.1 Suitable Educational Environment for TPRs give more detailed descriptions how to design the learning environment.

2. Develop and Design Learning Content:
   - Create slides, materials, and worksheets, including digital formats, to facilitate seamless learning;
   - Divide learning content into smaller, manageable chunks to maintain student engagement;
   - Use a mini-lecture format to introduce new material, keeping each segment between 10-20 minutes;
   - Plan interactive activities, such as group work or experiments, to allow students to explore topics more deeply;
   - Conclude each lesson with a summarizing activity to reinforce key takeaways (e.g., discussions or addressing the muddiest point).

3. Utilise Cooperative Tools and Active Learning Methods:
   - Use cooperative tools to manage group work effectively, ensuring active participation from all students, including those mediated by TPRs;
   - Incorporate active learning methods to engage students and enhance their understanding of the material.

4. Design Content Suitable for TPRs Users:
   - Use font sizes of 24 pt or 28 pt for slides and 18 pt for printed materials to ensure readability;
   - Choose high-contrast colour schemes for slides, such as black and white, to improve visibility;
   - Use broader lines for whiteboard sketches to ensure clarity;
   - Ensure the TPR has an optimal view of learning materials by finding the best angle and spot in the classroom;
   - Utilize good lighting conditions, and if necessary, take photos with the TPR for better clarity, as photo quality is often superior to live camera feeds.

By following these comprehensive recommendations, educators can create an inclusive and engaging learning experience that effectively integrates TPRs technology, enhancing the educational experience for all students.

Checklist for preparation before the lesson:

- ☐ TPRs is charged.
- ☐ TPRs have clean moving corridors.
- ☐ Learning content is designed to be visible to TPR student.
- ☐ Paper materials are accessible in digital format.
- ☐ Prepared the cooperative tools to use in learning process.
- ☐ Light is turned on.
- ☐ Windows are covered with shades.

3.1.4 During the lesson

The teacher must always **explain the purpose of** one or more students using TPRs without being in a real classroom. **Explain** to students what a TPR is, why it is being used, and its goals. Introducing students to TPRs can help reduce their fear of robots (monomorphism).

Introduce Ethical Practices: Educate students on ethical practices related to TPR usage, such as respecting privacy and maintaining appropriate behaviour during lessons involving TPRs. Essential aspects of ethical behaviour include the following:

- Before helping the TPR body, ask for consent that the TPR-mediated student agrees to be helped;
- Speak once at a time, not simultaneously, for TPRs, all voices are treated equally important;
- Do not be intentionally violent;
- Do not block TPRs view intentionally;
- Treat equally.

Use icebreaking activities to help TPR-mediated students blend in.

What the telepresence robot is.

Telepresence robot (TPR) is remote controlled wheeled device, that have audio and video capability. TPRs is designed to

A TRPs moves only if the operator moves it. The operator of a TPR can not record audio or video. It is like borrow a body in remote location.

The main purpose of the TPR is to facilitate virtual presence, enabling individuals to be socially and interactively present in locations they cannot physically access.

3.1.5 After the lesson

Leave time to TPR-mediated students a opportunity to ask questions.
Control does the robot is back it's charging station.

3.2 Teaching via a TPR

3.2.1 Be ready to operate a TPR

Before conducting a lesson with the TPR, observing a lesson where the TPR is being used or where a student is participating via the TPR would be beneficial. If observation is not possible, it would be a good idea to start by physically seeing the TPR you will use later. Practical TPR management skills will allow you to move independently during the lesson, necessary for interacting with different students or study groups. Practice more to gain sufficient proficiency in moving with the TPR.

Checklist for do controlling do you have a basic level of operating a TPR in the remote location is the following:

- ☐ Move forward and backward
- ☐ Turn left and right
- ☐ Look up and down
- ☐ Zoom in and out
- ☐ Take a photo
- ☐ Adjust volume

Recommendation for achieving better proficiency
Practice driving and operating in same classroom where your lesson will be.

Once you have mastered the basic skills of moving and operating the TPR, challenge yourself with more complex tasks. For example, try viewing a computer screen, a whiteboard, or text written on paper. Try to move the classroom to a specific location.

3.2.2 How you can Represent you good

When conducting a lesson remotely, the TPR represents you. To ensure the best representation, we need to ensure that the image of you visible in the classroom is professional and that students can see your face. Appendix A outlines points that will help ensure a good presence in the classroom. The key factors are how large you appear, the lighting, and the background behind you.

You need a quiet workspace with no distractions to focus on the lesson and navigate both the physical and virtual spaces (with students in the classroom). A good, stable internet connection enables you to keep a connection with the classroom. Noise is the quickest way to tire us out, so high-quality headphones are essential. It's also vital that students in the classroom can hear you well, so the microphone you use should be of good quality.

Checklist for ensure your good representation while using TPRs:

- ☐ The background of the video is clear and neutral. You have removed all unnecessary objects behind you, such as private or improper objects.
- ☐ There are only two fingers of free space above the head and no more
- ☐ Your position in the frame is in the middle
- ☐ Make the face as large as possible in the video, but do not crop out your leg or your head.
- ☐ Camera is on the same level as your eyes
- ☐ Light source (window, bulb) is behind the camera, not behind you.

