Chapter 22
Soft and Hard Technologies in Technology Education

Kin Wai Michael Siu
The Hong Kong Polytechnic University, Hong Kong & Massachusetts Institute of Technology, USA

Yi Lin Wong
The Hong Kong Polytechnic University, Hong Kong

ABSTRACT

There is a common misconception that technology is limited to physical devices (i.e., hard technology). However, technology also includes soft technology, which is concerned with human and social factors. The emphasis on hard technology has prevented technology education from widening its scope and thus catering to the needs of a changing society. This chapter first briefly identifies the common definitions of soft and hard technologies. It then argues that technology education should emphasize both hard and soft technologies. Through a case study of Hong Kong, the chapter identifies the issues surrounding the inclusion of soft technology in the technology curriculum. The issues comprise the outdated perceptions of the government and schools with respect to technology, teachers' backgrounds, and students' abilities. The chapter then proposes recommendations and suggestions for resolving these issues. The future trend of an all-round and balanced approach toward hard and soft technology in technology education is discussed.

INTRODUCTION

The development of technology education has progressed in line with technological and industrial development over the past few decades (Siu & Wong, 2011). For example, in Hong Kong, plastics and rubber materials have been widely adopted in technology education since the rapid development of the plastics industry in the 1960s. Computers have been widely used in technology lessons since their popularization in the 1980s. In recent years, researchers have begun to understand technology better and their discussions of the topic adopt a wider scope. However, in education, the concept of technology is still often limited to the manipulation of physical devices to solve problems, i.e. hard technology. According to Jin (2011), hard technology is "the technology of controlling the

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'object'" (p. 25), for example, tools and machines. The limited scope of technology education hinders the potential for further development that might cover technology in its broadest sense.

Technology education should emphasize both hard and soft technologies. Soft technology refers to the technologies that involve human factors (Jin, 2011) and that facilitate human flexibility and initiatives (Norman, 2003). Soft technology emphasizes human needs rather than objects. It is essential to include soft technology in technology education, as students need a wider knowledge of technology to face the technological society of today. The current emphasis on hard technology in technology education may be unable to cater to the needs of a changing society. It is important to educate the next generation with the necessary knowledge and skills of soft technology for a future technological world.

This chapter, which is based on the definition of hard and soft technology provided by Jin (2011), discusses the limitations of the emphasis placed on hard technology in current technology education, and hence argues that there must be a paradigm shift moving away from hard technology toward soft technology. The issue is discussed using the case of Hong Kong. The aims of this chapter are to (1) define soft and hard technologies in the context of technology education, (2) identify the issues through a case study of Hong Kong, (3) identify the needs of soft technology in technology education, and (4) provide suggestions for stakeholders in promoting soft technology to develop a balanced secondary school curriculum.

BACKGROUND

The English word "technology" originated from the Greek word "*tekhnologia,*" meaning "systematic treatment" (Oxford Dictionaries, 2013). It is derived from the ancient Greek notion of "*techne*" (craft) (Reydon, 2012). Technology was associated with any man-made artifacts that were different from natural products. Ancient Greek philosophers believed that there was a fundamental distinction between natural products and artifacts, and that "technology learns from or imitates nature" (Franssen, Lokhorst, & van de Poel, 2009).In this view, artifacts are unable to reproduce themselves whereas natural products are able to reproduce, grow, and change. Obviously, the understanding of technology in ancient Greece focused on artifacts that were distinct from nature, and the purpose of these artifacts was generated to fulfill certain needs. Jin (2011) posited that in primitive times, technology was "the making and use of tools and the utilization of fire and language" (p. 22), which we would regard as hard technology.

In the twenty-first century, the definition of technology has become broader, and is no longer limited to the making and using of tools. The rapid advancement of technology and society has changed how we perceive technology. McNeil (2002) claimed that technology "seeks to find practical ways to use scientific discoveries profitably, ways of turning scientific knowledge into utilitarian processes and devices" (p. 3). Grady (2010) believed that technology is "a way of thinking about a problem, and a way of putting thought into practice" (p. 13). Koelega (1995) claimed that technology "is not only machines or procedures to perform a special task, but also the social and cultural context within which technics are being developed and applied" (Notes section, para. 2). As with our ancestors' perceptions, technology today is still driven by external needs. However, the emphasis on "tools" in primitive times has shifted toward a focus on the ways in which technology is used to tackle problems and produce useful outcomes. The emphasis is no longer on tangible substances, but on ways of thinking and how technology interacts with human minds and knowledge.

The shift in our perception of technology suggests that there may be two kinds of technology: hard and soft technologies. Jin (2011), as mentioned in the previous section, distinguished