

DIGITAL EDUCATION HUB | JULY 9, 2026

Course Hub

Research idea: learning-process data and feedback

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- **Course Hub** brings together course materials, videos, Q4R, exercises, quizzes, dates, coding resources, and learning games.
- The core is an **explicit learning record**: students deliberately save their work status.
- Instructors receive **aggregated teaching feedback** on material progress, comprehension issues, and quiz/Q4R work.
- Complementary learning artifacts such as games and crib sheets make practice, transfer, and exam preparation observable.
- Privacy line: course operation and learning organization are standard operation; research data and SampleCircle require separate approval.

⇒ Goal: a course-facing interface that visibly connects orientation, feedback, and research potential.

Current Project Status

Area	Status in July 2026
Course operation	ESDA 2026 as a course manifest with password protection, dates, videos, slides, Q4R, exercises, and quizzes
Access/roles	Shibboleth through reverse proxy, course password, and server-side teacher checks
Learning record	Material progress, slide page, difficulty, comprehension, Q4R/quiz data, and notes
Additional sources	Regritter, CSI Hohenheim, and crib-sheet pipeline as practice, transfer, and artifact data
Privacy	Research data only with approval, purpose limitation, and individual preference; SampleCircle remains separate

Educational Data Sources

Source	Observable learning trace	Educational research question
Course Hub	Progress, Q4R, quizzes, notes, video aggregates	Where do comprehension problems emerge?
Learning games	Attempts, levels, repetitions, solution paths	How do students practice through play?
Crib sheets	Scope, compression, topic coverage, OCR	What do students consider exam-relevant?
SampleCircle	Thresholded attendance and contact aggregates	Do learning contacts support participation?

⇒ The shared idea is not more data for its own sake, but better feedback on learning processes.

Course Entry

- Entry point with university login, course access, and privacy information.
- Course pages run under a configurable public address.
- Access through password/cookie and server-side approval.
- Language switch and course navigation remain visible.

15 MATERIALS	2 Q4R BATCHES	3 EXERCISE SHEETS	2 VIDEOS
Schedule Semester plan with topics, practical groups, exercise sheets, and software-supported data analysis.			

Student Workflow

- Students find lectures, exercises, Q4R, videos, software, and dates in one place.
- Materials are grouped by course and language and are directly accessible in the course interface.

The screenshot displays a student's course interface for 'Statistical Data Analysis'. At the top, a navigation bar includes links for 'Stat', 'Schedule', 'Slides', 'Q4R', 'Exercises', 'Software', and 'Tools'. A 'My dashboard' section shows 'EN' and 'DS' courses, with 'Tracking' set to 'Paused'. The main heading is 'Week 1 - Course goals and data basics'.

Navigation

- WEEK 1: Understanding the course and data basics
- WEEK 2: Descriptive statistics and visualization
- WEEK 3: Probability essentials

Introduction to Statistical Data Analysis
Summer term 2024 - Welcome

15 2 3 2

Schedule
Semester plan with topics, practical groups, exercise sheets, and software-supported data analysis.

Coding resources
Direct entry points for R code, short exercises, and the semester computing environment.

- Public repository**
Open course materials and small code
[Open](#)
- AIDAHO JupyterHub**
Open course materials and small code
[Open](#)
- bwJupyterHub**
Open course materials and small code
[Open](#)

SLIDES PDF
Lecture slides
Course goals and an introduction to data
33% completed
[Open material](#)

NOTES PDF
Annotated slides
Handwritten annotations from the live session.
Available from Apr 8, 2024, 12:00
[Open material](#)

EXERCISES PDF
Exercise sheet 1
Practice with course tooling and the first exercise sheet
[Open material](#)

Q4R PDF
Review questions
Short reflections to consolidate core concepts.
0% completed
[Open material](#)

VIDEO PDF
Lecture recording
Stream the recording hosted on the course video service.
62% completed
[Open material](#)

Student course-view demo

Explicit Learning Record

- Slides store current page and progress.
- Q4R and exercises capture status, difficulty, comprehension, and need for repetition.
- Free text remains personal organization; analysis needs separate rules.
- LaTeX help supports mathematical notes.