Design your lesson, and consider where you will be in the classroom. In section 3.1.1, How to Adjust the Learning Process, there are recommendations on how to adjust the learning process if there are TPR-mediated participants, and it also applies in lessons where the teacher is TPR-mediated. Plan your activities so the TPR isn't just used for delivering a long lecture. Divide the lesson into segments with different active learning activities. Suppose you want to engage students in a discussion. In that case, you'll need to use a microphone solution in the classroom that allows every student's voice to be captured by the microphone. Handheld or throwable microphones might be the solution in larger rooms, and setting them up may require collaboration with a local multimedia specialist or instructional designer.

3.2.3 Choosing the best technical setup

When planning to conduct the lesson while being TPR-mediated, it is recommended that first, you must answer the following questions:

- Who is your target audience, meaning what prior knowledge and skills do the learners have (including digital competencies)?
- What is the size of the room where the lesson takes place?
- What is the number of learners you are teaching?
- What is the lesson, and what learning activities does it include?

Recommendation for additional reading:
Appendix B section 3. Presenting content on TPRs screen consist detailed descriptions how to use video conferencing or live presentation.

We can choose a solution that suits our needs based on these responses. Table 1 outlines possible technical solutions for using TPR in the classroom. Using only the TPR is sufficient if one-on-one interaction is vital during the lesson, such as conversation, guidance, or consultation with just one student. All your speaking, listening, viewing, and displaying learning materials on the screen can be done solely through the TPR.

Relying solely on the TPR screen during a lesson in a small classroom is not enough. We need to project learning content onto the big screen, which becomes inadequate for sharing learning materials (such as presentations, worksheets, etc.) with the entire class simultaneously. In this case, it is necessary to use either video conferencing (e.g., MS Teams or Live) or live presentation alongside the TPR to share materials on a more extensive classroom screen (smartboard, video projector screen, TV).

In a larger classroom, where the speaker's voice is usually amplified with a microphone and speaker system, the TPR's sound also needs to be amplified. The simplest way to do this is to transmit the audio using a video conferencing solution instead of relying solely on the TPR's own speakers.

Table 1. Witch technical solution to select

	To mediate Video	To mediate sound	Delivering learning content
One to one communication (individual work with student)	 Telepresence robot		
In a small classroom	 Telepresence robot		 Video conference
In a large classroom	 Telepresence robot	 Video conference	

When conducting a lesson remotely as a teacher, it is essential to have an on-site assistant who can help with the logistics of the robot, prepare the learning environment, start the necessary systems for sharing learning materials, and physically show things on your behalf. The assistant can be a colleague or another teacher. Cooperation with the assistant should ideally begin before you go on a trip or the actual lesson.

The assistant will be your on-site support, helping you with the following tasks:

- Setting up the TPR before the lesson starts. If necessary, bring the TPR into the classroom.
- Adjusting the environment if needed.
- Starting the local devices if needed for content sharing.
- Helping you test before the lesson begins to ensure all solutions are working and check the TPR's sound level.
- Showing things during the lesson and providing you with ongoing feedback.
- Returning the TPR to the storage room if necessary.

Recommendation for additional reading:
Section 4.2 Technical support gives more precise overview of the assistant role and what kind of preparations is wise to do together with assistant to ensure smooth learning experience for all participants.

The assistant can be one of the students or a support person from the university. But when using students as your assistants in the TPR sessions, they must train what they must do. And ensure that they can:

- access to the classroom, and can they open doors before the lesson;
- start the AV system and local computer;
- get the TPRs, bring them into the classroom and return these after lessons to the store.

4 Guidelines for Technical preparation for TPR integration to the learning process

In this section is for you if you need technical guidelines, recommendations (1) how to create a suitable educational environment for TPRs, (2) how to overcome physical limitations with technical support and (3) how to create inclusive, ethical and cybersecure learning with using TPRs.

4.1 Suitable Educational Environment for TPRs

Creating an optimal classroom environment for TPRs is crucial for their effective participation in the learning process. Different TPRs models have varying capabilities in terms of movement, vision, and audio; however, they generally have limitations compared to human abilities. Ensuring that TPRs can navigate the classroom independently, have a stable Wi-Fi connection, and are positioned to see and hear adequately is essential. Additionally, addressing

potential obstacles, maintaining good lighting, and ensuring high-quality audio communication are critical for supporting both academic and social interactions. This section provides detailed recommendations on how to prepare the classroom environment to maximise the effectiveness of TPRs in educational settings.

4.1.1 Ensuring that TPRs can move independently.

Before a TPR enters the room, it is essential to verify that the space is suitable for the robot to navigate independently. Ensuring that TPRs can move freely without encountering obstacles is crucial. Common barriers include:

- Chairs and tables;
- Cables connecting devices (e.g., external TVs with HDMI, laptop charging cables, power cords, extension cords);
- Narrow gaps between furnishings (e.g., tables and chairs) that TPRs cannot pass through;
- Other belongings obstructing the movement path;
- Elevation changes in the room (e.g., thresholds) that TPRs cannot traverse without assistance.

Classrooms with movable furniture are most conducive to creating ideal learning environments where TPRs can operate independently. In cases where furniture is fixed (e.g., computer labs), testing is necessary to determine whether there is adequate space for TPRs to manoeuvre.

TPRs can only move independently if their batteries are charged. Therefore, a charging station must be added to the classroom for sessions longer than the battery's lifespan. While charging, TPRs can be used for telepresence functions (hearing, talking, and seeing) but not for navigating the classroom. When planning lessons with TPRs, it is essential to select activities that can be conducted while the robots are charging. To optimise the placement of charging stations, consider the following questions:

- Where are the power sockets located?;
- Will TPRs be able to see the screen and easily hear the teacher?;
- Does an additional power cord enable the charging station to be placed in a location that enhances visibility and audibility for the TPR-mediated person?.

