

# minib 14

marketing of scientific  
and research organizations

no. 4(14)/2014

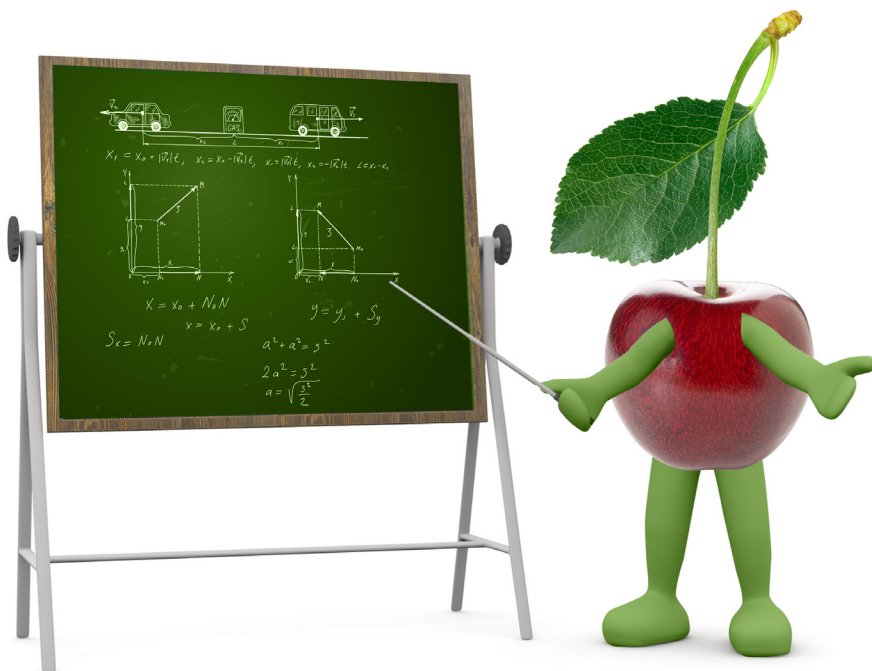


research  
for future

eISSN 2353-8414

pISSN 2353-8503

december 2014



**POPULARIZATION OF SCIENCE AS A MARKETING TOOL EXEMPLIFIED BY "PATHS OF COPERNICUS" — A PROGRAMME FUNDED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION**

# POPULARIZATION OF SCIENCE AS A MARKETING TOOL EXEMPLIFIED BY "PATHS OF COPERNICUS" — A PROGRAMME FUNDED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION

**Adam Piasecki, M.Sc. Eng.**  
Institute of Innovative Technologies EMAG, Poland  
e-mail: [apiasecki@emag.pl](mailto:apiasecki@emag.pl)  
DOI: 10.14611/minib.14.04.2014.14



## Summary

This article concerns the project Mine Surfers (2013–2014) carried out by the EMAG Institute of Innovative Technologies within a programme funded by the Ministry of Science and Higher Education. The authors present the positive marketing effects resulting from the project. In the case study, they describe the project against the backdrop of activities undertaken by other project teams. As well as the issues related to the execution of the project as such, focus was also placed on operations aiming for project promotion as well as popularising research and educational activities. Finally, the results of media monitoring with respect to the project are discussed.

**Keywords:** popularisation of science, Paths of Copernicus, workshops, research, promotion, scientific marketing, mining

## Introduction

On 3 December 2012 the Minister of Science and Higher Education announced the establishment of the project under the name "Paths of Copernicus" [13]. According to the announcement<sup>1</sup>, the aim of the "Paths of Copernicus" project was to popularise science among the members of the local community, especially among young adult learners. Furthermore, the announcement stated that within the competition no more than 16 projects would be selected (no more than one project per province).

Consortia consisting of at least one scientific institution and one entity acting on behalf of science were asked to develop and implement a programme of activities promoting and disseminating scientific activities and their results. The result of the project was to be the creation of unconventional course modules illustrating ways and methods of interesting young people in science issues, awakening their curiosity, and deepening their knowledge. The modules were to include activities that were part of scientific research conducted with the involvement of people outside the scientific community, especially schoolchildren. As a result, after the evaluation of proposals, 16 projects were selected, one for each province. The submitted projects include topics related to physics, chemistry, astronomy, biology, and even linguistics.

