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Scientific theatre as a form of popularizing knowledge of natural sciences

I was dostrzegłem, o dumni badacze (I noticed you too, the proud researchers),
Gdy wami burza jak śmieciem pomiata (When the storm casteth you as trash),
Zamknięci w sobie, jak w konchy ślimacze (Locked in itself, as in snail's conch),
Chcieliście, mali, obejrzeć krąg świata (You, miserable, wanted to watch the circle of the world).
Adam Mickiewicz, *Rozum i wiara*, 1832

There is a common perception that the former scientist worked alone, in recollection, silence and seclusion. He was above the unworthy of him world and he never lowered to its level (Fig. 1). It is a false belief – scientists, from the beginning of science, searched not only for knowledge but also sought the sources of funds. Therefore they organized various demonstrations for potential sponsors. In Middle Ages those took place mostly at royal or aristocratic manors (Fig. 2).

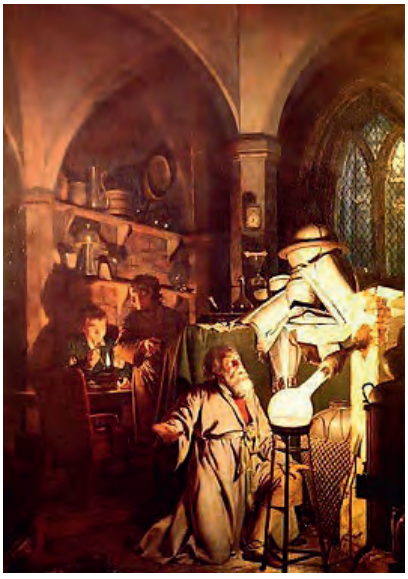

Fig. 1. The common belief – Silent work of former researcher in the laboratory – The Alchemist Discovering Phosphorus.

Source: https://upload.wikimedia.org/wikipedia/commons/thumb/9/97/JosephWright-Alchemist.jpg/270px-JosephWright-Alchemist.jpg [access: 07.12.2015]

Fig. 2. Show of Sedziwoj in Prague with the participation of the Emperor Rudolf II. The alchemist made famous transmutation, which was commemorated by the emperor. He ordered a marble plaque to be placed on a wall of the room where Sedziwoj carried out the show. There was an inscription on the plaque: "Faciat hoc quod fecit quispiam alius Sendivogius Polonus"(Let someone else do what the Pole Sedziwoj did)

Source: https://pl.wikipedia.org/wiki/Micha%C5%82_S%C4%99dziw%C3%B3j#/media/File:Alchemik_Sedziwoj_Matejko.JPG [access: 07.12.2015]

Public scientific demonstratios became fashionable especially in the 17th century – they were aimed at raising funds for further research from a wide audience interested in science. Fig. 3 presents the public lesson of anatomy. The work was created as a commemoration of the autopsy carried out in public – one of those which was held every year in Amsterdam. Such demonstrations were at that time popular throughout Europe and gathered people involved with medicine, as well as many adventurous people. The Canvas presented autopsy of a thief Adriaan Arish conducted by Dr. Nicolaes Tulp.

Another example of such performances is a public experiment conducted by physicist and mayor of Magdeburg, Otto von Guericke in the 1650s (Fig. 4.) commemorated on a post stamp.

As a result of some scientific demonstrations available for a wide range of recipients there were also humorous applications presented in satirical drawings in illustrated magazines (Fig. 5).