Stable lighting conditions are crucial in the classroom. When driving around the room, TPRs operator may need to adjust camera settings frequently to maintain good visibility. The following recommendations can help ensure good visibility:

- Keep window coverings drawn forward;
- Switch on room lights to ensure even light distribution, especially in rooms without windows, as this prevents the room from being too dark.

The quality of the Wi-Fi connection is critical to the success of a TPR session. A TPR operator will experience a smooth drive and high-quality video and audio if the Wi-Fi connection is stable. Both the classroom and the remote locations must have good internet quality. Public Wi-Fi is generally unsuitable for connecting TPRs from the classroom for two main reasons: public Wi-Fi is not secure, and it often lacks the necessary upload and download speeds. Using a dedicated Wi-Fi network exclusively for TPRs is preferable.

4.1.2 Ensuring seeing shared content and good audio communication

When a mediated student enters the lesson, the robot is often positioned at the end of the room, which can lead to issues with hearing audio and seeing shared content. The primary problem with hearing is that TPRs microphone is unsuitable for picking up sound from a long distance. While increasing the microphone volume is possible, it also amplifies the noise level. TPRs usually have built-in noise reduction and echo-cancelling systems, but these systems further process the audio as the volume increases, resulting in decreased audio quality. Additionally, the mediated student may find it challenging to follow conversations if multiple people are talking simultaneously, further complicating the audio experience.

Another audio issue is that a mediated person in a TPR can only listen to one person at a time. The TPRs microphone's directional pattern picks up sound from all around TPRs, meaning the operator can hear people from both the front and the back. In a room full of people, TPRs microphones capture all sounds, making it difficult for the operator to discern who is speaking and what is being said. This can be particularly problematic during group discussions or when multiple students are asking questions simultaneously.

When TPRs are placed at the far side of the room, the operator cannot see the screen or whiteboard effectively due to the following reasons:

- The distance from the screen or whiteboard is too great for clear viewing.
- Other students may obstruct the view.

Figure 1. Example of blocked view of TPRs

In cases where the presenter (teacher or students) is at the front of the room, the location of the TPRs must meet the following criteria:

- A short distance from the presenting person;
- A clear view of the screen or whiteboard;
- Only one person should speak at a time.

To enhance the effectiveness of TPRs, it is essential to ensure that the robot is positioned in a way that maximises both audio and visual access, allowing the mediated student to fully participate in the lesson.

4.1.3 Recommendations for the environment preparation

Recommendations for the Surrounding Environment in using TPRs in classroom:

- Ensure minimal gaps where TPRs drive through are at least 50 cm wide. The gaps between chairs should be wider, as chairs often change position during lessons;
- Place cables near the walls and out of the areas where TPRs drive to prevent any entanglements;
- Analyse possible moving trajectories. If any thresholds or other floor drops or raisings exist, test to determine whether TPRs need assistance to navigate these obstacles;
- Provide charging stations in locations where TPRs can see and hear presentations and participate in active discussions or group work that does not involve driving. This ensures that TPRs remains functional throughout longer class periods;
- Maintain even lighting in the classroom to support TPRs orientation and ensure the mediated person can see clearly. Avoid shadows and excessively bright spots that could affect visibility;
- Ensure a stable Wi-Fi connection throughout the classroom so that the connection to TPRs is not interrupted. Public Wi-Fi is generally not suitable due to security and performance issues; a separate, dedicated Wi-Fi network for TPRs is preferable.

These recommendations will help create a supportive environment for TPRs, allowing them to function effectively and ensuring a seamless integration into the classroom setting.

4.2 Technical support

This section addresses how to overcome physical limitations when integrating TPRs in the classroom. While section 4.2 covered general physical limitations, this section delves into specific challenges encountered during the learning process. For instance, TPRs that are not stationary require assistance to navigate thresholds and elevators. Additionally, TPRs operators cannot manipulate classroom computers, AV systems, or handle physical objects due to the lack of hands. To mitigate these issues, a support person, referred to as an assistant, is essential. This section outlines the role and preparation of the assistant, offers recommendations for conducting lessons with TPRs, and emphasises the importance of pretesting to ensure successful implementation.

Additional shortcomings in the learning process include:

- Non-stationary TPRs cannot independently navigate to the classroom; they need assistance to cross thresholds and use elevators;
- TPRs operators are unable to manipulate classroom computers or start sharing learning content on projectors or TV screens;
- They cannot adjust classroom light, audio, and video systems;
- The learning environment must be prepared to make it suitable for TPRs participation;
- Most TPRs lack hands and, therefore, cannot handle objects or demonstrate physical materials.

To overcome these shortcomings, a support person, referred to as an assistant, is needed.