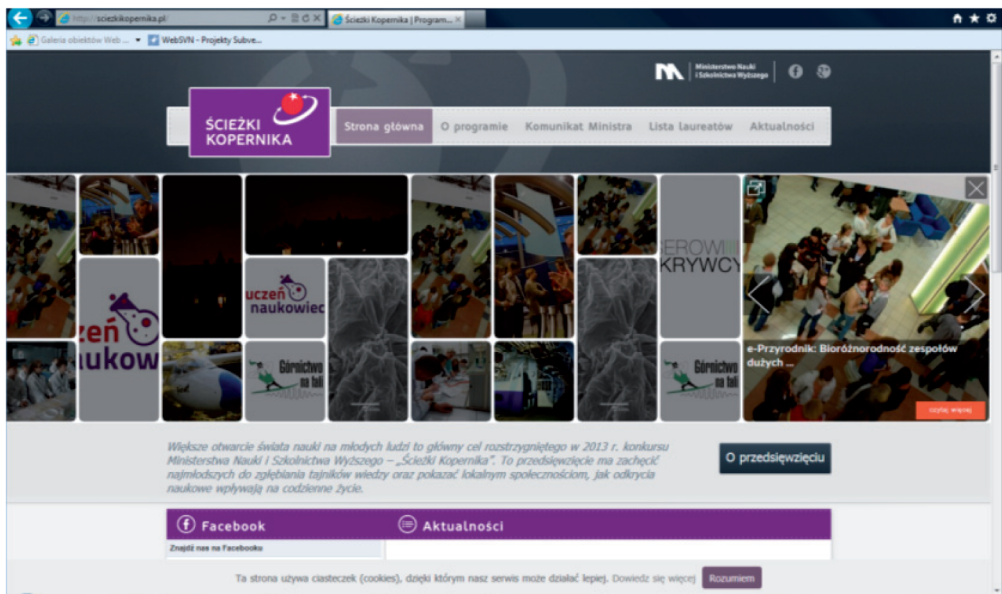
Acting in accordance with art. 2 of the Research Institutes Act of April 30, 2010 [7], which covers the dissemination of knowledge as one of the core activities of research institutes, the EMAG Institute of Innovative Technologies became involved in the implementation of the "Paths of Copernicus" project, preparing, together with its partner, the GUIDO Historic Coal Mine in Zabrze (ZKWK GUIDO), the proposal for the project "Mine Surfers". The project involved the preparation of a learning module covering issues related to physics, engineering, and coal mining. The premise of the project was to employ modern technologies used in the mining industry, which is the EMAG Institute's main area of expertise, to illustrate physical phenomena known to project participants from schoolwork, but often remaining in the realm of elusive theory. In order to conduct classes in conditions similar to actual mining conditions, an educational trail was built at Level 320 of the GUIDO Mine (320 m below the surface) including 5 sites for presenting phenomena associated with mechanical and electromagnetic waves and their use in the mining industry. For the educational trail developed as part of the project, the only one of its kind in the world, a series of research workshops were conducted from May to



November 2014. There were about 750 participants, mostly schoolchildren, but also, in the context of open days, other people interested in the issues the project covered. The course is complemented by a book in which the superhero created for the project — Surfer Hajer<sup>2</sup> — explains the issues covering wave physics and its use to the readers.

Descriptions of the individual programs are available on the “Paths of Copernicus” contest page, which can be seen in Figure 1.

Figure 1. Website of the MNiSW “Paths of Copernicus” project



Source: [www.sciezkipopernika.pl](http://www.sciezkipopernika.pl) [10.11.2014 r.].

Due to the value of the subject matter, its unique character, and the wide range of beneficiaries, the project met with great interest from the local media.

## The EMAG Institute's motivation for participating in the “Paths of Copernicus” competition

Like any modern scientific unit, the EMAG Institute of Innovative Technologies has to carry out marketing activities in order to sell its research services and licences for the solutions it develops. It is also important to tend the EMAG Institute's positive image

among potential new and existing customers, as well as the local community where the EMAG Institute's work originates. In this context, it is also crucial to attract new personnel who want to pursue a career with the EMAG Institute in the future. To this end, it was decided to use the "Paths of Copernicus" competition to create a tool for achieving EMAG's intended marketing purposes as part of its statutory duty to popularise science.

The decision on the EMAG Institute's involvement in preparing an application, and then implementing the project, was thus the result of the opportunity to present the Institute's activities to a very wide group of stakeholders — the local community, particularly young people as the direct participants, but also teachers, families, journalists and local authorities. In addition, the EMAG Institute's intention was to help the local community understand issues related to mining — an industry that represents the identity of our region — and at the same time to exert a beneficial effect on the image of the industry in which the Institute operates.

It was also significant for the Institute to draw attention to the innovative solutions developed by EMAG and their uniqueness worldwide. In encouraging young people to choose technical fields of study in the future, it is also EMAG's intent to attract attention of apprentices and trainees — people with open minds — over the next few years. They can then become the new, educated research staff at the Institute and contribute to its further development.

As expected, the project met with great interest in the media, as evidenced by numerous publications in the press and online, as well as broadcast radio material. Furthermore, the project included the promotion of direct meetings with Silesian educational staff — Figure 2.

At the start of the preparation of the proposal, in relation to the profile of the Institute's activities closely related to engineering, it was decided to focus on the hard sciences, and physics in particular. The concept of the educational module was based on the opportunity to present physical phenomena using the solutions developed by the EMAG Institute of Innovative Technologies. It was decided that the common denominator that would allow for the development of a coherent and attractive curriculum are wave phenomena — mechanical and electromagnetic waves — used in many of the Institute's studies. It was planned that the educational module, in addition to a theoretical introduction to wave phenomena, would be based on experiments carried out using the systems and equipment employed in the mining industry. This would enable the schoolchildren to have direct contact with physical phenomena, and the formula for the classes prepared by the practitioners would facilitate easy assimilation of issues in physics, engineering, and earth sciences.

Figure 2. Silesian educational workers at a conference in the GUIDO Historic Coal Mine



Source: Own report.

As a basis for the development of the learning module, the following solutions were selected:

- The PASAT M intrinsically safe wireless seismic apparatus, which enables the study of stresses in the subsurface,
- The ATZK ultrasonic anemometer, which is a functionally simplified version of the MTZK Substitute Climate Temperature Meter, which enables the airflow velocity in the mine to be measured,
- The WLSS Underground Transport Logistics Support System, for monitoring underground transport,
- The WALKER isotope-free portable ash meter — a device for determining coal quality.

