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A Study of Chinese College Students' Images of the Scientist

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Abstract

Using the Draw-A-Scientist Test (DAST), this study investigated Chinese undergraduates' images of scientists. The stereotype of the scientist was stable in Chinese undergraduates' conceptions as an elderly or middle-aged, intelligent, knowledgeable, hardworking and committed male. Chinese students tended to view the scientist as not well adjusted, dressing simply, serious, thin, living an introverted and unpleasant life. However, alternative images such as a smiling face and an optimistic outlook also emerged in a small portion of the participants' drawings of a scientist. Chinese students are impressed by the high social recognition and success of scientists. It is worth noting that most Chinese students imagined scientists as individuals working alone to conduct scientific studies. What is more, a considerable number of Chinese students regarded social contributions as the primary motivation for pursuing a scientific career instead of internal interests and passion for science.

Key words: Scientist image, undergraduate, China

Introduction

The images of scientists have been studied worldwide since the seminal study with American high school students conducted by Mead and Mertraux in 1957. A few years later, Beardslee and O'Dowd (1961) investigated the images held by American college students, and argued that the strong features of the images of the scientists are "highly intelligent individual devoted to his studies and research at the expense of interest in art, friends and even family".

A number of similar studies on college students have been carried out in different parts of the world. For example, Rubin and Cohen (2003) investigated Hebrew- and Arabic-speaking pre-service teachers' conception of scientists in Israel using the "Draw-A-Scientist-Test" (DAST) (Chambers, 1983). It was found that the image of the scientist is perceived as predominantly male, a physicist or a chemist, working in a laboratory. However, the Arabic-speaking students showed a preference for "classical Islamic scientists." Bovina and Dragul'skaia (2008) studied humanities and science students' representations of science and the scientists via a free word association test in a Russian college, and found that students from two groups produced positive and negative associations about science and scientists. Demirbas (2009) adopted the DAST to determine Turkish science teacher candidates' perceptions and attitudes with regard to science and scientists. Their study produced similar results that students imagined scientists as careful, intelligent, creative and hardworking and described scientists as wearing glasses, having a wired hair style, in a laboratory wearing a lab coat, having a beard and being bald.

Despite a considerable amount of research elsewhere, there have been few studies reporting college students' image of scientists from the People's Republic of China. Some have indicated that the perceptions of scientists held by students are related in some way to their attitudes toward science, locus of control, and self-efficacy (Finson., Riggs, & Jesunathadas, 1999; Schibeci, 1989, Erten, Kiray & Sen-Gumus, 2013). Besides, college students will eventually constitute an influential segment of the citizens whose views make up the public response to science. Therefore, in this study we attempted to investigate Chinese undergraduates' perceptions of scientists and might have some implications for science educators.

Method

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Participants

This study consisted of total 93 undergraduates in Huazhong University of Science and Technology (HUST), a top comprehensive research university in China. Student participants were randomly selected from different majors including engineering, art, education, economics, management, and philosophy. Fifty-five male students and thirty-eight female students participated in this study.

Research instrument

The Draw A Scientist Test (DAST) has been used in previous studies to determine students' views about scientists (e.g., Newton & Newton, 1992; Barman, 1999). The DAST was also translated into Chinese and adopted by Chinese scholars to probe K-12 students' images of scientists (e.g., She, 1998; Chiang & Guo, 1996; Zhang, 2005; Wu, 2010; Zhang, 2011.). For this aim, it was judged that using a questionnaire by revising the DAST would be appropriate in this study. The questionnaire involved five questions which had different contents and response types, as summarized in Table 1.

Table 1. The structure of the questionnaire

Question	Contents	Response Type
1	Physical image of the scientist	drawing a picture with some captions
2	Source of the image	Choosing among given options
3	Activity of the scientist drawn	Writing 3 activities
4	The scientists around us	Identifying someone and giving reason
5	Willing to embark scientific career	Answering Yes or NO and giving reason

Results and Findings

Questions 1: physical images of the scientist

This question was adapted from the DAST and Song and Kim's study (1999). Students were asked to draw the appearance of a typical scientist and to give some captions with relevant information, such as the age of the scientist, the characteristics of the scientist's appearance, what the scientist is doing and the environment of the scientist in the drawing.

