LehrPuls

LehrPuls — Manual

This manual describes LehrPuls in full: every view, every button and the workflows behind them. You can read it front to back to get to know the application, or use the table of contents to look up a single question. Chapter 2 is enough to run your first session; chapters 3 to 11 walk through each area in detail; chapter 12 collects teaching recipes and chapter 13 the troubleshooting.

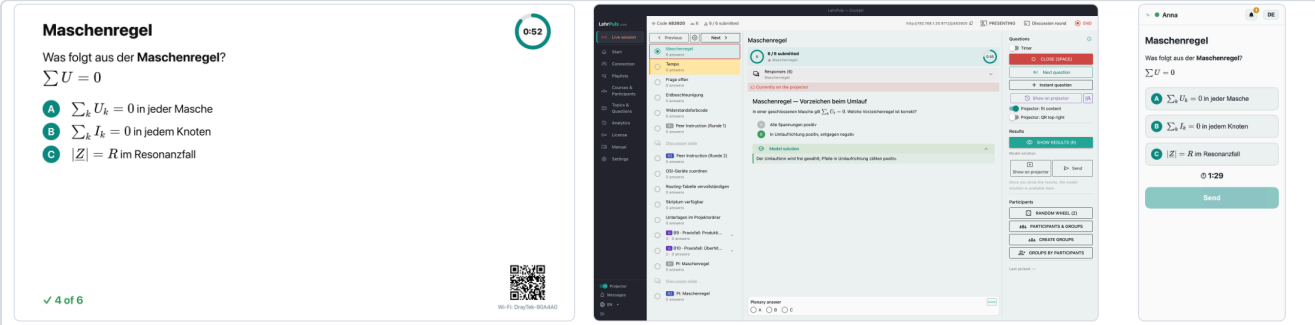
Contents

1. About LehrPuls

1.1 What LehrPuls is

LehrPuls is a polling and questioning tool for classroom teaching. You ask a question during your lecture or seminar, the participants answer on their own smartphones, and the result appears on the projector immediately. Then you discuss it together. The technical term for this is classroom response system, or — after the older hardware with handheld transmitters — "clicker".

What sets it apart from the familiar web services is its architecture: **your laptop is the server.** When a session starts, LehrPuls launches a small web server on your own machine. Participants connect to that machine directly by scanning a QR code, usually over a hotspot or the room's Wi-Fi. No external service is contacted, no account is created, and the answers never leave the room.



Projector — lecture hall | Cockpit — instructor | Smartphone — participants

1.2 Who it is for

LehrPuls is aimed at lecturers at universities and universities of applied sciences, particularly in technical and scientific subjects, and at freelance trainers in professional education. That explains its priorities: mathematical formulas in the question text, numeric and estimation questions with tolerance and unit, a stock of questions that grows across semesters, and analytics that show whether a question actually measures what it is supposed to measure.

1.3 The basic idea in four sentences

You build your stock of questions once under **Topics & Questions**, organized in a topic tree that follows your course. Before class you assemble a **playlist** from it and start a **session**. During class you open questions, close them and reveal the answers. Afterwards the session stays in **Analytics** permanently, where you can see how well each individual question performed — and, across all sessions, how well each topic sits.

1.4 What LehrPuls deliberately is not

Some things LehrPuls cannot do on purpose, because they would work against its purpose.

- **Not a graded exam.** LehrPuls measures understanding as teaching happens. There is no proctoring, no identity verification and no grade calculation. For legally binding exams you need an examination system.
- **Not homework.** A session is tied to the moment. There are no deadlines and no asynchronous work.

- **No learning management system integration.** No LTI, no Moodle coupling, no user accounts. You can import questions from Moodle; that is the extent of the connection.
- **Not a game show.** There are no leaderboards, no music and no competitive display. The focus is on subject feedback, not entertainment.

1.5 System requirements

You need a Mac running macOS or a PC running Windows 10 or newer, and a Wi-Fi network in which participants can reach your machine — or the ability to set up a hotspot instead (chapter 5). Participants need any device with a browser: phone, tablet or laptop. There is no app to install and no account to create. An internet connection is not required for operation. The Windows version is not yet signed with a publisher certificate; on first launch Windows therefore shows the SmartScreen notice — **More info** and **Run anyway** take you past it.

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2. Getting started

2.1 The first launch

The very first time you start the application, the **quick guide** opens at its first section, **Getting started**: five steps through a complete course — prepare questions, create a course, check the connection, run a session, review afterwards. Each step has a button that takes you straight to the area it describes, so that reading and trying things out do not fall apart.

You can close the quick guide at any time and reopen Getting started later under **Settings** → **Getting started** → **"Show getting started again"**; the same quick guide is also available via the info buttons in the playlist toolbar and the live cockpit and via **Markdown** and **Formulas** in the editors. It is not marked as "done" just because you dismissed it once.

2.2 The bundled examples

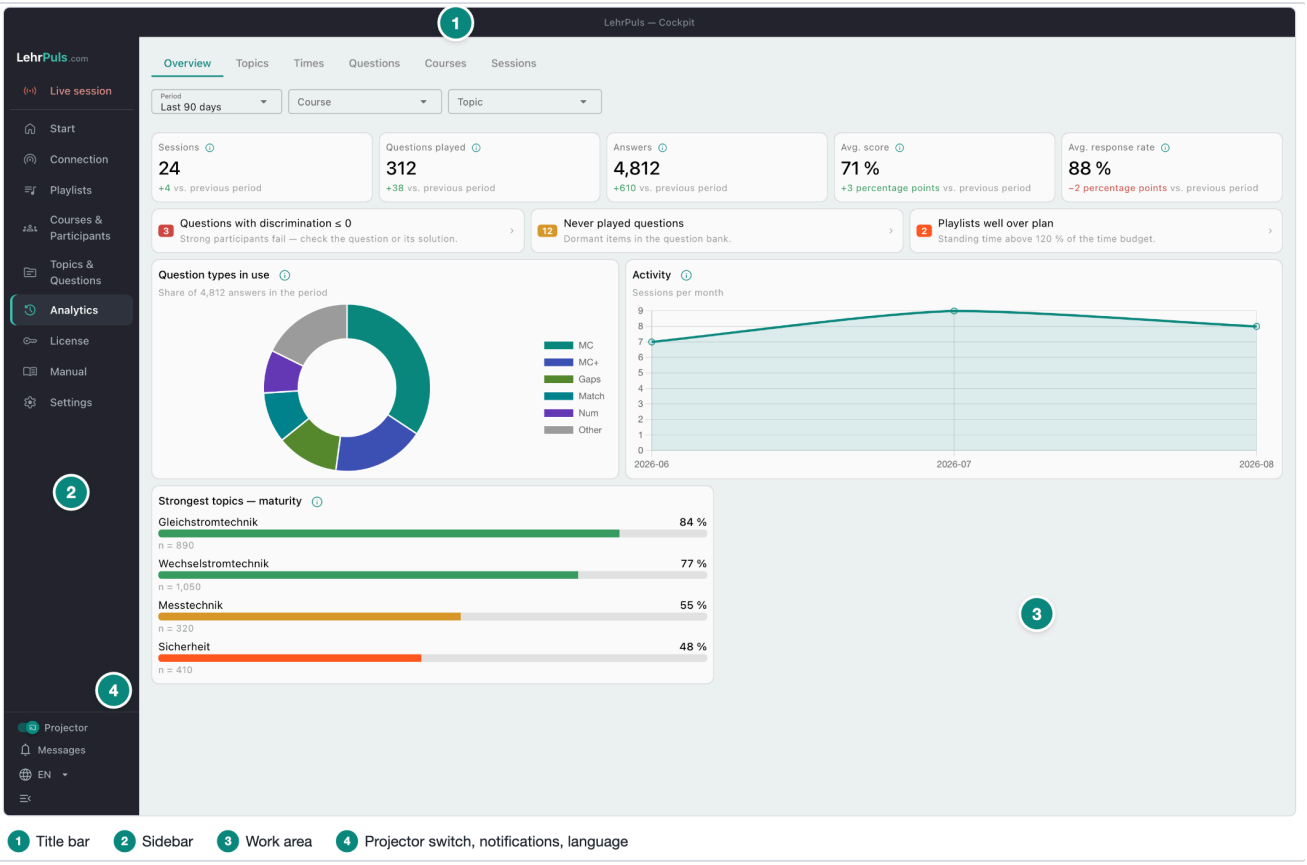
LehrPuls does not ship empty. It contains ready-made topics and questions, example courses with participants, and sessions that have already been analyzed. This lets you look at every view with realistic data before creating your own — especially the analytics, which would otherwise stay empty until you have run a session.

Example data is marked with the label **Sample** in front of the name. It appears before course names, before top-level topics and before the sample playlists. This marker is deliberately a spelled-out word rather than just an icon: a sample course can have exactly the same name as a real course, and then it must be obvious at a glance which is which.

The samples also include ready-made **playlists** (chapter 7), among them a course-independent warm-up round for the start of a lesson. Under **Settings** → **Samples** you can hide the examples, choose their language, and restore or remove the two sample sets separately. See chapter 10 for details.

2.3 How the window is laid out

The cockpit window always has the same structure.



Title bar (top). It carries the window title "LehrPuls — Cockpit" — extended by the **name of the license holder** once a license has been activated, otherwise by "Trial license" (section 9.2). LehrPuls draws its own dark bar for this (on Windows the same text sits in the familiar system title bar). If someone else's license happens to run on a machine, it is noticed straight away. The version number is at the foot of the **Settings** page.

Sidebar (left, dark). At the very top sits the wordmark **LehrPuls.com** — a click opens the maker's website in your browser. Below it, nine entries: at the top what you need immediately before and during the lecture, below that maintenance and follow-up:

Entry	Purpose	Chapter
Start	Landing page: next playlist steps, deletion deadline reminders	2.4
Connection	Set up the network and check reachability	5
Playlists	Assemble sessions, start them, and plan the semester	6, 7
Courses & Participants	Participant lists, deletion deadlines	4
Topics & Questions	Create and maintain your stock of questions	3
Analytics	Statistics across all sessions and the archive of each one	8
License	Trial version, activate a key	9
Manual	this document	—
Settings	Samples, session & projector, analytics, getting started	10

As long as no license has been activated, the **License** entry carries a **Trial** badge.

While a session is running, a red **Live session** entry appears at the very top. It is the way back: if you switch to the analytics or to your question pool during the lecture, one click returns you to the live cockpit. The entry disappears once the session has ended.

The foot of the sidebar. Four controls that stay reachable from every page: the **Projector** switch (shows and hides the projector window, see section 6.6), the **Messages** button, the **language selector** (German/English, applied immediately across the entire cockpit interface; the participant view chooses its own language — every device carries its own language button) and the icon that **collapses** the sidebar. Collapsed, a narrow icon rail remains — the pulse line stands in for the wordmark, and every icon explains itself via a tooltip; after a restart the sidebar deliberately starts out labeled again. The **Messages** button opens the log of the same name: every notification that appears at the bottom of the window — "Imported", "Saved", error messages too — is recorded there with a timestamp and its full text, newest first, together with **Copy to clipboard** and **Clear history**. A red badge counts unread errors. This lets you re-read a message that vanished too quickly; the log covers the current program run only.

Work area (right). This holds the current page. Several pages are split into columns whose dividers you can drag with the mouse, and whose outer columns can be hidden entirely via small buttons when you need more room.

What the colors mean. The interface uses only a few colors, and each keeps the same meaning everywhere. **Teal** is the base color: main buttons, the selected page in the sidebar, the active selection, and the heatmap in Analytics. **Yellow** means "up next": the badge of that name on the next playlist step, in the live cockpit the yellow fill for what the **Next question** button will open, and the yellow bar of starred answers. **Red** means "running right now" or "attention": the pale red fill and the red outline of the open question, the **Live session** entry in the sidebar, error messages and delete buttons, an attainment of 50% or less in the playlist, and the ↻2 mark of a peer instruction question. **Green** stands for "correct" and "done": the check mark on playlist entries that have already been played, the correct option in the reveal, and the **running** badge of a still-open session in Analytics. **Gray** stands for "not included": skipped playlist entries, questions that are not part of the running session, and absent course members. **Purple** marks everything that goes beyond the single question: question blocks (symbol ⧉), scenario badges, stations, the planned duration and the time totals in the topic tree, and the projector states **Discussion round**, **Look-back**/**Preview**, and **Show on projector** (sections 6.4 and 6.5).

2.4 The start page

The start page is deliberately sparse. Its center belongs to the **semester playlists**: one line per course of lectures with the **up next** suggestion — the first section still open — and the **Open** button that takes you straight there (chapter 7). At the foot of the page, a note reminds you of the projector window and the **Projector** switch. It is where you land two minutes before your lecture.

It matters for a second reason: this is where **deletion deadline reminders** appear. If you stored a deadline for removing personal data on a course and that deadline has been reached, an orange card shows the course name, the deadline date and the number of names affected. You can then delete immediately or postpone by 30 days. Details in section 4.5.

2.5 The shortest path to your first session

If you only want to see what it feels like, it takes three minutes:

1. Open **Playlists** and click the sample playlist **Mood Checks and Ice Breakers** in the table at the top — its question tree appears below.
2. Click the play button in the toolbar — it reads **Start**, or **Continue** or **Repeat** after a first run. The start dialog already has the open questions ticked; you can leave the selection as it is.
3. Under **Participation** choose **Anonymous** (the join mode you used last is preselected) and click **Start session**.
4. A code and an address appear on screen, plus a QR code in the projector window. Scan it with your own phone — you are now a participant in your own session.
5. In the cockpit, open the first question with the **space bar**, answer on the phone, close it with the **space bar**, reveal with **R**.
6. Click **End**. The session is now under **Analytics**.

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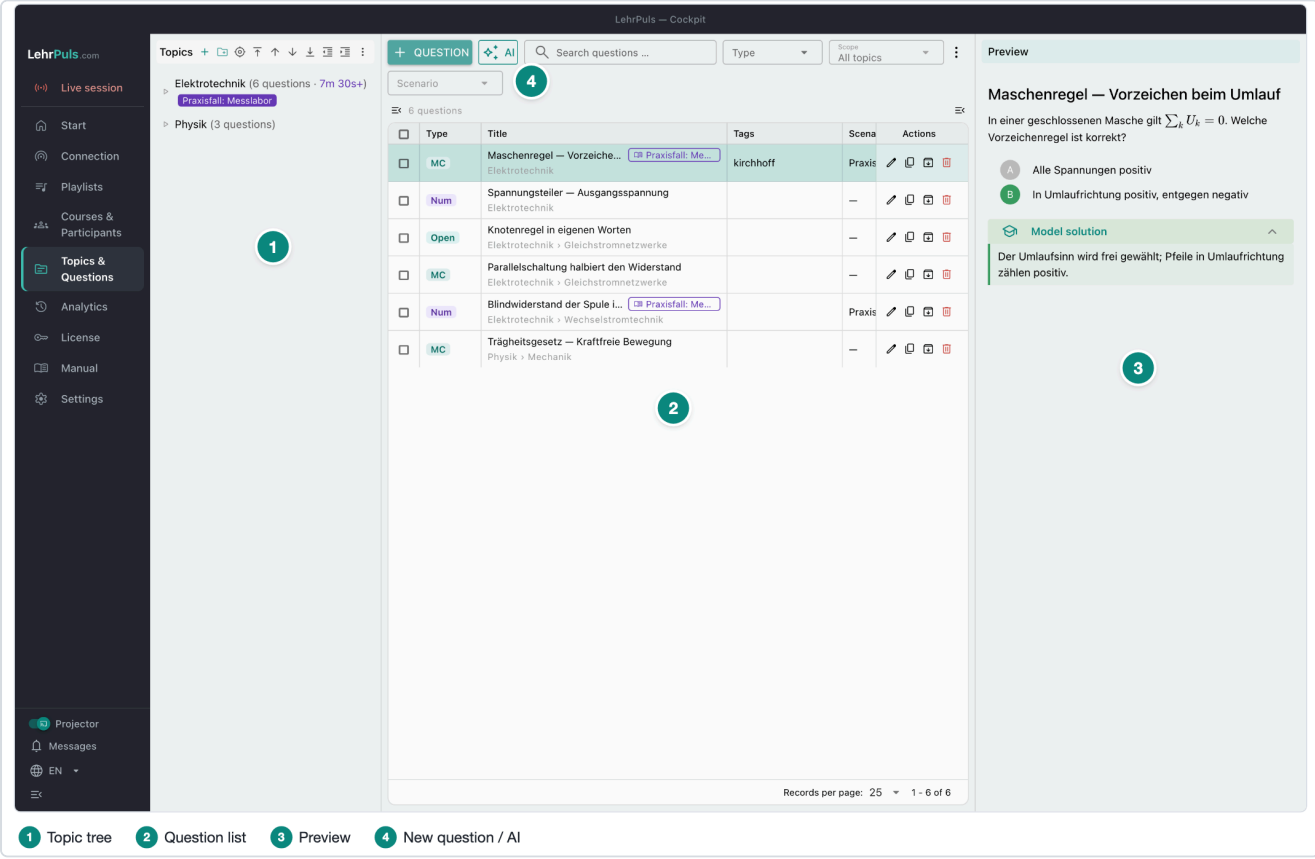
3. Topics & Questions

Topics & Questions holds the stock every session draws from. It is permanent: questions you create once are available every semester, and the analytics of several semesters can be tied to the same question (longitudinal view, section 8.11).

The page has three columns: the **topic tree** on the left, the **question list** of the selected topic in the middle, and a **preview** of the selected question in projector styling on the right. The left and right columns can be hidden via the small buttons in the path row below the toolbar.



3.1 The topic tree

The topic tree organizes your question stock. A common structure is one level per course and one subtopic per chapter below that; there is no depth limit.

Creating. Two icons sit above the tree. The **plus sign** always creates a topic at the **top level**, regardless of what is selected — that way a new course is one click away, without having to clear the selection first. The second icon creates a **subtopic** below the selected topic and is only available while a topic is selected. The dialog tells you in one sentence where the new topic will end up, and the tree expands the parent by itself so you see the new subtopic straight away. New topics are created at the **beginning** of their level, not at the end.

Ordering. Six more icons move the selected topic: to the very top, up, down, to the very bottom, out one level, or in as a subtopic of the entry above it. Between the two creation icons and these six sits a jump icon that scrolls to the selected topic when it has drifted out of view. This lets you bring the tree into the order of your course without recreating anything. The same four moves (to the very top, up, down, to the very bottom) are also available, labeled, in the ⋮ menu. The keyboard is quicker: ⇧↑ and ⇧↓ move the selected topic, ⇧← lifts it out one level, ⇧→ makes it a subtopic of the entry above.

What appears to the right of a topic. Behind each topic the tree shows the number of its questions and the sum of their planned durations — subtopics included in both. A "+" after the time means: some questions have no planned duration, so the real total is higher. Violet badges name the topic's scenarios (section 3.2) — filled as soon as questions refer to them, otherwise outlined only.

More actions (⋮ menu at the right of the tree's toolbar; the following entries act on the selected topic).