4.2.1 The Assistant Role Description

To enable sessions to run smoothly and efficiently, it is sometimes necessary to have the support of a team member or assistant in the classroom. Their role can be crucial in ensuring that everything runs smoothly from start to finish when administering TPRs. The assistant's help is regularly needed for the following tasks:

- **TPRs Logistics**: Transport the TPRs into the classroom before the session and return them to storage afterward;
- **Session Preparation**: Ensure stable Wi-Fi connectivity and place the charging station appropriately;
- **Connection Control**: Confirm that audio and video functions are working properly and that the TPR operator's audio volume is suitable for the session;
- **Classroom Layout Preparation**: Assist in setting up the classroom layout, as the teacher in the TPR cannot do this;
- **Audio Setup**: If needed, select and set up appropriate microphones and speakers;
- **AV System Operatio**n: If required, start the classroom computer and AV system, including room controls, projectors, or TV screens, for sharing learning content;
- **Instant Feedback**: Provide immediate feedback during lessons about audio volume levels, connection quality, etc;
- **Hands-on Assistance**: Act as the TPR's hands when needed, such as showing teaching tools to the students;
- **Technical Support:** Support the TPR operator during the lesson by solving any issues that arise, such as a TPR getting stuck, changing Wi-Fi settings, low battery, or needing a reboot.

4.2.2 The Assistant preparation

Assistant training is necessary before one can effectively assist with TPRs operations. The assistant must be knowledgeable in the following areas:

- **Basics of a TPR Function:** Understanding the fundamental operations of TPRs;
- **Essential Environment**: Knowing what kind of environment is required for the TPR to move, listen, speak, and see effectively;
- **Technical Skills**: Learning how to manoeuvre the TPR, change Wi-Fi settings, reboot the system, and place it into charging stations.

During the learning process, it is crucial for the TPR operator and the assistant to maintain a separate communication channel (e.g., chat in Teams, Discord, Messenger) for instant messaging.

When recruiting a student to serve as an assistant, consider the following recommendations:

- **Classroom Access**: Ensure that the student can access the necessary classroom.
- **Convenience and Motivation**: Arrange a schedule that is convenient for the student and motivates them to assist during the agreed period.
- **Extended Periods**: If the assistant is needed for extended periods, consider recruiting more than one student to share the responsibilities.

4.2.3 Recommendations for conducting the lesson with the help of the Assistant

To ensure the success of lessons involving TPRs, it is crucial to meticulously plan and test the lesson beforehand. If the assistant has prior experience with TPRs in educational settings, they can contribute significantly to the lesson design. Keep the following considerations in mind:

- **Clear Expectations**: Ensure that assistants are fully aware of what is expected from them;
- **Plan Testing**: Collaboratively test the lesson plan with the assistant. This step is vital to identify and address any potential issues before the actual lesson;
- **Involving the Assistant:** Including the assistant in the testing phase can uncover previously unnoticed aspects that might need adjustment.

During the planning phase, consider the following elements:

- **Classroom Layout**: Determine what changes in table and chair arrangements are necessary;
- **Location of TPRs**: Decide where the TPR will be positioned during the lesson;
- **Planned Activities**: Identify the learning activities that will take place;
- **Content Presentation**: Determine if the TPRs will present or share content, and if so, what technical solutions will be employed;

- **Classroom Size**: Assess the size of the classroom to ensure adequate space for TPRs movement and functionality;
- **Audio System**: Consider whether a classroom audio system is needed to support teachers and presenters effectively.

4.2.4 Recommendation for pretest

If a plan for integrating TPRs into the learning process is developed, conducting a pretest is essential to verify that everything functions correctly and to identify any areas needing improvement. Pretesting should be supported and include checks on the following aspects:

Access and Setup:

- Does the assistant have access to the classroom and can they open doors before the lesson?
- Does the assistant have access to the necessary software?
- Are external microphones working so the TPR operator can hear other participants?
- Is the TPR battery fully charged?
- Are TPRs access links available and accessible?
- Is the classroom suitable for TPRs participation? Consider a test drive to ensure the environment suits TPRs movement.

Content Sharing:

- Which computer will be used to share content on the classroom projector or TV screens?
- Can the assistant log in to the computer to share content with the classroom?
- Is the content on the slides visible (e.g., correct background, font colour, and type)?
- Are the projector or TV screens functioning properly?

Video Conference Sessions:

- Are the video conference links created and working?
- If audio is shared through the video conference, do the additional microphones, speakers, and cameras work?
- If using a whiteboard, is it functioning correctly?
- If using the video conference to transmit the TPR operator's voice, what kind of speakers are used to amplify the voice, and are they working?

Live Presentation Environment:

- Is the live presentation session working correctly?
- Is the audio of the live presentation session muted when necessary?

Ensuring these aspects are tested and functional will help guarantee a smooth integration of TPRs into the learning process, minimising disruptions and technical issues during actual lessons.

4.3 Inclusive, Ethical and Cybersecurity aspects of using the TPRs in learning.

This section addresses the critical considerations for ensuring inclusiveness, ethical practices, and cybersecurity when integrating TPRs into the learning process. Emphasising these aspects is crucial to creating an equitable and secure educational environment for all students, including those mediated through TPRs. This section discusses strategies to provide equal learning opportunities, maintain high ethical standards, and safeguard against cybersecurity threats, ensuring that TPRs are used responsibly and effectively in educational settings.

4.3.1 Inclusive Learning with the TPRs

"Inclusive" means that all students have equal learning opportunities, whether attending in person or mediated through TPRs. Both groups must be able to participate in all learning activities to achieve the desired learning outcomes. When a teacher is mediated via a TPR, the quality of instruction must remain equivalent to that provided by an in-person teacher.

To ensure inclusive learning with implementation TPRs, the following aspects must be addressed:

- Hearing and speaking capabilities;

- Design of learning content;
- Freedom of movement;
- Participation of all students in every learning activity;
- Socio-economic factors, such as access to a suitable and stable internet connection.

Aspects related to movement and internet accessibility are discussed in Suitable Learning Environment for TPRs.