As the site for conducting lessons and at the same time for experimenting with using the above equipment and systems, the GUIDO Historic Coal Mine in Zabrze was selected, which is owned by the Coal Mining Museum in Zabrze, which became part of the "Mine Surfers" consortium. The special atmosphere of the workshop site and the thrill of working underground enable the participants to more fully understand the

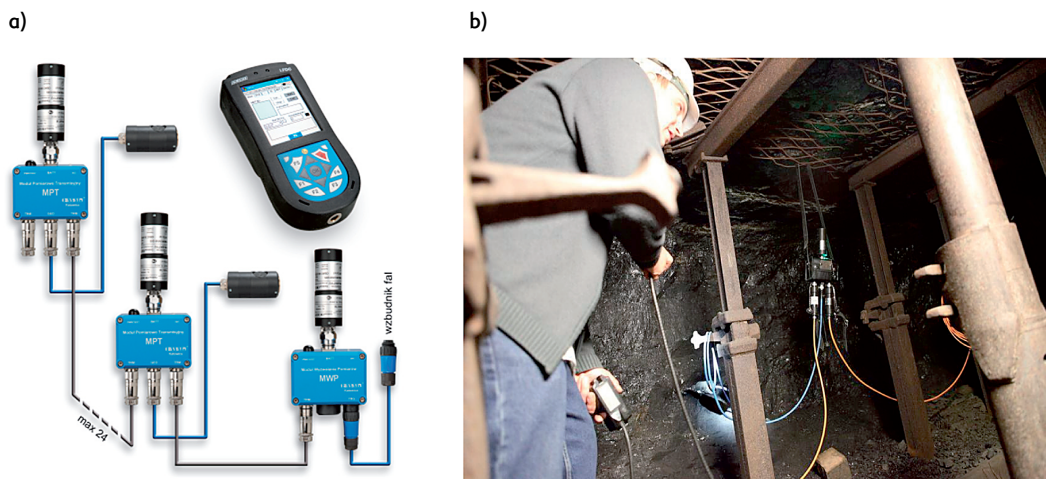
dangers associated with the profession of miner. This also positively influences an increase in confidence in institutions such as EMAG and raises public awareness of its responsibility for the safety of underground workplaces [3]. Due to the nature of the Silesia, associated for centuries with the mining industry, the mine interior also fits perfectly into the specifics of the technical solutions used in the project.

## Using mining solutions for teaching purposes

In developing the educational module, special attention was paid to the relationship between the operating principles of the selected devices and the teaching content included in the secondary school curriculum. It was planned that classes would be conducted within the framework of an educational trail laid out at level 320 of the GUIDO mine and consisting of four locations.

Figure 3. Apparatus at the position for stress testing in the subsurface using seismic waves:

a) PASAT M portable intrinsically safe apparatus — view, b) the PASAT M apparatus at test station no. 1



Source: Own report.

At the first position information is presented on mechanical waves, in particular seismic waves. The equipment at the teaching station is the PASAT M Intrinsically Safe Wireless Seismic Apparatus (Figure 3). The PASAT M enables the capture and collection of data and their transmission in digital form for further processing in order to:



- determine the stresses in the orogen and their changes in time and space (stress anomalies associated with: the edges of halted operation, the effects of carbonaceous residues on adjacent layers, the active operation on the face, the limit of old workings, corridor excavations, and faults),
- determining geological heterogeneities ahead of the excavation face (holes, leaching, faults, etc.),
- determining the parameters describing the physical and chemical properties (Young's modulus, Poisson's ratio), which characterise the strength and compactness of the orogen,
- recognising the appropriate sites for attaching measuring probes in explorative geophysics,
- ground reconnoitring prior to construction work,
- collecting other data in the form of registering voltage or current signals fed to the apparatus from intrinsically safe autonomous sources (sensors).

At the first station, course participants will be introduced to concepts such as: seismic wave, wave propagation velocity, reflection and refraction of waves, Poisson's ratio, Young's modulus, the risk of ejection of rocks and gases, geological structure of the bed from the standpoint of mining operations; and they will conduct studies — geotomography of the active rock face — using the PASAT M apparatus and analysing the results.

The second station enables the participants to familiarise with mine ventilation issues, ultrasonics, and measurement of air velocity. At this station the ATZK ultrasonic anemometer is employed (Fig. 4). The ATZK handheld anemometer is a portable device used to continuously measure the air flow rate with the time ultrasonic method and the opportunity to record and view measurements.

At the third station, participants will be introduced to the topic of underground transport and the location of underground facilities. Teaching at this station uses the WLSS Underground Transport Logistics Support System (Fig. 5) that is based on the use of electromagnetic waves (radio communication). The WLSS system is dedicated to underground transport systems and features the following functions [8]:

Figure 4. Apparatus at the station for testing the air flow rate using ultrasonic waves:

a) ATZK ultrasonic anemometer — teaching version — view, b) ATZK anemometer at study station no. 2



Source: Own report.

