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WHAT IS A CESAME?

CESAME = Centre for Education in Science

for Africa the Mediterranean and Europe

A PROJECT UNDERTAKEN BY THE AEMASE NETWORK OF SCIENCE ACADEMIES

IN PARTNERSHIP WITH *LA MAIN À LA PÂTE* FOUNDATION IN FRANCE
THE GLOBAL SCIENCE EDUCATION PROGRAMME OF IAP,
THE ALLEA SCIENCE EDUCATION WORKING GROUP,
AND THE NETWORK OF AFRICAN SCIENCE ACADEMIES

AEMASE = AFRICAN EUROPEAN MEDITERRANEAN ACADEMIES FOR SCIENCE EDUCATION
IAP = INTERACADEMIES PARTNERSHIP
ALLEA=ALL EUROPEAN ACADEMIES

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AEMASE
AFRICAN EUROPEAN MEDITERRANEAN ACADEMIES FOR SCIENCE EDUCATION

A) Science education in Africa, the Mediterranean and Europe

The fourth Sustainable Development Goal (SDG) for 2015-2030 of the United Nations calls for "inclusive and equitable quality education for all". It comes right after poverty, hunger and health issues, because the quality of education contributes very much to *human social development*. The very name CESAME of the present project sounds like the little sesame seed and is symbolic of the improvement and organized life that a seed bears within itself.

Science education (taking the word 'science' in the broad sense of Science, Technology, Engineering and Mathematics-STEM) promotes a broad education by the acquaintance with scientific methods, approaches and contents: it is a strong asset for building up and maturing the curiosity, intelligence, imagination, rigor, rationality, critical thinking, self-confidence, democratic debating and humanistic values of the next generation. This topic is today the focus of great attention in the North-South axis of Africa – the Mediterranean – Europe (AME). Experts agree that science is often inadequately taught in schools, hence not raising the interest of pupils. Science education requires a profound improvement: a sound science education is a robust cornerstone for human and social development as well as for democracy.

A better science education is a powerful tool to improve development and society welfare and at the same time to sustain economies. It increases the scientific knowledge of students and contributes to the number of young people deciding to choose studies which will allow them to enter scientific careers in the North as well as in the South. An increased number of scientists, engineers and technicians will help in the fight against climatic, environmental and other global challenges. Eventually it will allow everywhere a healthy and sustainable development and improve the standards of living. Renovating science education is thus an important part of SDG 4 objectives and will impact in a positive way on many of the other SDGs.

In the last two decades, this renovation has already been undertaken by many pilot projects worldwide, under the name of *IBSE (Inquiry Based Science Education)*, especially with the support of the European Commission. In this pedagogy students are encouraged to actively participate in classes, to carry on scientific experiments, and their competencies in reasoning and debating are developed while their disciplinary knowledge is increased. It was thus well demonstrated that IBSE has strong positive effects on student learning and can be used as a method to improve science education. These projects were often initiated and supported by science Academies and their members. In fact, most of science Academies are well aware of their responsibility in science education, for which they have many assets: scientific excellence and credibility; a wide audience including the political decision makers and potential sponsors; and expertise in international collaboration. In fact, IBSE has been widely promoted by

science Academies through the InterAcademy Partnership (IAP), which has settled up a global Science Education Programme (SEP) in 2003.

Stemming from IAP/SEP, from the science education working group of the European network ALLEA (All European Academies), and from the African NASAC (Network of African Science Academies), a network of Academies of science called *AEMASE (African, European, Mediterranean Academies for Science Education)* was launched in 2013. All AEMASE member Academies are members of IAP. The network deals with the AME region, a region of great importance for the global peace and development, which hosts numerous intercontinental scientific collaborations that contribute to these goals. Following a long history of conflicts, the nations belonging to this region have progressed in mutual understanding. The participants of the AEMASE network have the strong and unifying will to contribute reforming science education in a collaborative way, fostering international scientific and educational collaborations in the entire AME region, which will also efficiently promote peace.