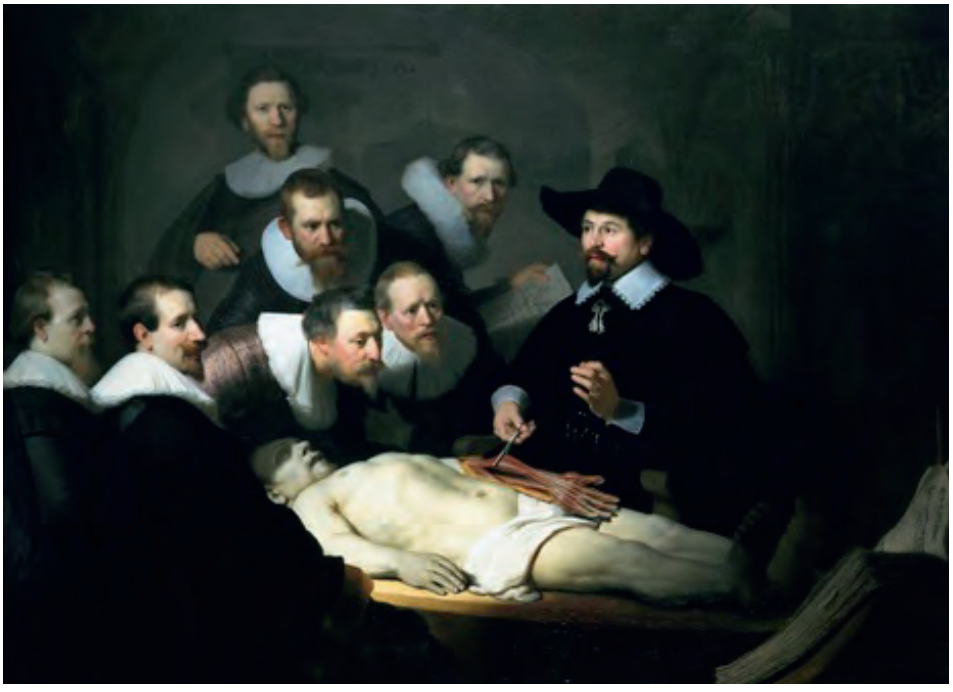

Fig. 3. Public lesson of anatomy

Source: https://upload.wikimedia.org/wikipedia/commons/thumb/8/8c/The_Anatomy_Lesson.jpg/1024px-The_Anatomy_Lesson.jpg [access: 07.12.2015]

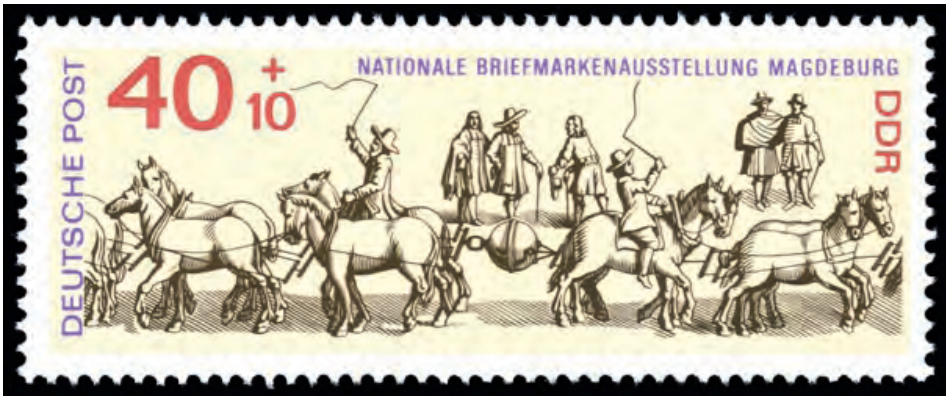

Fig. 4. Experiment conducted in public in the 17th century

Source: https://upload.wikimedia.org/wikipedia/commons/thumb/a/aa/Stamps_of_Germany_%28DDR%29_1969%2C_MiNr_1514.jpg/1280px-Stamps_of_Germany_%28DDR%29_1969%2C_MiNr_1514.jpg [access: 07.12.2015]

