



Hybrid Classroom at GSOM SPbU

Design approach and technology
setup overview



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Who this report is written for and why

This document reports on the experience of designing a hybrid classroom at the SPbU Graduate School of Management. We understand a hybrid classroom as a set of technologies that enable in-class and distance learning at the same time. Our experience has shown that hybrid classroom design goes beyond mere stitching together various types of hardware and software. **A comprehensive solution goes hand in hand with teaching methodology and meets specific needs of those involved in the learning process.**

Having designed a hybrid classroom from scratch and gained precious insights, we decided to share our experience with those of our colleagues who have yet to introduce new technologies into their classroom. **This report will be particularly useful for university staff responsible for digital transformation and transition to hybrid learning, i.e. vice-rectors for IT and heads of IT departments.**

The report gives an overview of our approach to hybrid classroom design and a detailed description of the outcomes, i.e. the setup of the GSOM SPbU hybrid classroom and the results of implementing the solution. In this report you will find:

- ✔ Design principles of a hybrid classroom
- ✔ Basic hybrid classroom requirements
- ✔ Elements of a technical solution for hybrid learning
- ✔ Technical requirements and classroom design
- ✔ An example of a technology setup and a management system

The challenge: learning during and after the pandemic

In March 2020, at the very beginning of the pandemic, GSOM SPbU switched to distance learning. The challenges that the Business School encountered while transitioning to online learning were not limited to organizational and technological issues. An even greater challenge was adjusting the content to the new format.

Besides, we feared that the pandemic would last for a long time, as it eventually did. Switching to online learning left the Business School without an important learning aspect – campus experience. It became obvious that a gradual return to in-class learning was needed, although many international and non-resident students were still unable to come back to St. Petersburg. Thus, we needed a format that could accommodate both in-class and online students.

What the Business School needed was a comprehensive solution that would simultaneously bring together the instructor, in-class and remote students.

To do this we needed to create:

- a special methodology for how to deliver learning content and to test knowledge within the blended mode;
- a special space, i.e. a hybrid classroom, that technologically enables the blended mode;
- and a UX-solution that would make working with the new system as smooth as possible.

The solution had to take into account the key principles of hybrid learning:

1. Students should get **equal learning opportunities** regardless of the preferred learning format.
2. **In a digital environment, methodology and technology are inextricably connected:** methodology generates a need for technical implementation, whereas infrastructure sets the limits of what is possible.
3. In a hybrid classroom, solutions are **a set of technically simple and easy-to-understand tools** for faculty and students.
4. **A seamless digital learning environment** is a benchmark for developing digital solutions when there is an oversupply of technology.
5. A hybrid classroom should be **economically viable** in both its production and its use.

The resulting hybrid classroom setup has incorporated teaching tools, new technological solutions and a user-friendly interface. The classroom concept was first implemented at the GSOM SPbU Mikhailovskaya Dacha campus and tested for two years. After a number of iterations and improvements, the setup is being successfully used in the existing classrooms of the Business School. Additional classrooms are also being equipped, creating a school-wide technological platform that is needed to integrate a hybrid learning methodology for the post-pandemic environment.

Basic requirements for a hybrid classroom

The new hybrid teaching format calls for a technical solution – a space, hardware and software that allow to teach students simultaneously in-class and online. Having studied some of the world's best university practices we found out that depending on the university's needs technical solutions can vary in their complexity from simple video conferencing software installed on an instructor's computer to all-round TV studio-like facilities.

The first technical requirement that is equally relevant at every level of the solution is a stable Internet connection and an all-campus Wi-Fi network. Moreover, both in-class participants and online students should be provided with an internet-connected device.

The solution used for hybrid learning should meet the basic needs and objectives of the instructor and students both online and offline. The core elements of a solution that address all of the instructor's and students' needs before, during and after learning in a hybrid classroom are listed on the right.