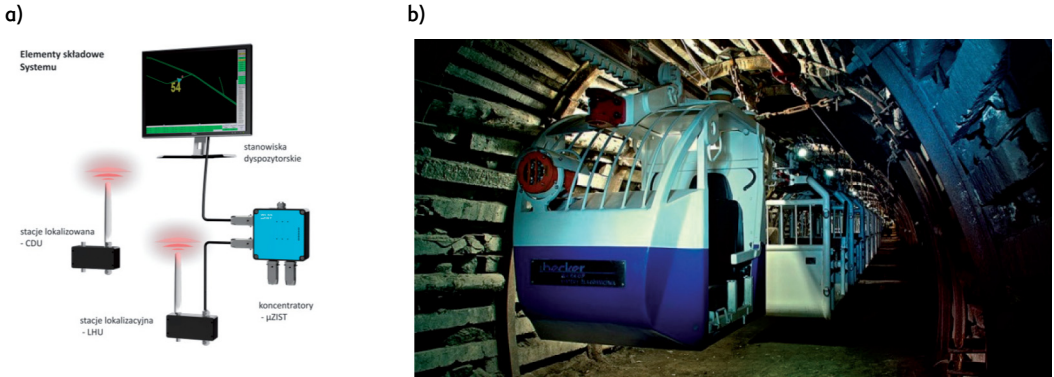
- precise location of the position of vehicles in real time,
- detection of currently occupied track (on a two-way track),
- detection of the probability of vehicle collision,
- visualisation of the deployment of vehicles using a GIS/SCADA application,
- communication with drivers via text message,
- sending of priority alarm messages to/from vehicles,
- transmission of diagnostic data from vehicles,
- detection of certain types of wheel failure (suspended railways),
- visualisation of this diagnostic information in the SCADA applications

At the third station, course participants will learn about the concepts of electromagnetic wave, radio waves, and underground transport in the mining industry.

The fourth station is dedicated to issues concerning the quality of solid minerals. The workshop participants carry out experiments here using the WALKER Isotope-free portable ash meter (Fig. 6), whose operation is based on natural gamma radiation, which is an electromagnetic wave with very high frequency.

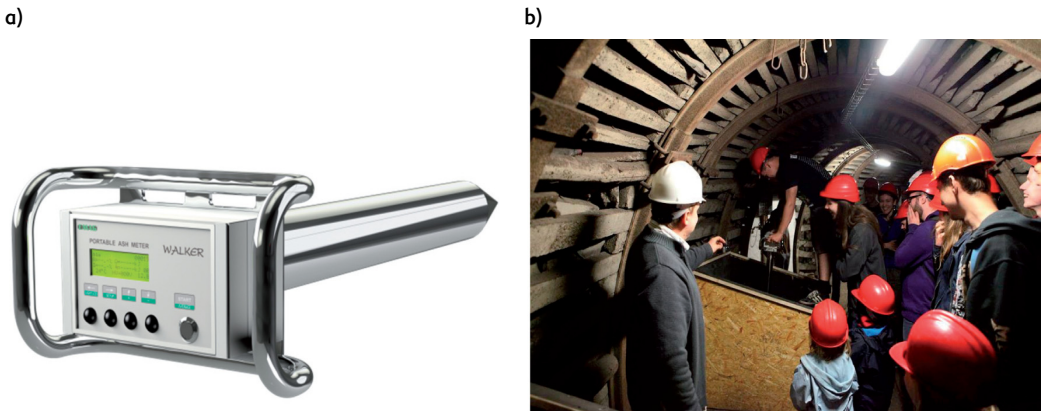
Figure 5. Apparatus at the station for testing radio communications using electromagnetic waves:

- a) WLSS Underground Transport Logistics Support System — view,  
b) suspended railway equipped with the WLSS system at study station no. 3



Source: Own report.

Figure 6. Apparatus at the teaching station for testing coal quality using natural gamma radiation: a) WALKER portable ash meter — view, b) WALKER ash meter at research station no. 4



Source: Own report.

The WALKER ash meter is designed for fast, mobile determination of ash content in coal, directly at the place of storage, e.g. in user dumps or railway wagons. The WALKER also allows estimation of the calorific value of the material tested, after entering the moisture parameter, however.

At the fourth station, participants will be introduced to the concepts of radiation, gamma radiation, coal quality parameters, calorific value, the natural radiation energy spectrum, and the operating principles of the scintillator and photomultiplier.

### **The "Mine Surfers" project against the backdrop of other projects in the "Paths of Copernicus" competition**

Among the award-winning 16 projects — one for each province - are unusual and original programmes of activities. All use the knowledge and facilities of scientific research units, including laboratories, equipment, and scientific exhibits. Scientists are engaging young people in research and observation, and thus to data collection and the compilation of reports on research carried out<sup>3</sup>. It would be hard to deny that "Paths of Copernicus" has 16 appealing projects. In the Świętokrzyskie province, young researchers, using state-of-the-art technology, are exploring unknown heritage sites hidden even among large areas of forest, and in the Subkarpackie province they are investigating the possibilities of designing safe tourist air routes for glider pilots in the Bieszczady region.

In general, an analysis of the projects in the "Paths of Copernicus" competition shows that they form part of a presentation of consistency in the environment surrounding us. The topics addressed pertain to phenomena we deal with every day, and their occurrence can be divided into four areas (Fig. 7):

- distant space,
- the sky and surrounding area in visual range,
- phenomena associated with life on the surface of the earth (including various aspects of life from cultural heritage — archaeological and historical, through creating inventions, natural science, chemistry, physics, marketing and sociology),
- underground phenomena — both natural and resulting from the use of technology.