Scientific events also Based on the perfomances there were also

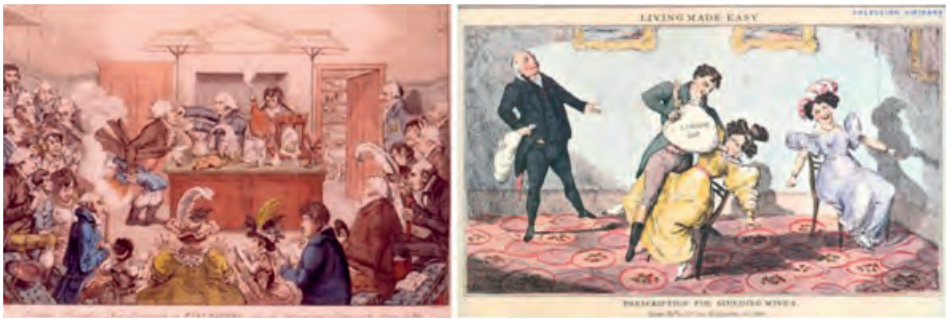

Fig. 5. Pictures presenting experiments in pneumatics (left) and a satirical cartoon with prescription for scolding wives (right)

Source: https://upload.wikimedia.org/wikipedia/commons/7/79/Laughing_gas_Rumford_Davy.jpg; https://upload.wikimedia.org/wikipedia/commons/b/b2/Royal_Institution_-_Humphry_Davy.jpg [access: 07.12.2015]

Currently, researchers are still looking for sponsors and media interest in their work but their role and the role of the teacher has slightly changed. The scientist should not only conduct scientific research and look for funding but should also be an animator and a popularizer of knowledge. This applies to teachers as well. The examples presented in figures 6 and 7 may serve as exemplifications of the above presented statement.

Figure 6 presents Debby Heerkens, a biology teacher who became famous on the Internet after the publication of a film of her lessons. She presented the human body by using her own as an example. She removed her clothes and appeared in costumes presenting muscles, bones and veins. This unusual teaching technique not only drew the attention of the media from around the world, but also the students – they probably will remember this event for a lifetime. There is no denying that this form of teaching has more in common with theater and role playing, than with the traditionally understood role of the teacher. Figure 7 presents a chemistry teacher who demonstrates an experiment. It can be observed that the border between lesson and theatrical show is very thin.

'Theatricality' of learning is exhibited by both the Polish projects, as well as by foreign ones. For example in Poland there was a project realized by the Copernicus Science Centre - Singing Wikipedia. Well known guests were asked to sing various entries from Wikipedia without prior preparation (Fig. 8).

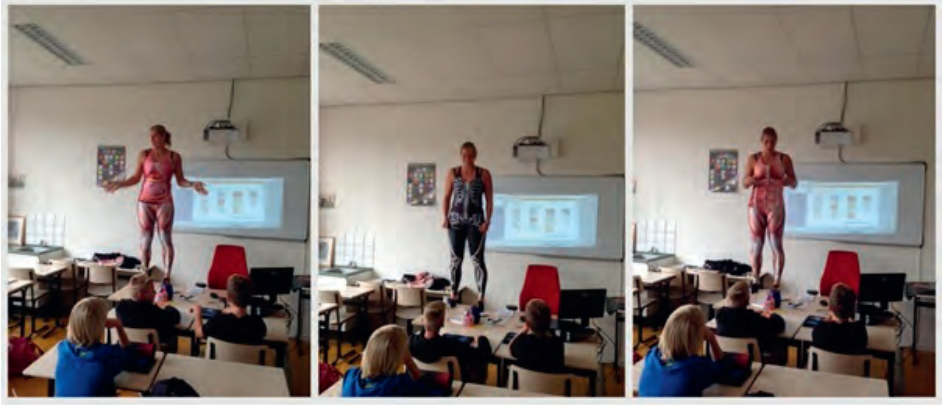

Fig. 6. Biology teacher Debby Heerkens during the lesson

Source: http://i.iplsc.com/foto-groene-hart-scholen/0004QHQZNS1SUX4Q-C122-F4.jpg [access: 07.12.2015].