- **Edit** — change the name.
- **Duplicate (with questions)** — creates a complete copy of the topic including all questions inside it. A dialog asks for the name of the copy first, prefilled with the existing name, so the two topics are immediately distinguishable in the tree. The copy is placed **first** on its level. Useful when you carry a course over into a new semester and want to adapt the questions afterwards.
- **Move to topic** — attaches the topic anywhere else in the tree. Type in the dialog to filter; "— Top level —" makes it a root topic.
- **Delete** — permanent, including subtopics and questions; the confirmation dialog lists beforehand what will disappear. Deleting is only blocked while contents are still used in playlists, analytics or scenarios of other topics — the same prompt then offers archiving instead.
- **Archive** (in the archive block at the very bottom of the menu, next to **Show archived topics**) — removes the topic from view without deleting anything. To bring an archived topic back, take three steps: switch on **Show archived topics** in the ⋮ menu, click the grayed topic in the tree, then choose **Restore topic** in the ⋮ menu (the entry takes the place of **Archive**).

The same ⋮ menu additionally offers **Expand all**, **Collapse all** and **Show archived topics**, plus **Print topic list** and, in the **Export** submenu, **Export topic list (CSV)** — both output the root topics, with the number of their subtopics, the question counts (own and including subtopics) and the creation and modification dates.

Backing up and passing on (.lpx). The same menu carries LehrPuls's own exchange file: in the **Export** submenu the entries **Export selected topic (.lpx)** and **Export all topics (.lpx)**, next to them **Import (.lpx, .json)**. Unlike the foreign-format import in section 3.9, an `.lpx` file transfers everything losslessly — all eleven question types, images, formulas, scenarios and the structure of the tree. This is the way to pass questions on to a colleague, move a collection to another computer, or secure a topic before deleting it.

3.2 The question list

The questions sit to the right of the tree. The tools are above the list:

- **+ Question** creates a new question in the currently selected topic; next to it, **AI** opens question creation with an AI service (section 3.10).
- The **search field** searches titles, question texts and tags. The search matches word beginnings: "diff" finds "differential equation".
- **Type** filters by one of the eleven question types.
- **Scope** determines which questions are shown at all: **This topic only**, **With subtopics** (the selected topic and everything below it) or **All topics**. This is the most important filter on the page — with "All topics" the search becomes a search across your entire stock. While no topic is selected, the field is disabled and "All topics" applies. If the selected topic has no questions of its own but its subtopics do, the empty list says so explicitly ("No questions of its own in this topic — 6 questions are in subtopics.") and offers the button **Show with subtopics**, which switches the scope; the tree on the left always counts the topic together with its subtopics.
- **Scenario** filters by the questions of one scenario (see below); **Without scenario** shows the questions with no assignment. This filter, too, needs a selected topic.

Below the toolbar sits the **path row**: it shows where in the tree you currently are, next to the number of questions displayed.

Scenarios. A shared starting situation that several questions refer to (section 6.10) is called a **scenario**. The **scenario bar** above the list shows the selected topic's scenarios as violet chips, those inherited from parent topics as gray ones; **+ Scenario** creates a new one, the pencil next to a chip opens it for editing. Which question belongs to which scenario is shown by the **Scenario** column and the filter of the same name in the toolbar; it is assigned in the question editor (section 3.3), or for several ticked questions at once via **More actions** → **Assign a scenario to marked questions** and **Remove the scenario from marked questions**. That menu also holds **Show archived scenarios**. A scenario that has already been used in sessions is better not edited in place but replaced via the **New version** entry in the ⋮ menu of the edit dialog (which also holds **Move** and **Delete**): LehrPuls creates a new scenario with the changed text in the same topic and archives the previous one; the **Repoint questions and playlists to the new version** checkbox (default: on) attaches all questions and playlist entries to the new version — the dialog says how many are affected. That way earlier sessions keep, in the analytics, the wording they were played with. The **Archived — no longer offered in selection lists** switch takes a scenario out of the selection lists without removing it; **Delete** is only possible while no question and no playlist refers to it — otherwise LehrPuls offers archiving instead.

Columns. The list shows type, title, tags, scenario, difficulty (column header **Diff.**) and time (the planned duration). Via the **Show/hide columns** section in the **More actions** menu you can additionally show **Created**, **Modified** and **Source**; for imported questions, "Source" names the file they came from. Column widths can be dragged, and your selection survives restarts.

Order. Questions appear in an order you define, not alphabetically. Use the **More actions** menu to move the selected question up or down one row, or straight to the **top** or **bottom**. The keyboard is quicker: ⇧↑ and ⇧↓ move the selected row, while ↑ and ↓ on their own merely move the selection. Any ticks you have set travel with it. Manual ordering is only available in the **This topic only** scope, and only while there is no search text, no scenario filter and no column sorting.

Per-question actions (four icons at the right of the row):

- **Edit** — opens the question editor.
- **Copy / move** — with the sub-options **Copy within this topic** (creates "… (copy)"), **Copy to topic**, **Move to topic** and **Export question (.lpx)**.
- **Archive** or **Restore**.
- **Delete.**

Several questions at once. The tick boxes on the left of the list select any number of questions. The **More actions** menu then offers **Copy selected questions to topic** and **Move selected questions to topic** — the usual way to reorganize a chapter without touching every question individually. The selection is cleared after a move.

Printing and output. Also in the **More actions** menu, in its **Print** and **Export** submenus: **Print question list** and **Export question list (CSV)** output the list as an overview, exactly as it is currently filtered and sorted. **Print questions with content**, by contrast, puts the questions themselves on paper, with question text, answer options, formulas and images; its sibling **Print questions with content and solutions** adds the correct answer and the model solution — one is the handout, the other your lecturer's copy. If questions are ticked, the entries say so explicitly ("Print selected questions with content") and print exactly that selection.

Passing on (.lpx). For lossless exchange the **Export** submenu of the same menu offers **Export selected questions (.lpx)** and **Export listed questions (.lpx)**, next to them **Import (.lpx, .json)**; a single question is exported via **Export question (.lpx)** in the row's **Copy / move** menu.

Delete versus archive. A question that has never been used in a session can be deleted permanently. Once it has been asked, answers belong to it, and those answers are part of your analytics. LehrPuls therefore does not delete such questions but **archives** them, and tells you so: the question disappears from the list, but the old sessions remain fully analysable. Archived questions are visible under **More actions → Show archived questions**, and can be restored from there.

3.3 The question editor

Clicking **+ Question** or **Edit** opens the editor. It is split in two: input on the left, and on the right a **preview in projector styling** — what you see there is what participants will see later.

The fields at the top:

- **Title** — the question's heading. The title appears in the question list, in the playlist and in the analytics — and it is also shown above the question text on the projector and on the participants' devices. So keep it short and neutral: it may name the question ("Chain rule"), but must not give away the answer.
- **Question type** — see section 3.4. The type determines which fields appear below.
- **Difficulty** — your own estimate from 1 to 5. It serves sorting and filtering; the difficulty actually measured appears later in the analytics.
- **Planned duration** — how long answering should take. You type what you mean: **15** is fifteen minutes, **1:30** is one minute thirty, **45s** is forty-five seconds, and **2h** is understood as well. The value is always displayed as minutes and seconds (1:30), or as hours and minutes ("2:00 h") from one hour upwards. It is taken over when you leave the field or press Enter; anything unintelligible falls back to the last valid value. Only an empty field means "no figure" — and 0 as well, because zero seconds is not a planned duration. The value is a planning figure and never enforces anything: the playlist adds it up per section and per question block (section 7.1), and during the session the timer proposes it (section 6.5). Leave the field empty if you do not want to plan with it — the timer then keeps its default.

- **Tags** — free keywords, separated by commas. They are searchable and work well for cross-sections the topic tree does not cover ("calculation", "conceptual", "exam material 2025").
- **Scenario (optional)** — in the row below; assigns the question to a shared starting situation. **New scenario** creates one right from the editor (sections 3.2 and 6.10).

Then the **question text**. It understands Markdown, mathematical formulas and images; the next three sections explain how. Two buttons with an info icon directly above the field — **Markdown** and **Formulas** — open the quick guide at the **Markdown** or **Formulas** section — each a table of "How to write it" / "How it looks", rendered with the same renderer as the real question; a third column with a copy button puts the respective example on the clipboard.

At the very bottom, the **model solution** (optional, Markdown as well). It only appears when you reveal during the session — on the projector and on the participants' devices. This is where the explanation belongs, not just the result: why is the correct answer correct, and why is the obvious mistake wrong?

⌘↵ or **Ctrl+**↵ saves and closes.

3.4 The eleven question types

Multiple choice (one correct). The standard case. You enter several options and mark exactly one as correct. Participants pick one answer. Good for conceptual questions where the wrong options represent typical misconceptions — such options are called distractors, and the analytics show you which one attracted votes.

Multiple choice (several correct). Several options may be correct; participants tick as many as they want. Only the exactly correct combination counts as **correct**; the attainment (section 7.4) works with partial credit alongside that, but deducts wrong ticks. Say so in the question text if more than one answer can be correct.

Open question. Free text. You set the maximum answer length in characters — which is also a didactic constraint: 80 characters force a single sentence, 500 allow a justification. Open questions are not scored automatically; their value lies in what you do with them afterwards (section 12.4). During the session the answers arrive in the cockpit without appearing on the projector by themselves; you can put individual answers on the wall deliberately from the **Responses** area with the **Show on the projector** button, with or without the name (section 6.4).

Poll. Like multiple choice, but with no correct answer. For opinions, self-assessments and decisions ("Which topic shall we go deeper into?"). The analytics show only the distribution, no difficulty and no discrimination.

Poll+ (multiple selection). Like the poll, but participants may check several options ("Which topics should we revisit?"). The distribution counts ticks per option; the percentages refer to the total number of ticks and add up to one hundred percent; the reference line above shows "7 ticks from 3 participants" (section 6.5). Badge in the lists: "Poll+".

Numeric answer. Participants enter a number. You store the **correct value**, a **tolerance ±** and optionally a **unit**. An answer counts as correct if it falls within the tolerance. The tolerance is the actual instrument: with ± 0 you test exact calculation, with a generous tolerance the order of magnitude.

Estimate. Also a number entry, but without a correct answer. Optionally you store a **unit** and a **reference value** that is shown when you reveal. On reveal, LehrPuls shows the **group mean** and the number of answers. The classic use is a Fermi question at the start of a chapter: let them estimate first, then calculate together.

Ordering. You enter the elements in the **correct** order; participants receive them **shuffled** and sort them. The reveal states how many participants found the completely correct order; partial hits only feed into the

attainment (section 7.4). Suitable for process steps, chronological sequences and magnitude comparisons.

Matching. You define **categories** and, below them, the **items**, each with the category it belongs to. Participants receive the items shuffled and move each one into a category. Only a completely correct assignment counts; the reveal shows how many got everything right. Typical uses are term pairs, classifications and case examples ("Which of these symptoms belong to which clinical picture?").

Cloze. You write the text and put the gaps, including their solutions, straight into it: `{{solution}}`, or `{{solution|alternative}}` when several wordings count. Participants fill the gaps within the running text. Submitting is possible from the first filled gap onwards — an empty gap counts as wrong, because forcing completeness only produces invented answers. Good for definitions, parts of formulas and technical terms in context. The **Insert gap** button places the braces at the cursor position. Case does not matter in the comparison, and for numbers a comma and a point are equivalent. Tables work too: **Table from clipboard** brings cells copied in Excel or Calc into the question text as a table, and you then turn individual cells into gaps — a table of values, say, in which participants fill in the missing figures.

Notice (in the editor: "Notice (with optional response)"; badge "Info")**.** Not a question but a message: a note sent to every device, optionally with a **link or an email address** — tappable on the participant devices and shown as a QR code on the projector as well. This is how you hand out a script, a form or a survey outside LehrPuls in the middle of a lecture without dictating the address. If you enter an email address instead of a link, tapping or scanning opens a new message to that address right away; use it to collect questions or submissions by email, for instance. LehrPuls adds "https://" or "mailto:" itself when saving. Without buttons, or with a single confirmation button, a notice is not graded; only with two labeled buttons does it count in the analytics (see below).

Below that you decide what participants should send back — by labeling the buttons yourself. Two fields do this: **Button 1 label (optional)** and **Button 2 label (optional)** (40 characters each at most). What appears on the devices follows from the labels:

- **Both fields empty** — the default. The notice appears, there is nothing to tap, and you move on whenever you like.
- **Only button 1 labeled** — a single confirmation button, worded however you like: "OK", "Found it", "Understood". On reveal you see how many confirmed — useful when you want to wait until the room has caught up.
- **Both buttons labeled** — a choice between two answers: "Folder opened" / "No access", "Done" / "Not working". You then see both numbers. That is the follow-up question about success: with eighteen "Done" and four "Not working" you know that four people need your attention, instead of guessing.

The **order carries meaning**: in the analytics, button 1 counts as positive feedback ("Worked", "Yes") and button 2 as negative ("Did not work", "Canceled"). A single confirmation button deliberately stays ungraded — someone who can only agree decides nothing, and counting every confirmation as correct would flatter the session's success rate. A second button without a first one is not a choice; the field says so, and saving is refused.

In summary:

Type	What participants enter	Correct answer?	Special feature
Multiple choice (one)	one option	yes	distractor analysis
Multiple choice (several)	any number of options	yes	only the exact combination is correct
Open question	free text	no	length limit, verbatim in the archive
Poll	one option	no	pure opinion picture
Poll+	any number of options	no	opinion picture with multiple selection
Numeric answer	number	yes	tolerance ± and unit
Estimate	number	no	group mean, reference value
Ordering	a sorting	yes	shuffled display, partial hits count in the attainment
Matching	items into categories	yes	only a fully correct assignment counts
Cloze	entries in gaps	yes	gaps sit in the running text
Notice	nothing, or one of two freely labeled buttons	only with two buttons	link with QR code; button 1 counts as positive feedback

3.5 Markdown in the question text

Markdown is a simple notation for text formatting: you type ordinary text and mark only what is special with punctuation characters. This applies to the question text, the model solution and the answer options.

How to write it	How it looks
`**bold**`	**bold**
`*italic*`	*italic*
`` `source code` ``	`source code`
`- first point` (per line)	bulleted list
`1. first step` (per line)	numbered list
`> Highlighted note`	indented quote
`[description](https://example.org)`	link

A single line break in the input field produces a line break in the output as well — so you do not have to remember any paragraph rules.

3.6 Formulas

You write formulas between dollar signs. **One** dollar sign before and after places the formula inside the sentence, **two** dollar signs set it apart, larger, on a line of its own.

How to write it	How it looks
`$x^2 + y^2 = r^2$`	$x^2 + y^2 = r^2$
`$\frac{a}{b}$`	$\frac{a}{b}$
`$\sqrt{2}$`	$\sqrt{2}$
`$\alpha, \beta, \Omega$`	α, β, Ω
`$\vec{F} = m \cdot \vec{a}$`	$\vec{F} = m \cdot \vec{a}$
`$\sum_{i=1}^{n} i$`	$\sum_{i=1}^{n} i$
`$\int_0^1 x^2\,dx$`	$\int_0^1 x^2\,dx$
`$\lim_{x \to 0} \frac{\sin x}{x} = 1$`	$\lim_{x \to 0} \frac{\sin x}{x} = 1$

With **two** dollar signs the same formula is set apart and larger. So `$$\int_0^1 x^2\,dx = \frac{1}{3}$$` becomes:

$$\int_0^1 x^2\,dx = \frac{1}{3}$$

The notation is LaTeX, as customary in scientific writing. Curly braces group what belongs together: `x^{10}` puts ten in the exponent, `x^10` only the one. You will find more extensive commands in any LaTeX reference — everything the KaTeX formula library knows will work.

If a formula is malformed it is displayed in red rather than rendering the whole question unusable. A glance at the preview before saving saves you the surprise in the lecture hall.

3.7 Images

You insert images with **Ctrl+V** (**Cmd+V** on the Mac) directly into the question text — copy a graphic to the clipboard and paste it where you want it. A line like `![Bild](media/8e41….png)` then appears.

You can freely change the text in **square** brackets; it describes the image for screen readers. The part in **round** brackets is the internal name of the image, derived from its content — it must not be changed, or the application will no longer find the image.

Because the name is derived from the image content, the same image is stored only once even if you paste it into ten questions.

3.8 The preview

The right-hand column shows the question selected in the list exactly as it will appear on the projector: question text, answer options, for numeric questions the correct value with tolerance and unit, for estimates the reference value, and the model solution. Use it as a final check before a question goes into a session.

3.9 Importing questions

Use **More actions → Import from Moodle, GIFT, Aiken, XML** to take over ready-made questions from other systems — typically from Moodle.

Supported formats

- **GIFT** — Moodle's text format (`.txt`, `.gift`).
- **Moodle XML** — the standard export from the Moodle question bank (`.xml`). Matching questions (`matching`), the tolerance of numeric questions and Moodle's embedded answers (`multianswer`) are taken over as well; LehrPuls turns the latter into a **cloze** question.
- **Aiken** — a simple line-based format for multiple choice questions (`.txt`).
- **Detect automatically** — the default; LehrPuls determines the format from the content.

How it works. The import places the questions in the topic selected in the tree on the left — so select it before opening the dialog; the dialog merely displays the destination under **Target topic**. Use **Choose file (.txt/.gift/.xml)** to pick a file — your operating system's file dialog opens, and the preview then runs by itself — or paste the text directly into the field and click **Preview**. It shows what was recognized, in the form "Preview (17 of 20 importable)" — so you see in advance what will be dropped. Confirm with **Import N**. All imported questions automatically receive the tag `import`, so you can find them again and work them over.

What to check. Foreign formats do not map one-to-one onto the LehrPuls question types. After importing, check formulas in particular (Moodle partly uses its own notation), images (they are not carried over) and questions with several correct answers.

3.10 Creating questions with an AI service

The **AI** button next to **+ Question** opens the dialog "Create questions with AI". It lets an AI service of your choice — ChatGPT or Claude, for example — turn your own material into a ready-made set of questions, which you then bring into LehrPuls in one go. LehrPuls itself contains no artificial intelligence and sends nothing to the internet: you hold the conversation in the service's own window, LehrPuls merely supplies the building instructions and takes delivery of the result.

The structure description. So that the service knows what to deliver, it needs the description of the LehrPuls question format. **Save structure description (PDF)** stores it as a PDF file, **View** opens it for reading. The document describes the structure of the file, the permitted question types and their fields, and contains complete examples — it is meant as an attachment for the AI service, not as reading matter for you.

Five steps. First, save the structure description as a PDF. Second, upload two files in the AI service: your source material (a script or a chapter as a PDF, say) and the saved structure description. Third, copy the **example prompt** from the dialog, adjust the number of questions, the question types, the planned durations and the difficulty to your liking, and send it off. Fourth, copy the service's answer in full and paste it into the field **Paste the AI's answer here** below. Fifth, read the report and import.