Read more on functionality of hybrid classrooms and some of the world's best university practices in the ["Hybrid Learning In Universities Across the World" report by GSOM SPbU and Moscow City University.](#)



Basic requirements

Image: video conferencing hardware and software which allows instructors and students to see each other's face and interact naturally while learning.

Sound: hardware and software for transmitting speakers' voice over Internet connection, allowing to hear each other and communicate.

Presenting information: hardware and software for displaying learning content, allowing to share various types of learning media (slides, video, audio, etc.) and to engage in synchronous interaction (spreadsheets, etc.) simultaneously online and offline.

Digital environment (video conferencing and LMS): digital environment and software for managing the learning process and course administration. The instructors need these technologies to organize their classes, store, edit and share learning content, which in turn should be readily accessible for students.

Systems management: solutions that allow the instructor to control hardware and software before, during and after class. They are designed to manage all hybrid classroom systems autonomously or assisted by an IT specialist, and to access class content.

The GSOM SPbU hybrid classroom setup

The GSOM SPbU hybrid classroom setup has been developed by a cross-functional team featuring IT specialists, instructors, methodologists, anthropologists and a designer. The default setup has been applied to four more hybrid classrooms on the GSOM SPbU city campus and out-of-town Mikhailovskaya Dacha campus (May 2022).



Core technologies of a hybrid classroom

The interaction between all peripheral devices in a classroom, image and sound processing, and Internet data transmission are all assured by a stack of equipment securely stored in a server rack cabinet. Each of the units is critical and engages in a constant interaction with one another, which calls for providing a high level of ingress protection and keeping them close to each other.

Core technologies include:

- Classroom controller
- Video matrix switch
- Audio processor
- Presentation and streaming computers
- Router
- Power controller

Image

- Instructor facing camera
- General view camera

The hybrid classroom is equipped with an auto-tracking camera that gives a close-up shot of the speaker and follows them across the classroom. A general view camera is used for an overall shot of the classroom. The solution enables the instructor to move around freely and helps online and offline students maintain eye contact.

Sound

- Microphone array
- Sound reinforcement

For classroom sound transmission a beamforming microphone array is used, which captures multi-channel audio from anywhere in the classroom. An audio processor then removes background noise, enhances the active speakers' voices and gives priority to voices coming from specified areas. The technology helps the instructor and students move more freely around the classroom without the constraints of wearable microphones.

Presenting information

- Classroom PC
- Lectern display
- TV panels
- Projector screens
- Interactive whiteboard
- Displays
- Document camera

The classroom is equipped with two TV panels facing the instructor that display online participants and the active online speaker. The two projector screens behind the instructor's back are used to display learning content and online participants. This allows the instructor to see online participants at the end of the class, whereas in-class students can see the online participants behind the instructor's back.

Depending on the operating mode, the interactive whiteboard can serve as an additional display, as a tool to add an extra "layer" over an existing presentation or as a separate input device to feed in visuals to the shared stream.

Content can be accessed from the classroom's presentation PC, document camera or interactive whiteboard.

Digital environment

Classes are organized and held with the help of two digital platforms, Microsoft Teams and Blackboard. Collaboration between online and offline participants is assured by additional software such as online document editors, Kahoot, Mentimeter, Miro, etc.

Systems management

A controller serves as a single classroom control center. Users can gain access to control via a touch pad on the instructor's desk. The instructor can automatically launch a required set of equipment by selecting one of the hybrid learning modes.

Hybrid learning modes help execute scenarios such as "lecture & presentation", "discussion", "group work" and "online project presentation". The selected mode automatically forms video streams for the classroom displays and online participants, as shown in the example below.

Finally, the control panel allows to control lighting and doors in the classroom. Its simple and intuitive interface helps use the system without consulting the manual.