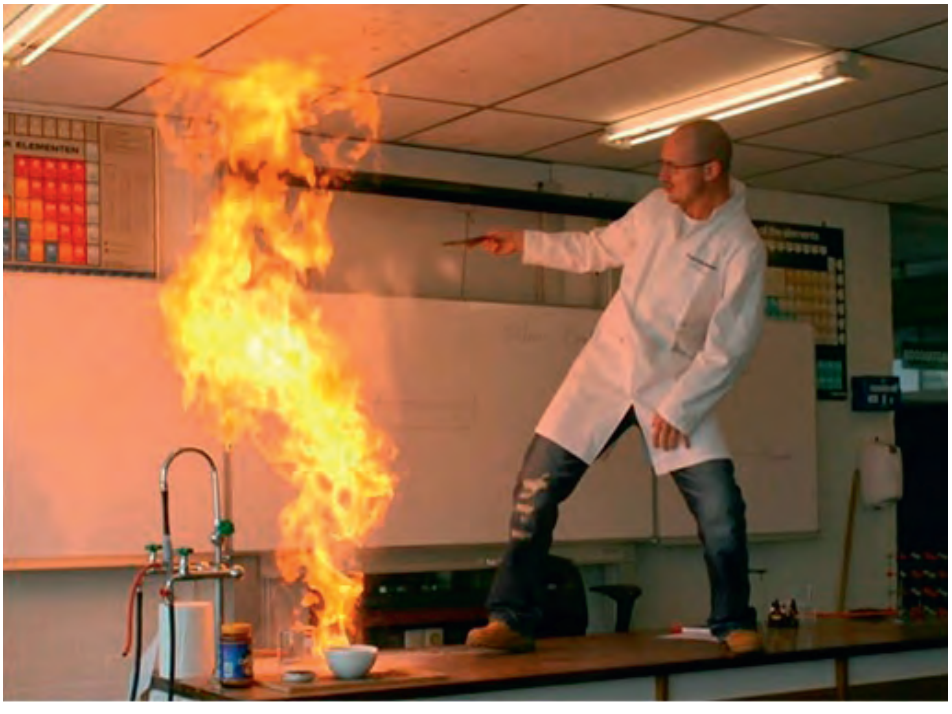

Fig. 7. Chemistry teacher during the lesson/show

Source: http://filing.pl/wp-content/uploads/2015/03/filing_images_ea061f009f99.jpg [access: 07.12.2015]

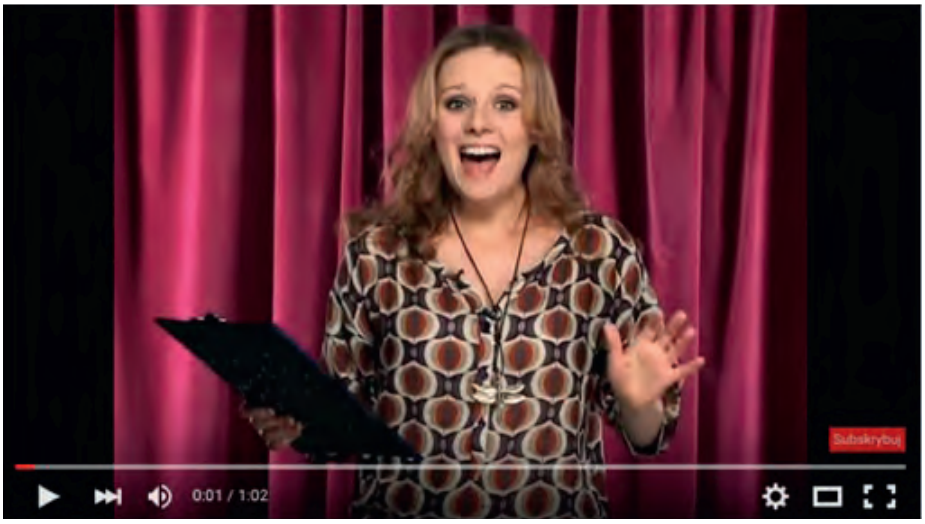

Fig. 8. A screenshot from the performance of Ewelina Flinta in the Singing Wikipedia project – the definition of the term alcohol