A critical element of inclusion is ensuring everyone has the opportunity to hear and be heard. All participants must be able to listen to others, whether they are in-person attendees or mediated by TPRs. Depending on the classroom size, there may be instances where TPRs cannot hear in-person participants and vice versa. Table 2 outlines potential problems and their solutions.

Table 2. Potential Audio Communication Issues and Solutions for TPR-Mediated Classrooms.

Situation	Possible problems	Solution
The teacher is a TPR-mediated, and students don't hear or understand what the teacher is saying.	A TPR speakers are too weak.	Share audio via videoconference to the classroom AV system.
The a TPR-mediated teacher must hear the students' comments, questions, or answers.	A TPR microphone range does not cover	A teacher must move closer to the student. The downside is that moving to a new location takes time and energy. Use a microphone system that allows quick microphone transfer (e.g. CatchBox, handheld microphone). That's means, that you must use external channel to share classroom audio to TPR-mediated student. Video conference-based solution can use for that.
The student is a TPR-mediated and wants to hear fellow students' comments, questions, or answers.	A TPR microphone range does not cover all classroom	Use a microphone system that allows quick microphone transfer (e.g. CatchBox, handheld microphone). That's means, that you must use external channel to share classroom audio to TPR-mediated student. Video conference-based solution can use for that.

4.3.2 Ethical aspects

When integrating TPRs into the classroom, it is crucial to address several ethical considerations to ensure their responsible use. This section discusses key ethical issues, such as explaining the purpose of TPRs to all participants, maintaining appropriate distances, using zoom and recording functions responsibly, and ensuring user authentication. By adhering to these ethical guidelines, educators and students can foster a respectful and secure learning environment that protects the privacy and comfort of all participants while leveraging the benefits of TPRa technology. The first and most crucial step is to explain the purpose of the TPR in the lesson to all participants. This includes explaining to students:

- Why the teacher or student is using the TPR;
- The goal of using the TPR.

If students are unfamiliar with TPRs, a brief introduction is appropriate to clarify any misconceptions and alleviate any fears or discomfort related to robots (robo-morphism).

Several ethical aspects must be addressed while operating TPRs. This section outlines the most relevant considerations:

- **Maintaining Appropriate Distance**: When driving the TPR, it can be challenging to estimate the distance between the robot and other objects or individuals. The TPR operator should avoid getting too close, which might cause discomfort. Asking for feedback on the appropriateness of the distance is advisable;

- **Ethical Use of Zoom**: The zooming function on TPRs should be used responsibly. Some models allow for multiple magnifications, providing detailed views that can exceed human capability. Avoid using zoom to capture inappropriate images;
- **Camera and Microphone Usage**: Muting the microphone when not speaking is recommended. There are situations where turning off the camera is necessary, such as during emergencies or to protect privacy. Generally, the TPR operator's face should remain visible, but temporary camera shutdowns are acceptable when justified;
- **Photography Limitations**: Some TPRa models allow for taking screenshots secretly. Ethical use requires obtaining permission from participants before taking any screenshots, ensuring they are not used for malicious purposes;
- **Background Visibility**: The TPR operator should be mindful of what is visible in the background while operating remotely. Following camera configuration recommendations (see Section 4.3) helps maintain appropriate visuals. Horizontal screens on TPRs may display more background than intended, so careful setup is essential;
- **User Authentication**: Verify the identity of the person using the TPR. With advancements in technology, there are risks of impersonation through deep fake audio and video. Ensure that the classroom participants' privacy is protected by using secure methods, such as operating from a separate room and using headphones;
- **Appropriate Usage Times**: TPRs should only be used for their intended educational purposes and during agreed-upon times. Using TPRs as surveillance tools to observe others without their knowledge is unethical.

By addressing these ethical considerations, the integration of TPRs in the learning environment can be conducted responsibly, maintaining trust and respect among all participants.

4.3.3 Cybersecurity aspects

Ensuring cybersecurity is paramount when integrating TPRs into the learning environment. This section outlines potential cybersecurity challenges and offers strategies to mitigate risks, safeguarding both data and privacy. Using TPRs on public Wi-Fi networks is discouraged due to low cybersecurity standards. Instead, it is recommended to use private, password-protected Wi-Fi connections to minimise vulnerabilities and reduce the risk of unauthorised access and data breaches.

When TPRs are used outside the classroom, it is essential to consider the environment. Teachers and assistants must ensure that no sensitive information is inadvertently captured by the TPR. Adjusting the room setup can help maintain privacy and prevent the disclosure of confidential information.

Each TPRs session should generate unique access links that are valid for a limited time to prevent unauthorised access. Sharing these links through one-to-one communication minimises the number of people who can access them. Creating weekly or monthly access links ensures controlled access over time for recurring lessons. Unauthorised use of access links can lead to sensitive information being exposed or the TPR being moved without permission.

If a connection is made outside of planned sessions, there is a risk that the TPR operator could overhear sensitive information. While some TPRs models send audio notifications when someone connects, others allow these notifications to be turned off, enabling secret connections. It is crucial to manage these settings to protect privacy.

Lastly, unauthorised movement of the TPR can occur, allowing it to navigate and observe areas without permission. Ensuring strict access controls and monitoring usage can prevent such unauthorised activities.

4.3.4 Recommendation to inclusive, ensure ethical and cybersecurity use of TPRs in the learning process.

To effectively integrate TPRs in educational settings, it is essential to adopt practices that promote inclusivity, uphold ethical standards, and ensure cybersecurity. The following recommendations provide a framework for planning and conducting lessons with TPRs, ensuring that all students can participate fully and safely.