The data from students' pictorial and written response were added together, but, if the same information appeared in the drawing as well as in the caption, this was counted only once. The data were analyzed according to Chamber's seven traits of standard image of scientist (lab coat, eye glasses, facial hair, research symbols, knowledge symbols, products of science, and captions). Researchers who have used the DAST have reported the images drawn were overwhelmingly male, so it would seem reasonable to add the sex of the scientist to the seven indicators of the standard image (Finson, Beaver, & Cramond, 1995).

Table 2 shows the percentages with which each of the eight traits occurred in students' sketches. The Chinese undergraduates' perceptions of the physical image of the scientist turned out to be similar to the results of previous studies. That is to say, "male" (91.7%), "weird facial hair" (73.8%), "eyeglasses" (56.0%), "lab coat (47.6%)" and "knowledge symbols" (41.7%) were the most popular features of the physical image of the scientist. Besides, 64.3% of the subjects in study described the scientist as being elderly or middle aged. It reflected that Chinese undergraduates depicted scientists as elderly or middle-aged, intelligent, knowledgeable, hardworking and committed. The typical drawings were seen in Figures 1 and 2.

Table 2. Physical image of the scientist drawn

Characteristics	Percentage (%)
Male	91.7
Wired hair style	73.8
Eyeglasses	56.0
Lab coat	47.6
Knowledge symbols	41.7
Captions	37.0
Products of science	21.4

Research symbols	17.9

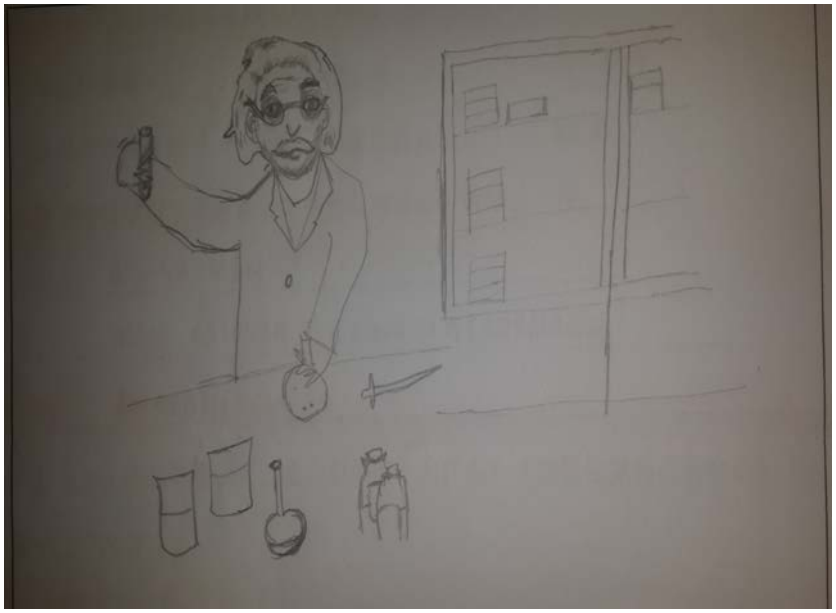

Figure 1. An Einstein-like image of the scientist by a Chinese undergraduate student