Source: https://www.youtube.com/watch?v=XsVJjxmnMwA [access: 07.12.2015]

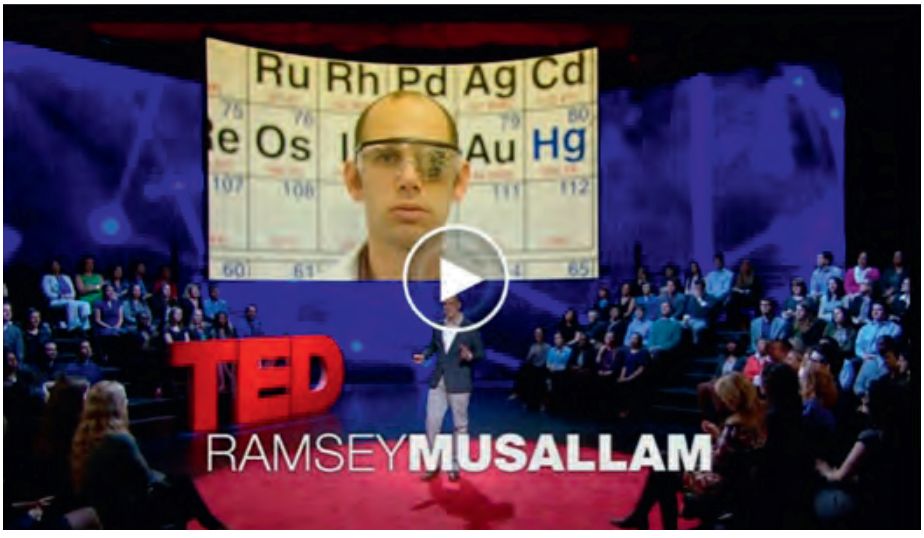

Fig. 9. A screenshot from the lecture of Ramsey Musallam

Source: http://www.ted.com/talks/ramsey_musallam_3_rules_to_spark_learning [access: 07.12.2015]

Therefore, it seems that college students in addition to the professional knowledge should gain the skills of popularizing science, for example through theatrical performances. These skills will be useful when playing with children, teaching them at universities of children (Fig. 10), when preparing popularizing

events such as science festivals (Fig. 11), charity events (Fig. 12), open days and other activities, etc.