When planning a learning process, ensure that all students, including those mediated by TPRs, can engage in the activity. Agree on the methods of participation for TPR-mediated students and prefer digital tools such as web-based interactive boards and collaborative writing platforms. For paper worksheets, use a larger font size (18 pt) or provide digital copies to accommodate TPR-mediated students. Adjust activities to ensure that TPR-mediated students can achieve the same learning outcomes as their in-person peers.

During lessons involving TPRs students or teachers, it is crucial to maintain ethical behaviour. Avoid actions that intentionally block the TPR's movement or vision, and always seek permission before moving the TPR to another location, even when assistance is required.

Guidelines for teachers to ensure the ethical and secure use of TPRs include:

- **Explain the Purpose**: Clearly explain to students what a TPR is, why it is being used, and the goals of its use;
- **Introduce Ethical Practices**: Educate students on ethical practices related to TPR usage, such as respecting privacy and maintaining appropriate behaviour during lessons involving TPRs;
- **Control Access**: Generate access links for TPR sessions for a limited period. This task can be handled by an assistant or the person responsible for managing access;
- **Limit Link Distribution**: Share access links only with those who need them to prevent unauthorised access.

By following these guidelines, educators can create an inclusive, ethical, and secure learning environment that enhances the educational experience for all students, whether they are physically present or participating via TPRs.

APPENDIX A. Suitable environment for operating TPRs

This section provides guidelines for creating an optimal environment for operating TPRs remotely. It outlines recommendations for selecting a suitable room that minimises background noise and distractions and details the technical setup necessary for effective TPRs communication, including sound quality and camera configuration. Key aspects include the importance of good audio equipment, multiple screens in classrooms, and proper camera positioning and lighting to ensure clear and effective interactions between the TPR operator and the classroom.

1. Recommendation for the TPRs Educational Environment

On the remote side, where the person operating a T PR is located, we must create an environment that supports mediating a TPR operator into another room. When choosing the room or place to be in the session with a TPR, consider the following recommendations:

- Avoid loud noise from the background;
- Avoid bright light from the background;
- Use a room where there are no other distractions;
- Avoid operating TPRs in public places (e.g. cafeteria) or while travelling by car, train, or bus.

It's necessary to create an environment where you, as a TPR operator, can focus all your attention on manipulating a TPRs and interacting with people in the classroom.

2. The technical solution for operating TPRs

Good sound quality is essential when working with TPRs. Therefore, if possible, use headphones with a noise-cancelling system. The question, "What type of communication through a TPR will you participate in?" needs to be addressed. The minimum requirements for a TPR for one-to-one communication include a computer with an integrated microphone, speakers, and a web camera. The recommended setup should feature a high-quality web camera with a built-in microphone and external speakers or headphones.

When using a TPR in a smaller classroom and sharing learning content with students, it is crucial to use two screens. One screen should have interactive capability (e.g., an iPad) to enable annotations if needed. In larger classrooms, video conference software can be used to share audio with all students through the classroom AV system. Additional headphones may be useful for listening to a TPR audio if needed.

Table 2. What type of information is shared with TPR, and what type of room?

Criteria for communication via TPR	**Recommendations for technical solutions**
Mediate your video and voice. Won't share any content (etc., presentation, photos, video, interactive questionnaire)	Minimal requirements: computer with: • integrated microphone. • integrated speakers. • integrated web camera. Recommended requirements: • high-quality web camera with a built-in microphone. • external speakers or headphones.
Mediate your video and voice and share any content (etc., presentation, photos, video, interactive questionnaire) in small size (class)room	Minimal requirements: computer with: • integrated microphone. • integrated speakers. • integrated web camera. Recommended requirements: computer with: • two screens. One screen with interactive capability (e.g. iPad) • high-quality web camera with a built-in microphone • external speakers or headphones

Mediate your video and voice and share any content (etc., presentation, photos, video, interactive questionnaire) in large size (class)room	Recommended requirements computer with: • two screens. One screen with interactive capability (e.g. iPad) • high-quality web camera with a built-in microphone • two headphones

3. Recommendation for the Configuring Camera

Usually, only the mediated person's face is presented on a TPR screen. Proper video framing enhances communication quality and access to mediated human interaction. Key aspects include composition, framing, camera angle, and correct lighting.

Composition: When mediating through a TPR, ensure your face occupies as much of the screen as possible. Position yourself in the centre of the frame, with your eyes two-thirds of the way up. Leave minimal space above your head, at most two finger widths, to avoid distracting dead space. Pay attention to composition to prevent parts of your face from cropping off due to a TPR screen's framing.

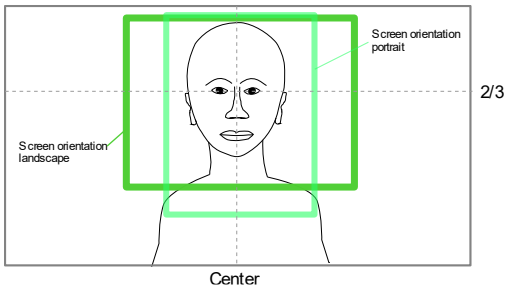

Figure 2. Recommended frame size for TPRs whit portrait and landscape screen orientation.