To date, the network of Academies which have launched AEMASE has convened two intercontinental conferences: in Rome in 2014, and in Dakar in 2015. The technical and scientific contents of these meetings included the international sharing of course materials, curricula, pedagogical methods and strategic expertise to improve science education. They were focused on the IBSE pedagogy, especially in primary and middle schools. However, what can two short conferences that convened up to 200 persons achieve when compared with hundreds of millions of students of the AME region for which science education is still of a poor quality ? Definitely, the efforts have to be amplified and this is why, in September 2016, the Afro-European scientific committee of the AEMASE network, with the support of IAP, ALLEA and NASAC, decided for the next AEMASE III conference in October 2017 in Paris, to launch a concrete field action with long term vision. Under the guidance of the intercontinental steering committee presented above, the project aims to establish the concept and a network of *Centres for Education in Science for Africa, the Mediterranean and Europe (CESAME)*.

B) Objectives of the CESAME project

The objective of children developing their personality and humanity is pursued in the CESAME project via IBSE dissemination in schools of the AME region, in particular through the professional development and training of teachers dealing with science and of their educators to help them practice an IBSE pedagogy. The specific target is the creation of *a collaborative and intercontinental education support system* throughout the AME region, in partnership with scientists. This empowering and personal development of teachers is not to be achieved through top-down formal lecturing, but as a co-construction by partnerships between trainees (teacher educators and teachers) and scientists, with face-to-face personal contacts and activities, as well as on distance

follow-up activities. The trainees are usually polyvalent teachers in pre-elementary and elementary schools, or more specialized science and mathematics teachers, in middle and high schools. Their scientific partners can be faculty members, scientists, engineers and technicians as well as motivated graduate and PhD student in all areas of science.

Ultimately, the CESAME system will rely on a network of CESAME centres spread over all the AME region, interconnected by all means to jointly develop and share experiences and resources for the implementation of IBSE. As many of the existing pilot projects have developed over the AME region in the last decade, they form a solid baseline to build upon them the CESAME centres which will amplify their goals.

C) Realization

a) What does a CESAME centre do?

A CESAME centre will work the year around and gather for short workshops each year two kinds of participants, all from various countries and continents: on the one hand teacher educators, plus some local teachers, will become trainees; on the other hand practicing scientists, technicians and pedagogy educators, will be their trainers. During these workshops (up to two weeks long) in a CESAME centre, the teacher educators will get acquainted with the IBSE pedagogy. They may or may not possess a basic disciplinary knowledge in science, depending upon the level at which they teach, but in any case will refresh their scientific background. The trainees will gain an expertise beyond the mere transfers of an outer know-how. With the trainers they will jointly explore the beauties of science within its various fields, the scientific ways of reasoning, the IBSE pedagogy. In this way trainees will enjoy true opportunities to get acquainted with living sciences and technics; the pedagogical resources that the workshop participants will jointly build up will be truly innovative. When at home, adapting to the various school levels (primary, middle, high school), teacher educators will be equipped to implement IBSE, while continuing to receive support from the distant CESAME. The pedagogy of the Centre activities will be also of the hands-on IBSE type.

The above model has been successfully experimented in France (*Maisons pour la science au service des professeurs,* since 2012, handling nearly 8.000 teachers every year) and in the UK (*National Science Learning Centers*, since 2006). These two experiences will represent excellent examples able to inspire CESAME Centres. It is required that each CESAME centre be in close connection with existing local scientific infrastructures. A CESAME Centre can be the result of the organized network of participating labs, universities, organisms and of innovating technical enterprises. Scientists, researchers, engineers, technicians and possibly graduate students will contribute in the workshops and participate in the follow-up activities. The site where a CESAME Centre will be established should offer adequate facilities, in order to ensure a collaborating

companionship among all participants, scientists, teachers and teacher educators, and pedagogy educators, many of whom will come from far away.