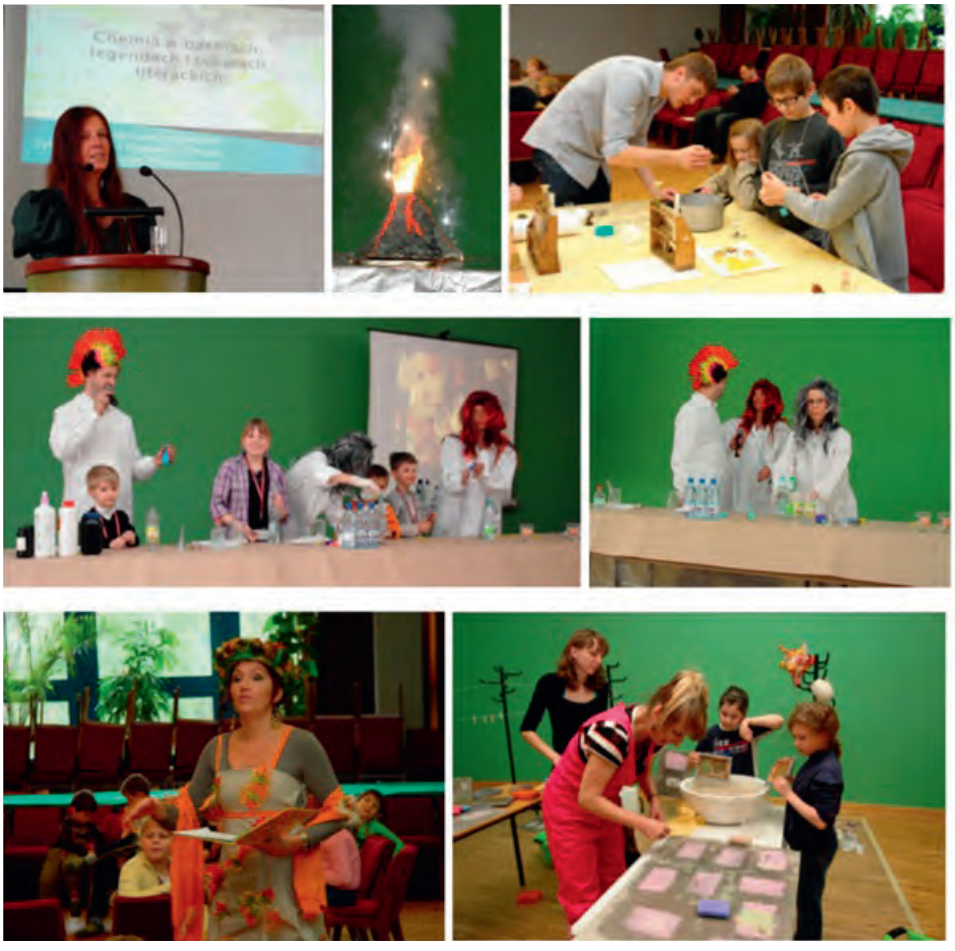

Fig. 10. Lecture and performances at the Pedagogical University of Cracow as part of the University of Children and Parents. Fot. M. Pasternak

Source: http://www.dzieci.up.krakow.pl/?page_id=4954)

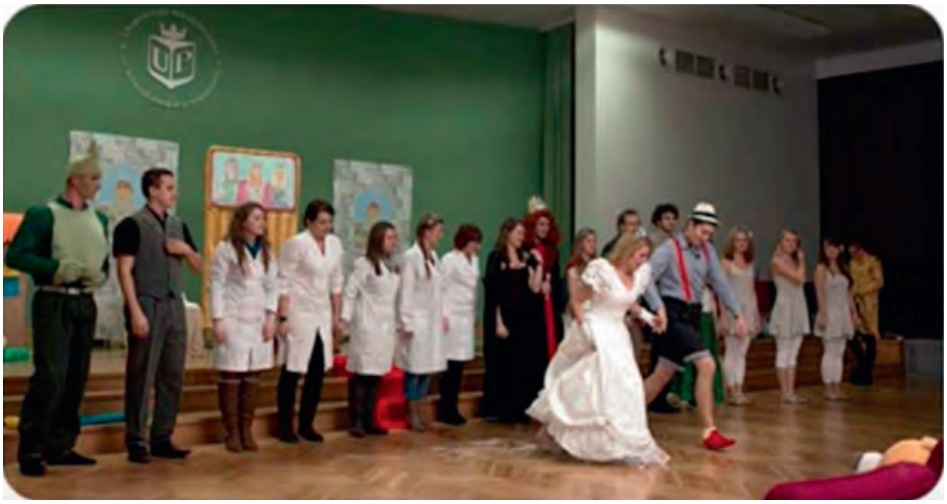

Fig. 11. Charity performance in the Aula of the Pedagogical University of Cracow. The spectacle was prepared by students of biology and chemistry