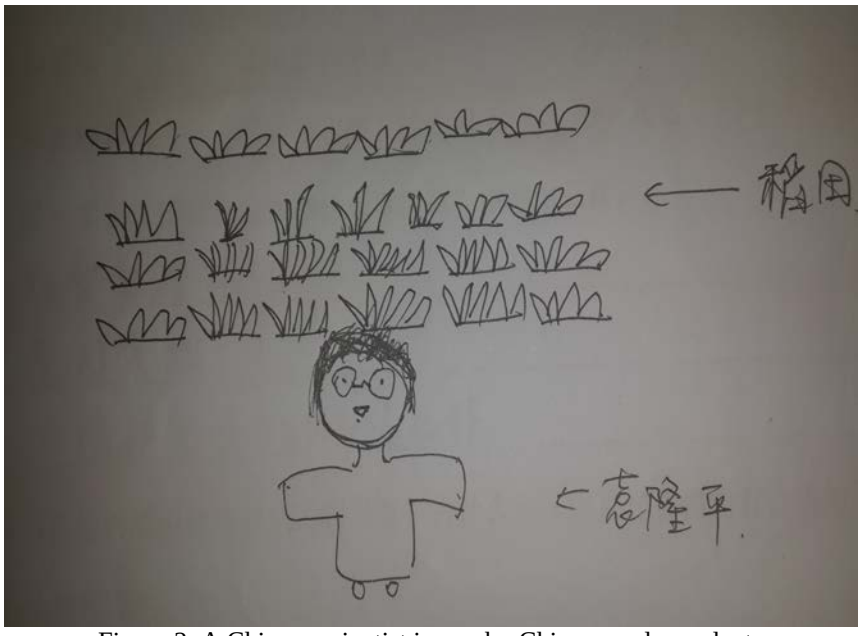

Figure 2. A Chinese scientist image by Chinese undergraduate

It is of interest that only 18% of the drawers presented research symbols such as flasks and testing tubes in their drawings. Out of the 93 participants, 60 undergraduate students identified the research filed of the scientist drawn, among which nearly half (45%) of the students suggested chemistry, followed by physics (25%), biology (21.7%), geography (3.3%) and mathematics (1.7%). This confirmed that the least showing of research symbols in student drawings is not because students do not pop up chemistry or physics field in their mind during drawing, rather it might attribute to undergraduate students' constant exposure to laboratories and contact with actual science researchers on campus, and therefore they sketched what they really saw in laboratory instead of old memories of chemistry equipment in school lab or fictional images of science lab.

In their written responses a significant proportion of students used terms such as "balding", "growth of hair", "wild-haired", "bearded", or "long sideburns" to describe the scientist they drawn. This implied that Chinese undergraduate students tended to view scientists as behaving strange and not well-adjusted. What is more, most undergraduates thought the scientist drawn was "thin" or "slim" which revealed that scientists were believed by Chinese undergraduates as working hard and living a low quality life.

However, contrasting perceptions of scientists also emerged. Out of the 93 undergraduates, 38.5% imagined scientists with "untidy dressing", 23% portrayed scientists as "simply dressed", while 38.5% depicted scientists as "dressing neatly" or "dressing in suits". Similarly, with regard the facial expression of the scientist drawn, 22% of the subjects described as "committed", 16.7% associated with the term "serious', while 8.3% considered the scientist as "smiling", "optimistic" or "eye-beaming". This reflected that Chinese undergraduates began to view scientists as "everyday" people and reflect reality rather than fictional character being depicted.
Across the 93 pictorial representations of scientists, eleven scientists were given names by students. Four students used the name 'Longping Yuan,' a Chinese agricultural scientist known for developing the first hybrid rice varieties since 1970s. Four students used the name 'Einstein,' two students used the name 'Hawking,' and one used the name 'Newton.' These scientists are pervasively reported in the Chinese mass media (e.g., Hawking, Longping Yuan） or frequently presented in science textbooks (e.g., Newton, Einstein).

Question 2: source of the images

In this question, undergraduate students were provided five possible sources of information for images of scientists (magazines and newspapers, movies and TV, internet, textbooks and teachers, parents and friends) and asked to select one from which they mainly derived their knowledge of the scientist. The results were shown in Table 3.