Face Size in the Frame: Make your face as large as possible on a TPR screen for optimal representation. Use a neutral but contrasting background. Adjust the zoom of your webcam to change the size of your face. Use the webcam manufacturer's software, a manually zooming camera or software that creates a virtual camera (e.g. OBS Studio). Be careful not to zoom in too much so that pictures of your chin or head are not cut off.

Camera Angle: Position your web camera at eye level to be an equal communication partner while mediating through a TPR. Elevate your computer with a stand or suitable materials if using a laptop-integrated web camera.

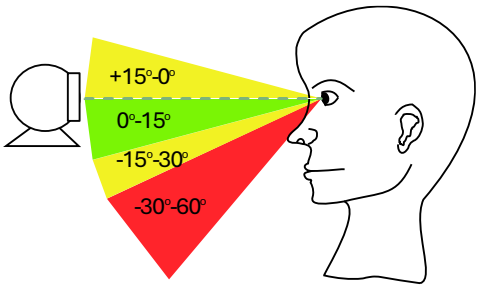

Figure 3. Web camera in eye level

Light Direction: Correct lighting ensures that communication partners can clearly see the mediated person on a TPR screen. The light source should be in front of the person and behind the web camera. A light source behind the mediated person can interfere with camera sensors, making the video dark or unclear. When using natural light (e.g., from a window), ensure it is directly in front or at an angle; light from the side can cast half the face in shadow.

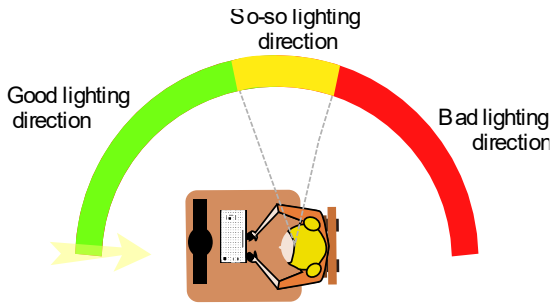

Figure 4. Light direction.

APPENDIX B Cognitive limitations

This section addresses the challenges of cognitive load associated with using TPRs in educational settings and provides strategies to mitigate these limitations. The section explores effective methods for sharing content in one-to-one and one-to-many communication scenarios, ensuring optimal visibility and interaction. Recommendations are offered for minimising cognitive load, including practical steps for preparing the learning environment and using technology efficiently. Presenting content through TPRs often requires the operator to manage multiple tasks simultaneously, which can be cognitively demanding. By following these guidelines, educators can create a more effective and engaging learning experience for students using TPRs.

1. Recommendation for remote computer screen layout

Using an external channel to deliver a presentation to the classroom introduces the risk that a TPR operator may lose sight of a TPR interface and, consequently, classroom awareness. To mitigate this risk, it is advisable to use two monitors or a single large monitor (such as a 4K display). This setup helps maintain visibility of all necessary application windows simultaneously, ensuring the operator remains situationally aware.

A TPR operator must arrange the layout of their screens to ensure that all critical application windows are visible at once. This arrangement is crucial for maintaining awareness and effective classroom management. In a typical lesson where the teacher is mediated through a TPR and uses an external channel to share learning content, the following application windows should be visible at all times:

- A TPR interface;
- Communication channel with the assistant (technical support);
- Shared content (presentation);
- External video conference system.

Maintaining situational awareness in this manner helps the operator perform better by reducing cognitive load and ensuring smooth interaction between the remote and classroom environments. By carefully managing these application windows, the operator can respond promptly to any issues, maintain effective communication with the classroom, and deliver a seamless educational experience.

Additionally, the operator should conduct regular checks and practice sessions to familiarise themselves with the setup, ensuring that they can quickly and efficiently navigate between the necessary applications. This preparation will further enhance their ability to manage the classroom effectively and maintain a high level of engagement with the students.

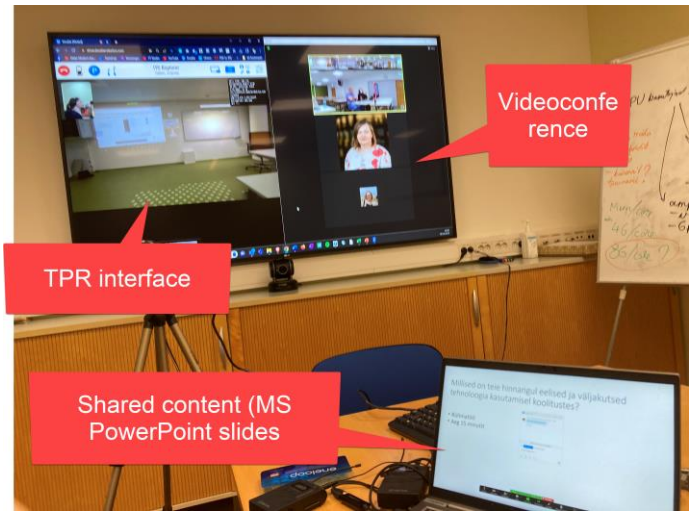

Figure 5. Example of Screen layout

2. Recommendation for lowering the cognitive load

To reduce cognitive load in the learning process, a TPR operator can take several steps to ensure effective operation and communication:

- **Familiarise with a TPR User Interface**: Spend adequate time learning the TPR's user interface to ensure smooth navigation and operation during sessions;

- **Practice Driving the TPR**: Regular practice in driving a TPR enhances proficiency and reduces the likelihood of operational errors;
- **Select a Quiet Operating Location**: Choose a quiet spot for operating a TPR to minimise distractions and improve focus;
- **Plan Note-Taking Strategies**: Think through effective methods for taking notes during the session, ensuring important information is captured without disrupting the operation;
- **Arrange Necessary Application Windows**: Simultaneously display all necessary application windows, including a TPR user interface, slide-sharing platform, and any other relevant applications, to maintain awareness and control;
- **Choose an Appropriate TPR Model**: If possible, select a TPR model that best suits the specific session's needs, considering factors such as audio and video quality, mobility, and interaction capabilities;
- **Practice Presentation and Manipulation**: Before giving a presentation with a TPR, find time to practise both presenting and manipulating a TPR to ensure smooth delivery.

