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Flipped AI Literacy Classrooms: Student Motivation and Engagement in Secondary Education

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Outline

1 Background

2 Flipped Classroom Design

3 Research Questions

4 Methodology

5 Findings

6 Discussion

Background & Motivation

- AI literacy: key goal in secondary education
  - understand & interact with AI
  - evaluate outputs critically & responsibly
  - UNESCO AI Competency Framework (UNESCO, 2024)
- Flipped Classroom (FC) (Abeysekera & Dawson, 2015; Bishop & Verleger, 2013)
  - content before class, active learning in class
- But: pre-class phase demands SRL (Urak et al., 2026; Werner & Spannagel, 2018)

Aim of this Work

- Flipped AI literacy session with `prompting.school` (Brünner et al., 2026)
  - guided prompt engineering practice
  - scaffolded tasks, feedback, stars & badges
- Design-Based Research (DBR) (Reimann, 2010)
  - one design cycle in authentic school setting
  - design-relevant evidence, no causal claims
- Focus: students' experience
  - motivation, engagement, perceived learning

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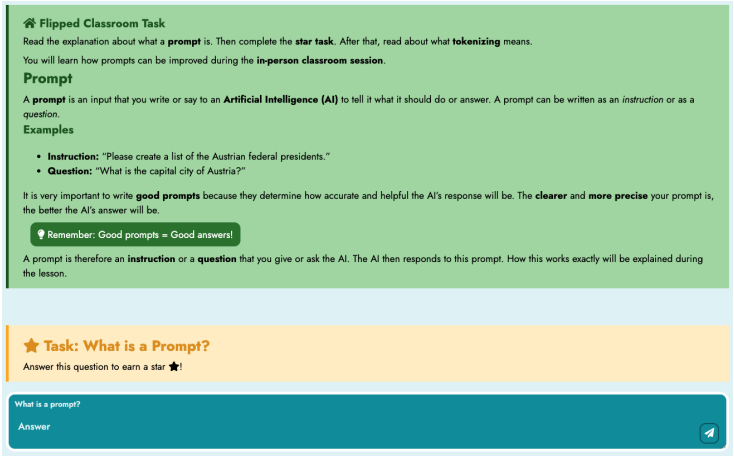
6 Discussion

Flipped Classroom Design

- Pre-class (at home)
  - selected platform tasks
  - basic concepts, first contact
- In-class (teacher-led)
  - discussion, clarification, application
- Aligned with UNESCO framework (UNESCO, 2024)

- Example: Lesson 2 on prompting
  - home: What is a prompt? examples, star-rated task, tokenizing
  - class: *How can prompts be improved?*
- Home phase = preparation $\rightarrow$ need for in-class elaboration

Example: Lesson 2 Task



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Research Questions

- **RQ:** How did students experience a flipped classroom design using an AI literacy platform in relation to motivation, engagement, and perceived learning in secondary education?
  - **Sub-RQ1:** How did students perceive the AI topic, platform comprehensibility, and task clarity?
  - **Sub-RQ2:** How did students engage with the flipped classroom tasks, as reflected in self-reported task completion and timestamped platform activity?
  - **Sub-RQ3:** How did students perceive workload, learning, traditional homework, and gamification elements?

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Setting

- Course with 4 lessons in prompting.school
  - home: platform, class: teacher-led
- Voluntary survey, anonymized data
- Platform logs: 3,096 timestamped entries
- Analysis: descriptive statistics, heatmap, thematic coding

Data & Analysis

- $N = 56$ students, age 10–14
  - Austrian lower secondary school
  - *Basic Digital Education*