In general, college student images of scientists were affected mostly by school education. 34.7% of the undergraduates indicated that they acquired knowledge of scientists from their school teachers and textbooks. The internet (28.4%) was the second source of information, followed by movies and TV (19.0%), and magazines and newspapers (11.6%). However, no one indicated parents and friends as the source of information (0%). This might account for the independent mind of college students as adults as well their usually living apart from their families in terms of physical distance.

Table 3. Source of the images of the scientist

Sources	Percentage (%)
Textbooks and teachers	34.7
Internet	28.4
Movies and TV	19.0
Magazines and newspapers	11.6
Parents and friends	0.0

Question 3: activities of the scientist drawn

Undergraduate subjects were asked to write three activities the scientist they drew might carry out as their work. It was found that the activities of scientists were generally imagined as observing and experimenting (29.4%), searching literature (16.5%), data analyzing and writing report (16.5%), thinking (11.8%), attending conferences and seminars (7.5%), and lecturing (2.5%), as seen in Table 4. It can be seen that Chinese undergraduates possessed beliefs that scientist predominately conducted scientific studies within laboratories (experimenting, thinking, data analyzing and so forth) and did not see much variation in their scientific work.

Table 4. Activities of the scientist draw

Activities	Percentage (%)
Observing and experimenting	34.7
Searching literature	28.4
Data analyzing and writing report	19.0
Thinking	11.6
Attending conference and seminars	0.0
Lecturing	2.5

It is of interest that although students in this study were given the opportunity to draw more than one scientist, only one student did so. This revealed that in most Chinese undergraduate's minds, the scientist is an isolated figure and there is an unawareness of collaboration between scientists and team work among Chinese undergraduates.

Question 4: willingness to pursue a career in science

Over half of the Chinese undergraduates in this study did not have the occupational aspirations to be a scientist. The subjects of interest were asked whether they would like to pursue a scientific career in future. 42.5% of the subjects indicated they were thinking of being a scientist, and 54.8% of the students answered that they had no plan to be active in science field.

Across the students who had no intention to be a scientist, 37.2% expressed that their "personality is not suitable for scientific work." 23.3% said that they were not "interested in science," and 14.0% of the students did not feel they were competent to become a scientist. Students expressed concerns that to be a scientist required "full dedication to time consuming work", "great determination", and "patience and perseverance in boring research." For these students, this image of a scientist implied that scientists were socially inept, introverted and fully devoted to his studies regardless of other demands on his or her time, even family. The kind of life a scientist lives is thought by Chinese students to be unpleasant and greatly limited by the nature of scientific work. If these features of the life of the scientist do not fit with the student beliefs about themselves and hopes for the future, it is not surprising that students would not consider an occupation in science.

Among the students wishing to enter the science field, 33.3% expressed that they would like to consider a career in science because scientists could "contribute to society, the country and human well-being." 23.0% indicated an intention to become scientists due to their "interest in science." 18.9% of the participants regarded "achieving personal value" as their motivation to enter science. This revealed that on the one hand Chinese undergraduates were impressed by scientists' high social status and success; however, on the other hand, many of them tended to follow science out of patriotic devotion rather than from internal interest, curiosity or personal enthusiasm for science.

Summary

In conclusion, the images of scientist held by Chinese college students resembles in many ways the image held by college students from other countries across the world. The majority Chinese undergraduates hold the stereotypical image of the scientist as elderly or middle-aged, intelligent, knowledgeable, hardworking and committed.

Specifically, Chinese students tended to view the scientist as not well adjusted, dressing simply, serious, thin, living an introverted and unpleasant life. However, alternative images of the scientist also emerged in this study that a small portion of the participants depicted the scientist as smiling and optimistic. Besides, the high social recognition and success of the scientist as positive aspects of the scientist was impressed by Chinese students.
It was worth noting that most Chinese students did not see much variation in the scientist's work. Most of them imagined the scientist working alone. It is interesting that a considerable number of Chinese students regarded social contribution as their primary motivation to pursue a scientific career, which revealed a kind of pat patriotism instead of internal interest and passion as their motivation to be active in science.

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