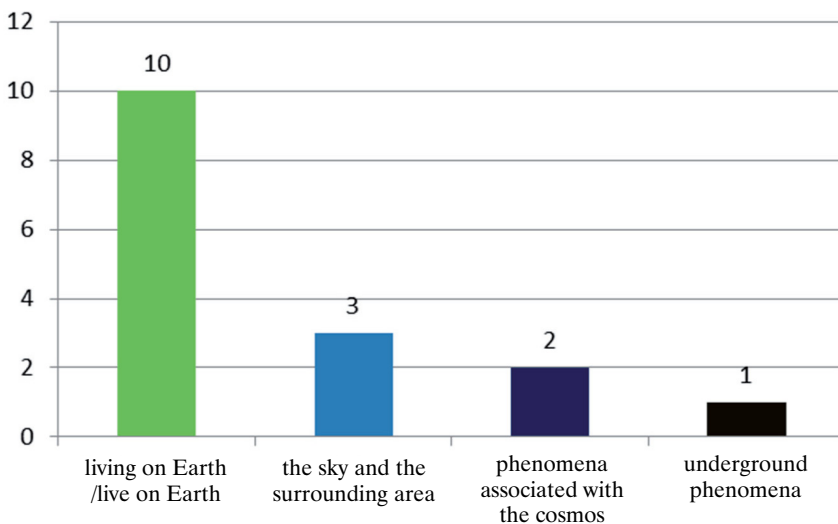
Against the backdrop of the topics discussed, the classes in Silesia, belonging to the last of the thematic groups, are exceptional. Here, young people interested in physics are involved in the only research workshops conducted underground at a depth of 320 m. In the course of the experiments in the corridors of the GUIDO Historic Coal Mine in Zabrze, they realise how important it is to use knowledge of physical phenomena in the modern mining industry. During the course not only



is the experience of scientists from the EMAG Institute used, but the unique solutions they have developed, including mine safety, geophysics, and measurement of mineral quality parameters. Conducting experiments using these devices, and using the phenomenon of physical waves, allows the schoolchildren close contact with physical phenomena, and shows how much influence the solutions developed have on the safety of miners. The formula of the classes prepared by the practitioners makes it easy to assimilate issues in physics, engineering, and earth sciences, while the GUIDO mine underground walkways enable the creation of a unique atmosphere during the experiments, adding to the participants' interest.

The GUIDO mine, even though it is now a museum, operates according to the same rules as an active mine and is supervised by the State Mining Authority. Thanks to this, workshop participants gain unique experience in the operation of an underground mine. The journey to level 320 and safe movement along the underground walkways, subject to the appropriate procedures, provide a picture of the daily operation of a mine. Moving under the watchful eye of a guide, the group has the opportunity to learn the history of the mine and mining traditions that have lasted for decades.

Figure 7. The number of projects in the "Paths of Copernicus" competition depending on the topics discussed



Source: Own report based on [11].

The "Mine Surfer" has enabled them to discover what is usually invisible; hidden deep beneath the earth's surface. These are undeniably the "lowest level" courses of all the activities carried out within the "Paths of Copernicus". This, however, is only due to hosting the classes on level 320 of the GUIDO mine. Evidence of the high professional standard is the feedback survey completed by the participants, and the high and very high marks given to both the teachers and the topics covered (Fig. 9).

### **PR and marketing activities undertaken by the "Mine Surfer" consortium**

From the point of view of the marketing goals drawn up by the EMAG Institute, it was very important that there was adequate publicity for the project and it reached the widest possible audience of potential participants. Various PR measures were conducted: from presentations at national conferences, through participation in scientific innovation exhibitions, to local media use. A detailed description of the action taken is contained in a report prepared by the EMAG Institute [6].

One of the first important objectives was to find participants for the research workshops. Recruitment was organised, as was an associated information campaign.

Information about the project, the consortium and recruitment appeared in a large article in the Trybuna Górnicza newspaper (13 February 2014) and published in the Życie Bytomskie weekly (24 March 2014). Furthermore, courtesy of Radio eM, radio material was broadcast on Radio eM, Radio Fest, and Radio Katowice. A press release also appeared on numerous websites, incl.: Nauka w Polsce PAP [16], Onet [15], Gazeta Wyborcza [18], NETTG [14], TVP [17], Money [11], Biznes [9], and Dziennik Zachodni [10].

Information about the project and the results of the recruitment are available at the GUIDO<sup>4</sup> mine, EMAG Institute<sup>5</sup>, and project<sup>6</sup> websites. In order to ensure a transparent recruitment process and equal access to the valuable educational activities prepared for the project, rules for the recruitment were developed which provide for the need for candidate schools to develop a multimedia presentation describing the educational physics activities undertaken at the school. The presentations submitted by interested schools were evaluated by a committee composed of representatives of the leader and partner. Thirty-six schools submitted applications to participate in the classes. After checking the submitted presentations, 30 schools were invited to participate in the project, and a reserve list including 3 schools who received information about opportunities to participate in the project in the event of a vacancy was also created

(e.g. as a result another school withdrawing). Finally, by increasing the number of classes by 7 (3 classes for school groups and 4 workshops during open days), these schools participated in the workshops on normal principles.