3. Presenting content on TPRs screen

New learning content is regularly presented on a projector or TV screen during the learning process. This content typically includes presentations (e.g., PowerPoint, Keynote, Google Slides), text documents, or videos. Sharing content mediated by a TPR imposes a significant cognitive load on a TPR operator, who must manage both a TPR interface and the content-sharing process simultaneously.

Content sharing can be categorised based on communication types: (1) In one-to-one communication, content can be presented directly on a TPRs screen; (2) In one-to-many communication, content is shared via external channels, often requiring assistance from classroom support personnel.

In one-to-one communication, sharing content via a TPR screen is easy. Different TPRs models offer different options for sharing content, including sharing hosted computer screens, on-screen text, web pages and sharing satellite cameras via web page links. Some models also feature touch-activated screens that enhance user interaction and control. This versatility makes TPRs screens a valuable tool for seamless information sharing. In addition, the intuitive user interface ensures that even those with limited technical knowledge can use them effectively. In one-to-many communication, external content sharing is often necessary. Assistance from support personnel, such as a support worker or student, is required to start content sharing from the teacher's computer and activate the local projector or TV screens.

The following external classroom content-sharing channels can be used while presenting learning content with TPRs:

- Videoconference-based solutions (e.g., Zoom, MS Teams);
- Live presentation environments (e.g., Live MS PowerPoint, Miro).

The presenter initiates the presentation and shares it remotely in videoconference meetings. The shared presentation is then displayed on a classroom projector or other multimedia screens. Table 1 provides a checklist of essential activities to ensure effective content delivery.

Table 1. Checklist for Video Conference Solutions.

Activities on the remote side:	Activities in the classroom:
1. Start a video conference meeting. 2. Share the access link with the assistant (student or co-worker). 3. Mute microphone and webcam. 4. Share content (e.g. slides) in meetings.	1. Join a videoconference meeting from the on-site computer (e.g., the stationary computer at the teacher's table) 2. Start the local projector/TV screens so all people in the classroom can see the slides.

The videoconference solution offers the capability to use the built-in whiteboard for adding additional annotations to slides during live sessions. This functionality enhances interactivity and allows for real-time feedback and updates during presentations. Additionally, we can utilise various web services that enable live presentations, providing flexibility and accessibility for different types of content delivery. Suitable online tools include Online MS PowerPoint 365, which allows for live presentations (available to Business or Education users), and Miro board (free for educational users). These tools support collaborative engagement and facilitate dynamic presentations with interactive features.

The presenter must initiate the live presentation on the remote side, ensuring that all necessary materials are prepared and accessible. The same live presentation must be projected onto a projector or other multimedia screen in the classroom, ensuring that all students can view the content clearly. This setup requires proper coordination and testing to ensure seamless integration between remote and in-class technologies.

In some applications, there may also be a need to mute the microphone and webcam to avoid distractions or feedback issues during the presentation. This step is crucial for maintaining audio clarity and ensuring that the focus remains on the content being shared. Additionally, presenters should be familiar with the technical aspects of these tools to troubleshoot any issues that may arise during the session. By effectively utilising these technologies, educators can create a more engaging and interactive learning environment that benefits both remote and in-class students.

4. Redesign learning environments

In preparation for integrating a TPR into the learning process, making relevant changes in the classroom environment is crucial to further reduce cognitive load. The following recommendations can help create an optimal learning environment:

- **Prepare Low-Noise Learning Environments**: Ensure that the learning environment has low noise levels. High background noise can make it difficult for the speaker to be heard clearly, affecting the quality of communication;
- **Provide Clear Instructions to Students**: Give explicit instructions to students using the TPR, outlining their roles and responsibilities to avoid confusion;
- **Emphasise One-at-a-Time Speaking**: Explain to all participants the importance of speaking one at a time. This helps a TPR operator distinguish between different speakers and follow the conversation more effectively;
- **Offer Instant Audio Feedback:** Provide immediate feedback to a TPR operator about audio levels, making adjustments as necessary to ensure clear communication;
- **Optimise TPR Sound Levels**: Adjust a TPR sound levels in the classroom to ensure optimal audio quality, as a TPR operators may not be aware if the audio level is too low or too high;
- **Assist in Optimal TPR Placeme**nt: Help a TPR operators position a TPR in the best spot within the classroom to ensure they can hear and speak effectively, facilitating better interaction and understanding;
- **Consider Robot Height in Seating Arrangements**: When arranging classroom chairs and tables, consider the robot's height. For example, place the chairs in an arc so that everyone can see the shorter robot's face, enhancing engagement;
- **Maintain Adequate Lighting**: Keep the classroom lights on during the lesson; avoid dimming the lights as it may hinder visibility for a TPR operator.

By following these comprehensive guidelines, TPRs operators can effectively manage their cognitive load, leading to a more productive, engaging, and seamless learning experience for all participants.