

Cross-course collaboration between software and hardware modules

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1. Background

Students often focus on specific knowledge or skills in individual modules but neglect the relations between them. We should encourage students to acquire a broad range of knowledge or skills across their entire degree programme.

In the "BSc(Eng) Internet of Things Engineering" degree programme, "Software Engineering" is a core module that provides an introduction to modern software development techniques and "Microprocessors for Embedded System" is a core module that examines the structure, programming and applications of microprocessor and microcontroller devices. This project is to design and implement a cross-course collaboration between these two modules to provide a coherent learning experience for students.

3. Activities

We designed a collaborative coursework between the two modules and tried it out on a large class of 180 students. The students worked in small groups (6 students/group) with their own hardware kits. They spent two months completing both a software development and a hardware design and had to make them work together. At the end of the project, the groups submitted their reports and code online. We organised a demonstration day for all groups to present their projects.

Activities included:

- Design collaborated coursework
- Build hardware kits
- Teaching assistants training
- Hands-on workshop
- Joint group demonstration



Fig 1. The hardware kits



Fig 2. Hands-on workshop

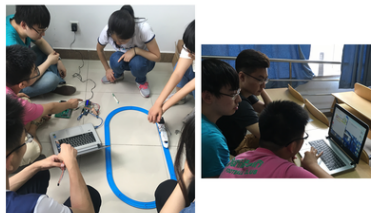


Fig 3. Group demonstration 2016:
A Tourist Train Journey Management System

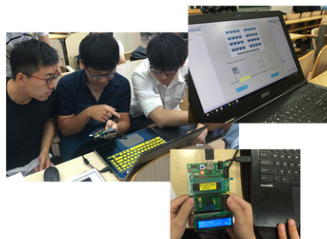


Fig 4. Group demonstration 2017:
A Self-service Ticketing Kiosk for Cinemas

2. Aims

- Help students understand the relation between the modules and the complete curriculum
- Provide opportunities for students to engage in active learning
- Prepare students for their future careers
- Help teaching staff know what colleagues are doing in other modules
- Provide opportunities for staff collaboration and sharing of good practice

4. Outcomes

- 30 sets of reusable hardware kits
- Well-designed coursework collaboration framework and marking scheme
- Automated marking and feedback forms
- Archive of outstanding students' projects
- Project webpages to allow access of software and instructions, including videos

5. Evaluations

An anonymous online survey shows the collaboration between the software and hardware modules is well received by the students.



Fig 5. Survey results

Our teaching assistants observed: "The students were much more engaged in the labs and the group work because the hardware kits were more accessible."

Other teaching staff attended the demonstration day commented: "It went very smoothly. Some projects were very impressive."

6. Challenges

- Managing the large number of students
- Maintaining the hardware kits for reuse
- Providing training to teaching assistants
- Giving timely feedback to students

7. Further work

- Extend the scope of the collaboration
- Expand the collaboration to more modules
- Share reusable hardware kits and developed software