- Post-unit questionnaire
  - star ratings, categorical, 5-point, open-ended

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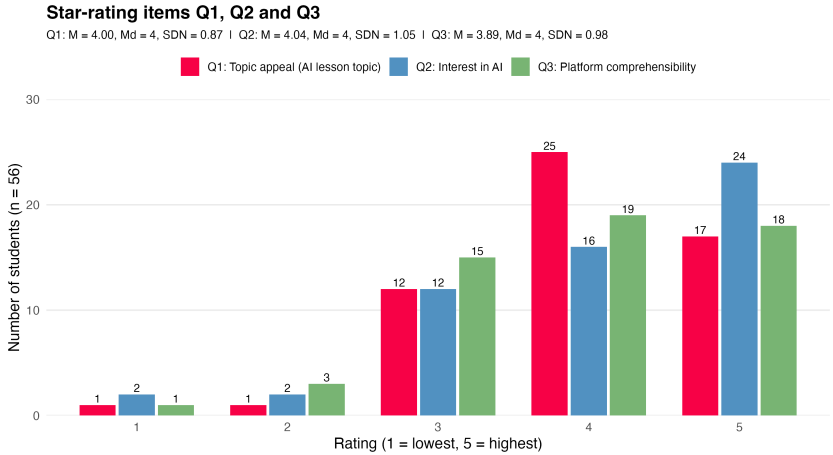
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Interest in AI & Platform Comprehensibility

- Q1 – liked AI as topic
  - $M = 4.00$, $Md = 4$, $SD_N = 0.87$
  - 75.0 % four or five stars
- Q2 – AI interesting
  - $M = 4.04$, $Md = 4$, $SD_N = 1.05$
  - 71.4 % four or five stars
- Q3 – platform content understandable
  - $M = 3.89$, $Md = 4$, $SD_N = 0.98$
  - 66.1 % four/five, 7.1 % one/two stars

Star Ratings Q1–Q3



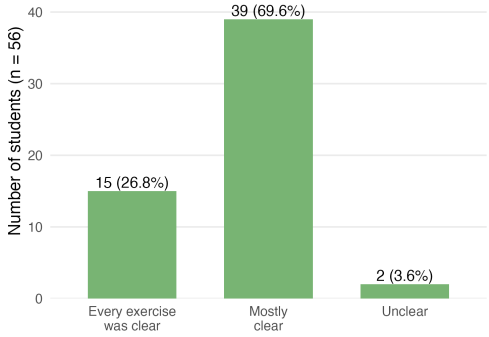
Task Clarity & Task Completion

- Q4 – task clarity
  - every exercise clear: 26.8 %
  - mostly clear: 69.6 %
  - $\rightarrow$ 96.4 % knew what to do (at least mostly)
- Q5 – FC tasks at home ($n = 55$)
  - fully: 28, partially: 25, not at all: 2
  - $\rightarrow$ 96.4 % at least partially

Task Clarity & Completion (Q4, Q5)