The promotional activities of the Coal Mining Museum for the "Mining Surfer" project were carried out by sending email information about the project directly to the people responsible for education in 182 municipalities/counties of Silesia. Furthermore, schools in Zabrze, Gliwice, Chorzów, Ruda Śląska and Katowice received information about the project and the opportunity to participate via contact boxes located in their respective municipal offices. On 27 February 2014, an information conference was organised for representatives of the educational departments at Municipal Offices and school representatives (Fig. 2). During the conference, the assumptions of the programme and recruitment rules were presented.

On 8 May 2014 an information seminar and workshop were conducted to launch the "Mine Surfer" project. These were addressed to representatives of schools accepted to participate in the project. During the seminar, participants were familiarised with the guidelines for exploring the underground workings of the GUIDO Historic Coal Mine, informed of the detailed schedule for workshops, shown the functionality of the project website, including in particular the method of submitting applications to participate in classes, and initial training was conducted in the use of the interactive task module. Representatives of the project leader presented details of the content and organisation of the planned workshops and acquainted the audience with the rules for safe participation in the classes. For participants there was also a presentation of the prepared research stations and condensed "Mine Surfer" workshops were conducted. Representatives of editorial boards from the press, radio and television were invited to the inaugural seminar. Radio eM and Polsat News decided to take advantage of the invitation. Radio eM broadcast a wide-ranging report on the "Mine Surfer" project, while Polsat News provided some information as part of broader coverage devoted to mining.

On 14–16 May 2014 during the EMTECH scientific and technical conference in Szczyrk a paper was presented on the assumptions and implementation of the "Mine Surfer" project. The paper met with a very positive response from the participants, and its content was published in the conference proceedings. In addition, on 23 May 2014 as part of the sixth "Day of Science and Industry" in the Gliwice Technopark, at the stand of the Institute of Innovative Technologies EMAG a poster was displayed on the assumptions and implementation of the "Mine Surfer" project. Again, the project was highly popular event among event participants.

On 6 June 2014, the Trybuna Górnicza website<sup>7</sup>, one of southern Poland's most popular mining community weeklies (circulation 75 thousand copies), published a report on the launch of the educational workshops conducted as part of the "Mine Surfer" project<sup>8</sup>. With the publication of the paper weekly on 12 June 2014 a comprehensive article about "Mine Surfer" was published describing the specifics and features of the project.

The project also provides for the organisation of 4 workshops in the form of open days. These classes were scheduled for 1–4 July, and recruitment was held in June. Invitations were issued to: heads of departments of education in the central sub-region of Silesia, and directly to middle and secondary schools in Gliwice, Zabrze, Ruda Śląska, and Bytom. Separate invitations were also addressed to young people from disadvantaged social backgrounds (orphanages, youth educational centres) and young people spending holidays in organised forms in the cities of the Upper Silesian agglomeration (community centres). Information on recruitment was also to be found on the GUIDO website and electronic media, including the competition, Nowiny Zabrzeńskie<sup>9</sup>, and Śląskie Trendy websites<sup>10</sup>.

Much attention was paid to the preparation and updating of the profile on the most popular social networking site — Facebook. The results of marketing research in social media indicate that the portal has over one billion users worldwide. It is also the perfect arena for conducting marketing activities due to the fact that its users often visit it and spend a considerable amount of time there [1]. This portal is as popular in Poland as worldwide and in terms of number of users dominates other social media. Therefore, the project profile<sup>11</sup> hosts up-to-date news about the project and photographic reports on successive classes. Information on participation in the project is also posted on social networking profiles and on the websites of schools that have participated in the workshops. There are reports on the workshops held, reviews of the teachers, and photo reports prepared by the participants.

The course is complemented by a book in which the superhero created for the project — Surfer Hajer — explains the issues covering wave physics and its use to the readers [2]. Information on the physical phenomena which the participants encounter during the workshops is presented in a simple and fictionalised form. The author of the handbook, on the basis of materials prepared by experts, is Waldemar Cichoń, an employee of the EMAG Institute, and privately author of books for children and young people. The handbook is available free of charge in electronic format on the project website<sup>12</sup>.



As the project is addressed mainly to young people, it was considered particularly important to develop an attractive project logo. In principle, it would suggest the content of the workshops and simultaneously arouse interest and entertain the participants. Therefore, reference is made to character from the handbook, Surfer Hajer, giving him characteristics like those of superheroes which can be found in literature, comics, and cartoons. The logo design finally adopted is shown in Figure 8.

Figure 8. The logo of the "Mine Surfer" project and consortium



Source: Own report.

In addition to the ministerial funding and patronage of the "Paths of Copernicus" competition, the consortium obtained additional patronage from the Mayor of Zabrze and the Silesian Schools Superintendent — extremely valuable and important for the project from the point of view of its promotion.

## Summary

On the basis of information obtained, it may be assumed that the EMAG Institutes main marketing goals were achieved. Due to the media presence, in the positive context of activities to popularise science, EMAG has created the image of a local research unit involved in the education of young people and promoting the quality and safety of Silesia's main industrial sector, i.e. mining. However, most importantly, EMAG is seen by the participants as an interesting workplace, where theory and practice meet.