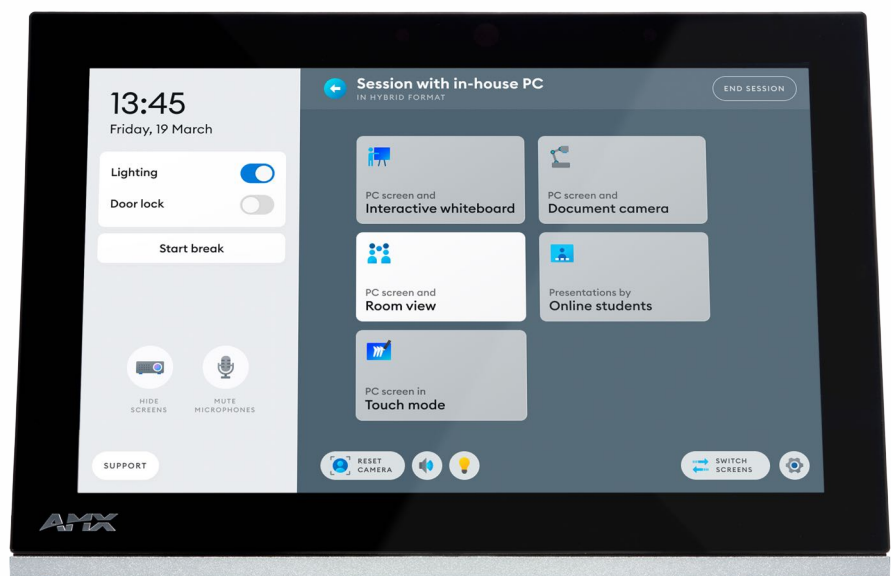
More scenarios can be found in the video "[Hybrid classroom of GSOM SPbU \(MD\): control panel](#)"



A hybrid classroom scenario example

The instructor has selected the "**PC screen and Room view**" mode to engage the hybrid classroom participants in a discussion based on the displayed content.

When using this mode the instructor expects that the content can be seen by both in-class and online students, and that all the participants are able to see each other and hold a proper discussion.

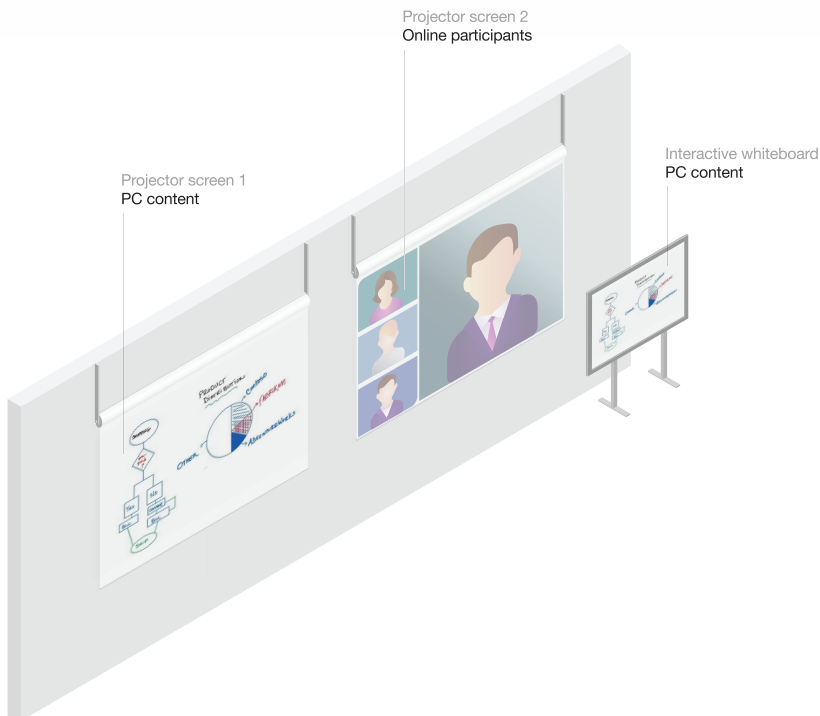


Online participants see a split screen:



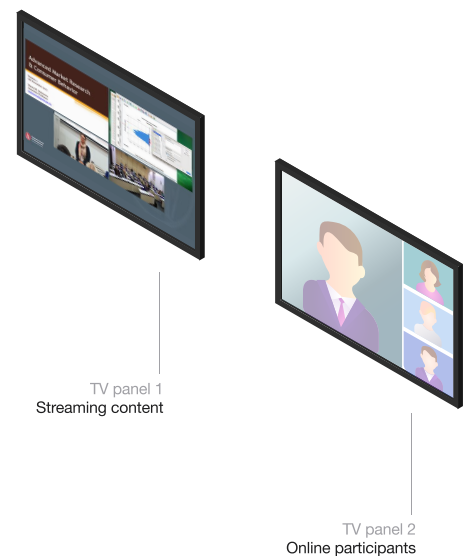
Online participants can hear in-class students through a ceiling microphone array. Background noise is eliminated, and up to five most audible voices are picked up from the discussion, with the priority given to the instructor's area.

What offline participants see:



In-class participants can hear online students through speakers; noise is eliminated, echo suppressed and audio normalized.

Instructor's TV panels:



Equipment specifications

Having designed the hybrid classroom setup, we came up with specific sets of equipment that could steadily work in conjunction. When selecting hardware we gave the priority to both reliable and value-for-money solutions. Below you will find a list of certain brands that have been tested in our classroom. However they can be substituted with their equivalents with similar functionality to fit a different hybrid classroom setup.

Image

Classroom video is captured by:

- AVER PTZ310N camera;
- Cisco video conferencing camera.

The cameras are fed into a video matrix switch.

Sound

Audio transmission, sound reinforcement, background and feedback noise removal, as well as sending audio signal from all sources to classroom speakers and over the Internet are assured by:

- Shure microphone array;
- Biamp Tesira Forte audio processor;
- Bosch mixer amplifier.

Presenting information

Information is displayed with:

- Two 3.5m x 2.5m projector screens;
- A 65" interactive whiteboard on a mobile stand;
- Two 75" TV screens;
- Two instructor's displays on the lecturer's desk.

Presentations are delivered with:

- A presentation PC on the instructor's desk with two displays: the main one and the backup one;
- Before streaming, video is processed with:
 - vMix live video streaming software;
 - Streaming HP Z620 computer with capture cards.

Systems management

The classroom equipment is controlled with:

- AMX controller;
- AMX Modero 10" touch panel.

The classroom equipment is switched with:

- Digis MMA 16N video matrix switch;
- Cisco router.

Video conferencing is controlled from:

- Lenovo ThinkSmart Hub 500 video conferencing PC.

Data exchange protocols

Besides the standard HDMI protocol, NDI is used to exchange video streams between cameras, the presentation computer and other peripheral devices. It helps the video matrix switch share an already formed video stream with vMix across a local area network. This allows to spread video mixing over two stages and create distance services for monitoring and quality control of shared content.

The ceiling microphone array communicates with the audio processor through DANTE.

Testing the GSOM SPbU hybrid classroom setup

The described technology setup has been implemented and tested in classroom 2229 on the GSOM SPbU Mikhailovskaya Dacha campus, 109 Sankt-Peterburgskoye shosse, build. A, St. Petersburg, Russia.

Operations experience summary

The users report that despite some concerns prior to the beginning of classes they witnessed a completely new approach to sound and video transmission. Moving around the classroom without losing contact with online students proved to be very practical. The regular classrooms seem significantly less convenient for communication and material presentation.

The first classroom prototypes were equipped with AMX Optima 8x8 video matrix switch, and this required adding extra twisted pair video receivers and transmitters that turned out to be the weak spot of the whole system. Our experience shows that sets of twisted pair receivers and transmitters often malfunction, and their quantity should be minimized.