The report. As soon as there is text in the field, LehrPuls checks it by itself — there is nothing to click. Above the field you get either the green line "All good — ready to import" together with the size of the delivery ("1 topic, 9 questions") or a red line with the number of questions that were flagged. Below it, every single question appears with its title, its type marker and, if something is wrong, the reason in plain words. So you see what you are getting before you import it.

When something is flagged. The **Import** button stays disabled as long as even one question is not in order — you never end up with half a set. The button **Copy findings** puts all the findings, question titles included, on the clipboard; paste that text into the AI service and ask for a corrected version. The most common case is a misplaced key: the marking of the correct answer belongs inside the answer options, and some services put it next to them by mistake. **Clear input** empties the field and the report so you can paste the next version.

Importing. If nothing is flagged, click **Import** and choose under **Target topic** where the delivery is attached; **— Top level —** creates the delivered topics as new main topics. The questions then sit in the tree, and you rework them in the editor like any other question.

The route via a file. If you would rather save the answer first, store it with the extension `.json` and bring it in via **More actions** → **Import (.lpx, .json)**. The result is the same; pasting the text merely saves you the detour.

What this route cannot do. Images are not transferred — an AI delivery contains no image files, and image references stay empty. **Cloze** questions are excluded as well: they have their own notation inside the question text and are created by hand where you need them.

What to check. An AI service produces linguistically clean text, but not necessarily text that is correct in substance. Read the questions before using them, check the answers marked as correct, the wrong answer options and the model solutions in particular, and strike whatever does not fit your material. The preview (section 3.8) shows you each question exactly as it will appear on the projector.

Confidentiality. What you upload leaves your computer and ends up with the provider of the AI service. Check beforehand whether you hold the rights to your source material, whether it contains personal data, and what the rules of your institution say about it. This route is not intended for unpublished exam questions or confidential documents.

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4. Courses and participants

A course in LehrPuls is a participant list with names and a semester. You need one **only** if you want feedback tied to names. For an anonymous mood check, start a session with no course at all.

The page is split in two: the **course list** on top, the **participants** of the selected course below. The course list can be collapsed when you are working in a long participant list.

4.1 Courses

Creating and editing. The **+ Course** button opens a dialog with the fields **Name**, **Semester** (such as "WS 2026/27" or "SS 2026"), **Description** and **Deletion deadline (optional)** — pick the date via the calendar picker on the field. Only the name is mandatory.

Duplicating. The copy icon in the course row creates a complete copy of the course including all participants; a dialog asks for the name of the copy first. This is the usual route when the same group continues into the following semester: duplicate, change the semester, remove those who left, add those who joined. Even large lists are copied instantly, and the copy is placed first.

Printing and output. The menus offer **Print course list** and (in the **Export** submenu) **Export course list (CSV)** as well as **Print participant list** and **Export participant list (CSV)**; the CSV export contains every column, including the ones currently hidden. For lossless exchange the same submenu holds **Export course with participants (.lpx)** and **Export all courses with participants (.lpx)**, next to them **Import (.lpx, .json)** — securing a single list or your entire course collection in one go.

Deleting. Deletes the course and its participant list. Sessions already held are kept together with their name and only lose their **course assignment** — they no longer appear under the course filter in the analytics, but can still be found by name. The participant names stored in the sessions remain in place; anonymization

happens only via the deletion deadline (section 4.5). If you want to remove the personal reference, use **Delete now** there **first** — deleting the course is no substitute for that anonymization.

Searching and sorting. The search field above the list filters across all columns. You set the order of the courses by hand: via the entries **Move to top**, **Move up/down one position** and **Move to bottom** in the row's ⋮ menu, or with ⇧↑/⇧↓; an active column sort is cleared in the process so that the move stays visible.

4.2 Adding participants individually

+ Participant opens a dialog with **Name** (mandatory), **Student ID / identifier**, **E-mail** and **Note** (for group assignments, for example). For small seminar groups this is the fastest route. Newly created participants appear at the **top** of the list, so you can see straight away that the entry has arrived. The search field above the list filters participants.

4.3 Importing participants

For lecture-sized groups, use **Import**.

1. **Choose a file.** The button **Click to choose a CSV or Excel file** opens the file picker; CSV, Excel (`.xlsx`, older `.xls` too) and ODS are supported. If you work with Apple Numbers, export the table beforehand via "File → Export" as Excel or CSV.
2. **Map the columns.** LehrPuls shows the recognized columns and the row count. You assign a field to each column; only the name is mandatory.
3. **Split names.** University exports frequently supply first and last name separately. That is what **Name part 1** and **Name part 2** are for — assign the first name to one and the surname to the other (preset: surname / first name), and LehrPuls assembles the full name.
4. **Add to list.** The button of that name transfers the mapped rows into the import list — this intermediate step is mandatory. The list can then still be extended ("Add individually") or cleared.
5. **Import.** Afterwards LehrPuls reports how many entries were taken over and how many were skipped as duplicates.

This makes an import repeatable: you can read the same file again after a late registration without producing duplicate entries.

4.4 What the participant list is for

You need the list exclusively for the **With names** join mode (section 6.2). Participants then pick their name from the list instead of typing it — which prevents spelling variants and joke names and makes attribution in the analytics unambiguous. Anyone not on the list can still join and enter their own name — provided the **Allow guests** switch is on at session start (default: on, section 6.2); such people are marked as a **guest** during the session and can be added to the course list with a single click (section 6.2).

4.5 Deletion deadlines and data protection

Participant names are personal data and may only be stored for as long as the purpose requires. LehrPuls supports you in this without patronizing you.

Setting a deadline. In the course dialog, enter a date under **Deletion deadline (optional)** (format YYYY-MM-DD), typically the end of the semester or a few weeks after.

The reminder. Once the deadline is reached, a card appears on the **start page** with course name, semester, deadline date and the number of names affected. Two options: **Remind me in 30 days** postpones the reminder, **Delete now** opens the deletion dialog.

What gets deleted. The dialog spells it out beforehand: the **names** are removed from the participant list. The **sessions and answers** are preserved — anonymized as statistics. Your analytics and the longitudinal view across several semesters therefore remain untouched while the personal reference disappears. This is exactly the separation that the General Data Protection Regulation suggests.

Sample privacy notice. In the header of the courses page you will find a button that opens a **sample privacy notice**: a pre-written text you can show participants or fold into your course materials — the copy button in the dialog (tooltip **Copy to clipboard**) puts it on the clipboard for that. It describes which data LehrPuls processes, that processing happens locally on your device, and how long data is kept. It is a template, not legal advice — check it against the requirements of your institution.

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5. Connection

This is the most important chapter of the manual when something does not work. Everything else in LehrPuls runs locally; only here do you depend on the reality of networks you do not control.

5.1 How joining works

When a session starts, LehrPuls opens a small web server on your machine. Participants use their browser to open an address that points to your machine — usually by scanning the QR code on the projector. They load a very small page directly from your laptop and stay connected to it for as long as the session runs.

Two things follow. First: **no internet is needed** — it is enough for the devices to be on the same network. Second: **the devices must be able to reach your machine.** That is exactly where it occasionally fails, for a single reason explained in the next section.

5.2 The four routes — and why the hotspot is recommended

The **Connection** page (page title: "Connection & help") shows the possible routes as cards. **Clicking a card selects the route** for the next session start — the selected one carries the **Selected** badge. For the three local routes this choice changes nothing technically at start time — the session always runs through the same built-in server; the choice only determines which guide applies, which card records the test result, and which Wi-Fi details the projector shows. Only the relay card actually switches the route (section 5.7). Each card also remembers its last test result: "works" with a date after a passed self-test, otherwise "not checked yet".

Hotspot (badge "recommended"). You set up your own Wi-Fi network with your laptop or phone and participants join it. This is the most reliable route because you control the network yourself. Enter the hotspot's **Wi-Fi name (SSID)** and **Wi-Fi password** on the card — the projector start screen then also shows a small **Wi-Fi QR code** for joining the network directly (section 6.6).

Shared Wi-Fi. Everyone is already on the same network — the seminar room Wi-Fi or the campus network. This works if the network allows it.

Mobile router. A small travel router (a GL.iNet, say) sets up its own Wi-Fi without internet — independent of the lecture hall Wi-Fi and free of client isolation. The setup recipe sits in the expandable section at the bottom

of the page — the card points to it with "Guide below" (section 5.4); it too has fields for the **Wi-Fi name and password**, from which the projector builds the Wi-Fi QR code.

Relay (badge "Online"). For online and hybrid teaching via your own relay server — section 5.7.

The catch with campus Wi-Fi is called **client isolation** (often "AP isolation" on routers, "peer-to-peer blocking" or "PSPF" on campus equipment): for security reasons the devices on the network are shielded from each other and may only talk to the internet, not to one another. For LehrPuls that is fatal, because "to one another" is the whole point. On eduroam, client isolation is the rule rather than the exception. So: **test a new network before you rely on it** — with the self-test in the next section.

5.3 The self-test

On the **Connection** page, under "Check reachability", there is a test that tells you within a minute whether your machine can be reached by other devices. It always starts the same small local test server for this, whichever route is selected — what matters is solely the network your machine is currently on — and writes the result onto the selected route's card; only the relay is excluded — there the **Check relay** button on the relay card takes over (section 5.7).

1. Click **Start test**. A QR code and an address appear; on the "Shared Wi-Fi" route it also says which Wi-Fi network your laptop is currently on.
2. Scan the QR code with **your own phone** — the phone must be on the same network as the laptop.
3. If the request arrives, the page reports **Reachable** and names the address it came from. If it stays at "Waiting for the call from the test device …", your machine is not reachable on this network — use the hotspot.
4. Click **Stop test**. Otherwise the test server keeps running for as long as you stay on the page; when you leave the page it stops by itself.

Run this test **once before your first lecture in a new room**, not in the lecture hall in front of eighty waiting people.

If LehrPuls does not show the Wi-Fi name, the location permission is missing on macOS: enable **System Settings → Privacy & Security → Location Services → LehrPuls**. The operating system treats the network name as location information. The test itself works without that permission.

5.4 Setting up a hotspot

macOS (Internet Sharing). System Settings → General → Sharing → Internet Sharing. The source does not matter — even a "local only" share without internet access is enough for LehrPuls. Choose **Wi-Fi** as the way to share, set a network name and password there, then switch it on.

iPhone as a hotspot. Settings → Personal Hotspot → "Allow Others to Join". The laptop connects to the iPhone's Wi-Fi, and so do the participants. Keep an eye on your data allowance — the amount LehrPuls itself uses is negligible, as the participant page is only a few kilobytes, but devices may use the hotspot for other things on the side.

Android as a hotspot. Settings → Connections → Mobile Hotspot and Tethering. Set a name and password, switch it on.

Windows. Settings → Network & Internet → Mobile hotspot. (In the app, the expandable section **Set up a hotspot (recipes)** on the connection page collects these guides; it currently covers macOS and iPhone — the

Android and Windows recipes appear only here in the manual.)

Mobile router. For the travel-router route, the recipe sits in the expandable section **Set up a mobile router** at the bottom of the connection page: once only, create a Wi-Fi network with its own name and password — USB power from the laptop is enough, and the router needs no internet.

A practical hint: name the hotspot after the course and enter its name and password on its card on the connection page. The projector start screen then shows a small **Wi-Fi QR code** next to the join QR, and devices sign into the network directly (section 6.6) — nobody has to read out or type the password, and joining is done within the first minute instead of becoming the subject of the lecture.

5.5 The firewall on first launch

The first time you start a session, the operating system may ask whether LehrPuls is allowed to accept incoming connections. **Allow** is the right answer here — without it, nobody can reach you.

- **macOS:** the dialog only appears if the firewall is active (System Settings → Network → Firewall). Click "Allow".
- **Windows:** the "Windows Security Alert" appears. Tick the network type **Private** and allow it.
- **Security suites** (Norton and the like) additionally ask with a window of their own — choose "Allow" there too. The question may reappear after a LehrPuls update.

If you accidentally chose "Block", find the entry in your operating system's firewall settings and change it there.

5.6 Common stumbling blocks

A VPN on the participant's device. An active VPN routes even local connections through the tunnel and makes your machine unreachable. This is the single most common cause of "it doesn't work for me" on an otherwise functioning network. Ask them to switch the VPN off briefly.

The QR code is not recognized. On the iPhone the camera app scans automatically. On Android the scanner sits either in the camera app or in the quick settings, depending on the manufacturer. To be safe, always show the **address in text form** as well — it appears in the projector window next to the QR code (with the join code right above it) and is short enough to type.

"Not secure" in the address bar. Browsers put this label on every address starting with `http://` — it belongs to local operation and is not a fault: nothing is blocked, and the participant page works in full. The reason is how LehrPuls is built: **your laptop itself is the server**, reachable at a private address such as `192.168.1.25` that differs from room to room. A security certificate cannot be issued for such an address, and a self-made one would produce a full-page red warning that every participant would have to click away — considerably worse than the gray label. What travels is questions, answers and, depending on the join mode, names; **there are no passwords**, as LehrPuls has no user accounts. And the data stays in the room, with a hotspot literally within your class. Where it does leave the building — online mode via the relay (section 5.7) — the connection is encrypted and additionally end-to-end secured. If someone in class asks, one sentence does it: "The page comes straight from my laptop, not from the internet — and nobody types a password here."

A device joined the wrong network. Phones like to switch back to the familiar campus Wi-Fi on their own. If individual devices drop out, that is the first suspect.

Joining late. Latecomers can join at any time, even mid-session. They will see the question currently open.

5.7 Relay for online and hybrid teaching

For teaching where participants are not on the same network, there is the **relay**: a forwarding service that carries the connection when no shared network exists. Content is end-to-end encrypted — the forwarding server only relays and cannot read the questions and answers. All three join modes (section 6.2) are available online as well: with **By name**, each device receives the course list over the same encrypted channel as the questions, so the names stay hidden from the forwarding server too.

On the relay card of the **Connection** page you enter the **Relay address** and verify it with **Check relay**; the card remembers the result, and clicking it selects the relay as the route for the next session.

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6. Running a session

6.1 Assembling the playlist

Every session is run from a **playlist** — they live on the page of the same name, which chapter 7 describes in detail. For a single lesson you only need the smallest part of it: create a playlist (or take a sample playlist), put questions in, **Start** (after a first run the button reads **Continue** or **Repeat**). And for the entirely unprepared lesson there is the **Spontaneous session** button (section 6.8).

Questions enter the playlist in two ways: via the **Properties** dialog you take over a whole topic including its chapter structure from the topic tree, and via the checkboxes of the question list you add individual questions — both are described in section 7.2. In the tree you move entries with ⇧↑ and ⇧↓ or via the toolbar and remove them with the remove icon; this only deletes the playlist entry, never the question itself. The order in the tree is the order in which questions will appear later — though you can deviate from it at any time during the session.

Peer instruction. For choice questions (single or multiple choice), select the question in the tree and set **Turn on peer instruction** in the ⋮ menu **More actions**; it is undone in the same place. Enabled questions carry a red circular-arrow symbol with a 2 right next to the question type: this question is asked twice — individually first, then, after a discussion phase in small groups, a second time. In the playlist of the running session this appears as two rows marked **R1** and **R2** with the row **Discussion slide** in between; the analytics later show both distributions side by side. There is no peer instruction inside question blocks — a question block opens all its sub-questions at once. The teaching method behind this is described in section 12.1.

6.2 Choosing the join mode

In the start dialog — the **Participation** field — you choose how participants join. This is the most consequential decision of the entire session, because it determines what you can analyze afterwards.

Anonymous. No name, no attribution. You only see distributions. This is the most honest mode for sensitive questions ("Who understood last week's material?"), because nobody has to fear being identified by a wrong answer. No course required.

Pseudonym. Participants choose a name for themselves. Answers can be attributed to the same person across the session without you knowing who that is. A good middle ground: in the analytics you can say "this person made the same mistake three times" without exposing anyone. No course required.

With names. Participants pick their name from the participant list of the course assigned to the playlist. Only this way can you attribute individual answers to people. You set the course in the playlist's **Properties** (section 7.1).

A course can also be assigned in the other participation modes — the session is then assigned to the course and shows up in the analytics course filter without any names being recorded.

Guests. With the join mode **With names**, the **Allow guests** switch appears as soon as a course is set (default: on). It decides whether someone who is not on the course list may take part: visitors, latecomers, people who joined at short notice. With it on, the participant page offers the button **I'm not on the list** and the name is typed in. With it off, only the list counts — the button does not appear at all, and a note explains why.

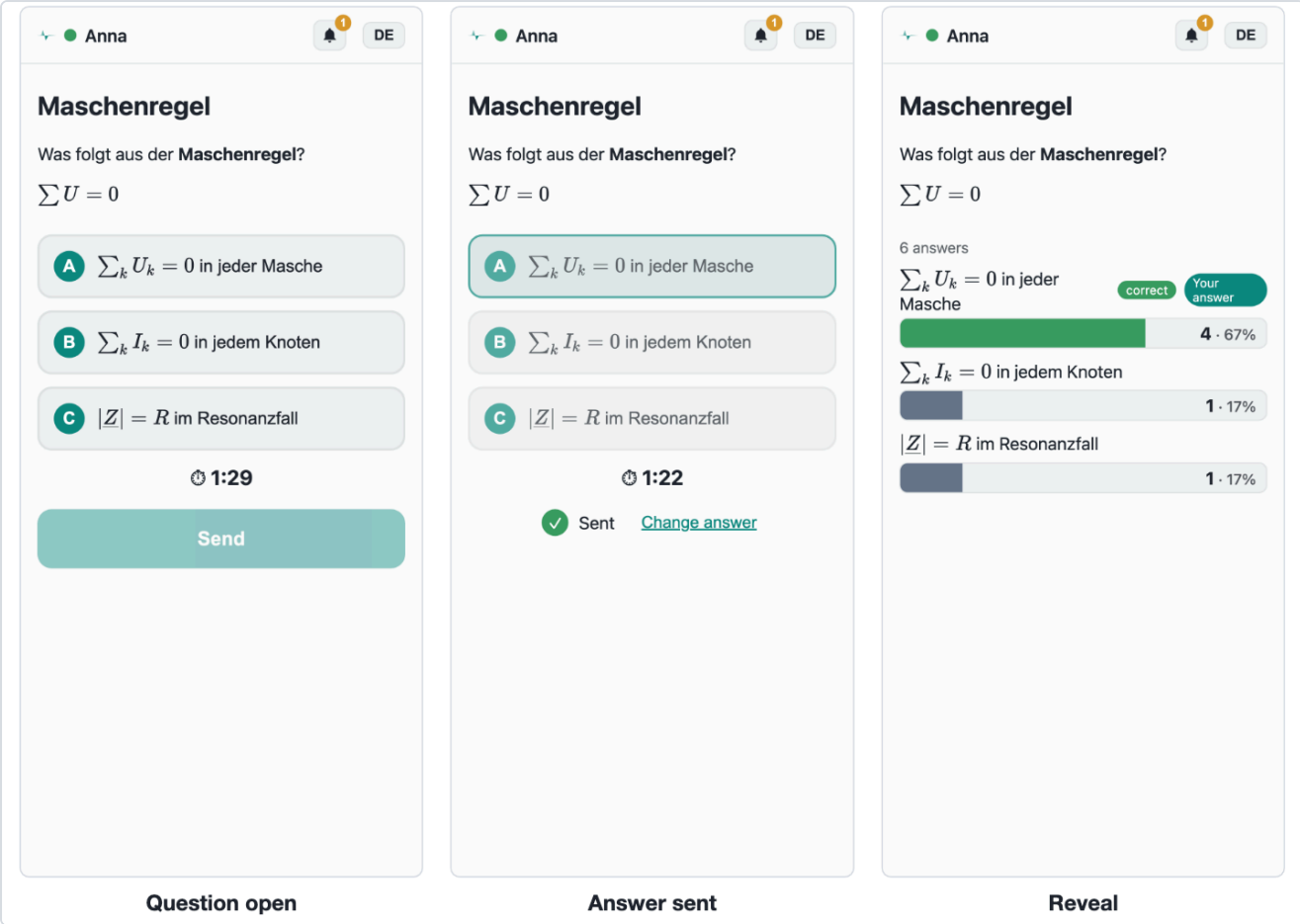
Anyone who joins that way carries the **guest** badge during the session. It sits right behind the name in the **Participants & groups** dialog, so you can always see who is off the register; the participant board on the projector does not show the badge. If someone stays for good, the dialog's **Add to course list** button is enough: the name is created in the session's course and the badge disappears. The running session is untouched by this — from the next one onwards the name is on the list and selectable.

