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OPPORTUNITIES AND SPECIFICITY OF APPLYING THE DRAW-A-SCIENTIST TEST TECHNIQUE ON RUSSIAN SCHOOLCHILDREN

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Abstract

The present article discusses the results of the first-ever Draw-a-Scientist Test (DAST) used in Russia to study the image of a scientist which children develop at the age of 9-11 years old. The patterns revealed in their perception of a scientist are compared with those obtained by means of DAST in other countries on a similar sample. They have found the image of a scientist to remain stable regardless of the cultural context. Younger schoolchildren are characterized by structuring the image of a scientific worker on the basis of such stereotyped criteria or indicators, attributing a person to the scientific community, as: clothing, eyeglasses, facial hair growth, symbols of research and knowledge, scientific results and relevant captions. In addition to these, junior schoolchildren's social and perceptive imagery includes gender, race, age, object environment, elements of danger and facial expressions. The following stereotypic indicators of the image of a scientist are found to be specific to the domestic sample: a scientist has his hair standing on end, a bald patch on his head, a disproportionately large head, dirty clothes, and is young. There are general trends, such as: uncertainty of the image and its archaization. The results obtained show that children possess incomplete information about the activity of scientists and have an undeveloped and amorphous perception of this image.

Keywords: Stereotype, scientist, DAST, a picture test, indicator or criteria, image.

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1. Introduction

The choice of career and subsequent professional socialization and self-realization are the most important stages in an individual's life path. Apart from one's individual personal inclinations, interests, abilities, preferences, value orientations and opinions of the immediate social environment (parents, relatives and peers), the factors of professional choice also include the child's representations about existing professions, their realities and a detailed character (Klimov, 2004). A significant role in professional self-determination belongs to public opinion, society's perception of this or that profession, and the degree of recognition and respect by representatives of the profession which the subject wants to pursue. All of these apply justly to the profession of a scientist.

The development of the image of science and that of a scientist in children largely occurs indirectly without their communication with a scientist in person. The key to this process is held by mass media whose content and emotional-evaluative level have a great effect on the formation of ideas in younger generation about science and scientists and form stereotypes of their perception of a scientist. For example, the leitmotif of the cinematographic image of a domestic scientist during the Soviet period includes his self-sacrifice, rejection of narrow-minded interests and his service to the cause and people, each of which is interpreted as a criterion of scientific truth (Medvedeva, 2015; Zudina, 2011). The images of scientists being translated by modern media tend to be less unambiguous and more multifaceted that makes it difficult to form appropriate conceptions in children. At the same time, the less stereotypical the image of scientists among schoolchildren and students are, the more likely they are to positively relate to science and, subsequently, choose scientific activity as a professional career (Bodzin &Gehringer, 2001; Christidou, 2011; Matkins, 1996; Rosenthal, 1993). The content characteristics of the standard image of a scientist are studied and summarized on a sample of more than 4,000 respondents by using Chambers's Draw-a-Scientist Test (DAST) as the main methodological instrument (Chambers, 1983). The results allows the author to identify seven indicators, the presence of which in the drawing corresponds to the stereotypic image of a scientist, viz: a lab coat, eyeglasses, facial growth hair (moustaches, beards, etc.), symbols of research (instruments and laboratory equipment), symbols of knowledge (books and filing cabinets), technology (the products of science), relevant captions (formulae, comments like "Eureka!" and "I've discovered", etc.). These stereotypes of a person belonging to the scientific community are of stable and cross-cultural nature and develop by the age of 9-11 years old, which has been confirmed by the samples of children in Bolivia, Greece, Colombia, the USA, Turkey and Sweden (Chabay, 2008; Christidou et al., 2012; Korkmaz , 2009; Jerez & Middleton, 2011; Miele, 2014; Monhardt, 2003; Türkmen, 2008).

Notwithstanding a rather long history of the DAST use by foreign colleagues for studying the image of a scientist, Russia has never seen it applied. It leaves a significant gap in cross-cultural studies of the image of a scientist.

