

## A. ISSUES IN THE DESIGN OF CSCL SYSTEMS

# Symphony-Q: A Support System for Learning Music through Collaboration

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### ABSTRACT

This paper describes the Symphony-Q support system for learning music. This system integrates a sensing board and a computer, and is used for collaborative learning in a face-to-face setting. One of the aims of Symphony-Q is to enhance music experiences: children who do not have music skills can easily participate in music learning, enjoy making sounds, and play rhythmically to music in collaboration with others. The paper discusses comments and feedback from school children and their teachers, which were collected during experiments with Symphony-Q carried out in a Japanese public elementary school.

### Keywords

Music learning, music experience, collaborative learning, interaction, , sensing board, elementary school

### INTRODUCTION

This paper describes a support system for learning music through collaboration. Several studies have indicated that it is very important for individuals to have rich music experiences, especially in their infancy, in order to fully develop their capability for music (Gordon, 1997). The system proposed in this paper, Symphony-Q, aims at enriching learners' musical experiences and developing their musical capabilities through the learning of tones, rhythms, and chords in an easy manner. Symphony-Q uses a sensing board that was developed by the authors. This board was applied to a support system for learning about environmental problems (Kusunoki, 1999), and electronically-enhanced board games. In Symphony-Q, a personal computer and the sensing board are linked together, and animations generated by the computer are projected onto the surface of the board through an LCD projector. When a learner places physical pieces on the board, the system makes different sounds based on their location, and changes the animations.

The features of Symphony-Q can be summarized as follows:

- CSCL for music: a group of learners sits around the sensing board of Symphony-Q, and uses it in a face-to-face situation. They can learn about tones, rhythms and chords through their interactions and communication, and enhance their own music experiences.
- Raising learners' motivations with games: learners with Symphony-Q can start learning music, as they would play a game, which is an effective way to motivate children to learn.
- Augmented reality: by integrating sounds, animations and a physical board, Symphony-Q creates an immersive learning environment. The system also supports learners who have difficulty using traditional input devices for computers (a mouse and a keyboard), or musical instruments. It enables learners to participate in music learning situations by directly and intuitively manipulating physical objects in the real world.

### SYSTEM CONFIGURATION

Symphony-Q is composed of a sensing board, a personal computer, an LCD projector, a MIDI sound device, and audio speakers. The sensing board and the computer, and the computer and the MIDI sound device are connected through their serial interfaces. An animation of a musical instrument (for example, a piano keyboard) is projected onto the surface of the

board. When a physical piece is placed on a certain area of the instrument (for example, one of its keys), the corresponding sound is immediately emitted through the speakers.

One, two or three persons can use Symphony-Q. When it is used by a group of learners, Symphony-Q generates animations and sounds of multiple instruments at the same time. Each learner can select his or her favorite instrument and participate in an ensemble.



Figure 1. Example of using sensing board

The system changes animations based on learners' inputs. For example, if the pieces are placed correctly, a character on the board smiles and guides learners to the next question. If the pieces are not placed correctly, the character looks sad and prompts learners to try again. The background image of the animations also changes in relation to learners' scores from a pleasant atmosphere, for satisfactory performance, to a sad atmosphere for unsatisfactory performance, in order to raise learners' motivation and engagement.

## CLASSROOM EXPERIMENTS

The experiments and evaluation of Symphony-Q were carried out in a Japanese public elementary school (in Yokohama, Kanagawa prefecture) from February to June 2001. The teacher in charge of the class and a music teacher were asked to use the system in their music lessons. Thirty school children (15 boys and 15 girls) in a fifth grade class participated in the experiments. The school children were randomly divided into 10 groups of three. After using the system, the children and their teachers freely discussed their experiences. All of the experiments and discussions were recorded by two video cameras. Post-experiment interviews were also carried out, and information by means of questionnaires was collected.

## DISCUSSION

The system supported learners who were not skilled at manipulating conventional computers in school lessons. By supporting the intuitive manipulation of pieces and making the computer invisible, the system encouraged children to play and learn music. Many music learning support systems use traditional graphical user interfaces (GUIs) and input devices (Williams, 1998). Compared with these systems, Symphony-Q's learning environment has the potential to enhance learners' communication skills, interactions, and level of participation. Further experiments with Symphony-Q are required to address the finding that animations may disturb children's learning. In addition, it is not clear whether children can truly acquire musical knowledge and skills as a result of their interaction with the system. Another issue is related to the game feature of our system. Playing a game may direct learners to focus on the superficial aspects of the system, such as animations or characters, rather than on learning musical concepts, such as chords or rhythms. Achieving a balance between the game aspect and the learning of music are interesting and challenging problems that require investigation in the future.

## REFERENCES

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