Pupils’ images of the biologist: a small-scale explorative study

Abstract
In the past, the image of the special scientist who does the sub-categorical scientific work, for example the biologist, is rarely explored. This study examined pupils’ images of the biologist by administering a Draw Biologist Test (DGT) to 34 seventh-grade junior school pupils in China. Results suggest that the pupils’ images of the biologist relate to more descriptors of lab coat, spectacles, microscope, and fewer descriptors of facial hair, knowledge and technology symbols than those in other countries and regions elsewhere. This implies that school biology educators should duly expose pupils to more biological work in the field rather than a single indoor laboratory setting, acquaint pupils with more biological research equipment and technological products than being limited to the microscope if necessary, and negotiate the culture of their own with the development of the proper image of the biologist.

Keywords: pupil image, biologist, drawing

Abbreviations: DAST, draw-A-scientist test; DGT, draw biologist test; DBT, draw biologist test.

Introduction
The scientist is a man who wears a white coat and works in a laboratory. He is elderly or middle aged and wears glasses. He may be bald. He may wear a beard. He is surrounded by equipment: test tubes, Bunsen burners, flasks and bottles, a jungle gym of blown glass tubes and weird machines with dials. He pours chemicals from one test tube into another. He peers raptly through microscopes. He scans the heavens through a telescope [or a microscope!] He writes neatly in black notebooks.1 The above description by Mead and Metraux presents the popular projective image of the general scientist possessed by high school pupils. Pupils’ images of a professional, as a product of their learning, are one of important factors that will impact their appreciation of the relevant professional field. Finson, Beaver and Crampod’s study reveals that pupils’ negative images of the scientist are indicative of negative perceptions which may barrier their interest in learning school science.2 Although the biologist is also considered as a scientist, the image of the biologist is not very clear as it is submerged in the large image of the general scientist in the previous literature on the scientist’s image. In the past, many studies have been mainly focusing on the image of the scientist (general scientist), but they rarely explored the image of the special scientist who does the sub-categorical biological work (i.e. the biologist). How pupils see the biologist is yet to be charted.

Literature review
The exploration of the images of the general scientist and science are abundant in the literature.3–6 Mead and Metraux’s study shows that the image of the scientist relates to a man with a white coat.1 Newton and Newton revealed beards had high presence in students’ drawings.6 Fung’s research discloses that laboratory equipment, books, shelves or stationery and computers are frequently shown up in students’ drawings.10 All the above studies largely focus on the image of the general scientist and are less informative of the image of the special scientist of the biologist. This study aims to expose how junior school pupils from China see the biologist by exploring their drawings. The information regarding pupils’ images of the biologist can enable biological educators to tweak their practices to promote pupils to form more positive images of the biologist which can positively enact in their biological learning as well as a possible future biological career choice.

Methods
In the past decades, Chambers11 Draw-A-Scientist Test (DAST), which asks students to draw the scientist at work on a paper, was widely employed to investigate students’ images of the scientist. According to the indicators emerged in students’ drawings, Chambers extracted seven indicators considered to be the stereotypical image of the scientist. The seven indicators relate to laboratory coats, spectacles, facial hair (e.g. beards, moustaches and sideburns), research symbols (lab equipment and instrument), symbols of knowledge (e.g. books), technology product (e.g. television and computers), and relevant captions.2 The current study adapted the DAST to a Draw Biologist Test (DBT), which invites pupils to draw working biologist(s) on a paper. We administered the DBT papers to 34 seventh-grade pupils in a local junior high school in China. The pupils were told that there were no right standards about what they would draw and they can draw as they like. The pupils participated in this study were about 13 to 15 years old. After these pupils finished their drawing, the authors intensively scrutinized each pupil’s drawing throughout and looked for the recognizable indicators, symbols and descriptors as indicated.

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in Chambers’ study. Then the number and frequency of these indicators, symbols and descriptors were counted and listed in tables (Tables 1–4). Multiple examples of an indicator and symbol would be counted only once. For example, if a pupil drew more than one book, only one count would be assigned to the knowledge symbol. A high number of the indicators and symbols suggest a constitution of the stereotypical image of the biologist.