2. Problem Statement

Scientific breakthroughs can only be accomplished by means of combining resources (including human ones) from different countries. In setting up international scientific corporations and organizing their work, it is important for their participants to share values and normative ideas about scientific work, which is bound to facilitate and streamline business interaction in this field. Having been developed in childhood,

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the concept of scientists and scientific activity leaves an imprint on one's attitude to the profession in the future, on the choice and specificity of its implementation. This calls for cross-cultural studies to investigate the formation of the image of a scientist in different countries.

3. Research Questions

1. Does the image of a scientist among Russian children differ from that found in other countries?

2. What are the specifics of junior schoolchildren's perception of a scientist based on the use of DAST?

3. What are the diagnostic capabilities of the DAST method after its adaptation it to use on a Russian sample?

4. Purpose of the Study

The pilot study of the image of a scientist in Russian children by using DAST aims to establish the presence and content of stereotyped indicators of the image of a scientist, and to compare the patterns obtained with those established earlier.

5. Research Methods

The Draw-a-Scientist Test was used as a main research method.

5.1. Subjects (cases)

The study was conducted in the city of Yaroslavl in 2016-2017. The sample consisted of 241 schoolchildren aged from 9 to 11 years old (the average age 10.4 years old) of primary school. There were 124 girls (51.5%) and 117 boys (48.5%) among the subjects under test.

5.2. Procedure

The course of the study, instructions and equipment were in full compliance with the classical DAST procedure developed by D.W. Chambers (1983). When analyzing the drawings, we assessed both stereotypical indicators proposed by D.W. Chambers and additional characteristics of the image of a scientist, as proposed in later works (Jerez &Middleton, 2011; Leblebicioglu, et al, 2011; Türkmen, 2008).

6. Findings

The results allowed for cross-cultural comparison with the data obtained on similar samples (in terms of age, education, gender, and time parameters) in Bolivia, Colombia and Turkey (see Table 1).

Table 01. Correlation between stereotyped and additional indicators (criteria) for the image of a scientist in the Draw-A-Scientist Test on different samples (%)

DAST Indicators	Turkey (2008)	Bolivia (2011)	Columbia (2011)	Russia (2017)
Laboratory coat	46.7	50.7	60.9	35.68
Eyeglasses	30.7	36.6	51.1	45.64

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Facial hair (beards, moustaches and sideburns)	17.4	25.1	24.9	23.24
Symbols of research (instruments and equipment)	86.1	75.3	77.1	69.29
Symbols of knowledge (books and filing cabinets)	51.2	15.6	21.1	36.10
Technologies (products of science)	45.1	21.9	20.3	49.38
Relevant captions	33.5	49.6	17.5	34.44
Computers	40.8	-	-	8.29
Male gender	94.1	89.0	79.7	78.01
Ethnicity (Caucasian)	100	90.7	93.9	99.6
Older age	69.7	11.3	50.9	9.13
Mysticism/ fantasy	2.5	6.02	7.94	6.22
Secretiveness	2.4	2.12	0.0	0.0
Work in a laboratory (in a closed space)	79.8	89.7	81.5	46.47
Danger	1.7	2.12	1.63	9.54
Modern casual clothes	53.3	-	-	24.48
Smile	61.0	-	-	41.49
Lamps	-	1.41	4.2	12.03

Note: The dash indicates that that indicator was not taken into account in the work of the researcher.

The results showed that the stereotypic indicators of a scientist, singled out by D.W. Chambers (1983), occurred with as much frequency as they did in foreign samples. There were practically no drawings where all the 7 indicators were present simultaneously. Some of the indicators are much less common in Russian children than in their peers from other countries. As few as 35.68% of the children drew the scientist in a lab coat in the situation of laboratory experiments (Fig. 1, 2a, 2b.). In fact, a lab coat was no longer an integral part of a modern scientist's real outfit and was used by the representatives of a rather limited number of scientific professions that involved laboratory research. The scientist was more likely to be dressed in everyday modern clothes (24.48% of the drawings) (Figures 2c, 3b). Quite often (12.44%), the children drew a scientist wearing a special protection suit (in full or some of its elements: gloves, helmets, etc.). Thus, according to the first indicator, the children reflected a real state of affairs rather than a stereotypic one. However, in 28.9% of the cases, the costume lacked detailed treatment and was unidentifiable (Figure 3a), which could be explained by the fact that schoolchildren's ideas about the specifics of a scientist's work had not been formed to the full.