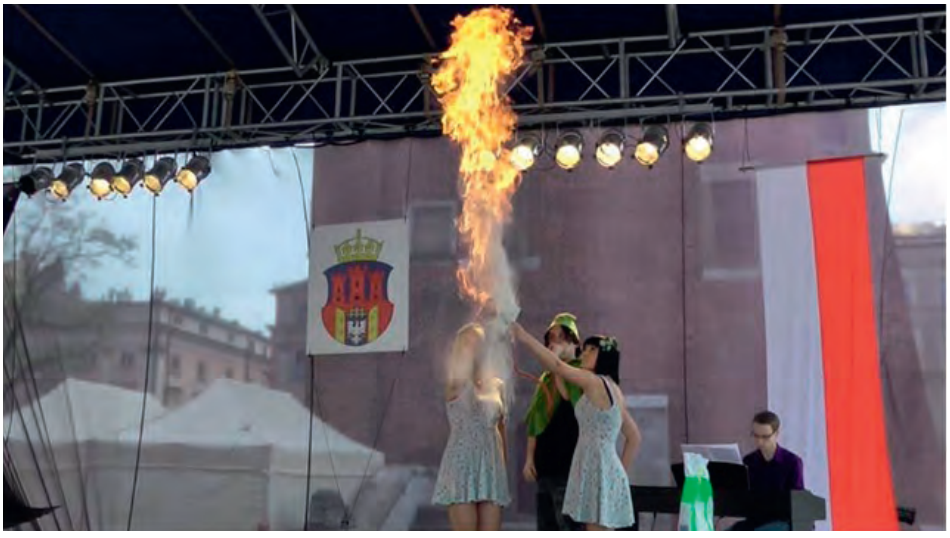

Fig. 12. Show at the Main Market Square in Kraków, The performance was part of The Festival of Science – prepared by students of third year Chemistry UP (V 2012)

In frames of the classes "Scientific theatre" and "ICT and new forms of social communication" realised as a part of the project "Animation of nature culture (Animacja kultury przyrodniczej)" undertaken were activities connected with providing the new scientists not only with wide tematic knowledge, but also with skills of transfering that knowledge to various groups of recipients. This was realized through theatrical scenes. The task of the student was to prepare a play based on

chemical experiments and to record it with a camera and finally to put together a movie using dedicated software (Raichvarg, Potyrała, Di Scala-Fouchereau, 2015).

The question arises: What is the educational effect of such actions?

Hard competences are mainly concerned with specialistic knowledge. Students must be able to choose among these chemical experiments, which are suitable for show (on the one hand experiment must be impressive and on the other hand safe). They familiarize themselves with the characteristics of chemicals used by reading "Safety data sheets". They must do it more thoroughly than in other situations. To ensure that the experience comes off on stage students must perform it several times in many variations of experimental conditions. Moreover students practice skills of using computer software for image and video processing, as well as art skills by preparing suitable decorations.

Soft competences are rarely the basic aim of academic education. They concern the psychophysical and social skills, focus on human behavior, their attitudes, way of living. They relate primarily to the management of a person's own world, motivation and interpersonal skills.

In frames of the classes students practiced the following soft competences:

- cooperation within a group,
- ability to act on a broad forum, which leads to the skills of delivering speeches and other public performances,
- communication skills,
- dynamism of action,
- creativity,
- resistance to stress,
- time management,
- body language,
- sense of humor and ability to laugh with each other,
- emotional intelligence.

It seems that the benefits of this type of activities should cause that they should be compulsory at all higher studies. A scientist now cannot be withdrawn and silent and should carry the torch of education to the nation.

References

Raichvarg D., Potyrała K., Di Scala-Fouchereau E., 2015, *Teatr naukowy, czyli publiczny dyskurs z nauką i popularyzacja wiedzy*, Wydawnictwo Libron, Kraków.

Scientific theatre as a form of popularizing knowledge of natural sciences

Abstract

The article shows how the role of the scientist as a popularizer of science changed over the centuries. On this basis the role of the classes with students on educating their competences of animator of natural culture is shown. The classess "scientific theatre" and "ICT and new forms of social communication" were realised as a part of the project "Animation of nature culture (Animacja kultury przyrodniczej)".

Key words: scientific theatre, popularization of science, animation of nature culture

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