A full assessment of the benefits of the project can only be carried out after its completion, i.e. in 2015, but even today there are other noticeable positive developments related to the project. The EMAG Institute, as initiator and executor of the project, has had a positive impact not only on its own image, but also on the image

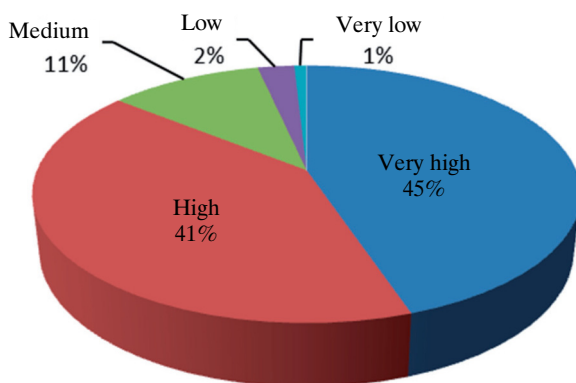
of the entire industry, and is able to distribute information on its scientific activity to a broad mass of stakeholders. The execution of the project was an opportunity to show the mining industry as a modern industry using innovative technologies. A industry that is modern in world terms, that forms the identity of Silesia, combining the traditions of the industry's past, with the technologies of the future. It is worth noting that these technologies can be used in other industries and not just in the harsh conditions of underground mines.

Thanks to the project EMAG also received other benefits. During the workshops, devices and systems were subjected to testing by about 750 non-professional users (the number of participants), which allows for interesting feedback on their functionality and identification of the weak points in their design.

Many specialists from the EMAG Institute were involved in the development of the educational modules — practising engineers and staff with extensive theoretical knowledge, which allowed for a mix of different points of view and led to interesting conclusions to be applied in the development of new devices.

In addition, the lessons offered match school educational needs well, and are appreciated by both pupils and teachers. The assessment studies carried out indicate that over 86% of the participants found the level of activities provided good or very good (Figure 9). Full development of the materials available, taking into account the order of the course and the two separate age groups (middle and secondary school) will be prepared after the completion of the project.

Figure 9. Results of the assessment of activities by workshop participants



Source: Own report based on [4].

Based on the results of the evaluation, the consortium executing the project decided to continue the workshop at the end of the project funded by the Ministry of Science and Higher Education. For this purpose, a new formula for classes and new regulations for participation adapted to the new conditions of the financing of the project will be developed.

## References

- <sup>1</sup> <http://www.nauka.gov.pl/aktualnosci-ministerstwo/komunikat-ministra-nauki-i-szkolnictwa-wyzszego-o-ustanowieniu-przedswiezecia-pod-nazwa-sieczki-kopernika-,akcja.pdf.html> [5.12.2012 r.].
- <sup>2</sup> Hajer — górnik strzałowy, jedna z najbardziej odpowiedzialnych i najniebezpieczniejszych funkcji pracownika pod ziemią [5] <https://sieczkikopernika.pl> [10.11.2014 r.].
- <sup>3</sup> <http://sieczkikopernika.pl/lista-laureatow/> [10.11.2014 r.].
- <sup>4</sup> <http://www.kopalniaguido.pl/wiadomosci/112-pomaranz/1179-znamy-uczestnikow-projektu-gornictwo-na-fali> [30.05.2014 r.].
- <sup>5</sup> [http://www.emag.pl/news.php?new\\_id=247&l=](http://www.emag.pl/news.php?new_id=247&l=) [30.05.2014 r.].
- <sup>6</sup> [www.gornictwonafali.pl](http://www.gornictwonafali.pl) [30.04.2014 r.].
- <sup>7</sup> [www.nettg.pl](http://www.nettg.pl) [10.11.2014 r.].
- <sup>8</sup> <http://www.nettg.pl/news/121386/nauka-lekcja-fizyki-w-podziemnym-wyrobisku> [6.06.2014 r.].
- <sup>9</sup> <http://www.nowinyzabrzańskie.pl/aktualnosci/gornictwo-fali/> [15.07.2014 r.].
- <sup>10</sup> <http://slaskietrendy.pl/gornictwo-na-fali-zajecia-w-guido/> [15.07.2014 r.].
- <sup>11</sup> <https://www.facebook.com/gornictwonafali> [10.11.2014 r.].
- <sup>12</sup> [http://gornictwonafali.pl/images/\\_PLIKI\\_/Listy\\_uczestnikow/podrecznik\\_wersja2.pdf](http://gornictwonafali.pl/images/_PLIKI_/Listy_uczestnikow/podrecznik_wersja2.pdf) [10.11.2014 r.].
- <sup>13</sup> [http://gornictwonafali.pl/images/\\_PLIKI\\_/Listy\\_uczestnikow/podrecznik\\_wersja2.pdf](http://gornictwonafali.pl/images/_PLIKI_/Listy_uczestnikow/podrecznik_wersja2.pdf) [10.11.2014 r.].