The eyeglasses in the Russian children's drawings occurred with about the same frequency as that in children from other countries. They continued to be associated with research and, primarily, reading (45.64% of the images) (Figure 1) as they tended to be worn by older scientists, whereas they were quite rare among younger ones. Most probably, eyeglasses had already begun to lose their sacred meaning as an attribute of learning. A disproportionately large head (24.07%) or just the image of a scientist's head (face) (9.54%) appeared as an alternative indicator reflecting learnedness, (Figures 2b, 2c).

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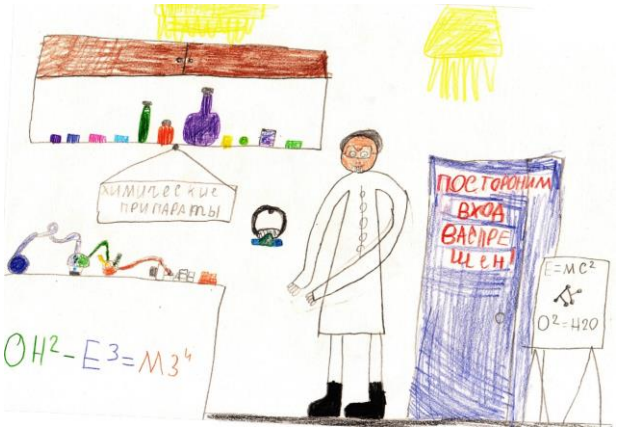

Figure 01. The drawing that reflects all the stereotypic DAST indicators and some additional ones

Facial growth of hair (moustaches, beards and sideburns) was depicted by 23.24% of the Russian children, and this corresponded to the frequency of this indicator in the drawings by children from other countries. This cast doubt on the high degree of stereotype of the indicator. With the Russian children, this indicator could be transformed or supplemented with hair standing on end (18.67% of the drawings) (Figures 2a, 3b), or, conversely, lack of hair – a bald head (21.16%). In our opinion, this was a graphic example of the impact of the images of scientists translated by mass media on children's perception. The rare appearance of beards and moustaches in the Russian children's drawings was also due to the fact that they tended to portray a female scientist (13.69%) (Figure 2b) as well as people of undeterminable gender (8.29%) (Figure 3a). This might testify to the fact that the male scientist stereotype was dispelled, largely, which was explained by women's traditionally high activity in all the spheres of professional and public life in Russia.

The most frequent stereotypic indicator appearing in the Russian schoolchildren's drawings is the symbols of research (most often, these were vials, beakers and retorts) - 69.29% (Figures 1, 2a, 2b, 2c, 3b). But, it is found less commonly than in those by children from other countries. Computers, or some other modern digital devices which now constitute the working tools of scientists of all specialties, are depicted extremely rarely (8.29%) (Figure 2a). Most likely, the profession of a scientist is perceived by children as something special and totally different from ordinary life, whereas computers and gadgets have become an integral and everyday part of life of many modern schoolchildren. The scientist, being "unlike anyone else", cannot use new technologies, but at the same time, he makes much use of outdated technologies. This can testify to the children's rather simplistic and limited notion about scientific specializations and forms of scientists' work.

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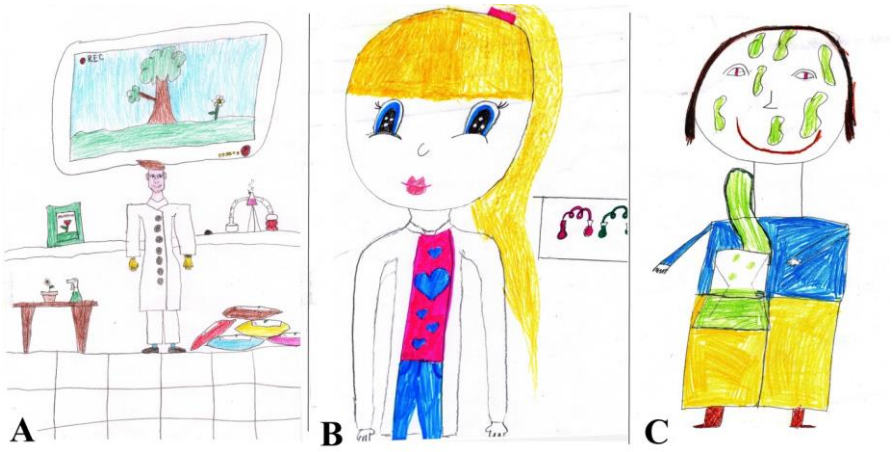