Table 1 Laboratory coat and spectacles indicators (number and percentage)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Grade 7 (N=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory coat</td>
<td>21 (61.7%)</td>
</tr>
<tr>
<td>Spectacles</td>
<td>12 (35.3%)</td>
</tr>
</tbody>
</table>

Table 2 Facial hair indicator (number and percentage)

<table>
<thead>
<tr>
<th>Indicator (descriptor)</th>
<th>Grade 7 (N=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial hair (beard / moustache/ sideburns)</td>
<td>3 (8.8%)</td>
</tr>
</tbody>
</table>

Table 3 Symbols of research, knowledge, technology products (number and percentage)

<table>
<thead>
<tr>
<th>Symbol (Descriptor)</th>
<th>Grade 7 (N=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Symbols</td>
<td>27 (79.4%)</td>
</tr>
<tr>
<td>Knowledge Symbols</td>
<td>7 (20.5%)</td>
</tr>
<tr>
<td>Technology Symbols</td>
<td>2 (5.8%)</td>
</tr>
</tbody>
</table>

Table 4 Captions indicator (number and percentage)

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Grade 7 (N=34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>plant and insects, doing an experiment, living organism, journalizing tree growth, specimens, African rhinos, Casimir Fabre, studying grass and etc.</td>
<td>5 (14.7%)</td>
</tr>
</tbody>
</table>

**Symbols of research, knowledge, technology products**

A majority of the pupils (79.4%) presented various lab instruments such as test tube, microscope (Figure 1), bottles, and breakers as the research symbols (Table 3). About 20.5% of the pupils’ drawings mainly depicted graphic molecular model, books, pencils or blackboard as the knowledge symbols. Only a tiny number of the pupils (5.8%) produced a computer as the technology symbols.

Figure 1 An oversized microscope, descriptor of research symbol, emphasizes its importance in biological research.

**Relevant captions**

Table 4 shows that 14.7% of pupils’ drawings contain various descriptors of captions. The captions are mainly biology-related, emphasizing certain elements or supplementing either the elements that are not readily discerned or the missing elements that are hardly to be drawn.

**Discussion**

Using the DBT, this study endeavored to present pupils’ image of the biologist. Some differences have surfaced between the Chinese pupils’ image of the biologist and those images of the scientist recorded in the previous literature. For the laboratory coat and spectacles indicator, the Chinese pupils drew more laboratory coats than did those students in Mead and Metraux, Koren and Bar and Painter, Jones, Tretter and Kubasko’s studies. It is suggested that the Chinese pupils’ images of the biologist work is more indoor lab room-related, they are less likely to foresee those biological work in the field. As the Chinese culture treats a person wearing spectacles as reading much and the facial hair of beard, moustache and long sideburns as less favorable, the pupils tended to draw more spectacles and less facial hair than found in the previous studies. This indicates that the image of the biologist is not merely a passive reflection; but also an active construction. The national culture plays a nonnegligible role in developing and constructing their images. The previous studies show that the chemical equipment of test tubes and beaker are frequently appeared in students’ drawings of the scientist. But in this study, most pupils tended to draw a microscope as the research symbols, indicating it is research equipment peculiar to the biologist. When comparing with Christidou, Hatzinikita and Samaras’ and Fung’s studies, the Chinese pupils tended to present fewer knowledge and technology symbols than their Hong Kong and Greek counterparts. Modern products such as computer are less likely to be perceived in the biologist’s work than their Geek and Hong Kong counterparts. A few pupils supplemented captions in their drawings. The captions are expositive of the type of the drawn
biologist’s work and activities. For instance, a pupil wrote the name of Casimir Fabre to demonstrate the type of entomologic work. The captions in the Chinese pupils’ drawings are conventional and contain no caption of creation such as “inventor” commonly found in Fung’s study.

Conclusion
The study shows that the Chinese pupils’ images of the biologist in some extent differ with those of the scientist found in countries or regions elsewhere. In contrast to those in Geek, Hong Kong, South Korean and the U.S., the Chinese pupils inclined to include more descriptors of lab coat, spectacles, microscope, but fewer descriptors of facial hair, knowledge and technology symbols than those in other countries and regions. This implies that school biological practitioners should duly expose pupils to more biological work in the field rather than a single indoor laboratory setting, acquaint pupils with more modern biological research equipment and technological products than being limited to the microscope if necessary, and negotiate the culture of their own with the development of the proper image of the biologist.

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Conflict of interest
The authors declare that they have no conflict of interest.

References