Each CESAME initiative should be supported by a focused task force of a few motivated builders and should have the strong support of the official educational system of the corresponding country. Regardless of its location it should allow to build up tight trainees-scientists partnerships, which should be pursued after the workshops through various means, ranging from simple document exchanges to internships. Together with local scientists, many other will come from external institutions within the AME region, for short stays. The contacts and exchanges between the scientific and educational worlds that usually do not know much of each other will be an important, original characteristic of CESAMEs, in comparison with the traditional faculties of education, which the Centers would nevertheless not ignore. In the long term it will be beneficial for the individuals, as well as for economy and society.

The education personnel trained in the CESAMEs will come from different countries, regions and continents. In the centre they will have joint activities with colleagues from different cultures and environments and exchanges about the difficulties and success factors that are encountered in their various places. They will perform a synthesis between the IBSE knowledge gained in the CESAME sessions and the pedagogical tools they use in their own local and national cultures. Back in their professional environments, they will spread the new IBSE pedagogy to the school teachers and contribute to a transformation of science education, with the necessary local adaptations, as leaven in the local and national dough. Hence a gradual improveing from the inside of the science educational system, which will, little by little, in an umbrella manner reach most students in the AME region. A more detailed description of the requirements needed to launch a CESAME centre is described in the attached Appendix.

b) **The CESAME network**

It is likely that the project will start up step after step and progress in phases. During the initial phase (five years) the opening of a few CESAMEs, could be planned, at least one in Europe and one in Africa. These early centres will host the first training teams and thus play a major role. They will not only have the mission to provide the first intercontinental IBSE training sessions, but also to help the launching of other new CESAMEs, coordinate internationally the IBSE workshops, develop the charter and terms of reference characterizing a CESAME centre, and even lead fund raising activities for the first years of the network. Another crucial mission will be to develop adequate tools, in order to ensure a follow-up at distance, through Internet, of the local activities triggered by the persons having attended a workshop. Right from this initial phase, the CESAME centres should be connected to one another.

The second phase, after five years, should initiate the true building up of a network, with a longer-term plan to disseminate IBSE pedagogy and structure links within the whole AME region. As more and more intercontinental CESAMEs are established, they could be

interconnected to one another as a hub-and-spokes network in which each spoke is internationally linked to a few hubs which develop together. Then, the CESAMEs, having already found their cruise regime, may give rise to new initiatives.

Institutions with an already existing mission of teacher education (or training of teacher educators) may wish to join the project and launch a CESAME centre for various reasons: gain expertise in the IBSE pedagogy; get better acquainted with living science; enlarge their disciplinary breadth; share their expertise with other centres; or extend their geographical reach through international actions; etc. Other putative CESAME centres could be in the process of being established in a scientific city and wish to start on the best tracks thanks to the IBSE method. Other applications could come from scientific research centres wishing to enlarge their mission to teacher education activities, in order to better disseminate in society their passion for science.

D) Conclusion and perspectives

The plan of action for launching the first phase of the CESAME project is currently being elaborated by the Steering Committee. It includes a call for expressions of interest from science academies and other potential hosting organizations in the AME region, the basic idea of which having been approved by the Executive Committee of IAP in April 2017. The establishment of a CESAME Centre will rely entirely upon the availability of a suitable site located in a scientifically active environment, offered at no cost by a local organization/institution. Negotiations with some institutions or places that have already shown interest to host a CESAME will continue in the hope that these potential CESAMEs can be proposed to political authorities and sponsors during the Paris AEMASE III conference on 3-4 October 2017. It is anticipated that the running costs for a Centre to be established in Europe will be in the range of 600.000 euros per year.

The teacher educators who will attend a CESAME training workshop, be they from the same country or from abroad, will necessitate a support from their own national educational authorities for permission/replacement and for transportation/flight costs. Specific agreements will thus have to be signed between each CESAME Centre (or the AEMASE Network) and the national Ministries of Education. The Paris conference could therefore be a place to launch discussions with political and educational authorities about these aspects of the project. It is also an opportunity for a potentially interested Academy, or group of organizations, to interact with the AEMASE Steering Committee.

There is thus the hope that some “Premise for CESAME centres” can be presented at the Académie des sciences – Institut de France in Paris early October 2017, in front of a wide audience of scientists, politicians and sponsors. This is how we hope to start on the road to improving the quality of science education for all.