## Bibliography

1. Bullock L., Agbaimoni O.: *Marketing w mediach społecznościowych — dlaczego i jak firmy muszą z niego korzystać?*, Prace Instytutu Lotnictwa, Warszawa, 2012.
2. Cichoń W.: *Górnictwo na fali, czyli przygody Surfera Hajera*, Podręcznik uzupełniający do zajęć „Górnictwo na fali”, Instytut Technik Innowacyjnych EMAG, Katowice, 2013 (wersja elektroniczna).
3. Jezeršek Turnes J.: *Włączanie nauki do publicznej dyskusji*, Marketing Instytucji Naukowych i Badawczych nr 3(13)/2014, Instytut Lotnictwa, Warszawa, 2014.
4. Muzeum Górnictwa Węglowego w Zabrzu: *Analiza częściowa ankiet ewaluacyjnych wypełnionych przez uczestników projektu „Górnictwo na fali”*, Zabrze, 2014.
5. Simonides D.: *Śląski horror. O diabłach, skarbnikach, utopcach i innych strachach*, Śląski Instytut Naukowy, Katowice, 1984.
6. Slotorski A.: *Sprawozdanie merytoryczne z realizacji umowy*, Instytut Technik Innowacyjnych EMAG, Katowice, 2014 r. (niepublikowane).
7. Ustawa z dnia 30 kwietnia 2010 r. o instytutach badawczych, Dz.U. nr 96 rok 2010 poz. 618.
8. Wiszniowski P., Babecki D., Szpak T.: *System WLSS — możliwości, praktyka, perspektywy*, EMTECH 2012, Katowice, 2012.

## Websites

9. Biznes.pl: Zapisy na naukę fizyki — w zabytkowej kopalni węgla, <http://biznes.pl/magazyny/edukacja/zapisy-na-nauke-fizyki-w-zabytkowej-kopalni-wegla,5609584,magazyn-detat.html> [30.04.2014 r.].
10. Dziennikzachodni.pl: Korepetycje z fizyki — w zabytkowej kopalni węgla w Zabrze, <http://www.dziennikzachodni.pl/artukul/3369879,korepetycje-z-fizyki-w-zabytkowej-kopalni-wegla-w-zabrze,id,t.html> [30.04.2014 r.].
11. MNiSzW, Ścieżki kopernika, <http://sciezki.kopernika.pl> [10.11.2014 r.].
12. Money.pl: Zapisy na naukę fizyki — w zabytkowej kopalni węgla, <http://nauka.money.pl/artukul/zapisy-na-nauke-fizyki---w-zabytkowej-kopalni-wegla,179,0,1498291.html> [30.04.2014 r.].
13. Nauka.gov.pl: Komunikat Ministra Nauki i Szkolnictwa Wyższego o ustanowieniu przedsięwzięcia pod nazwą „Ścieżki Kopernika”, <http://www.nauka.gov.pl/aktualnosciministerstwo/komunikatministra-nauki-i-szkolnictwa-wyzszego-o-ustanowieniu-przedsiwziecia-pod-nazwa-sciezki-kopernika-,akcja,pdf.html> [5.12.2012 r.].
14. NETTG.pl: Zabrze: na poziomie 320 będą uczyć fizyki, <http://www.nettg.pl/news/119048/zabrze-na-poziomie-320-beda-uczyc-fizyki> [30.04.2014 r.].
15. Onet.pl: Zapisy na naukę fizyki - w zabytkowej kopalni węgla <http://wiadomosci.onet.pl/slask/zapisy-na-nauke-fizyki-w-zabytkowej-kopalni-wegla/pz6eg> [30.04.2014 r.].
16. PAP Nauka w Polsce: Zapisy na naukę fizyki — w zabytkowej kopalni węgla <http://www.naukawpolsce.pap.pl/aktualnosc/news,399671,zapisy-na-nauke-fizyki--w-zabytkowej-kopalni-wegla.html> [30.04.2014 r.].
17. TVP.pl: Fizyka w zabytkowej kopalni, <http://www.tvp.pl/katowice/aktualnosc/rozmaitosci/fizyka-w-zabytkowej-kopalni/14435910> [30.04.2014 r.].
18. Wyborcza.pl: Zapisy na naukę fizyki — w zabytkowej kopalni węgla, [http://wyborcza.pl/1,91446,15643341,-Zapisy\\_na\\_nauke\\_fizyki\\_\\_\\_w\\_zabytkowej\\_kopalni\\_wegla.html](http://wyborcza.pl/1,91446,15643341,-Zapisy_na_nauke_fizyki___w_zabytkowej_kopalni_wegla.html) [30.04.2014 r.].

**Adam Piasecki, M.Sc. Eng.** — Graduate of the Silesian University of Technology at the Faculty of Automatic Control, Electronics and Computer Science. Doctoral student at the Department of Informatics and Communication at the University of Economics in Katowice. Head of Department of Science and Research at the EMAG Institute of Innovative Technologies. Longtime manager of projects related to the development and implementation of IT projects in industry and government. Inter alia, he developed and implemented the infomat-e IT system to be used in territorial administration units, which provides easy access to public information for people with visual and aural disabilities. Co-author and co-executor, and in 2014 also manager, of the structural project "Mine Surfers" implemented within the Ministry of Science and Higher Education project "Paths of Copernicus".



Institute of Aviation  
Scientific Publishers  
al. Krakowska 110/114  
02-256 Warsaw, Poland  
phone: (+48 22) 846 00 11 ext. 551  
e-mail: minib@ilot.edu.pl

[www.minib.pl](http://www.minib.pl)  
[www.twitter.com/EuropeanMINIB](https://www.twitter.com/EuropeanMINIB)