

A neuroscience pull-out gifted program in a high school in Hong Kong: Connection of neurodegenerative diseases and traditional Chinese medicine in research-based learning

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In 2010, we reported the development of a school-based neuroscience curriculum in a Hong Kong's high school (Suen et. al. 2010). The curriculum highlighted brain cell culture and research-based learning as effective learning activities (Suen et. al. 2008; Suen et. al. 2007). In recent years, we have started developing a neuroscience pull-out program for the students who are scientifically gifted in science (Suen et. al. 2013). In the present report, we describe and evaluate how the gifted students learn neuroscience and develop scientific literacy through doing a scientific research in which neurodegenerative diseases and traditional Chinese medicine are connected. Learning areas related to neurodegenerative diseases may include brain structure, brain functions, structure of neurons, communication between neurons, mechanisms of neuronal cell death and some physiological basis of the diseases. Yet, neurodegenerative diseases are not mentioned in high-school science curricula (integrated science in junior forms and biology in senior forms) in Hong Kong. While traditional Chinese medicine is not unfamiliar in our city, students have rare opportunities in school to conduct learning activities about Chinese herbs. In our neuroscience pull-out gifted program, we aim to develop research-based learning activities in which neurodegenerative diseases and traditional Chinese medicine are introduced and connected. Four scientifically gifted students aged 14-15 were invited to join this pull-out program. They carried out the following tasks in 4 cycles within 6 months: doing literature research on neurodegenerative diseases, studying the common neuroprotective effects of some traditional Chinese medicine, looking for any traditional Chinese medicine which may be potentially neuroprotective against neurodegenerative diseases, setting up experimental models and carrying out the experiments to study the neuroprotective effects of traditional Chinese medicine and acquiring laboratory skills to do cell culture and extract ingredients from the herbal medicine. Peer's assessment among students, teacher's observation on each of the above tasks, practical skills assessment and paper-and-pencil tests about basic neurobiology and nature of science indicated that scientifically gifted students can further develop their scientific literacy and acquire neuroscience knowledge through doing a 6-month scientific research in which neurodegenerative diseases and traditional Chinese medicine were highlighted and connected.