

# SynergyNet: Multi-touch in Education

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**Abstract:** The SynergyNet project is exploring the use of networked interactive surfaces in formal education settings, across a range of age groups. The project team is comprised of researcher in education, computer science and psychology who are looking at the development of multi-touch enabled classrooms from this interdisciplinary lens.

## Project background

The SynergyNet project is part of the UK's Teaching and Learning Research Programme's (TLRP) Technology Enhanced Learning (TEL) initiative that is funded as an interdisciplinary research project by the Economic and Social Research Council (ESRC) and Engineering and Physical Sciences Research Council (EPSRC). It involves researchers from Computer Science, Education and Psychology in developing multi-touch computer environments for learners in order to investigate collaborative learning in groups using single tables, and a networked environment for a whole classroom, in order to research the didactics and pedagogy for effective use.

## Interactive Surface Technology

The vision of the classroom (Figure 1) illustrates two types of surface. The teacher has a lectern-style surface whereas the learners have a flat, sit-to-use style table. Both tables are diffuse illumination (DI) based surfaces with rear-projection that, with the current vision system software, support 30 simultaneous touches. Additionally, two non-interactive projection screens are available.



**Figure 1.** Artist's vision of SynergyNet classroom

It is the SynergyNet software framework that provides the capability for all surfaces and projection screens to work together. Each table joins the network and discovers other tables and shareables that are available on the network. Once established on the network, the tables can communicate with each other through a common messaging system. This messaging system is available to all applications built for the classroom to use directly, however the SynergyNet content system also provides a convenient way to make all content shareable and updatable.

In terms of capability, this allows content such as text, video, images, PDFs and office documents to be seamlessly moved from table to table. One table can establish a view of another table and see content updates synchronously. If allowed, two tables can share the same content-space, allowing two tables to collaborate on the same task. This same content system allows the teacher to view any table or view all tables simultaneously as well as engage in command-and-control activities that facilitate classroom management. Rather than being focused on a specific application, the goal of the project is to develop a software system that facilitates single-table collaboration and whole-classroom collaboration.

The SynergyNet software framework is built in Java, using native OpenGL bindings via jMonkeyEngine, a commercial-grade scene-graph API. Using this platform, it has been possible to use libraries that read PDFs, office documents and videos along with giving access to hardware accelerated audio and the Open Dynamics Engine physics system.

## Target Audience

The SynergyNet project focuses on designing multi-touch classroom environments across all stages of formal education, with an emphasis on developing novel pedagogical strategies to support collaborative learning activities in classrooms. At this stage, our research has focused on students in the upper-primary (early middle-school) years, exploring differences in collaborative learning strategies between multi-touch and paper-based versions of the same task. We explore both how the technology can best support collaboration within small groups, and the development of curricula and tools that help the teacher monitor the groups and manage transitions between individual, small group and whole class work.

We have designed a number of framework activities (e.g. mysteries, math-pad) which can be used across age and ability groups, depending on the content that is chosen. By developing activity structures, we are able to explore how particular types of activity can be best supported through the technology, classroom design and curriculum supports. They also allow us to create a large number of learning activities, so that the multi-touch tables can be used for long periods of time, eventually becoming part of a standard classroom, where they support collaborative work, and function as normal desks for more traditional classroom activities.



Figure 2. Children using a SynergyNet table

### **Development, Implementation and Evaluation Priorities**

The SynergyNet project is developing software and curricula that allow for the use of networked multi-touch tables, teacher consoles and wall displays in a classroom setting, with a focus on children learning through small group and whole-class collaboration. Most current research into multi-touch tables has examined single tables used in isolation. This work suggests that multi-touch tables can support collaborative learning interactions, leading to more task focused conversation (Harris et al, 2009) and more equitable participation of collaborators (Marshall et al 2009). Studies also show that interactions are more fluid and conflicts are resolved more quickly (Hornecker et al, 2008). For a classroom environment, the challenge is to provide a mechanism by which more than one table can communicate with each other over a network and, thereby, facilitate rich dialogic activity (Alexander, 2008), and develop and study the types of pedagogy that best support such learning activities.

Our research work has a number of parallel strands. These include the development of networking capabilities, and exploration into the most fluid way for students and teachers to interact with the technology, research into the learning processes and outcomes that are enabled through use of the technology, and development of curricula and pedagogical supports to fully integrate this technology into classrooms.

### **References**

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