Which questions are played is set by the ticks in the dialog's question list; the quick selections above it set them all at once: **Open only** (default), **All**, **From selected** (from the question marked in the playlist onwards) and **Poorly answered** (questions whose attainment in the last run was 50 % or less — material for revision; details in section 7.3). The **Start session** button in the dialog becomes active as soon as at least one question is ticked. While a session is already running, no second one can be started — LehrPuls says so and points to the **Live session** entry in the navigation.

6.3 What participants see

After scanning the QR code, a plain page opens. Depending on the join mode it asks for a pseudonym, offers the name list, or joins anonymously right away. The page follows the device language and can be switched between German and English. Below the join button a short line says where the page comes from — it pre-empts the question why the browser says "not secure" (section 5.6) and disappears once you join.

After that it says "Waiting for the first question …". As soon as you open a question, it appears with the input controls of its type. After submitting, the answer can be changed as long as the question is open. Once it is closed, "Answers closed — waiting for the reveal …" appears, and on reveal participants see the correct answer and their own; the model solution joins them when you send it explicitly (section 6.5). In round 2 of a peer instruction question, each bar is prefixed with the round 1 share ("R1: 42% →"), so projector, cockpit and participant device all state the same figure.



Question open **Answer sent** **Reveal**

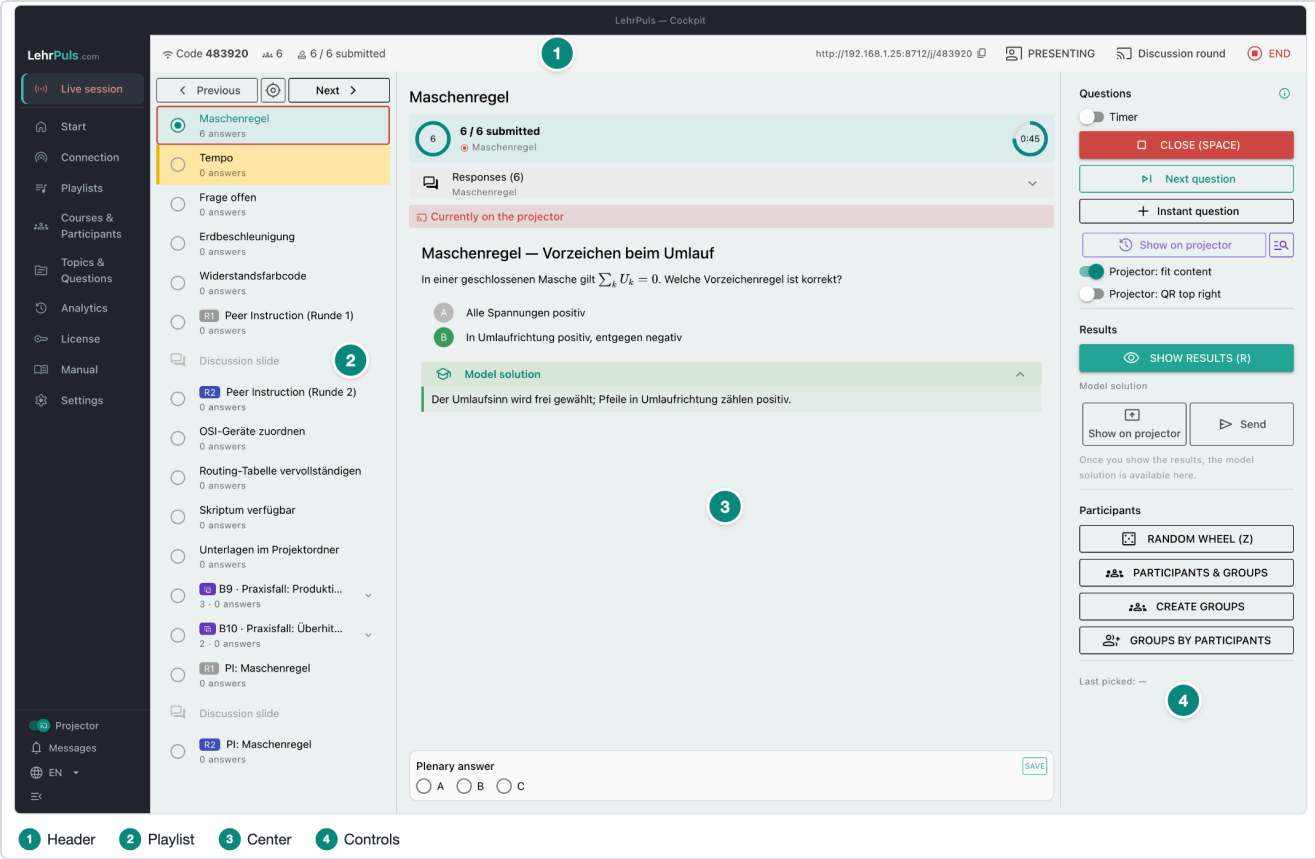
A small indicator at the edge shows the connection state. If the connection drops — screen lock, a brief radio shadow — the page reconnects on its own, and answers already typed are not lost: they are buffered on the device and submitted afterwards.

When the connection drops, an orange bar appears at the top and stays for a few seconds; once the connection is back, a green bar reports "Reconnected" — with the number of the interruption if it happens repeatedly. Because such bars inevitably disappear again, the header carries a **messages button** (bell) to the left of the language switch: it unfolds the history with times — connected, lost, reconnected. The badge on the bell counts what has arrived since it was last opened. That way you can check afterwards whether a device really had dropouts instead of guessing from the corner of your eye.

Frequent dropouts almost always have a cause on the device or in the network: the screen locks, Wi-Fi switches to power saving, or the device roams between two access points. The session itself — a break included — never disconnects anyone.

6.4 The live cockpit

When the session starts, the cockpit switches to the live view. It has four areas.



Header row. On the left the session **code**, the number of **connected devices**, while a question is running its progress ("12 / 30 submitted"), and for a playlist session the path of the playlist being played. In the right half follow the **join address** in text form (clicking it copies the join link to the clipboard, for example to paste into a Teams chat or an email), for a playlist session also the running **time display** and the **Pause** button (a spontaneous session has neither), the **Presenting** button (section 6.16), the **Discussion round** toggle (section 6.15), and at the far end the **End** button. This row is your confidence display: as long as the number of connected devices looks right, everything is running.

Playlist (left). All questions of the session with their state:

Icon	State	Meaning
empty circle	queued	not asked yet
ring with a dot	open	answers are being accepted
lock	closed	no more answers, not revealed yet
check mark in a circle	revealed	the solution has been shown

Clicking places the cursor on a question; the order is therefore free to change at any time.

In addition to the icons, colors show where you are in the flow: a **pale red fill** underlays what is currently running — the open question or the open question block including its sub-questions —, and the **red outline** marks the one row within it that is **on the projector right now**. The **yellow fill** marks what the **Next question** button will open; a **strong yellow outline** highlights the row within it that will be shown first. Questions outside the running selection only show the preview when clicked — the disabled main button says so. So before every press of "Next" you can see what is about to appear on the projector.

Adding grayed entries later. If you started only part of the playlist (say, only "Station 2"), the remaining entries appear grayed in the column — as a preview, but not as part of the session. The **list with plus** icon on a section or question block row adds that row's missing questions to the running session: they appear at once as queued entries, the selection jumps to the first of them, and in stations mode they are now listed on the assignment board (section 6.14). Nothing is opened. The same icon also sits on every grayed single question and offers two options: **Add this question** adds just that one, **Add from here on** adds it plus everything that follows it in its section and is still missing. This lets you jump to another place in the playlist in the middle of the lesson, backwards or forwards, and carry on from there: add, the question is selected, space bar. A question block that has already been played carries the **Repeat** icon instead: it appends the question block as a new **run** below the first one — with its own state and its own answers; the first run stays untouched, including its answers and analysis (section 6.14, variant 2). The same **Repeat** icon sits on every single question that has already been played: it appends the question as "Run 2" directly below the first one, the selection jumps to it, and **Show question** asks it again — for instance once more to the groups after the discussion. The main button itself deliberately stays locked on a played question so that nobody restarts a running reveal by accident.

Center. For every open question, a progress ring with the number of answers received. Below it the answers arrive as cards with the time each took — for all question types; with **open questions** you read along here while the class writes and pick out what you want to discuss afterwards.

Controls (right). Three labeled sections: **Questions** (timer, main button, next question, instant question, look-back/preview, the projector switches), **Results** (show results, model solution) and **Participants** (random wheel, Participants & groups, group phases). The **Next question** button adapts its label to what is coming up — ahead of a question block it reads **Next question block**. The info button next to the **Questions** heading opens the quick guide to peer instruction, question blocks, groups and stations. Section 6.5 explains the most important controls.

Who is here? — the Participants & groups dialog. The **Participants & groups** button in the "Participants" section of the controls opens the list of names, either **All participants** or **By group**. If a course is assigned to the session, the list mixes in the **absent course members** in gray — so you see not only who is present but also who is missing; a person icon in front of each name distinguishes connected from absent. Guests carry their badge (section 6.2). **Show on projector** puts the board on the wall. The **Wheel draws from: Connected / Course list** toggle sits in the controls directly above the random wheel button and determines the pool the wheel draws from — the people present, or the whole list; it only appears when a course is assigned to the session.

The divider between the playlist and the center can be dragged with the mouse. Whatever width you choose is kept until next time — long question titles deserve more room, reading along with answers less.

Reviewing answers and showing them. Below the progress indicator sits the collapsible **Responses** area holding all open answers to the question under discussion. Each card carries three buttons:

Button	Effect
star	**keep** the answer — it moves to the yellow bar above the cards
projector icon	send the answer **to the wall**; the same icon takes it back
person icon	**release** the name for this answer, or hide it again

Anonymous is the default: an answer stands on the projector without a name until you release it explicitly. The yellow bar holds the kept answers as numbered markers; the arrows let you step from one to the next during the lecture without hunting through the cards below. On the right of that bar you find a collective toggle that releases or hides the names of **all** kept answers at once, the same name release for the answer currently shown, and the cross that takes the projector back to the question. Above the cards there is also the **Names on**/**Names off** button: it shows the names permanently in the cockpit — a name still only reaches the projector via the release on its card.

6.5 The controls in detail

The main button. It always offers the next logical action and changes its label: **Show question (Space)** or **Show question block (Space)** — for round 2 of a peer instruction question **Show round 2 (Space)** — opens what the cursor is on — it appears immediately on the projector and on all devices —, the same button then reads **Close (Space)**, for a question block **Close question block (Space)**, in stations mode **Close stations**, with peer instruction **Close → discussion (Space)**, and after the reveal **End discussion** (takes question and reveal off the projector and the devices without opening a new question — section 6.16 explains when this is the right move and when Presenting is). After closing, the question stays on the projector — with the note "Submissions closed" — until you reveal, open the next question or end the discussion.

Timer. Before opening you can activate a timer and set the time in the **Duration** field; even with a question already open, switching it on takes effect at once — the time left starts running that moment. The countdown makes the thinking time visible; you still close the question yourself — it stays open after the time runs out until you close it, and the cockpit then reads "Time is up". The timer is useful to bound thinking time visibly — 30 seconds are usually enough for a conceptual question and stop the fast ones from getting bored. You type as you do in the question editor: **15** is fifteen minutes, **45s** is forty-five seconds (section 3.3). The remaining time counts down in the ring as minutes and seconds ("2:42"), in the cockpit as well as on the projector and the devices. If the timer should be on from the start in every session, set that under **Settings → Session & projector** (section 10.2).

Extending the time left. With the timer switched on, the **+1 min** button sits next to the field. It extends the **running** time left by one minute — remaining time plus the addition, not from the start — and the value in the field grows visibly with it, so you can still tell how much has been allotted in total. With no timer running, the button simply raises the figure for the next opening. This is the handle for the moment when the room is obviously still writing.

Ending the time left right away. Next to it sits the counterpart, **To zero**: it sets the running time left to zero at once — the cockpit says "Time is up", on the projector the ring reads 0:00, and the devices show the time in the warning color. That is the "pens down" signal for when everyone is visibly finished and you do not want to wait for the time to run out. The question stays open; you close it as always with the main button. The **Duration** field is left unchanged, as it is the figure for the next question. With no timer running, the button is grayed out.

Where the duration comes from. If you stored a **planned duration** when creating the question (section 3.3), it is already in the field when you switch the timer on. Independently of that it is shown as **Planned: 1:30** next to the timer switch — even when you work without a timer, because it is your guide to pacing and does not itself count down. For a question block it is the **sum of its tasks**: three tasks of 60, 120 and 120 seconds make 5:00 for the whole question block, because the question block is opened as a whole. That way the session runs on exactly the time you planned with. If you enter something else, your value applies to that question or question block; the **Use planned duration** button — it only appears when the field holds

something different — brings the plan back. Moving on to the next question or question block restores its own figure. Questions without a stored duration leave the value you last used — 60 seconds to begin with.

Close. Stops accepting answers. The question stays on the projector with the note "Submissions closed"; the distribution only appears with the reveal.

Show results (R). Shows the correct answer on the projector and on the devices. For numeric questions the correct value appears, for estimates the group mean and the reference value, for ordering questions the number of correctly placed elements.

Model solution. It is deliberately decoupled from the reveal and never appears on its own: after the reveal it stands ready in the **Results** section — **Show on projector** puts it on the wall (and **Remove from projector** takes it down again), **Send** additionally pushes it to the participant devices. Sending cannot be taken back and is locked during a discussion round (no devices).

Random wheel. Picks one of the connected people at random and shows the name large on the projector; "It's your turn!" appears on that person's device. The wheel has a **fairness memory**: whoever has already been picked becomes less and less likely to be drawn again — it is not ruled out. See section 12.5 on how to use it. At the very bottom of the "Participants" section it says who was picked last.

Keyboard. The four most frequent actions sit on a single key each, so you can operate them without taking your eyes off the audience:

Key	Effect
Space bar	opens what is marked yellow; with a question open, closes it; after the reveal, opens the next question (in the debrief of a question block: reveals the selected sub-question)
R	show results (reveal the correct answer)
Z	spin the random wheel
← / →	move through the playlist — selection and preview only, projector and devices stay where they are; the **Jump to the question on display** button brings the selection back to what is currently running

What the reveal shows. Next to each bar you see the count and its share ("3 · 43%"), and above them the reference figure. In round 2 of a peer instruction question, the round 1 share follows in brackets behind the bar ("18 · 75% (Round 1: 42%)"), so the shift can be read off in the cockpit already. With multiple choice this distinguishes two things that are easily confused: "7 selections from 3 participants" means three people set seven ticks between them — the bar percentages refer to the seven selections, not to the three people.

In addition there is the **attainment**: the share of the achievable result that was actually reached. For each person the correct ticks count, minus the wrong ones, divided by the number of correct options (never less than zero); the average across everyone who answered gives the figure. With three participants and three correct features, nine correct ticks would be possible; seven of them give 78 percent. The deduction for wrong ticks matters: without it, anyone simply ticking everything would score a full hundred percent. Questions without a stored solution — poll and Poll+, open question, estimate, notice without a two-button response — have no attainment figure (a notice with two labeled buttons counts button 1 as correct, section 3.4). The plenary answer does not count; it is the room's consensus, not an individual result.

6.6 The projector window

LehrPuls has a **second window** for projection. It shows only what the audience should see: before the start, the join page with QR code, address and code plus the number of people who have already joined; while a question is open, the question text with its answer options and the progress ("✓ 12 of 30"); after closing, the question with the note "Submissions closed"; after revealing, the distribution as a chart with the correct answer marked — the model solution only joins on request (section 6.5). For peer instruction it automatically shows a discussion slide between the rounds — round 1 closed, round 2 still to come — ("Discuss your answer with your neighbors") and contrasts the rounds as "Round 1 → Round 2" on reveal: each bar carries both rounds' shares side by side ("18 · 42% → 75%"). When someone is picked, the name appears large.

If **Wi-Fi name and password** are stored for the hotspot or the mobile router on the connection page (section 5.2), the start screen additionally shows a small **Wi-Fi QR code** labeled "Join Wi-Fi" next to the join QR: scanning it with the camera app signs the device into your network directly. Two device quirks are worth knowing: if an iPhone already knows the network with an older password, it tries to join with the stored credentials — in that case, forget the network first via **Settings** → **Wi-Fi** → **"Forget This Network"**. And on Android devices the quick-settings scanner merely shows the QR as text; devices connect automatically via the camera app (Google Lens) or the **QR icon in the Wi-Fi settings**.

Unless a discussion round (no devices) is running, the **join QR code stays in the corner** even while something else fills the screen: on the group board, with an instant question shown on the wall, and during a look-back (section 6.9). Anyone arriving late therefore always finds the way in, without you having to call up the join page again. By default it sits at the **bottom right**. In polls with many options it can end up on the last bar there; in that case switch it with **Projector: QR top right** — in the cockpit right below **Projector: fit content**. The **Projector: fit content** switch itself ("Questions" section of the controls, default: on) shrinks a long question until all of it fits on the screen instead of being cut off at the bottom; switch it off if large type matters more to you than completeness. The timer ring sits at the top right anyway; in the "QR top right" mode it moves left while a timer runs, so both fit side by side. Below the corner QR the **Wi-Fi name** is shown as soon as it is known — the detected one on shared Wi-Fi, the stored one for hotspot and router; with parallel networks in the room, everyone can always see which one is meant. And for latecomers who are not even on the Wi-Fi yet, the cockpit has the switch **Projector: Wi-Fi QR in the corner**: it shows the small joining QR (section 5.2) below the join QR — switch it on briefly, let them scan, switch it off again, and the picture stays calm. All three projector switches remember their state beyond the end of the session: the next session starts the way the last one ended.