The screenshot displays a web interface for recording learning progress. It is organized into four main sections: QUESTION/TASK, WORK STATE, DIFFICULTY, and UNDERSTANDING, followed by a CLARIFICATION AND NOTES section.

- QUESTION/TASK:** Contains a text input field with the placeholder text: "Which course goal is most important for your own learning this week?".
- WORK STATE:** A vertical stack of three buttons: "Open" (light blue), "Done" (dark blue, highlighted), and "Review" (light blue).
- DIFFICULTY:** A vertical stack of three buttons: "Easy" (dark blue, highlighted), "Medium" (light blue), and "Hard" (light blue).
- UNDERSTANDING:** A vertical stack of three buttons: "Understood" (dark blue, highlighted), "Partly" (light blue), and "Open" (light blue).
- CLARIFICATION AND NOTES:** Contains several interactive elements:
 - A checkbox labeled "Needs clarification".
 - Two buttons: "Issue type" and "Priority".
 - Two buttons: "Reassessing" and "High".
 - A text input field labeled "My understanding question" with the placeholder: "Which concrete questions do you want to ask in class, office hours, or get?".
 - A text input field labeled "My note" with the placeholder: "What was difficult? Which idea helped?".
 - A button labeled "Let's help".
 - A button labeled "Draft question".
 - Small footer text: "Save privately. Sharing only happens through a deliberate action outside this form."

Student Dashboard

Orientation

- Tabs instead of one long page
- Progress by material type
- Open reflection points
- Recently worked materials

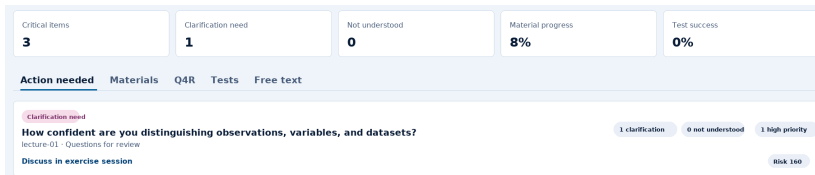
Exam preparation

- History for Q4R batches and exercise sheets
- Pacemaker for semester progress
- Rank/percentile from explicitly saved progress
- Contact-point simulator only in development context

Student dashboard demo

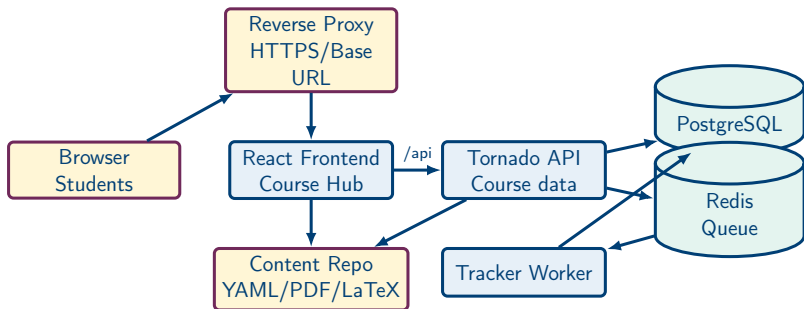
Instructor Perspective

- Aggregated analyses of material progress, Q4R, quizzes, and video use.
- No standard view with individual student histories.
- Free-text responses and comprehension questions are especially sensitive and remain purpose-bound.



Instructor dashboard demo

Architecture at a Glance



⇒ Frontend, API, database, queue, and content remain separate responsibilities.

Backend and Data Model

- **Tornado API:** courses, materials, progress, Q4R, quizzes, dashboard, profiles, and aggregations.
- **PostgreSQL:** authoritative data store for course structure and learning records.
 - ⇒ `courses`, `lectures`, `materials`, `course_events`
 - ⇒ `material_progress` with `progress_percent` and `current_page`
 - ⇒ `q4r_questions`, `q4r_responses`, `q4r_response_events`
 - ⇒ `quiz_*`, profile/preference data, and tracking tables
 - ⇒ Development tables for beacon/contact-point simulation
- **Redis:** queue for tracking processing, not an authoritative research data source.
- Migrations run on API startup; importer upserts course structure from YAML.

