

GOOD Flipped Classroom CASE



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Instructor
Professor Hailiang Wang

Department
School of Design (SD)

Subject
Design Research Methods

Class size

66

Students

Year 2 and Year 3 undergraduate students

Details of Flipped Classroom IMPLEMENTATION

Why did the instructor use the flipped classroom approach?

Teaching research methods to design students has traditionally been challenging. While design students often excel in visual thinking and prototyping, they may find academic research concepts abstract and difficult to grasp. Prof. Wang noticed that delivering conventional lectures on quantitative and qualitative research methods often left students confused, and valuable class time was frequently spent explaining foundational concepts rather than supporting practical application.

To bridge the gap between theory and practice, Prof. Wang adopted the flipped classroom approach. By moving foundational knowledge, such as the definitions and background of specific research methods, to a pre-class and post-class online platform, he aimed to free up in-class time for hands-on workshops and discussion. This allowed students to focus more on applying evidence-based, user-centred research methods to their design projects.

How was the flipped teaching approach implemented?

Preparation of materials

Prof. Wang, in collaboration with an external IT team and his PhD students, developed a customised AI-driven learning platform tailored to the needs of design students. He prepared a series of short micro-lecture videos, each around 5 - 20 minutes long, focusing on practical and relevant topics such as data visualisation and usability testing. AI tools were used to support the production process, including voiceover generation.

In addition to the videos, the platform featured an interactive Knowledge Graph to help students visualise the relationships among research concepts based on their performance on the test, as well as a custom AI virtual tutor trained on design research literature. These resources were designed to support students' understanding before class and provide more targeted assistance than general-purpose AI tools.

Pre-class activity

Before class, students were asked to access the platform to watch the short videos and explore the Knowledge Graph. The visual representation of concepts helped students better understand how different research methods and ideas were connected.

After watching the videos, students completed short quizzes to consolidate their understanding. These quizzes were ungraded during the pilot phase, but immediate feedback was provided so that students could check their understanding and identify areas for further review. Students could also ask questions through the AI virtual tutor if they needed clarification on particular concepts or methods.

In-class activity

Since students had already been introduced to the foundational knowledge before class, Prof. Wang only needed to spend a few minutes reviewing the core concepts at the beginning of each lesson. The majority of class time could therefore be devoted to interactive workshops and discussion.

Students worked in 11 groups to apply the research methods they had learned to their overarching project theme. Through discussion and practical tasks, they were able to test ideas, apply methods in context, and connect research more directly to their design work. Specifically, during the poster presentation session (Week 7), students experienced the role of a presenter at an academic conference and gained a deep understanding of how to highlight the key points of their research and capture the audience's attention within a very short time. Moreover, through the SPSS workshop (Week 9), students gained an introductory understanding of how to handle different types of data they collected and acquired basic statistical knowledge, such as descriptive statistics, significance tests, and causal analysis.

Post-class activity

After class, students continued to apply the research methods to their ongoing group projects over several weeks. They also used the AI virtual tutor to support brainstorming, refine their problem definitions, and improve the academic writing in their final project reports.

During tutorials, Prof. Wang reviewed students' progress and examined how effectively they had integrated the research methods into their project development and design outcomes.

What was the impact on student learning?

The flipped learning approach, together with the AI-driven platform, produced encouraging results. A comparative evaluation was conducted on two cohorts of design undergraduates with respect to their final academic reports. The 2025/2026 cohort used the customised AI system, while the 2023/2024 cohort received no AI assistance. Results from a blind expert review showed that the 2025/2026 cohort significantly outperformed the control group in overall score, with a median of 77.600 compared to 70.900 ($p=0.036$). Specifically, the system improved scores in Problem Definition (19.200 versus 17.200, $p=0.026$) and Analysis Quality (19.400 versus 17.500, $p=0.009$). Improvements in Method Selection ($p=0.116$) and Writing Quality ($p=0.117$) were not statistically significant, although the scores remained higher.

These outcomes suggest that the flipped design, supported by the tailored AI platform, helped students engage more actively with research methods and apply them more effectively in their coursework.

This work also contributed to a related short paper that was published at the ACM CHI 2026 conference, the premier international venue for human-computer interaction (HCI) research, where AI and Learning was featured as one of the official conference themes. This publication underscores the project's academic and practical significance at the intersection of HCI and education.

What are the good practices that can be learnt from this case?

Developing Bite-sized Digital Resources to Enhance Students' Self-learning

- To support students' pre-class preparation, Prof. Wang developed a set of short micro-lecture videos and online quizzes through a customised AI-Driven learning platform. These digital resources enabled students to build foundational knowledge at their own pace before class, making it easier for them to engage in workshop activities and apply research methods more confidently during lessons.

Tailoring an AI Virtual Tutor to Support Learning in a Niche Subject

- Instead of relying on general generative AI tools, Prof. Wang incorporated a custom AI virtual tutor trained on design research textbooks and recent academic literature. This helped provide students with more relevant, discipline-specific, and academically grounded support, especially when they were clarifying concepts, refining problem definitions, and improving their writing.

Visualising Abstract Research Concepts Through a Knowledge Graph

- To help visually oriented design students better understand abstract research concepts, Prof. Wang integrated a Knowledge Graph into the learning platform. This allowed students to explore the relationships among different methods, concepts, and data more intuitively, making theoretical content easier to understand and apply.

Focusing Flipped Learning on Practical and High-value Topics

- Recognising the heavy workload of design students, Prof. Wang carefully selected practical and project-relevant topics for the flipped learning materials, such as data visualisation and usability testing. This targeted design helped keep pre-class preparation manageable and showed students the immediate relevance of what they learned.

What were the challenges encountered during the implementation and what solutions were used?

Inconsistent Pre-class Preparation

One of the main challenges was that some students did not complete the pre-class preparation. As the quizzes were ungraded during the pilot phase, some students chose to skip the videos and related activities.

To address this, Prof. Wang made deliberate use of the platform's backend data to monitor student engagement and learning progress. He also ensured that the in-class workshops were closely linked to the pre-class materials. As a result, students became aware that without completing the preparation, it was difficult for them to participate actively in class. In future iterations, Prof. Wang plans to explore integrating platform engagement more formally into the assessment scheme.