Chapter 11
School Activities Using Handmade Teaching Materials with Dot Codes

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ABSTRACT
Practitioners have been using three communication aids in conducting many school activities at both special needs and regular schools. In the simplest system, voices and sounds are transformed into dot codes, edited with pictures and text, and printed out with an ordinary color printer; the printed dot codes are traced to be decoded into the originals by using a handy tool, Sound Reader. In the most complex system, in addition to audio files, multiple media files such as movies, web pages, html files, and PowerPoint files can be linked to each dot code; just touching the printed dot code with sound or scanner pens reproduces their audio or multimedia, respectively. The present chapter reports the software and hardware used in developing originally handmade teaching materials with dot codes and various school activities performed at both special needs and regular schools.

INTRODUCTION
It is very important for students with severe verbal and mental challenges to express their thoughts and needs to others by using various means such as signs, gestures, and tools; these communicative means enhance their lives and help them get along with others and function in society. To provide essential support for such students is an important task of special needs schools (Johnston, Beard, & Carpenter, 2007).

Developers and researchers have created many teaching aids based on an assistive technology (AT). Among these, voice output communica-
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Vocalization aids (VOCAs) are widely known and used for students with severe verbal and mental challenges; the school activities with such VOCAs sometimes work very effectively on such students (Ace Center, 2000; Axistive, 2011; Disabled Living Foundation, 2011; Gateway, 2011; Inclusive Design Research Center, 2011; Sussex community, 2011). In most VOCAs, however, output numbers and length are restricted. Therefore, we have been using three communication aids that can decode the dot codes printed on paper (Anderson et al., 2008; Ikuta, 2008a; Ikuta, 2008b; Ikuta et al., 2011; Kaneko et al., 2011; Ikuta, 2011). By using these systems, schoolteachers can create original handmade teaching materials suitable for the independent needs and desires of each student in their class.

In this chapter, we report several school activities including two long-term ones, undertaken at both regular and special needs schools, using the Sound Pronunciation System (SPS) developed by Olympus (1999). In this system, voices and sounds are imported into a personal computer (PC) through a microphone or voice recorder, then transformed into two-dimensional dot codes, edited to include text and pictures, and finally output with an ordinary color printer. Then, the dot codes on the printed sheet can be traced with a handy tool, Sound Reader, which decodes them into the original voices and sounds (Okawara et al., 2008; Ohshima et al., 2007; Ohshima et al., 2008).

The first long-term activity is a sensible, three-year approach to “Student A.” The SPS is used to facilitate communication with his family and classmates, and his transformations are described carefully. As a result of these efforts, he learns how to communicate with others and experiences the pleasures and satisfactions of everyday life. Furthermore, he gains competence and confidence and is now living peacefully. He also masters changing his clothes by himself, increasing his ability to perform tasks necessary for daily life, and is living confidently (Nemoto & Ikuta, 2010).

The second long-term school activity was conducted for students with intellectual and expressive language disabilities, where many handmade sheets with the voices of their homeroom teacher and volunteers, in addition to pictures, words, and phrases, enable them to acquire vocabulary, grasp word meanings, as well as achieve meaningful relationships (Ishitobi, Ezoe, & Ikuta, 2010).

From the abovementioned school activities, we demonstrate that it is essential for schoolteachers to develop original handmade teaching materials for supporting the independent needs and desires of each student. However, students with hand/finger or severe mental challenges at special needs schools and those in the lower grades at regular schools cannot trace the dot codes correctly to join in the same activities with their classmates. We, therefore, have started collaborative research with two venture business companies, Gridmark (2004) and Apollo Japan (2005), to develop new handmade teaching materials with a newly developed dot code and test them in school activities (Kaneko et al., 2011; Ikuta, 2011). These new dot codes are called Grid Onput (Gridmark, 2004) and Screen Code (Apollo Japan, 2005), and their “sound pens” are called SPEAKING PEN and Speakun, respectively. Just touching the printed dot codes with these pens reproduces original voices and sounds clearly, instead of tracing longer dot codes. The Grid Onput system has several interesting characteristics such as linking more than one audio file to one dot code and more than one multimedia file such as movies, web pages, html files, and PowerPoint files to the same dot code. These valuable new features enable the students with challenges to enhance their learning activities.

The SPS system cannot exceed an audio length of 40 s because the audio is directly printed on a sheet as two-dimensional dot codes. The software for the new sound pens, SPEAKING PEN and Speakun, however, can edit and compress the original voices and sounds effectively and save them onto a micro SD card in the pens (For
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