Content Pipeline

```
id: esda-2026
title: Statistical Data Analysis
term: Summer term 2026
trackingDefault: false
events:
  - id: week-03
    type: lecture
    title: "Frequency distributions"
materials:
  - id: q4r-08-en
    type: q4r
```

- Manifest as the domain source for the course.
- Importer validates IDs, types, files, and quiz answers.
- Q4R questions are extracted automatically from PDFs.
- Visibility through `availableFrom` and `availableUntil`.
- Removing old materials requires an explicit action.

Material Types

Type	Function in Course Hub
Slides	PDF preview, download, current page, progress
Annotated slides	Review and note-taking material
Exercises	PDF plus itemized tasks and subtasks
Q4R	Questions without submission pressure, private notes, and comprehension questions
Quizzes	Attempt, answers, correctness, score, and aggregated progress
Videos	Local video delivery, aggregated usage counts
External	GitLab, JupyterHub, datasets, games, and further links

Games Make Transfer Data Visible



Regression Knights of Hohenheim

- repeated practice in small tasks
- progress, streaks, time on task
- data: attempts and repetitions

⇒ Games complement Q4R and quizzes because they capture transfer and repeated application under lower pressure.



CSI Hohenheim

- case-based statistical problems
- transfer in decision situations
- data: solution paths and help use

Crib Sheets Reveal Exam Preparation

- The crib-sheet submission pipeline processes heterogeneous student submissions.
- It counts PDF, image, and Office pages, standardizes pages, and creates Excel outputs.
- Further steps: compression, area use, similarity, OCR, and vision-based topic coverage.
- Educational value: crib sheets show which content students compress, omit, or prioritize as exam-relevant.
- Research boundary: raw submissions contain names, student IDs, handwriting, and metadata; only approved, anonymized aggregates are usable.

⇒ The artifact becomes a data source on learning strategies, not a way to assess individual students.

Authentication and Roles

- Production login runs through Shibboleth headers from the reverse proxy.
- `/api/auth/me` returns authentication status, name, email, role, and method.
- The backend derives an internal pseudonymous user ID from Shibboleth email and HMAC secret.
- Teacher role is checked via `TEACHER_EMAILS`.
- Course access: password check, cookie, and server-side approval; course passwords are not exposed as plaintext in API metadata.
- Teacher/admin endpoints enforce instructor access in the backend.
- Proxy blocks for lecturer/dev routes remain defense in depth; `ENABLE_DEV_ROUTES=false` is the production assumption.

Privacy Boundary

Category	Standard operation	Boundary
Course access	Password, cookie, Shibboleth headers	no learning-history analysis from login data
Learning record	Progress, Q4R, quizzes, notes	explicit inputs, deletion in profile
Teaching feedback	Aggregates	no individual performance profiles
Video/games	Usage and practice aggregates	only pseudonymized or aggregated
Crib sheets	Topic coverage, compression	no publication of raw submissions
SampleCircle	Separate module	no production WebApp coupling

⇒ Concepts exist for the learning platform, SampleCircle, ESDA Quest, and research use.

Tracking vs. Learning Record

- **Explicit learning record:** progress, slide page, difficulty, comprehension, Q4R/quiz answers, and notes.
- **Operational aggregates:** e.g., video counts without user ID, Shibboleth ID, session ID, or individual history.
- **Personal tracking:** only after global admin approval and individual tracking preference.
- **Opt-out:** course materials must remain usable even when students do not consent to research tracking.
- **Free text:** no export or person-level analysis without a separate purpose check.

Deployment Model

- Development: Docker Compose with Vite frontend, Tornado API, PostgreSQL 16, Redis 7, tracker worker, and video nginx.
- Production: static frontend as nginx container, internal API, PostgreSQL/Redis without public ports.
- Public reverse proxy provides TLS and routes to frontend nginx in the external shibboleth_backend network.
- Frontend nginx routes API, content, and video requests to internal services.
- Content and videos are deployed in a controlled way from the course inventory.
- Backups and restore tests remain separate operational responsibilities.