Figure 02. Drawings reflecting additional DAST indicators: A is young age, B is the female sex, C is danger, the result of an unsuccessful experience

Symbols of knowledge (books, filing cabinets, etc.) are also found to have little presence in the drawings by the Russian children - 36.10% (the same is true for children from other countries) (Figure 3a). On the one hand, this is due to the introduction of information technology in life and professional activities. On the other hand, children fail to see such a function of scientific work as accumulation, systematization and transfer of knowledge.

The qualitative content of the last two indicators makes it possible to identify that what we term to be "archaization" of the image of a scientist in the minds of children. This is a phenomenon in which their perception of his personality and the specifics of his activity has a time lag of several decades. In the children's minds, a scientist is a man from the past who is excluded from real life. It reveals that in 18.7% of the cases the children draw the scientists they know to have existed in the past: Einstein, Mendeleev, Darwin (Figure 3b). Or, failing to convey a scientist's portrait resemblance, they put in a caption indicating the name of the scientist in question.

Technologies (the products of science) featured both material products (beakers full of liquids, robots and machines) and non-material results (ideas and insights). This indicator emerged in the drawings by the Russian children even more frequently than in those by children from abroad (49.38%). However, the fact that labour results are absent in more than half of the drawings shows that, firstly, children are little aware of connection between surrounding everyday objects and scientific discoveries and solutions; secondly, they believe scientific research to be abstract and incorporeal (Fig. 2b, 3a).

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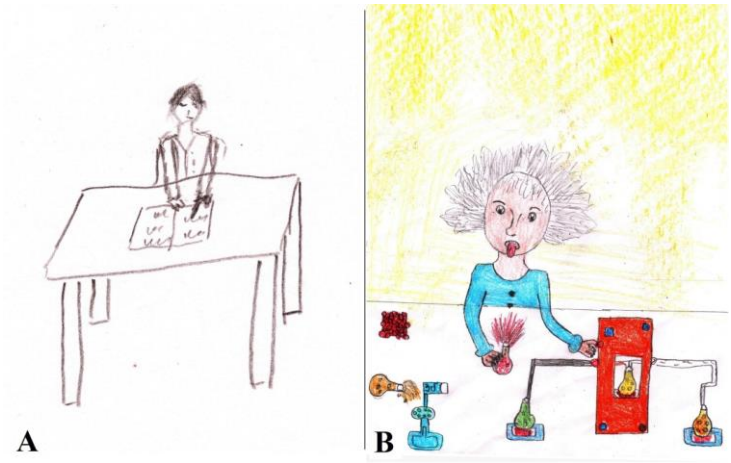

Figure 03. Specific features typical of the sample of the Russian children depicting a scientist: A - vagueness of the image, B – archaization

The relevant captions were presented in the form of mathematical formulae, warnings of danger, of the "Hurray" and "It's for sure" type of exclamations (34.44%); they occurred with about the same frequency as in children from other countries (Fig. 1). Thus, based on the standard DAST indicators of the image of a scientist we could not claim that it differed dramatically from that among children in other countries. In other words, it was of a universal cross-cultural nature, which appeared to stem from the ongoing processes of globalization and universalization of this professional activity.

We have examined some of the alternative indicators of the image of a scientist above. As far as others are concerned, one should note that Russian children show certain differences from their foreign peers.

Senior age is one of the typical alternative criteria that the authors use for distinguishing. But according to our data, a mere 9.12% of the children depict a scientist older than 55 years old, while 45.22% of the respondents show a young scientist who is younger than 35. Thus, in the minds of Russian children, the scientist is a young man (Figures 2a, 2b) or a middle-aged man. We consider him to be also the result of the impact of mass media which translates the relevant images of scientists to the public.