When the program starts, the projector window is **invisible**; starting a session opens it automatically by default — this can be switched off under **Settings** → **Session & projector** (section 10.2). You also show and hide it with the **Projector** switch at the bottom of the sidebar. That way you can set things up in peace, and the audience only sees something when you want them to. If you close the window with its cross, it is merely hidden; the switch in the cockpit follows that state.

Recommended setup: the projector window on the projector, the cockpit on the laptop screen. By itself the projector shows neither participant names nor individual answers nor your notes. What appears there is entirely your decision: a single piece of feedback goes on the wall only if you send it there explicitly, and the name with it only if you also release it (section 6.4).

If a license is active, the window carries the license holder's name in its **title bar**. In full screen on the projector the title bar is not visible; the reminder is for you, not for the room.

6.7 Ending a session

End in the header row closes the session after a confirmation. The server is stopped and the participants' devices show "Thanks for taking part!". The session with all its answers is available under **Analytics** from that moment.

You do not have to save anything separately; every answer is committed as it arrives. Even a crash mid-session costs no data.

If you close the program while a session is still running, the session is wound up properly: the server stops, the end time is recorded and the playlist stopwatch is stopped. And should the program ever crash or be killed, the next start catches up — the session then ends at the time of its last activity, not at the restart. So no session is left hanging as "still running" in Analytics.

6.8 Instant questions

Questions often come up spontaneously in the middle of a session — on the board, out of the discussion. That is what the **Instant question** button in the controls on the right, just below **Next question**, is for: you pick only the type (**Poll**, **Open question** or **Estimate**) and, optionally, a text; for a poll, the **Multiple selection (Poll+)** checkbox turns it into a Poll+ in which several options may be checked. The question is valid even without any text — it is then titled "Instant question", sits simply on the board, and the devices only show the input controls. For a poll you can additionally supply answer texts; leave them empty and the devices show only the letters, with the options written on the board.

The new question comes **up next**, not at the end of the lesson: it sits immediately behind the question or question block currently running, so "Next question" opens it. Instant questions are collected in their own **Instant questions** section at the end of the playlist. If something is already running — an open question, a question block, open stations — the dialog says so: the instant question is created, but it can only be shown afterwards, because the devices only ever hold one question or question block.

The **Show on projector** button in the dialog takes a different route: the question is then **neither created nor opened**, but merely sent to the projector as an image — like a look-back (section 6.9). The devices stay with the current question. This is the "I just want to throw something on the wall" case, without touching the flow of the session.

An instant question that has been created is stored under Topics & Questions with the tag `sofort` so you can find it (or clean it up) later. For a whole lesson in this style, the **Playlists** page offers the **Spontaneous session** button: it starts with no preparation at all, and every question is created live as an instant question.

6.9 Look-back and preview on the projector

Halfway through a lesson you often need an image on the wall without stopping the flow: the question from earlier, because the discussion has come back to it; or a look ahead at the task that is next. One button in the controls on the right does this, changing its label according to the marked question, and it affects **the projector only** — the participants' devices stay unchanged on the current question, and nobody's answering options are altered by it.

Look-back. Select a question you have already played in the playlist and press **Show on projector**. It appears on the projector complete with its reveal, exactly as it stood at the time. **Remove from projector** brings the image back to the running question.

Preview. Select a question that has not been played yet and the same button still reads **Show on projector** — only its icon changes from the review pointer to the projector arrow. The question is shown in the participants' view — without the reveal, because nobody is supposed to see that yet. This is how you announce a task, or read it together before actually opening it. The same works for an open sub-question of a running question block or of open stations: the wall then shows the overview or the station board while the question itself is only on the devices — select the sub-question on the left, and **Show on projector** puts it on the wall for reading.

From the archive and from the pool. The magnifier button next to it opens **Look-back & preview on the projector** with two tabs: **Earlier sessions** brings a question and its result from a previous session onto the wall — the mood check from last time, say, to show how things have moved. **Topics & Questions** brings any question from your pool up as a preview, including one that does not feature in this session at all.

Throughout all of this the join QR code stays in the corner (section 6.6), and **Remove from projector** brings the image back to the running question in every one of these cases — look-back, preview and an instant question shown on the wall are one and the same route, and it reads **Show on projector** everywhere. If more than one thing is on the wall — say, a group comparison over a reveal — the **Clear the wall** button below "Show on projector" takes everything overlaid down at once (comparison, scenario, look-back, model solution, board) and shows the running question again; it only appears while something is overlaid.

6.10 Question blocks: one scenario, several tasks

For larger assignments — a practical scenario with several sub-questions — there is the **question block** (section 7.2). In the live playlist it appears as a single entry marked ⧉. **Open** starts all sub-questions at once; participants work through them in **any order**, can go back, and can amend or change their answers until you close the question block — the most recently submitted version always counts. Time is measured for the whole question block, not for individual sub-questions.

The **preamble** consists of two parts: the **scenario** — the shared starting situation maintained under Topics & Questions and merely referenced by the question block (section 3.2) — and the optional **work assignment**, an extra text attached to this question block in the playlist alone ("Work through the questions from an IT-security point of view"). This lets several question blocks share the same scenario while setting different focuses; work assignments on parent sections are shown as well. Both are set in the playlist editor (section 7.2).

The preamble appears first when the question block opens — large on the projector, and as an overlay on the devices that can be recalled at any time via the **Scenario** button. In the cockpit the **Submissions** table replaces the answer feed: rows are participants (or groups), columns are the sub-questions, check marks show submissions. What the wall shows is steered under the **On projector** line with **Previous** and **Next** — they page through the scenario, "Tasks + submissions" and the individual tasks; the **Scenario** switch in the row below puts the starting situation on the wall at any time or takes it down again (shown filled while it is up); next to it, **Show on projector** sends the row of the question block selected on the left straight to the wall (gray as soon as selection and wall agree). After closing, reveal the sub-questions one by one; only in the plain list (in sessions without a playlist tree) do you have to expand the question block entry to do so.

6.11 Group phases

Group work in LehrPuls comes in three flavors, and all three start in the same setup dialog: either **all groups answer the same questions** (each group submits one joint answer), or the groups are assigned **different subquestions of one question block**, or you run **stations mode** — several question blocks in parallel, each group working on its own. In addition there is **free group building**, where the participants find their own

groups (end of this section). This section describes what all forms share: building groups, starting a round, how answers count. Connected devices are not required: **Create groups** is also available in a discussion round (no devices) — with **Course list** you compute the plan from the course roster, print it (printer icon in the dialog header), or show it on the projector as a board after **Start round 1**.

What a round is. A round is a **group composition** — not a work step. While a round is running you ask any number of questions, question blocks and station runs in this composition; questions without group reference may sit in between. Plan several rounds only if you want to reshuffle **within the same session**; **Next round** then changes the composition. A plan belongs to its session: a later session starts without a plan and is computed afresh — and the planner takes the **pairing history** of all earlier sessions of the course into account, so the participants mix over the semester by themselves. Rounds from an earlier session cannot be "reused", and there is no need to. Which form suits what is shown in the overview in section 6.12; the step-by-step procedures are in section 6.13 (one shared question block) and section 6.14 (stations mode).

With the **Create groups** button — it sits in the controls on the right, section **Participants**, below the **Participants & groups** button, as long as no group phase is running — you split the participants into groups. You specify **Number of groups** or **group size**; across several **rounds (everyone with everyone)** the built-in planner ensures that, as far as possible, everyone works with everyone else once. The achieved coverage is shown honestly ("43 % of all pairs together at least once") — perfect plans are often mathematically impossible — and earlier meetings of the same course are taken into account. Group mode requires joining with a pseudonym or name; anonymous participants cannot find each other in the room.

Who gets planned in? The **Connected / Course list** toggle decides that; it only appears when a course is assigned to the session — without one, the plan uses the connected participants. **Connected** plans only with those who have signed in on their device in the room. **Course list** plans with the whole registered group, including those who have not joined yet — the right choice when you want to compute and print the plan before the lesson. Anyone joining later is hooked into the group planned for them via their name. On the group cards and on the projector board, a person icon per member shows who is **connected** and who is **absent**, so you can see at once which group stays empty.

Rearranging by hand. If the computed allocation is wrong in one place — two people are meant to work together, one should change group — fix it in the **Participants & groups** dialog right at the person: the ⋮ menu next to the name offers **To group 1**, **To group 2** … and **Remove from group**, in the group cards, in the **No group** card as well as in the **All participants** list. This works for connected participants and for course members who are still absent; whoever joins later lands in the newly chosen group. This is also how you place latecomers who joined only after the group phase started. The devices of both affected groups receive the new group notice at once, and the moved person additionally gets the view of their new group — with a running question block or open stations, that means its tasks right away —, the projector board follows, and the stored plan of the round including the pairing history is updated. With freely formed groups the targets are named by their letters.

After a run, the **Compute plan** button only becomes active again once you change something in the inputs. Every run **replaces** the previous plan of the same session completely — discarded drafts therefore do not linger and do not distort the pairing history of future meetings. The printer icon at the top right of the **Set up group phase** dialog header (tooltip **Print group plan**; it only appears once a plan has been computed) lets you **print the plan** for posting in the room.

Group form and start button. Below the inputs you choose the **group form** from section 6.12: **A · Same tasks for all groups**, **B · Different tasks per group** or — as soon as the started selection contains at least

one question block — **C/D · Station work**. The start button at the bottom follows your choice: for A and B it reads **Start round 1**, for C/D **Round 1 + stations**; it only becomes active once a plan has been computed — before that it stays gray. Both paths begin the same way: the assignment becomes binding, every device shows a group banner with the group name, the round and "Together with: …", the projector shows the allocation as a board (with group numbers only if you prefer, toggle **Names on projector**), and the join QR code stays visible in the corner. **Start round 1** stops there — no question is opened, and you simply ask questions to everyone afterwards. **Round 1 + stations** instead jumps straight on to the assignment board of stations mode (below).

Answers count per group. While a round is running, a submission belongs to the group: every member may send, the group's last submission counts. In the cockpit every feedback card carries the group badge in front of the name once the name is visible (with "Anonymous" it is omitted), and the progress counter counts groups instead of devices — "2 / 3 sent" therefore means two of three groups; connected participants without a group keep counting individually. The reference figure in the reveal counts groups as well ("3 selections from 2 groups"). The header of the participant page shows one's own group throughout.

Next round. If several rounds are planned, the **Next round** button moves on: new composition according to the plan, a new board on the projector, new group notices on the devices — and in stations mode the prefill of the assignment board rotates along (section 6.14, variant 3).

Bringing back the group board. As soon as you open a question, the projector clears the group board by itself — the question belongs on the wall. If you want to show the allocation again in between, press **Show groups on projector** in the control panel; it sits right below the **Names on projector** toggle and reads **Remove groups from projector** while the board is up. The same toggle is available as **Show on projector** in the **Participants & groups** dialog (section 6.4). During a group phase the projector footer counts groups rather than devices: "✓ 2 of 2" means both groups have answered — the same units as the **2 / 2 submitted** indicator in the cockpit.

Groups by participants. Next to it lies the second path: instead of assigning, you let those present **build their groups themselves**. Each group gets a letter, and whoever sits down together picks the same one. This is the path for project groups that already work together anyway, and for the room where neighbors find each other naturally — for instance: "Form groups of three, pick a letter, then every group gets the same case study." **Stop group forming** closes the phase again; if no group remained occupied, it is simply cleared away. As soon as you open a question, a question block, or stations, group forming ends by itself — the groups stay, only the choose-a-group notice disappears from the devices. Latecomers and rearrangements are then handled as with planned groups, in the **Participants & groups** dialog via the ⋮ menu (targets are the letters).

Ending the group phase. The red **End group phase** action in the control panel dissolves the assignment: the devices lose their group badge, answers count per person again. The analyses of course keep the group answers of the questions played — marked with their group.

6.12 Group work at a glance: which form for what

The following overview sorts the flavors by what lies in the playlist and what the groups are supposed to do. All forms require a running group phase (section 6.11): joining with pseudonym or name, groups created, round started.

Form	What lies in the playlist	Flow in brief	Section
A · Same tasks for all groups — each group submits one joint answer to every question	single questions or one question block	**Start round 1**, open questions as usual, compare the group answers on the projector	6.13 a
B · One question block, different tasks per group — each group works only on its own subquestions	one question block with (at least) as many subquestions as groups	choose form **B**, assign subquestions, **Start round 1**, open the question block; each group presents its subquestion	6.13 b
C · Stations mode in one composition — several stations run in parallel, each group works on one; if every group is to do every station, further runs with swapped assignment follow, the groups stay together	several question blocks side by side in the same section; **one** round	choose form **C/D**, **Round 1 + stations**, assignment board, **Open stations**, **Close stations**; for the next run **Open stations** again — the board is then already prefilled with the swap	6.14, variants 1 and 2
D · Stations mode with a new composition — after every run the groups are reshuffled	as C, plus several **rounds** planned	as C, then **Next round** (new composition) and **Open stations** again	6.14, variant 3

Decision aid.

- Should everyone think about the same question, but decide in small groups and then compare? Form **A**.
- Is there one task with several sides — roles, perspectives, sub-problems — to be split up and brought together afterwards? Form **B**.
- Are there several independent assignments, ideally each with its own scenario, to be worked on at the same time? Form **C** — also when every group is to do all stations in turn: those are several runs in **one** round.
- Should the groups be reshuffled between runs? Only then form **D** with several rounds.

For all forms: what the groups are supposed to see belongs in the playlist before the start — the scenario on the question block, the planned duration on the subquestions (the timer is prefilled from it). If a section was left out at the start, it can be added later (section 6.4, "Adding grayed entries later").

6.13 One shared question block for all groups

The simplest group work needs no special playlist: one or more questions, ideally as a question block with a shared scenario (section 6.10). The two procedures differ only in whether all groups work on the same subquestions or each group on its own.

a) All groups work on the same tasks.

Prerequisites: the questions in the playlist (single questions or one question block); joining with pseudonym or name.

1. Start the session and let the participants join.
2. **Create groups** (controls on the right, section **Participants**): choose **Number of groups** or **group size**, **rounds** if needed, then **Compute plan**. If the plan should exist before the lesson, switch to **Course list** (section 6.11, "Who gets planned in?").

3. **Start round 1.** The devices show the group banner, the projector the board. No question is opened yet.
4. Open the question or question block as usual with the **space bar**. All groups see the same tasks; every member may send, the group's last submission counts. The progress counter counts groups ("2 / 3 sent"). The **timer** is prefilled with the planned duration — switch it on if the groups should see the remaining time. The countdown makes the thinking time visible; even after it runs out, the question is only closed by you (space bar or main button, section 6.5).
5. Close and **reveal**. With a question block, the **compare icon** (two opposing arrows) next to a subquestion puts all group answers side by side on the wall, each with its group name — the moment for comparing: where do the groups differ, and why? A second click on the same icon takes the comparison down again.
6. Further questions likewise. For a new composition **Next round**; at the end **End group phase**.

Who presents can be drawn with the **random wheel** (section 6.5).

Example — everyone with everyone across the semester. A seminar with 18 registered people is to work in groups of four, and over the semester everyone should work with everyone else once if possible. In every session you switch to **Course list**, set **group size** 4 and **rounds** 1, compute the plan at your desk and print it. In class you start round 1 and ask perfectly normal questions — each group agrees and submits one answer; questions without group reference may sit in between, the composition stays. Latecomers are assigned to their planned group automatically on joining; the person icons on the board show who is still missing. In the following weeks you compute a one-round plan again: the planner knows the **pairing history** of the earlier sessions of the course and prefers to put together people who have not worked together yet — the coverage ("x % of all pairs together at least once") grows from session to session. You only need several rounds in one session if you want to reshuffle within the same lesson.

b) Different tasks per group.

Prerequisites: **one** question block whose subquestions can be spread across the groups — ideally as many subquestions as groups, or a multiple of that, so that every group has the same amount to do. A shared scenario on the question block makes sure everyone talks about the same starting point. Joining with pseudonym or name.

1. Start the session and let the participants join.
2. **Create groups** (controls on the right, section **Participants**): align the **number of groups** with the subquestions, switch to **Course list** if needed, **Compute plan** (as in a).
3. In the setup dialog choose the form **B · Different tasks per group**, choose the question block and assign each subquestion to a group. The **All groups** entry (the default of every row) leaves a subquestion with all groups — say, an info notice with materials every group needs.
4. **Start round 1**, then open the question block with the **space bar**. Each group sees the scenario and only its own tasks; in the cockpit you see per subquestion whether the group in charge has submitted.
5. Close the question block. The debrief walks through the question block subquestion by subquestion with **R**; the **compare icon** (two opposing arrows) next to the subquestion puts the answer of the group in charge on the wall — the basis on which that group presents its part.
6. At the end **End group phase** — or append the question block once more with **Repeat** and play it with a swapped assignment (section 6.4); reshuffle with **Next round** first if the groups are to change. The assignment applies from **Start round 1** to all rounds of this group phase. You can change it at any time without losing the groups: while the phase is running, the **Create groups** button in the control panel reads **Edit groups**. It opens the same dialog with the existing plan and the current assignment; adjust the assignment and press **Apply assignment**. Even after **End group phase** the dialog still offers the previous

plan (note "Existing plan"), so **Start round 1** sets up the same groups again. Only **Compute plan** reshuffles the groups.

Example — one case study from four perspectives. The question block "Special exhibition" carries the museum scenario and four subquestions: concept, budget, security, communication. You form four groups, switch on **Different tasks per group** and assign one subquestion to each group. After opening, each group works on its perspective for ten minutes; then you close the question block and let the groups present in turn — with **R** you jump to the respective subquestion, and the projector icon shows the group's answer.

6.14 Stations mode: several question blocks in parallel

In stations mode several question blocks run at the same time, and each group works on its own. It pays off when there are several independent assignments — say, different scenarios or work steps of a project.

Prerequisites in the playlist.

- **One question block per station**, each with its own scenario and its own subquestions. The question blocks sit side by side in the same playlist section, for instance section "Group work" with "Station 1 · Concept" and "Station 2 · Planning". A recognizable name helps on the assignment board.
- **Planned duration** on the subquestions: the assignment board prefills the shared timer from it — the longest station counts; the shorter ones are finished by then anyway.
- When starting the session, **start the section that contains all stations** (or the whole playlist). If you started only one station, the **list with plus** icon on the grayed row brings the others into the session later (section 6.4).
- Joining with pseudonym or name.

Variant 1 — one run, one station per group.