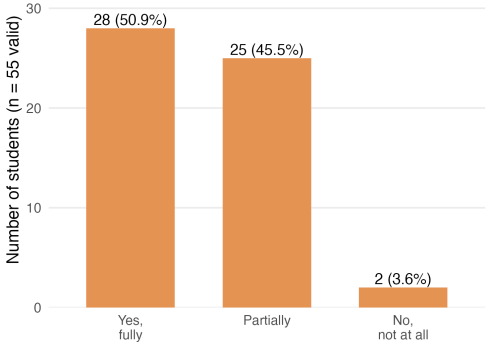
Q4: Task clarity

96.4% understood at least most of the exercises



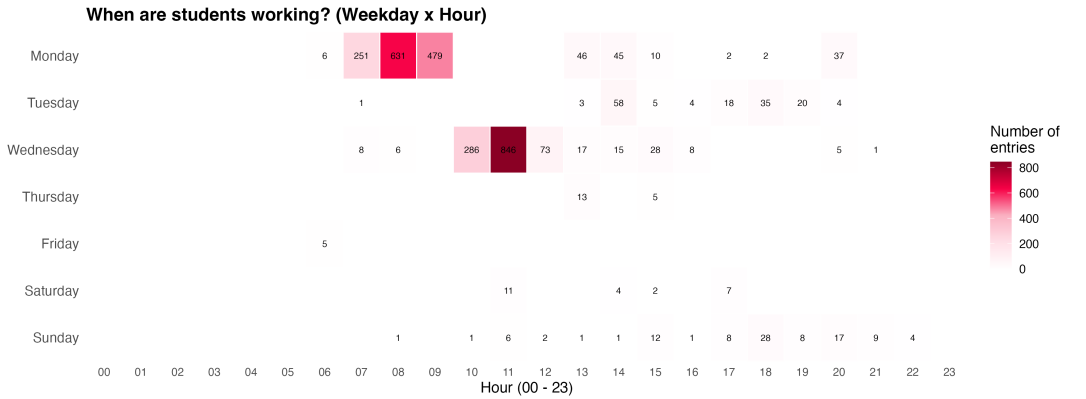
Q5: Completion of flipped classroom tasks

96.4% completed the tasks at least partially



Temporal Patterns of Platform Use

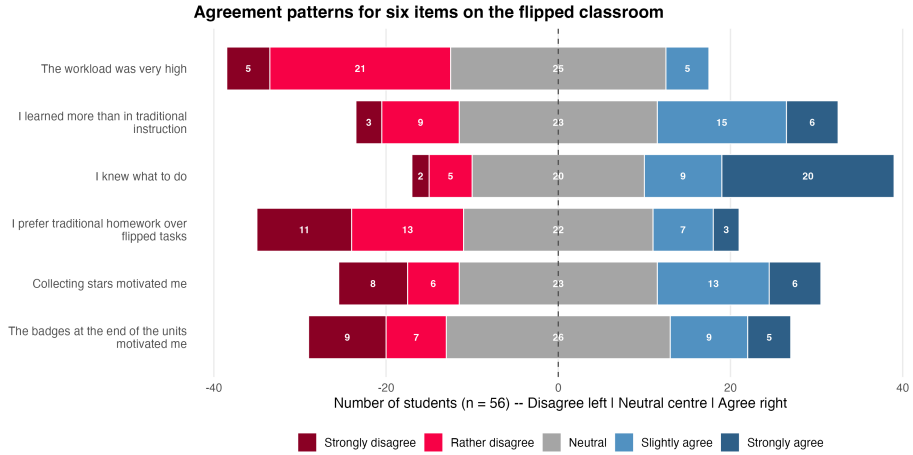
Peaks: Mon & Wed lessons | late afternoon → home-based work (Time in UTC)



Workload, Learning & Gamification

- Workload “very high”: $M = 2.54$
  - only 8.9 % agree, 46.4 % disagree
- Learned more than in traditional instruction
  - 37.5 % agree, 41.1 % neutral, 21.4 % disagree
- Prefer traditional homework: 42.9 % disagree, 17.9 % agree
- Gamification: stars motivating 33.9 %, badges 25.0 %
  - many neutral responses

Agreement Items



Qualitative Feedback

- AI topic
  - interest (13), fun (10), exciting (8)
- Flipped classroom
  - flexibility (3), independent work (4)
- AI block
  - learning gain (8), AI chatbot (6)
- Suggestions
  - mostly: “nothing, everything was great”
  - more appealing design (“boring”)
  - clearer homework explanations
  - task length, smaller parts

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Interpretation & Design Implications

- AI = motivating topic
- Task clarity = strongest result
  - key for SRL in pre-class phase
- Perceived learning: largest group neutral
- Manageable workload $\neq$ full completion
- Gamification: moderate role

- Make task goals explicit
- Visible bridges between phases
  - compare prompts, revise outputs
- Support SRL through structure
  - checklists, times, reminders
- Align gamification with progress
- Collect qualitative feedback

Limitations & Outlook

- Limitations
  - one cycle, one cohort
  - self-report only; no pre-post, no control group
  - brief open answers, no interviews
- Outlook: next DBR cycles
  - strengthen bridge platform $\leftrightarrow$ classroom
  - e.g. activation task using students' platform responses
  - explore reasons for partial completion

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Open Questions



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