No elements of mysticism were found to be present in the Russian children's drawings, but 6.4% of them depicted fabulous objects. They are the time machine, aliens and anti-gravity devices. That also results from watching science fiction films that feature scientists. Nor were signs of secrecy found in the work of scientists. At the same time, 9.3% of the cases pictured some danger that involved not only the scientist (explosions, contamination and injuries - Figure 2c), but also threatened all mankind. Neither could we claim that the stereotype of the scientist's emotional mood was all too common, according to which the scientist was a serious, gloomy and pensive person. Scientists smiled in 41.49% of the drawings (Figures 1, 2a, 2c), but less often than in drawings by their Turkish peers; and 11.20% of the drawings showed strong emotions, both positive (delight and joy) and negative (anger and disappointment.

The analysis of the environment in which the children put the scientist showed that the scientists were most likely to be in the laboratory (46.47%, which were also much more rare than in the case of their foreign peers) (Figures 1, 2a, 3b), and by far less often outdoors (during field research) or in the outer space (9.95%). In the laboratory, 13.9% of the drawings contained bright laboratory lamps (Fig. 1).

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What we believe to be a specific feature of the Russian sample is a considerable degree of uncertainty in the drawings (figure 3a). In 11.6% of them, it is impossible to determine to which specialty the scientist portrayed can be attributed to; in 8.29%, their gender is undeterminable; in 9.97%, it is impossible to determine their age; in 2,07%, the scientist is positioned with his back towards the viewer; in 43.56% of the cases the environment fails to be drawn in a detailed way, and the scientist seems to be soaring in a vacuum. All this shows that the image of a scientist is low on specifics, content and detail, and thus, testifies to the Russian children's undeveloped ideas about this profession, and lack of interest in it. The similar effect of an amorphous image was also observed in the studies of foreign scientists, though on a much smaller scale. (Leblebicioglu et al, 2011).

However, there are also some indicators, in which the rate of coincidence with foreign results is very high. Most of the drawings (99.59%) depict Caucasian scientists. There is only one case which depicts a black scientist, since the author of the drawing had seen one in the cinema.

Thus, the alternative indicators of the image of a scientist show significantly greater differences in the perception of a scientist among Russian children and their foreign peers, while a considerable part of the stereotypes observed is the result of the impact the media and film industry have on them.

7. Conclusion

The study has shown significant similarities between the image of a scientist in the minds of Russian children and those of other countries. There are some stereotyped indicators, such as: laboratory coats, eyeglasses, facial hair (moustaches, beards, etc.), symbols of research (instruments and equipment), and knowledge (books and filing cabinets), technology (the products of science) and relevant captions (formulae, "Eureka!", "I've found!", etc.). At the same time, frequency of occurrence of these indicators both in the drawings by the Russians and those by foreign children shows a certain loosening of stereotypes in the image of a scientist, and apparently, the formation of new ones that need to be studied.

The usage of DAST on the Russian sample enables us to establish a number of specific features of the image of a scientist in children aged 9-11. The schoolchildren demonstrate a formless, blurred, unclear and poorly detailed image of a scientist. This may be due to the fact, they are little aware of a scientist's activity and have extremely vague ideas about both the field of scientific activity and its representatives. We have also observed archaization of the image of a scientist. In the children's minds, it is associated with scientists of the past as they attribute obsolete ways of working and tools of their profession. This is due to the lack of the respondents' interest and emotional appeal of scientific activity field. Development of representations about scientific work and scientists in children is highly influenced by mass media. It finds its expression in translating some standard images into their drawings: young age and some relevant appearance (hair standing on end, a bald patch on the head, a disproportionately large head, soiled clothes, young age, etc.). These may be additional stereotyped indicators specific to the Russian sample. There is also some ambiguity in gender stereotype about the field of science as a purely male-dominated field of activity.

Thus, the first experience of using the Draw-A-Scientist Test on the sample of Russian schoolchildren has revealed its diagnostic value. Nevertheless, it is necessary to clarify the patterns observed and content and range of its indicators. It necessarily involves continuing efforts to study the

image of a scientist and a scientific group by using the present method. This research technology can be utilized to study and build psychological programs designed to support young people in their career choice, help form public opinion about science and address staffing issues with the aim of preserving tradition and continuity in the professional scientific community.

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