1. Start the session and let the participants join.
2. **Create groups** (controls on the right, section **Participants**): choose the **Number of groups** — equal to the number of stations, or a multiple of it if several small groups are to work on the same station —, **Compute plan**.
3. Choose the form **C/D · Station work**, then **Round 1 + stations.** The assignment becomes binding and the **assignment board** opens: one row per group with its station next to it, already prefilled (group 1 → station 1, group 2 → station 2 …) and changeable by hand. Several groups may choose the same station — say, four pairs on two stations; then two groups work on the same task in parallel, each submits for itself, and the comparison shows their answers side by side. "— none —" lets a group sit out; groups without a station and stations without a group are named explicitly below the board — allowed, but deliberately visible. Stations without a group stay closed.
4. **Timer**: the duration is prefilled with the longest planned time of the stations ("Planned"). Switch it on so that all groups see the remaining time; the countdown makes the working time visible but does not end the work phase — you always do that yourself with **Close stations** (step 6).
5. **Open stations.** On its devices each group sees only its own question block — with the scenario, free navigation through the subquestions and the group's shared submission state. In the cockpit every station card shows the check marks of its subquestions, **Scenario & subquestions** opens the view behind a station; the projector shows the stations board with the progress.
6. **Close stations** (main button) ends the work phase for everyone together. The station board stays on the projector with the note "Submissions closed" until you reveal the first subquestion or open something else.

The selection jumps to the first resolvable subquestion of the first station, and **R** or the **space bar** walk the debrief subquestion by subquestion — continuing automatically into the next station at the end of one. The selection stays on the question just revealed, so the middle pane and the feedback show exactly what is being discussed. Where several groups had the same subquestion, the projector icon puts the group answers side by side.

7. **End group phase** — or continue with variant 2 or 3.

Example — stations mode in a project seminar. Eight people present, and the playlist contains two question blocks "Station 1 · Concept" and "Station 2 · Planning". You open **Create groups**, leave **Connected** selected, set **Number of groups** to 2 and click **Compute plan** — the dialog shows "8 present → 2 groups" with the allocation. You choose the form **C/D · Station work**; **Round 1 + stations** makes the assignment binding, and the assignment board already reads: group 1 → station 1, group 2 → station 2. The duration stands at the longest planned time; you switch the timer on and click **Open stations**. Both groups now work in parallel while you follow the check marks on the station cards. When time is up you click **Close stations** and lead the debrief with **R** — first the four subquestions of "Concept", then automatically on through "Planning". To finish, the **random wheel** picks who presents for each group.

Variant 2 — same composition, swapped stations (every group at every station).

If the groups are to stay together and do all stations in turn, it remains **one** round; you simply open the stations several times with a swapped assignment. Submissions belong to the group slot — at its new station every group starts from zero, and the other group's submissions stay untouched.

1. Start the session and let the participants join.
2. **Create groups** (controls on the right, section **Participants**): **Number of groups** equal to the number of stations, **rounds** 1, **Compute plan**.
3. Choose the form **C/D · Station work**, **Round 1 + stations.** On the assignment board each group has its station prefilled (group 1 → station 1, group 2 → station 2 …); timer as needed, then **Open stations**. (Up to here this matches variant 1.)
4. After the work phase **Close stations** — do not reveal yet: save the debrief until after the last run, otherwise the next group already knows the solution from the wall.
5. **Open stations** (button in the "Participants" area of the control panel once the stations are closed): the assignment board is already prefilled with the swap — each group moves on from its previous station to the next one (group 1 → station 2, group 2 → station 1; with three or more stations one station further per run). Check, adjust if needed, open.
6. Repeat until every group has had every station. Then **Close stations** and lead the debrief: **R** or the **space bar** walk subquestion by subquestion through all stations, and the compare icon (two opposing arrows) next to a subquestion puts the answers of all groups side by side — every group had its turn, so comparing pays off.

If you want to see the runs separately in the tree and in the analysis, append the stations before the next run with **Repeat** as "… · Run 2" (section 6.4) and assign those new entries; the stations of the first run stay without a group (the board lists them under "Stays closed"). The same path also serves outside stations mode: a single question block that should be played once more — say, after a discussion or with a new task assignment — is appended with **Repeat** and opened like a new question block.

Example — two stations, two groups, every group both stations. You plan **one** round with two groups, choose **C/D · Station work** and start with **Round 1 + stations**: group 1 → station 1, group 2 → station 2,

Open stations. After ten minutes **Close stations**, without revealing. Then **Open stations**, set group 1 → station 2 and group 2 → station 1 on the board, open. After the second close you lead the debrief through both stations; at every subquestion the answers of both groups stand side by side.

Variant 3 — new composition per run (several rounds).

Prerequisite: when you **create groups**, plan as many **rounds** as there are to be runs. With every round the composition changes according to the plan (everyone with everyone), and the prefill of the assignment board moves on by one station.

1. Start the session and let the participants join.
2. **Create groups** (controls on the right, section **Participants**): **Number of groups** equal to the number of stations, **rounds** as many as there are to be passes, **Compute plan**.
3. Choose the form **C/D · Station work**, **Round 1 + stations**, check the assignment board (group 1 → station 1, group 2 → station 2 …), timer as needed, **Open stations**. (Up to here this matches variant 1.)
4. After the work phase **Close stations**. Debrief right away or all at the end.
5. **Next round**: new allocation on devices and projector.
6. **Open stations**: the assignment board appears with the rotated prefill; adjust if needed, then open. The stations run again, now with the new groups; earlier submissions stay with the earlier groups.
7. Close, further rounds likewise; at the end debrief and **End group phase**. In the analysis the answers are labeled with their group.

More groups than stations. Several groups may choose the same station — say, four pairs on two stations; each group submits on its own, and in the comparison their answers sit side by side. Duplicating the question block is not needed for this. Conversely, a group may sit out ("— none —"), for instance when there are fewer assignments than groups; stations without a group stay closed, and the board names both explicitly.

6.15 Discussion rounds via the projector only

Sometimes you just want to discuss together briefly, without anyone reaching for a device. For this, the session start offers the switch **Discussion round (no devices)**: the projector shows no join information, and the questions appear large on the wall — devices already connected still receive them, and answering is allowed too. You can also switch the mode **in the middle of a session** — depending on the current state, the button in the status bar reads **Discussion round** or **Allow participants**. So if you start a session and only then realize that nobody needs a device today, you do not have to end it and start again. Devices already connected stay connected; the mode only determines what is displayed. While a question is open, the cockpit offers the **plenary answer**: you tick the boxes together with the audience (or type text or a number), the marks appear live on the projector, and **Save** records the consensus — changing and saving again is expressly intended. Saving by hand is merely the option to do it earlier: if you close the question or reveal it without having saved, the current state is recorded automatically — what stands on the wall is not lost. On reveal, the projector contrasts the audience's gut feeling with the correct answer; for an open-text question, which has no correct answer, the jointly formulated sentence stays on the wall, because that is what the room is talking about. In analytics the plenary answer is shown labeled but does not count toward the statistics. By the way, the plenary answer is available in every session, even with devices connected.

6.16 Pause and presenting

If the session is playing from a semester playlist (chapter 7), the header shows the playlist path and a running **time display**. The **Pause** button stops it — the projector shows a calm break screen with the join QR code for latecomers — and **Resume** continues the time display.

The break also stops the **timer of an open question**. The remaining time is remembered: no countdown runs on the devices or on the projector during the break, and the cockpit shows the frozen time as a gray ring. **Resume** continues with exactly the time that was left — nobody loses their thinking time because you aired the room in between. If the session ends while a break is still running, the break screen ends with it, so the projector window is not left showing the old image. And if you simply open the next question while the break is on, the break ends by itself — the time display and the timer run again and the projector clears the break screen. No separate click on "Resume" is needed.

Presenting. Next to the break there is the **Presenting** button — the second kind of stop, for switching between presenting and asking within the same session. It does not pick the question up again, it clears it away: an open question (a question block or the stations mode as well) is closed, the projector and the devices are cleared back to the start screen, and the time display stops. The session keeps running — nobody has to sign in again, and because the join QR code stays on the projector, latecomers can still join. The devices show "About to start" while you present.

You continue with a **new** question: simply open it — what opens is whatever is marked in the tree, otherwise the next entry in sequence (the yellow marker shows it). Presenting then ends by itself, no extra click needed. If you want to end it without asking right away, the **End presenting** button does that. While presenting, the pause button is hidden — the two stops take turns, so there are never two buttons labeled "Resume".

End discussion or Presenting? Both clear the wall, and yet they are different tools — a difference worth knowing while operating the session.

End discussion is the small gesture after a revealed question: question and reveal disappear from the projector and from the devices (which show "Waiting for the next question" again) — nothing else happens. The session keeps running at full speed: the time display in the header — it is the playlist's time account — keeps adding up, and no special mode begins. The main button therefore only offers this action when nothing is open any more — it ends the debrief of one question, not the questioning itself. After an instant question it also returns the selection to the playlist position from which you had asked it.

Presenting, by contrast, is a real change of mode with three additional effects. First, it also clears away anything open: a running question, an open question block or open stations are closed — submissions are then in. Second, the time stops: the time display in the header, which is the playlist's time account — without a playlist there is neither the time display nor the pause button. Third, it is a state that lasts until you switch it off or simply open the next question.

An example makes the choice tangible. You have revealed a single-choice question and talked about the result for two minutes; now you want to move on briskly, but the bar chart should not stay on the wall during the transition. That is the case for **End discussion**: wall cleared, a short bridge, next question opened. The stop is so short that the time display may as well keep running — it is still question time, just between two questions.

Different after the debrief of a question block that is followed by twenty minutes of lecturing with your own slides before the next round of questions: that is the moment for **Presenting**. The wall is cleared and stays clear, the playlist's time keeping does not count the lecture minutes as question time, and the devices calmly

show "About to start" — nobody is left waiting in front of a stale reveal. When you later open the next question, presenting ends by itself.

As a rule of thumb: **End discussion** for the short transition between two questions, **Presenting** for the longer question-free stretch, **Pause** when the running question should afterwards continue exactly where it stood.

If the lesson ends in the middle of a section, simply end the session: the next start of the same section has the questions already covered pre-checked, and the time keeps adding up (section 7.3).

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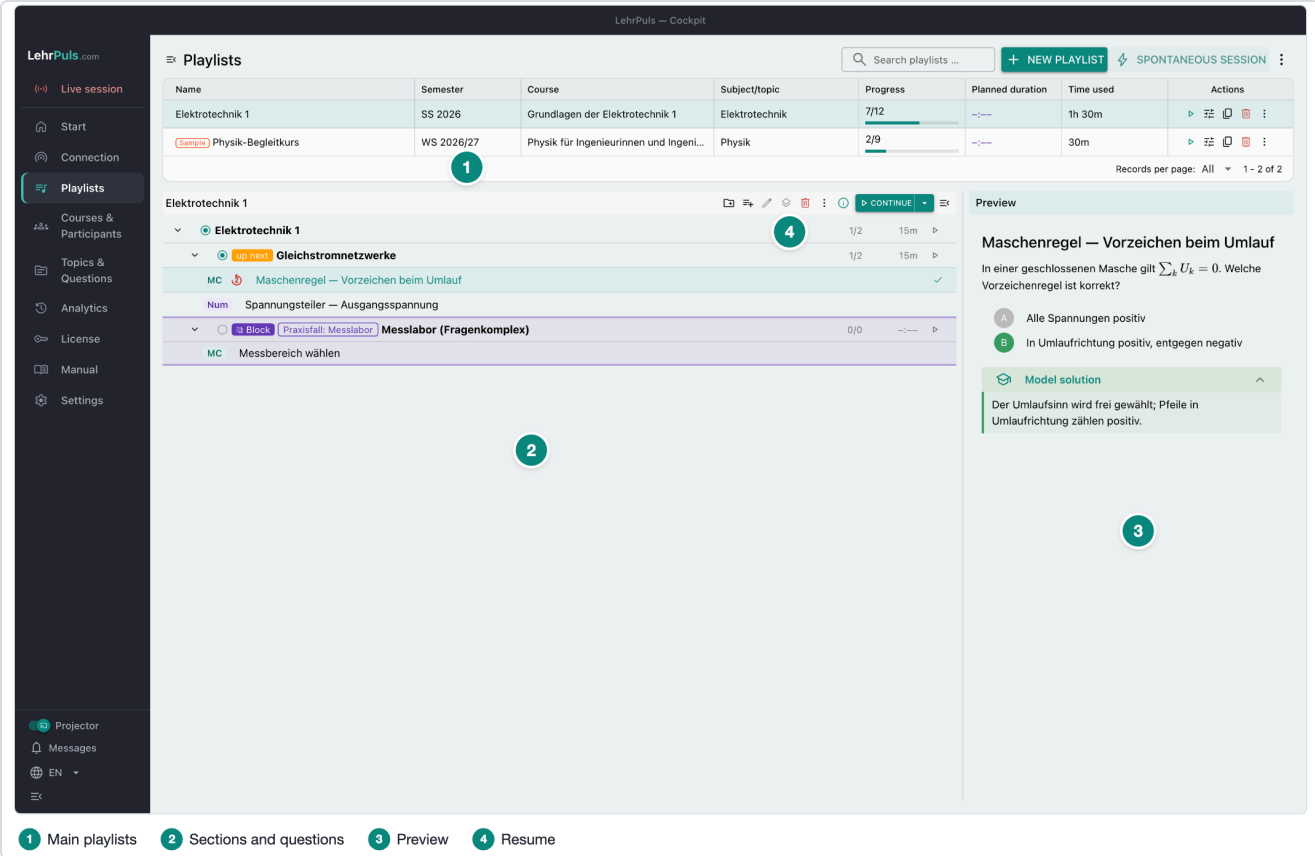
7. Semester playlists

The playlist from section 6.1 is ephemeral — clicked together for a single session. For an entire course of lectures there is the **Playlists** page: plan the semester as a tree of sections, play it session by session, and see at any time what is done and how much time it took.

7.1 Structure

A **main playlist** represents one course of lectures: name, semester and assigned course; the table's **Subject/topic** column shows the topic last taken over (section 7.2). Below it are **sections** (the chapters and subchapters of your course, say) — usually mirroring your topic tree — plus **question blocks** (section 6.10) and, at the end, ideally a section with reflection questions on the overall subject. Every row shows its state: ○ open, ● started, ✓ completed, plus "used/total" and two times; parent sections include their subsections. The **violet time** is the planned one: the sum of the planned durations of all questions below (section 3.3). The **gray** one to its left is the time actually measured in previous sessions. Both totals carry their unit — "39m 15s", "1h 52m" — so it is never unclear whether a figure means minutes or hours; only the duration of a **single** question is given as minutes and seconds (1:30), where the order of magnitude is unambiguous anyway. Read side by side, they answer the question that matters when planning the next semester: is the time I set aside enough? Sections where not a single question carries a figure show no planned time at all — "nothing planned" is not the same as "zero seconds planned". The **up next** suggestion marks the first non-skipped section with questions of its own of which some are still unused — a started section counts too; the start page also shows it as a card.



The same two times also appear in the **playlist table** above, as the columns **Planned duration** and **Time used**, next to **Progress** (a bar) and the hideable creation date (**Created**); which columns are visible is set in the table's column menu. Here, unlike in the tree, the planned time comes first; a tooltip on each cell says which of the two you are reading. If not a single question carries a figure, the cell shows "–:—".

A course is **not required** for a playlist. A collection you need in every course of lectures — a short warm-up round, say — is created without a course and without a semester; a session started from it then runs anonymously. The bundled sample playlist **Mood Checks and Ice Breakers**, which sits near the top of the list, is built exactly that way.

The divider between the tree and the preview on the right can be dragged with the mouse; the width you set is kept.

7.2 Assembling

The standard route runs through the playlist's **Properties** dialog. There the field **Take over topic (topic tree)** is deliberately an **action**, not a label: it is always empty when the dialog opens, and whatever you choose in it is copied into the playlist as a section tree, questions and all, when you save. This can be repeated as often as you like, with further topics too — which is how a playlist grows out of several subjects. Choose nothing and nothing happens. The list shows every topic with its full path ("Electrical engineering › Resonance and filters") and is sorted alphabetically, so identically named subtopics stay distinguishable.

Then strike out what the course does not need: the remove icon only deletes the playlist entry, never the question in the pool. Conversely, you can also **add individual questions** — say, a few revision questions from another subject: select in the tree the section they should go into, click the **Add questions** icon in the toolbar, pick a topic on the left of the dialog and tick the questions you want on the right; **Add** appends them to the end of the section. The same dialog offers **Include entire topic** below the topic tree for a whole topic and,

underneath, **Include scenario** (see below). From the moment of inclusion the playlist is decoupled from the pool: later pool changes do not shift your semester plan.

If the included questions carry a scenario, the **Bundle questions with a scenario into a question block** switch — in the Properties dialog and, for the individual inclusion, below the topic tree of the **Add questions** dialog — makes every group of questions sharing a scenario automatically become a question block. Switch it off and you get a flat list instead. The **Add questions** dialog additionally offers the **Include scenario** button: it pulls in a complete scenario together with its questions in one go.

In the tree's toolbar, the layers icon (tooltip **Group selection into a question block**) turns a selection into a **question block** with a name and an optional **work assignment** (Markdown and formulas; images belong in the scenario, which you maintain under Topics & Questions, section 3.7 — images cannot be inserted into the work assignment itself); select several questions **of the same section** for this with Cmd- or Ctrl-click individually, or with Shift-click as a range; questions that already sit in a question block cannot be bundled again. With a question block or section selected, the same spot in the toolbar shows the dissolve icon instead. The scenario reference and the work assignment can be changed at any time later via the ⋮ menu item **Question block & preamble**: the scenario is merely referenced there and remains maintained under Topics & Questions, while the work assignment applies to this question block alone — together they form the question block's preamble (section 6.10). The same dialog carries the **Play as a question block** switch at the top: with it you turn an ordinary section into a question block after the fact, or a question block back into a section, without moving its questions; for the main playlist itself the dialog does not exist. **Dissolve question block** — for a plain section the menu item is called **Dissolve section** — reverses the step: the questions move up one level and the question block disappears. A scenario that applies to several sub-blocks goes on their common parent section — it is passed along automatically during playback. The peer-instruction setting (section 6.1) is stored in the playlist; it does not exist for questions inside a question block — a question block opens all its sub-questions together.

Restructuring. In the toolbar, **New section** creates a section and **Rename** renames it. The ⋮ **More actions** menu moves the selection (**Move up**, **Move down**, **Move to top**, **Move to bottom**, **Indent**, **Outdent** — the same moves as the keyboard shortcuts in chapter 14), creates a copy right after the original with **Duplicate question**, **Duplicate section** or **Duplicate question block**, and with **Move to …** or **Copy to …** takes the selected questions to the end of a section or question block — in this or in another playlist; moved questions keep their play history, copies start without one. With a section or question block selected, the entries read **Move section to …**, **Copy section to …** or **Move question block to …** and **Copy question block to …** and take the whole content along; playlists and sections are valid targets, question blocks are not. In the target dialog, type to filter the list; the open playlist is listed first. **Expand all** and **Collapse all** tidy the view, and the info button next to them opens the quick guide at peer instruction, question blocks, groups and stations. You hide the playlist overview via the icon at the top left (**Hide playlist overview**) and filter it with **Search playlists …**; the preview on the right is shown and hidden via its own icon.