Contact Points in Course Hub

- The WebApp contains only a **development simulator** for contact points and attendance.
- Purpose: show the workflow without collecting real Bluetooth proximity data.
- Students see their own simulations in the dashboard and can delete them.
- Required before real implementation:
 - ⇒ integration with existing student and instructor accounts
 - ⇒ explicit opt-in for Bluetooth proximity processing
 - ⇒ replay/misuse protection, ID rotation, and short retention
 - ⇒ review/approval of privacy and governance concepts before production use

SampleCircle: Demo State

- External Android prototype; presentable state for a session demo.
- BLE scan filters for SampleCircle identifiers and counts only defined test identifiers.
- Session demo:
 - ⇒ button starts scan and advertising together
 - ⇒ five-minute session duration
 - ⇒ two-hour gap after session end
 - ⇒ at most three sessions per day
- Manual test state: demo app ran on three real devices; test identifiers were recognized in the session dashboard.
- `master` remains the stable reference; merge only after domain and technical review.

SampleCircle: Boundaries

- Current test identifiers are stably derived from a local test installation ID.
- Not yet implemented:
 - ⇒ security model and privacy approval for the mobile protocol
 - ⇒ cryptography, signed app credentials, and role checks in the mobile protocol
 - ⇒ replay protection and protection against multiple identifiers per account
 - ⇒ server upload, local database, and revocation/deletion model
- Target state: short-lived course/day/role credentials, local aggregation, and upload only of thresholded aggregates.
- Not a target: contact lists, movement profiles, concrete encounters, or central Bluetooth raw data.

Roadmap

Workstream	Next work
Course Hub	Further stabilize course import, ESDA/SBDA content, and UI for content management
Auth/roles	Further harden Shibboleth/teacher configuration, admin surfaces, and proxy rules
Privacy/export	Finalize approvals, profile/deletion functions, free-text rules, and export rules
Games	Position Regritter/CSI as optional practice data sources in the feedback and research concept
Crib sheets	Document pipeline, check anonymization, and validate aggregate indicators substantively
SampleCircle/ops	Clarify session model, credential protocol, backups, restore test, and monitoring

Discussion

- Which indicators actually help students prepare for exams?
- Which aggregated information do instructors need during the semester?
- Which data from games and crib sheets are educationally meaningful?
- Which free-text data may be visible in which role?
- Which functions belong in Course Hub, and which should remain in ILIAS or external systems?
- When is SampleCircle educationally and legally robust enough for a pilot?

Next milestone: productive course operation with a clear approval boundary

Appendix: API Surfaces

- Student-facing: `/api/courses`, `/api/materials/...`, `/api/student/dashboard`, `profile`, and `preferences`.
- Instructor-facing: `/api/lecturer/material-progress`, `/api/lecturer/q4r-progress`, `/api/lecturer/quiz-progress`, `/api/lecturer/video-usage`.
- Admin: `privacy approval`, `email test`, `user directory`, and `deletion/scope` functions.
- Tracking: `/api/tracking/preference`, `/api/tracking/events`, `/api/tracking/video-aggregate`.
- Development: `/api/dev/beacon/*` only with explicit activation; disabled in production.

Appendix: Open Checks

- Are privacy concepts, UI texts, and technical defaults consistent everywhere?
- Are teacher/admin rules consistent across backend, frontend, and reverse proxy?
- Are course passwords, Shibboleth IDs, and HMAC secrets handled with sufficient separation?
- Are backup, restore, data deletion, and manual DB corrections documented?
- Is there a robust decision for SampleCircle on mobile role credentials, thresholds, and revocation?

Backup: Maturity Levels

- **Near production:** Course Hub with course materials, learning records, aggregates, profile, and deletion functions.
- **Extendable:** Regritter, CSI Hohenheim, and crib-sheet pipeline as sources for practice, transfer, and artifact data.
- **Prototype:** contact-point simulator and SampleCircle as demonstrations of possible attendance and learning-contact aggregates.
- Limits of claims:
 - ⇒ Standard operation provides teaching feedback and learning organization.
 - ⇒ Research use requires approval, purpose limitation, and anonymization.
 - ⇒ Bluetooth and crib-sheet raw data remain especially sensitive.