

Scaffolded Electronics Design Studio

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Ocean University of China & Xidian University
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Reporting, Soldering and Simulation: Bilingual First Year Success in a China Joint Education Programme

133

Students across two
China JEP cohorts

100%

Overall satisfaction
rate (both cohorts)

67%

Very satisfied,
B37VA Pt.2 (n=60)

51%

Very satisfied,
Xidian Pt.1 (n=73)

5

Scaffold stages
across the semester

CONTEXT AND CHALLENGE

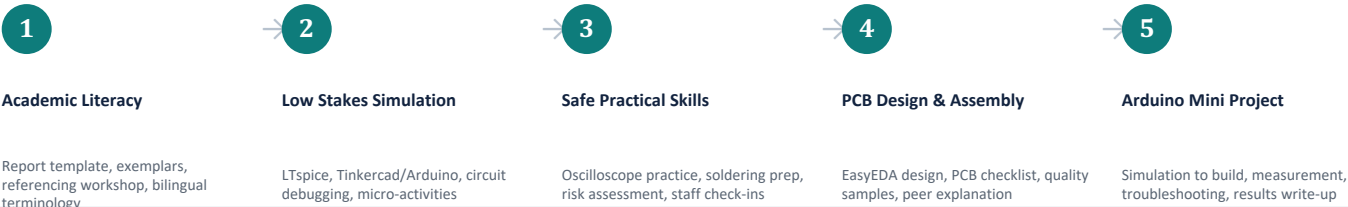
First year engineering students on bilingual China JEP programmes must master circuit theory, laboratory practice, academic writing and specialist software concurrently, in a second language and without established study habits.

- New disciplinary vocabulary encountered in a second language
- Multiple software environments (LTspice, EasyEDA, Arduino IDE) introduced concurrently
- Safety critical practical skills under cognitive load

RESEARCH QUESTIONS

- RQ1** How do early academic literacy supports (templates, exemplars, referencing workshops) influence report quality and feedback assimilation?
- RQ2** Does sequencing simulation, then soldering and PCB, then an integrated mini project enhance practical competence and troubleshooting confidence?
- RQ3** Which supports most benefit bilingual students in readiness, engagement, belonging and communication oriented performance?

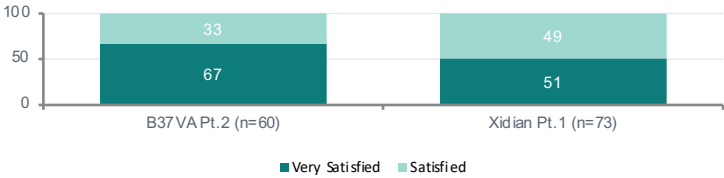
FIVE PHASE SCAFFOLDED PROGRESSION



MIXED METHODS EVALUATION

- Quantitative**
Rubric ratings, error pattern tracking, learning analytics
- Survey**
Pre/post self-efficacy across writing, simulation and soldering (n=133)
- Qualitative**
Focus groups and reflective prompts, oversampling bilingual students
- Moderation**
Teaching team calibration notes on rubric clarity and consistency

STUDENT SATISFACTION (BOTH COHORTS)



WHAT THE DATA SHOWS

- Templates and exemplars consistently praised; students linked report writing confidence directly to structured scaffolds
- Simulation before soldering reduced error propagation onto real PCBs
- Checklist artefacts (PCB, risk assessment) reduced dependency on staff during lab sessions
- Teacher patience and slowed delivery were flagged as critical to comprehension

SUPPORTS FOR EAL LEARNERS

- Consistent terminology across slides, templates and verbal instruction
- Annotated worked examples with margin commentary on disciplinary conventions
- Sequential, step-by-step artefacts to reduce working memory load
- Organised peer explanation, with optional bilingual glossaries
- Unmodified assessment: rubric criteria and academic standards unchanged

STUDENT VOICE

"I have carried out multiple electronic design practices... this laid the foundation for future work."

"The teacher is very patient... the teacher makes the effort to help us follow along."
B37VA Pt.2 students

CONTRIBUTION AND IMPLICATIONS

A transferable, reproducible paradigm for first year practical engineering education, integrating academic literacies, safety artefacts, simulation sequencing and bilingual access. The scaffold sequence mitigates cognitive overload while building disciplinary identity. Future work: longitudinal tracking of report quality, cross team rubric calibration and bilingual focus group analysis.