A well-considered list of equipment combined with training for all the key participants of the hybrid classroom learning process allowed to minimize the number of requests for technical support.



Reportedly, during the semester only one in twenty classes required technical assistance.

95,8 m²

Total classroom area

4,8 m

Ceiling height

2

Exits

0

Windows



Layout

An amphitheater with a desk and a lectern

Appendix 1. Equipment summary

Display devices

Interactive whiteboard	TeachTouch 4.5 SE-R 65"	1 pcs
Interactive whiteboard stand	Onkron TS1551	1 pcs
Multimedia projector	Panasonic PT-DZ770	2 pcs
Projector screen	Projecta	2 pcs
Instructor's display	HP	2 pcs
Monitor showing online participants	LG 75UT640S	2 pcs
Teams Room station	Lenovo ThinkSmart Hub 500	1 pcs
Ceiling display mount	Onkron N2L	2 pcs

Video equipment

Auto-tracking camera	AVER TC310N	1 pcs
Camera	Cisco	1 pcs
Document camera	Samsung SDP-960	1 pcs
Work station (streaming)	HP Z620	1 pcs
PC (presentation)	Dell	1 pcs
Thin client	HP H1Y50AA	1 pcs
Matrix switch chassis	Digis MMA-16N	1 pcs
HDMI input card	Digis MMA-I4-UH	1 pcs
HDMI input card	Digis MMA-I4-BT	2 pcs
HDMI output card	Digis MMA-O4-UH	1 pcs
HDMI output card	Digis MMA-O4-BT	2 pcs
Twisted pair video receiver	Digis EX-D71R	8 pcs
Twisted pair video transmitter	Digis EX-D71T	7 pcs
Set of twisted pair video receiver / transmitter	Digis EX-D72-2l	1 set
Splitter 1x2	Digis SMI-14-2	1 pcs
Twisted pair USB receiver / transmitter	Digis EX-USB50-2	2 pcs
Twisted pair USB receiver / transmitter	Gefen EXT-USB2.0-SR	2 pcs
NDI encoder	BirdDog MINI	2 pcs
External capture card	AVerMedia ExtremeCap UVC BU110	1 pcs

Audio equipment

Audio switcher	Biamp TESIRAFORTÉ DAN CI	1 pcs
Microphone array	Shure MXA910W-60CM	1 pcs
Mixer amplifier	Bosch PLE-2MA240-EU	1 pcs
Wireless microphone	Sennheiser EW 352-G2-A-EU	3 pcs
Gooseneck microphone	AKG	1 pcs
Wall mounted sound system	Bosch LBC3200/00	8 pcs

Control system

Controller	AMX NI-3100	1 pcs
Control panel	AMX Modero X 10"	1 pcs
Power distribution unit	AMX NXA-PDU-1508-8	1 pcs
Light control interface	Lutron QSE-CI-NWK	1 pcs
Dimming control unit	Lutron QSG	1 pcs

Additional equipment

Network switch	Cisco	1 pcs
Socket strip 19"	R-16-8S-V-440-1.8	1 pcs
Uninterruptible power supply	APC	1 pcs

Contacts



Teaching Excellence Lab
at the Graduate School of Management,
St. Petersburg University

The Graduate School of Management at St. Petersburg University is home to the Teaching Excellence Lab. The Lab develops and integrates innovative teaching methodologies and one-of-a-kind digital tools into learning as well as trains and upskills the faculty.

The launch of the Teaching Excellence Lab in 2022 is a major step towards GSOM SPbU's strategic goal of becoming Russia's leading business school with a unique learning environment and faculty dedicated to continuous improvement by 2025.

It is important for us to bring together people who are enthusiastic about education and technology. We are happy to inspire our colleagues and share our experience of digitalization in higher education.

More on other projects of the GSOM SPbU Teaching Excellence Lab at
method.gsom.spbu.ru

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GSOM SPBU TEACHING EXCELLENCE LAB