7.3 Playing through the semester

Three routes lead into the start dialog, and they differ in scope: the play icon in the row of the playlist table and the split button in the toolbar above the tree — labeled **Start**, **Continue** or **Repeat** depending on the state, with the menu items **Start from the beginning** and **Open questions only** — always mean the **entire playlist**; the start button on a single tree row means only **that section** (including subchapters). In all cases the **still open** questions are pre-selected (excluding skipped ones and archived ones, which are marked "(archived)"); if the button reads **Repeat** because everything has been played, all questions are ticked. In addition there are

the **Participation** field (join mode), the **Allow guests** switch when joining by name with a course, and the **Discussion round (no devices)** switch. Which rule produced the current selection is shown by the filled button in the quick selection; as soon as you change a checkbox by hand, that marking disappears. The quick selection offers — with an anchor set in the tree, **From selected** first — then **Open only**, **All** (a full run, e.g. for revision) and **Poorly answered** — questions whose **attainment in the last run** was 50 percent or less. That is exactly the figure shown in the question list on the left before the times, and it also appears behind every question in the dialog, so you can see why a question is included. The plenary answer does not count (it is the room's consensus, not an individual result), and questions without a correct solution — open question, poll and Poll+, estimate, notice without a two-button response — cannot be assessed at all. If nothing matches, the message says so, the previous selection stays as it is, and you can select by hand. **Skip** means setting a section to "skipped" via the ⋮ menu item of that name — the suggestion moves on, and **Include again** brings the section back at any time. **Continuing** is simply starting again: completed questions stay unchecked, the stopwatch keeps running.

7.4 Time and balance

Two times face each other: the **planned** one and the **measured** one. The planned time comes from the planned durations of the individual questions and is in the tree before the first session ever runs — it is what you calculate with when deciding how much material fits into one lesson. The measured time accumulates while you play the playlist.

Each question row shows three values side by side, as soon as they exist: the **attainment of the last run** (red at 50 percent and below), the time **actually needed** in the last run from opening to closing, and on the far right the **planned** duration. This order holds throughout the tree, in the section rows too: on the right what you specified, to the left of it what LehrPuls measured; only the playlist table above lists the planned duration first (section 7.1). If the question ran more than once, the average across all runs follows in small brackets: "44% (52%)" means the last run went worse than the average. The tooltip gives the number of runs, and for the time also the average. Together they answer the question that comes up before every repetition: did the course understand this, and how much time must I really allow? Questions without an assessable solution (poll, open question, notice without a two-button response) have no attainment figure; questions never played yet show only the planned duration.

Each entry runs a **stopwatch**: it starts with the session, pauses with the Pause button and stops with the session — explanation phases between questions count too, because that is exactly what planning the next semester needs. It is therefore regularly higher than the sum of the planned durations: those cover only answering, not discussing. Under **Analytics** → **Sessions** → **Playlist balance** you pick the playlist at the top and see, per section, the questions (used/total), the number of runs, the total time (own and including subchapters) and the time per used question; the **Show individual questions** switch adds the individual questions; **Print balance** outputs the table as a semester report; **Sessions** takes you back to the session list, and **Session details** jumps straight to the analysis of the session last selected, bypassing the list (with no session selected the button stays disabled).

7.5 Copying and printing

The **copy icon** in a main playlist's row creates a fresh copy of the whole tree for the next semester: same structure, same questions, progress and times reset to zero. A dialog asks for the name of the copy first, prefilled with the existing one — so no two playlists end up with the same name. The copy takes course and semester from the original — enter the new semester afterwards in the **Properties**.

In the ⋮ **More actions** menu → **Print** you produce a **Question catalog (without solutions)** or **Question catalog (with solutions)** — handout or lecturer's copy — and, with a question block selected in the tree, its **Task sheet (question block)** including the preamble; with a single question selected the menu offers **Selected question (without solutions)** and **Selected question (with solutions)** instead. Printing goes through the system dialog, saving as PDF included. The **playlist overview** itself is output via **Print playlist overview** and, in the **Export** submenu, **Export playlist overview (CSV)** in the ⋮ menu of the list header, including both time columns.

Passing on (.lpx). Via the **Export** submenu in the ⋮ menu of the list header you export one or all playlists as an `.lpx` file with **Export selected playlist (.lpx)** or **Export all playlists (.lpx)**, and read them back in elsewhere with **Import (.lpx, .json)** — with all questions, images, formulas and scenarios.

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8. Analytics

Everything you have ever run is here — permanently and with no expiry date. This page is the reason why building your own stock of questions pays off. Six tabs share the work: **Overview · Topics · Times · Questions · Courses** compute across all sessions — by topic, time, question quality and course —, while the **Sessions** tab shows the individual session in detail, just as you ran it.

8.1 The filter bar

Above the five statistics tabs sits a shared **filter bar**: **Period** (last 90 days, last 180 days, last year or all time), **Course** and **Topic**. One selection applies to all five tabs at once — switch the course on the Overview and you see the same slice under Topics and Times as well. The topic filter always takes the whole **subtree**: "Mathematics" includes Fractions and every other subtopic. With a course selected, the topic list only offers the topics that were actually played in that course — together with their parent topics, because those sum up the subtree.

Two principles apply throughout. First: **no figure without an explanation** — the tiles, most charts and many column headers carry an info symbol with the exact calculation rule behind it; the short version of this chapter thus always travels with the application. Second: **no claim on a thin basis** — below ten answers a maturity value is grayed out as "not enough data", and other evaluations too require a minimum number of answers before they judge.

The tables on the statistics tabs behave uniformly: columns sort on click, 20 rows per page, and via the ⋮ menu of the respective card (**Print table**, **Export table (CSV)**) the tables of the Topics, Questions and Courses tabs can be output; on the Times tab this menu sits on the scatter chart's card, and the planning-accuracy table has none. If the sample data is hidden in the settings (section 10.1), the filter bar says so — the statistics then show only your own sessions.

One property of the figures is worth knowing: answers are always assessed against the **current state of the question**. If you correct a solution later, you retroactively change the statistics of all earlier plays — deliberately so, because this way the corrected solution counts, not the old mistake. Instant questions without a topic run through the topic analytics as the collective item **"no topic (instant questions)"**, and the plenary answer (section 6.15) counts in no statistic.

8.2 Overview: the dashboard

The first tab answers "how are things overall?" at a glance. At the top are five **metric tiles**: sessions, questions played, answers, average score and average response rate — each with the change against the **previous period of equal length** (only with a bounded period — with "All" there is no comparison), in percentage points for percentages. So you see not only the state but also the direction.

Below them, **hint cards** point to matters needing attention: questions with discrimination ≤ 0 (the strong ones fail — check the question or its solution; counted from ten answers on, below that the value is chance), never played questions (dormant items in the bank) and playlists well over plan (used time — the sum of the standing times — above 120 % of the planned duration). A click on a card jumps to the responsible tab.

The rest of the Overview holds up to four cards: at the top the **question types in use** — the distribution of submitted answers by question type, the five most frequent types individually, the rest as "Others" — next to the **activity** as sessions per month; below them the main topics by **maturity** (the term follows in the next section): one ranking, or — once at least eight main topics have enough answers — the four **strongest** and the four **weakest** in two cards. Bars appear from ten answers per topic; topics below that are listed as a number with the note "not enough data" beneath the cards.

8.3 Topics: maturity and coverage

Maturity is the central metric for the state of learning: the average **score** of all scorable answers to a topic's questions in the chosen period. The score per answer is the attainment known from the reveal and the playlist (sections 6.5 and 7.4): fully correct counts 100 %, partial credit proportionally — three of four correct matches are 75 % —, fully wrong 0 %. A maturity of 0 % therefore does not mean "nobody answered" but "no answer earned even partial credit".

The **tree table** shows maturity, answers, coverage, level and trend per topic; each row sums up its whole **subtree** — the answers of "Fractions" also count in the "Mathematics" row. **Coverage** is the second, deliberately separate figure: how many of the subtree's active questions were played at all in the period. A topic at 95 % maturity with 2 of 40 questions played is not consolidated — which is why two honest figures stand side by side instead of one blended index.

The **level** translates maturity into words: from 75 % "solid", 50–74 % "in progress", below that "building up". Below ten answers there is no level, and the maturity is grayed out as "not enough data" — the figure remains visible, but it carries no claim. The **Trend** column draws the maturity per month as a small line; a click on the row opens the **trend across the individual sessions** — the topic's learning curve.

Below the table sits the heatmap **Maturity per main topic and month**: one row per main topic, one cell per month, darker petrol means higher maturity, an empty cell "not played that month". It appears once the period covers more than one month with data, and shows at a glance where work is happening — and where a topic has been resting for months.

8.4 Times: budget against actual

This tab checks your time planning against reality. Two as-is terms need distinguishing: the **working time** is the time per answer measured on the devices — how long do participants really need? The **standing time** is the span from "question opened" to "question closed" — how long did the question run in the room, waiting and discussion included? The plan comes from the **planned duration** in the question editor (section 3.3).

The scatter chart **Planned duration vs. working time** plots, per question, the planned duration against the median working time. Points on the diagonal: plan met. Points well above it: the question takes longer than planned. The list **Time sinks and quick runs** turns this into the ten largest deviations — median working time as a share of the planned duration. Scatter chart and list count only questions with at least five measured timings; answers from group phases carry no individual time and do not count here. For quick runs both options are worth checking: lower the planned duration or enrich the question.

Planning accuracy per playlist answers "does my 90-minute plan fit into 90 minutes?": per playlist the number of sessions, the planned time (sum of the planned durations of all questions), the used time (sum of the standing times in the period's sessions, all runs together) and their ratio.

The **time profile of a session** draws a single session on the time axis: each question as a bar from "opened" to "closed", the reveal moment marked in orange; the gaps in between are discussion and organization. That is the real rhythm of your class — often more instructive than any average.

8.5 Questions: the quality map

Where the analysis of a single session (section 8.9) computes per session, this tab computes **across all plays** of a question — the material inspection for your bank.

The **quality map** plots, per question, the **difficulty index P** (share of fully correct answers, round 1 only, no partial credit) against the **discrimination**, averaged across sessions (for the definition of both terms see section 8.9). Marked red are questions with discrimination ≤ 0 — it is precisely the strong ones who fail, check the question or its solution. Yellow are strikingly easy ($P > 0.9$) and strikingly hard ones ($P < 0.3$). The map shows only questions with at least ten answers — below that, P and discrimination are chance; how many questions are left out for that reason is stated beneath the map.

Next to it stand the **For review** lists: discrimination ≤ 0, too easy, too hard, **Unused wrong options** (dead distractors) — wrong options that are practically never chosen (below 2 % of answers, though the threshold is at least one answer — in small groups that means: never chosen at all; computed from ten answers in round 1) and thus give away guessing probability — and never played questions. A click filters the question list below to the affected questions; another click lifts the filter again.

The table **All questions with plays** lists, per question, type, topic, plays, answers, difficulty index P, discrimination and the last play; only the filter for never played questions shows a different set of columns — the creation date instead of plays and metrics. A click on the row opens the **detail analysis**: the answer distribution across all plays (with a note if dead distractors are among them), for cloze, matching and ordering questions the **error rate per gap, item or position** — so you see which part of a question fails —, and for estimates the reference value, the median of the answers and the median deviation in percent.

Finally, the card **Peer instruction: round 1 vs. round 2** compares, per two-round question, the share of correct answers before and after the group discussion. Only questions with at least ten answers in **both** rounds are shown — otherwise the gain would be chance; how many questions are left out for that reason is stated beneath the card. The gain in percentage points is the evidence figure for whether the method (section 12.1) works with your group.

8.6 Courses: learning curve and engagement

The **learning curve by course** draws, per course, the average score of its sessions in chronological order — does the line rise across the semester? With more than five courses, the lines show the five with the most

sessions.

The **response rate across the session** averages engagement by the question's position in the session: per played question answers ÷ participants, across all sessions of the period. A curve falling toward the end suggests fatigue or time pressure — an argument for not asking the most important question last. Questions with group answers are excluded from the response rate; their denominator would be the number of groups, not the number of participants.

The table **Courses in the period** sums up, per course, sessions, average score, average response rate, average participants and the trend; a click on the row lists the course's individual sessions. Sessions without a course run through as "no course".

Deliberately there are **no statistics about individual participants**: all evaluations start at course or session level. That fits the deletion deadline of the course lists (section 4.5) — names can disappear, the statistics remain complete.

8.7 Sessions: the individual session in detail

The sixth tab is the archive of the individual sessions; the shared filter bar does not apply here, it has its own filters. This is also where the **playlist balance** lives (section 7.4), reachable via the scales icon (tooltip **Playlist balance**) in the header; two routes lead back out of the balance: **Sessions** to the session list, and **Session details** straight into the analysis of the selected session. The detail of the selected session sits below the list; the magnifier icon next to it (tooltip **Show session details**) hides the list and gives the detail the full height — while collapsed it is highlighted in petrol, and another click brings the list back. With no session selected it stays disabled.

The table of sessions sits at the **top**, newest first, with timestamp, participation mode, course, and the number of questions, participants and answers. Above it a **course filter** and a **search field** that filters the table by timestamp, mode, course and the counts. A session currently running is marked "running". Everything else — questions and analysis — sits **below** it; the button in the header (tooltip **Hide session list**) collapses the session table when you need the room for the evaluation. While collapsed, the search field, course filter and ⋮ menu go with the list; the timestamp and course of the selected session take their place. Besides **Print analytics** and **Export analytics (CSV)** for the session list itself, the ⋮ menu also holds the table's column selection.

8.8 The question overview

Below the session table you first see all questions of the selected session with type, title, number of answers and state (opened, closed, revealed). That is the overview: which questions did you actually ask, and how many people took part? Because a title such as "Chain rule derivative, standard case" no longer reveals what was actually asked months later, the **question text can be expanded** on every row — rendered with formulas and images, exactly as it stood on the wall. The icons next to it print the question list.

8.9 The analysis

The **Analysis** button switches to the per-question evaluation; **Questions** takes you back to the overview. Four metrics and up to two charts: the answer distribution appears only for questions with answer options, the time chart from three measured times. Here too the question text can be expanded on every card, so metric and wording sit side by side.

Answer distribution. A bar chart across the options with the correct one highlighted. The first question is always: which wrong option did people go for? A distractor chosen by half the group is not a flaw in the question but a finding about the material.

Difficulty P. The share of correct answers in percent, classified as *hard*, *medium* or *easy*. A P of 100 % means the question measured nothing — everyone knew it. A P near 0 % can mean two things: the material has not landed, or the question is ambiguous. Which of the two, the next metric tells you.

Discrimination. This describes whether a question distinguishes between those who master the material overall and those who do not. **High** discrimination means: whoever got this question right also got most of the others right — the question measures the same thing as the rest. **Low or negative** discrimination is a warning sign: it is precisely the strong ones who fall for it. That almost always points to a linguistically ambiguous question or a distractor that is defensible on closer inspection. Such questions need reworking, not participants needing a scolding. It is calculated as an **upper-lower index**: all participants are ranked by their overall result in the session — the number of questions they answered correctly; the strongest 27% form the upper group, the weakest 27% the lower group (at least one person per group, at most half of the participants). A question's discrimination is then the share of correct answers in the upper group minus the share in the lower group, counted only over the people who answered that question. It ranges from –1 to +1; it is calculated from two participants upward, and it is omitted for questions without a correct answer.

Response times. The mean and the median processing time plus a chart of the distribution. Times are a subtle instrument: a question with a high hit rate and a strikingly long processing time was not mastered but laboriously worked out. The median is more meaningful than the mean here, because individual devices reappearing late skew the mean.

For polls, estimates and open questions, difficulty and discrimination do not apply — there is no correct answer there. Numeric answers with a stored correct value are assessed, however; for notices with two labeled buttons, P shows the share of answers on button 1 (section 3.4).

Not to be confused: difficulty P and attainment. Both are percentages, but they measure different things. The P in these analytics counts **whole** answers of a **single** session: right or wrong, with multiple choice only the exactly correct combination. The attainment in the playlist (section 7.4) and in the reveal (section 6.5) works with **partial credit** instead — two of three correct ticks are two thirds, wrong ticks are deducted — and refers to the **last run**. The same question can therefore show 40 percent here and 60 percent there without either figure being wrong. The statistics tabs (sections 8.2–8.6) compute with the score (attainment) throughout — only the difficulty index P and the discrimination of the quality map remain all-or-nothing, as is customary in test theory.

8.10 Individual answers

Below the analysis, each question has an expandable **Individual answers (n)** section — for open questions it is open from the start: a table with participant, answer, assessment and time taken.

How much appears there depends on the join mode. In an **anonymous** session the section only exists for open questions — their wording is, after all, the content — together with a note that answers cannot be attributed to individuals; for choice questions it is omitted entirely. With **pseudonym**, the self-chosen pseudonym precedes them; with **named**, the name from the participant list. The **anonymized** switch in the session's header replaces the names at any time with "Participant 1", "Participant 2" … — this also applies to the CSV export (section 8.12), whose file name then gets the suffix "-anonym".

The practical value lies with open questions: in the next session you can read out a formulation and have it explained to you — and in named sessions you know whom to ask.

8.11 Longitudinal view

The **Longitudinal** button on a question shows how that single question has developed across **all** sessions in which it was asked: per session as a trend. For gradable questions that is the difficulty P, for estimation questions the median estimate in the question's unit; polls and open questions have no per-session measure. If the question has only been asked once so far, a single point is shown.

This is the metric for your own teaching: same question, same chapter, different semester — and you see whether reworking your explanation actually helped. The prerequisite is that you reuse the question instead of rewriting it every semester.

8.12 Exporting and reusing

CSV export. The download icon in the session's header writes the answers to a CSV file; a save dialog suggests the file name ("Session-12.csv", or "Session-12-anonym.csv" with anonymization switched on). The format opens in Excel, Numbers, and in R or Python if you want to run your own analyses.

Report. The print icon next to the CSV export (tooltip **Print report**) opens the system print dialog with a paper-oriented version of the analysis. "Save as PDF" turns it into a PDF — suitable as evidence for course documentation or for colleagues.

Reuse playlist. Creates a new playlist from the questions of the displayed session ("Repeat · course name", or with the date if the session had no course; both rounds of a peer instruction question become one entry) and opens its start dialog right away; you choose the join mode there (and, where offered, **Allow guests**), while a course, if needed, is assigned in the new playlist's properties. The fastest way to run the same lesson again in a parallel group or the next semester.

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9. License

9.1 Trial version

Without a license key, LehrPuls runs as a **trial version**. It is **fully functional** — no feature is locked, no watermark, no time limit; only the window titles of cockpit and projector carry the suffix "— Trial license". The only restriction is the number of participants per session: **at most 6**. That is enough to try it out with a small group, not for a seminar or a lecture. As long as no license is activated, the "License" navigation entry carries the **Trial** badge.

9.2 Activating

The **License** page shows the current state. Paste the key you received by email into the **License key** field and click **Activate**. The **Activate license key** card stays in place after activation — a new key (after a license change, say) is entered the same way.

Activation is **offline**. No server is contacted and no data is transmitted; the key is verified mathematically on your machine. You therefore need neither internet nor an account, and there is no activation counter to get in

your way when you change machines. After activation the page shows the license holder's name and email address, the license type — as a short keyword such as "dozent" —, the purchase date and the participant limit ("unlimited"; technically a session accepts up to 250 concurrently connected devices), and the "Trial" badge disappears immediately.

From then on the **name of the license holder** is permanently shown in the title bar of the cockpit — on macOS in the dark bar that LehrPuls draws itself — and in the window title of the projector window. That is deliberate: if someone else's license is running on a machine by mistake, it is noticed straight away. On the projector the name is not visible in full screen.

9.3 License types

License	For whom
Lecturer	teachers at universities and schools, own courses
Trainer / commercial	freelance trainers, training providers, corporate training

Every license is a **personal seat**: it is issued in your name and is valid on all computers you use yourself. Institutions buy several seats at a tiered price; even then, every person receives their own key. When someone leaves, the seat is transferred to their successor free of charge — a new key is issued for that.

LehrPuls is **bought once**, not subscribed to. A purchase applies permanently to the major version acquired.

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10. Settings

10.1 Samples

The first section shows what sample data is in your database — courses, participants, completed sessions, playlists, topics and questions; the counts appear per sample set beneath its heading.

Language of the samples (dropdown). The samples exist in German and English; the database always holds just one language, independent of the interface language. Switching removes the existing samples and installs them afresh in the chosen language — changes made to samples are lost, your own data is untouched; the dialog says so beforehand. If no samples are installed at the moment, LehrPuls only remembers the choice — it then applies the next time you install them.

Hide samples (switch). Hides all samples in the course list, topic tree, question list, playlists and analytics without deleting anything. Reversible at any time; while no samples are installed, the switch is locked. This is the right move once you have your own content and the samples merely get in the way.

Below that stand **two separately switchable sample sets**: **Reference: All question types** — topic, course and playlist "All question types …" as a permanent reference work with one model question per type — and **More samples** — subject topics with questions, courses with participants and evaluated sessions, plus the remaining sample playlists. Each set has its own buttons:

Restore samples (or **install** them, if none are present). Resets the respective set to its delivered state. Changes you made to samples are lost in the process. **Your own** courses, topics and questions are never affected — nor are copies you made of samples. If **Hide samples** was on, it is switched off again in the

process. The samples do not age: when they are installed, their sessions, semester labels and years are moved forward by as many whole years as have passed since they were created — same calendar week, same weekday. So in 2028 "SS 2026" becomes "SS 2028", and the most recent sample session always falls in the current year.

Remove samples. Deletes the respective set's sample data permanently: courses with participants, their sessions including answers, and the sample topics with their questions; the other set stays untouched, and so does your own data. Sample questions that you used in a session of **your own** are not deleted but archived — otherwise your own analytics would develop gaps.

10.2 Session & projector

The second section gathers everything a session starts with. All items are **defaults**: each can be switched during a session without changing the default. You choose the access route for participant devices on the **Connection** page (chapter 5). The three projector switches in the live cockpit — fit content, QR corner, Wi-Fi QR — need no default: they remember their last state, and the next session starts with it (section 6.6).

Session opens the projector window. Starting a session brings up the projector window by itself. If it is already open, it stays open. The default is **on**.

Session closes the projector window. Ending the session makes the projector window disappear again; here too the default is **on**. You can always show or hide it by hand with the **Projector** switch at the bottom of the sidebar.

Timer switched on when the session starts. Sets whether the timer in the cockpit is on to begin with (section 6.5). The default is **off** — if you work with deadlines, switch it on here and save yourself the step in every lesson.

10.3 Analytics

The third section sets what the session view in Analytics (section 8.7) starts with. Here too: the switches on the page itself only affect the current view — the default stays as set here.

Show analysis instead of question list. A selected session opens the analysis (section 8.9) directly instead of the question overview. The right choice for everyone who looks at the metrics first anyway when opening a session.

Show names anonymized. The individual answers show placeholders instead of names — for instance when discussing the evaluation on the projector without putting anyone on the spot. The switch on the page remains usable.

10.4 Getting started

The fourth section reopens the quick guide at Getting started from section 2.1.

10.5 Program version and contact

At the very bottom of the page you find the product details: the program name with its **version number**, the copyright notice and the **homepage**, which a click opens in your default browser. You need the version number when you contact support — please always quote it. On macOS the same number also appears in the application menu: the **LehrPuls** menu at the far left of the menu bar, entry **About LehrPuls**.

11. Data, backup and moving machines

11.1 Where your data lives

LehrPuls stores everything in a single database file named `lehrpuls.db` in your user account's application data directory:

- **macOS:** `~/Library/Application Support/com.hollomey.lehrpuls/`
- **Windows:** `%APPDATA%\com.hollomey.lehrpuls\`

It contains topics, questions, courses, participants, sessions and all answers. Pasted images sit next to it as files in the `media/` subfolder. There is no cloud copy and no synchronization; what is on this machine is only on this machine.

11.2 Backup

Because everything is in one file, backing up is simple: include the directory named above in your backup. If you use Time Machine or a comparable system backup, that is already taken care of.

If you want to back up by hand, **quit LehrPuls first**. Do not copy the directory while the application is running: the database uses journal files (`lehrpuls.db-wal` , `lehrpuls.db-shm`), and a copy taken at the wrong moment can be incomplete.

Whenever an update changes the database schema, LehrPuls automatically places a backup copy of the previous state next to the database. You recognize it by its name, such as `lehrpuls.v7.backup.db` — the number is the old database schema version, not the program version.

Partial backups while running. Besides backing up the whole file there is the `.lpx` export — for topics and questions (section 3.1), for courses with their participant lists (section 4.1) and for playlists (section 7.5). These files can be created at any time without quitting the application, and they cover your subject matter, though not the answers of sessions already held. Before any larger reorganization — and before deleting a topic — such an export is the quickest insurance.

11.3 Moving to another machine

Start the new installation on the target machine once and quit it again so the directory is created. Then quit LehrPuls on both machines and copy the contents of the directory from the old machine to the new one. At the next start your entire stock is there. The license moves along too — it sits as a file in the same directory; only if you did not copy the directory completely do you enter the key again. Since activation happens offline, there is no limit on installations anyway.

12. Teaching recipes

Technology alone does not improve teaching. These recipes are proven ways to use the tools from the previous chapters.

12.1 Peer instruction

The method named after Eric Mazur is the single most effective application of a response system, and the reason for the two-round feature in section 6.1.

1. **Ask the question**, have it answered individually and in silence (round 1).
2. **Look at the distribution** — you, not necessarily the audience. The rule of thumb: if between 30 % and 70 % are correct, the question is ideal for this method. Above 70 % — reveal briefly and move on. Below 30 % — do not have them discuss, explain again instead; discussion without a solid basis only entrenches misconceptions.
3. **Let them discuss:** "Find someone with a different answer and convince them." Two to three minutes. The discussion slide that the projector shows by itself after closing round 1 prompts exactly this; meanwhile the participant devices show the same prompt together with each person's own answer.
4. **Ask the same question again** (round 2) — the main button offers it as "Show round 2".
5. **Contrast both rounds** — the projector window does this by itself, and the cockpit and participant devices state the same round 1 share in percent. The shift toward the correct answer is the learning effect, and it is visible to everyone.

For this to work you need questions with **good wrong options**: distractors that correspond to a widespread misconception. A question with three obviously absurd options is useless here.

12.2 Opening the session

A single question on last week's material, anonymous, within the first three minutes. The benefit is twofold: you learn what you can build on, and those present switch into an active mode before you start talking. If you use the same question across semesters, the longitudinal view (section 8.11) gives you a time series as a side effect.

12.3 The muddiest point

At the end of the lesson, one open question: "What was least clear today?", with the **Maximum answer length (characters)** in the question editor set to 120 (default: 500). The answers arrive in the cockpit while people pack up. You review them after class and start the next one with them. This is the cheapest available route to honest feedback — provided the session runs anonymously.

12.4 Using open questions well

Open questions unfold their value not while you collect them but afterwards. A proven sequence: collect, skim in the cockpit while the answers come in, pick two or three answers — a typical one, a surprising one, a wrong one — and discuss those three. Open answers never appear on the projector by themselves — only those you send there via **Show on the projector** (section 6.4) — so nobody is put on the spot involuntarily.

12.5 Using the random wheel fairly

The random wheel is meant to spread the conversation, not to create fear. Two rules have proven useful. First: **let them answer first, then draw.** Someone who has just submitted an answer has something to say — and even if the answer was wrong, the reasoning is interesting. Second: **announce the practice at the start of the semester.** The fairness memory makes sure that people already picked are drawn far less often while others have not been picked at all.

12.6 Estimation questions as chapter openers

Before the derivation, have them estimate an order of magnitude: "How much power does an average household draw on annual average?" The group mean appears on reveal, with the reference value next to it. The spread of the estimates is more revealing than the mean — it shows how much feel for the magnitude is present, and motivates the calculation that follows.

12.7 How many questions per lesson?

Three to five in ninety minutes is a good guideline. Each question costs five to eight minutes including discussion and reveal. More than five is tiring and pushes the material aside; fewer than three hardly justifies the setup. Plan the questions for the points where experience tells you to expect comprehension problems — not wherever they happen to fit.

13. Troubleshooting

Symptom	Cause and remedy
Nobody can join	Is everyone on the same network? Campus Wi-Fi often shields devices from each other (client isolation). Run the self-test on the "Connection" page, otherwise use a hotspot (chapter 5).
Individual devices cannot get in	Switch off any active VPN on the device. Check whether the device has switched back to the old Wi-Fi.
A firewall message appears on first launch	Choose "Allow"; on Windows, network type "Private" (section 5.5).
The QR code is not recognized	Have people type the address shown below the QR code. On Android, use the camera app — on some devices the quick-settings scanner merely shows the code as text (section 6.6).
The browser says "Not secure"	Expected: the page arrives via `http://` straight from the laptop, not from the internet. Nothing is blocked and there are no passwords (section 5.6).
The Wi-Fi name is not shown	macOS: enable Location Services for LehrPuls (section 5.3). The test itself works regardless.
"The trial version allows at most 6 participants per session"	Trial version. Activate a license key on the "License" page (chapter 9).
A device's connection drops	The participant page reconnects on its own; answers already entered are buffered and submitted afterwards.
The projector window is not visible	Switch on "Projector" at the bottom of the sidebar (section 6.6).
A question cannot be deleted	It has already been used in a session and is archived instead, so the analytics stay complete (section 3.2).
A formula is shown in red	An error in the LaTeX notation. Check the braces; the preview in the editor shows the result immediately (section 3.6).
An image is not displayed	The name in round brackets was changed. Paste the image again with Ctrl+V (section 3.7).
Imported questions look wrong	Foreign formats represent formulas differently and do not carry images. Use the `import` tag to rework them specifically (section 3.9).
AI delivery is flagged	The report names every affected question with its reason. Use "Copy findings" and hand the text back to the AI service for correction (section 3.10).
A session is missing from Analytics	Sessions still running appear in the list too, with the green "running" badge; otherwise check the course filter, the search field above the table and the **Hide samples** switch — it removes sample sessions from the list as well (section 10.1).
The analysis shows no names	The session ran anonymously, or the names were removed via the deletion deadline (section 4.5).

Symptom	Cause and remedy
The sample data is in the way	Hide it under "Settings → Samples", or remove it per sample set (chapter 10).

14. Keyboard shortcuts

The shortcuts apply as long as no input field has the focus and no dialog is open.

Key	Where	Effect
Space bar	live session	open/close a question, question block or stations; after that, whatever the main button offers next — in the debrief of a question block: reveal the selected sub-question (section 6.5)
R	live session	show results (reveal the correct answer)
Z	live session	spin the random wheel
← / →	live session	move through the playlist (selection and preview in the cockpit only; projector and devices stay unchanged)
↑ / ↓	question, course and session lists	move the selection
⇧↑ / ⇧↓	question list, course list, topic and playlist tree, playlist overview	move the selected entry
⇧← / ⇧→	topic tree, playlist tree	indent or outdent the entry
⌘-click / Ctrl-click, ⇧-click	playlist tree	select several questions — add one at a time or as a range
⌘↵ / Ctrl+↵	question editor	save and close
⌘V / Ctrl+V	question editor, scenario dialog	paste an image from the clipboard
↵	course and participant dialogs, Duration field	accept the entry or save

In the topic tree, ⇧↑/⇧↓ acts on the topic if you last clicked in the tree, otherwise on the selected question in the list. In the playlist overview it moves the selected playlist as long as nothing is marked in the tree; in the course list it clears an active column sort.

15. Glossary

Working time — the time actually measured for an answer; it appears on the session's answer cards, on the Times tab and in the analysis (sections 8.4 and 8.9). Not to be confused with the **planned duration**.

Attainment — the share of the achievable result actually reached, with partial credit and a deduction for wrong ticks; in the playlist the figure of the last run (sections 6.5 and 7.4). The statistics tabs call it the **score**; its average per topic is the **maturity**. Not the same as difficulty P.

Client isolation — a security setting in many public Wi-Fi networks that shields devices on the same network from each other. It prevents LehrPuls from working on that network (section 5.2).

Coverage — the share of a topic subtree's active questions that were played at least once in the chosen period; deliberately shown next to, not blended into, **maturity** (section 8.3).

Difficulty P — the share of wholly correct answers in percent, without partial credit. In the session analysis (section 8.9) each round of a peer instruction question has its own figure; the quality map (section 8.5) counts round 1 only.

Discrimination — a measure of how well a question distinguishes between strong and weak participants: share correct among the strongest 27 % minus share correct among the weakest 27 % of the session (ranked by total result). Above 0 the question separates; at 0 or below, check the question or its solution (sections 8.5 and 8.9).

Discussion round (no devices) — a mode in which the projector shows no join information and the questions are discussed on the wall only; the plenary answer records the consensus (section 6.15).

Discussion slide — the row between round 1 and round 2 of a peer instruction question in the live playlist; on the projector the slide "Discuss your answer with your neighbors" (sections 6.1 and 12.1).

Distractor — a wrong answer option in a multiple choice question. Good distractors represent widespread misconceptions; the answer distribution shows which one attracted votes.

Estimate — a question type with number entry and no correct answer; on reveal the group mean and the reference value appear. Not to be confused with the **numeric answer** (section 3.4).

GIFT — Moodle's text format for questions, importable by LehrPuls (section 3.9).

Group phase — Automatic division of those present into groups, optionally across several rounds so that everyone meets everyone; submissions count for the group (section 6.11).

Guest — someone who, on joining by name, does not pick from the course list but types their own name. Marked as a guest during the session and addable to the course list with one click (section 6.2).

Hotspot — a Wi-Fi network set up by your laptop or phone. The recommended route for operation (section 5.4).

Info — badge of the **Notice** question type in the question list and type filter: a message to every device, optionally with a link or an email address and with one or two freely labeled buttons (section 3.4).

Instant question — A question created spontaneously in a running session, valid even without text ("it is on the board"); comes up next and is stored in the pool with the tag `sofort` (section 6.8).

Join mode (in the app: the **Participation** field in the start dialog, the **Participation mode** column in Analytics) — determines whether participants join anonymously, under a pseudonym or with their name. It determines what can be analyzed afterwards (section 6.2).

KaTeX — the formula library LehrPuls uses to render LaTeX formulas (section 3.6).

Longitudinal view — the trend of a question across several sessions: difficulty P or, for estimation questions, the median estimate (section 8.11).

Look-back — bringing a question that has already been played, complete with its reveal, back onto the wall without touching what the participants' devices show. Its counterpart for questions not yet played is the **preview** (section 6.9).

.lpx — LehrPuls's own exchange file. Transfers topics, questions, courses or playlists losslessly between collections, including images, formulas and scenarios (sections 3.1, 4.1 and 7.5).

Markdown — a simple notation for text formatting in the question text (section 3.5).

Maturity — the average score of all scorable answers in a topic subtree in the chosen period; from 75 % a topic counts as "solid", below 10 answers no level is assigned (section 8.3).

Numeric answer — a question type with number entry and a stored correct value with tolerance; assessed like a choice question (section 3.4).

Peer instruction — a method with two voting rounds and a discussion in between (section 12.1).

Planned duration — the duration stored with a question for how long answering it should take. The playlist adds it up per section and question block, and the session timer proposes it; in Analytics it appears as **Planned** (sections 3.3, 6.5, 7.1 and 8.4).

Playlist — The sequence of questions of one session (section 6.1); as a semester playlist, the whole section tree of a course (chapter 7).

Playlist balance — the table under Analytics → Sessions that sums up questions, runs and times per section of a playlist (sections 7.4 and 8.7).

Plenary answer — The consensus worked out with the audience, ticked and saved in the cockpit; shown on the projector and contrasted with the solution on reveal (section 6.15).

Preamble — The opening text of a question block: scenario text plus optional work assignment; can be recalled at any time on the projector and on the devices (section 6.10).

Presenting — the second stop next to the pause: closes the open question, clears projector and devices back to the start screen and halts the time display while the session keeps running (section 6.16).

Question block — Several sub-questions under a shared preamble, opened as a whole; participants navigate freely, the last answer counts (section 6.10).

Relay — a forwarding service for sessions without a shared network, end-to-end encrypted (section 5.7).

Response rate — answers ÷ participants per played question, averaged over the questions; questions with group answers are excluded (sections 8.2 and 8.6).

Round — for a peer instruction question (marked ↻2), one of the two votes: round 1 before and round 2 after the discussion with neighbors; in the analysis each round has its own figures (sections 8.9 and 12.1). In group phases the changes of the group division are also called rounds (section 6.11).

Run — one complete play-through of a question block in a session. When a question block is repeated, a second run is created with its own state and its own answers; the playlist and the reveal show the attainment of the last run, while the playlist balance counts all of them (sections 6.4, 6.14, and 7.4).

Scenario — a shared starting situation that several questions refer to; maintained under Topics & Questions, played as the preamble of a question block (sections 3.2 and 6.10).

Semester playlist — The playlist tree of an entire course of lectures, with status, stopwatch and balance (chapter 7).

Spontaneous session — a session without a playlist, started via the button of that name on the Playlists page; every question is created live as an instant question (section 6.8).

Standing time — the span from "question opened" to "question closed" in the session, waiting and discussion included (section 8.4). Not the same as the **working time** of an individual answer.

Stations — the question blocks that run in parallel in stations mode; each group works on the station assigned to it (section 6.14).

Stations mode — group work in which each group works on its own station — a question block; set up via the group form "C/D · Station work" and "Round 1 + stations" in the groups dialog (section 6.11).

Structure description — The PDF "LehrPuls question format", which describes the structure of a question file; it is handed to an AI service as an attachment so that its delivery can be imported (section 3.10).

Work assignment — an optional extra text on a single question block in the playlist that, together with the referenced scenario, forms the preamble of a question block; this lets several question blocks set different focuses on the same scenario (sections 6.10 and 7.2).

LehrPuls — local, no accounts, no cloud.