STEM initiatives have been in place for almost a decade in the US and have fast taken hold in many countries around the world. But what is the true impact of these initiatives, and is there still some way to go before the benefits are felt?

In this edition, we ask researchers: how has STEM influenced your research; and are such initiatives encouraging growth in a national knowledge economy or the dispersal of talent to other parts of the world?
Dr Rafael Romero
(Brain Research Institute, University of California, Los Angeles, USA):

Although it is true that STEM initiatives have been having measurable short- and medium-term impacts, I believe that it is still too early to know what the long-term benefits will be. This is not to say that the current initiatives are defective, but rather that the lasting effects will only become obvious in the following decade(s). We need to wait until the students that were impacted by today’s initiatives move through the education pipeline to be able to truly gauge the growth in the knowledge economy. That said, I have no reason to believe that these STEM initiatives will fail. It is now obvious to scientists and pedagogues that we were teaching science incorrectly in the past, focusing too much on facts rather than processes. As we change the science curricula to address those shortcomings, more students will start to realise that science is more a way of perceiving the world and thinking about it than simply a meaningless collection of facts. In other words, more bright young minds (that would have otherwise been bored by what they thought was science) will consider the disciplines as an exciting and vibrant career option, and it is this that should ultimately improve the growth of the knowledge economy.

Dr Jalila Jbilou
(Centre de formation médicale du Nouveau-Brunswick, Université du Moncton, Canada):

I am registered as a mentor through the Canadian Institutes of Health Research (CIHR)’s Synapse Program. I have also been involved as a judge for Canadian sciences fairs. My field of research is educational interventions to promote healthy practices in men. STEM initiatives are critical in my field. Indeed, my project is based on an interdisciplinary approach where technology, science and mathematics are integrated at all levels. The project allowed training for postgraduate students in a learning context where rigorous methods and concepts are combined with applied and real-world, problem-based experiences. STEM initiatives in education and training enhance public health human capital by providing researchers who can continue the R&D that is central to the economic growth of our country. It has helped improve public health with basic and applied research, and led to effective educational interventions, technology innovation for health promotion, and statistical methods for gender mainstreaming analysis.

Dr Philip D McLoughlin
(University of Saskatchewan, Canada):

The public I encounter are increasingly savvy about the need for science- and evidence-based policy decision making. In the fields of ecology and conservation biology, this is especially encouraging. The greater the exposure to STEM and the critical thinking skills promoted by these initiatives, the easier it will be for society to make correct, even if unpopular, decisions on how to conserve our planet’s species and resources based on solid research and evidence.

Dr Alireza Aminsharifi
(Shiraz University of Medical Sciences, Iran):

The curriculum of surgical training has been revised dramatically since the introduction of minimally invasive surgery. With the help of STEM initiatives, virtual aviation and navigation simulation technologies have been applied to train new residents, and by simulating the real surgical environment managed to reduce operative time and intraoperative errors. During the previous two decades, rapid and extensive advancements in the field of computer and medical engineering have also revolutionised the technology of surgery. Such abrupt and radical change in a short period of time resulted in changing the surgical milieu from large incisions (open surgery) to key-hole surgery (minimally invasive surgery).

Laparoscopic and endoscopic surgeries were the first of such technologies and now robotic surgery, surgery through natural body orifices (scarless surgery) and tele-surgery are emerging into the field thanks to interdisciplinary contribution of STEM technologies.

They have placed a digital interface between the surgeon and the patient’s body; for example, laparoscopic or robotic surgery is actually a complex information system – we either look at internal organs and operate on them using a digital monitor, or use surgical robotic arms controlled by digital signals produced by a computer.

Laparoscopic and robotic surgical procedures make minimally invasive surgery and even tele-surgery a reality today – a magnified operative view, tremor free hand motion and improved dexterity result in more precise surgery with less tissue injury and quicker recovery.
Dr Felecia Nave  
(Prairie View A&M University, USA):  
With regard to impact in the field, when you look at the numbers it has not had the impact that I am sure they were expecting because, percentage wise, we have not made much movement in terms of minority and women participation. It is still just as low as it was several decades ago and we know that with our population ageing and with individuals in those positions retiring or just moving on, we do not have enough engineers to replace them. On the other hand, it has been project that by 2050 the US will be a ‘majority minority country’. Minority students tend to present the biggest challenges in terms of interest, preparation and retaining. Because the US continues to struggle with this challenge it impacts on our ability to stay innovative; we must engage, inspire, prepare and then retrain minority populations because they will be the majority in the future.

We are trying desperately to increase all students’ knowledge internationally. We tell our students that ‘your competitor is no longer the guy next door or the guy in the next state; your competitor is someone who may be 3,000 miles across the world’. My university tries to expose students to other languages, cultures and experiences; so they know how to interact with other professionals from other countries who may have different customs, and so forth. If our students are to compete, it’s our responsibility to make sure that we are infusing that as part of our educational system. Schools across the US are establishing international offices to allow students to study abroad or partake in foreign exchange programmes. Chinese and Arabic are becoming popular language choices for US students as these countries become more prominent in the global arena. From this perspective yes, it’s truly global.

Professor Andrew KS Jardine  
(University of Toronto, Canada):  
With regards to my institution, the University of Toronto’s Faculty of Applied Science and Engineering is committed to delivering K-12 STEM outreach. Our aim is to educate and inspire youth to pursue careers in science and engineering; foster education in STEM; develop positive relationships between the University and the community; enhance the student experience for our current undergraduate and graduate students through the delivery of outreach programmes; and recruit undergraduate students by giving them first-hand experiences of engineering education. Their programmes fall into two different categories – outreach and enrichment. Our outreach programmes acknowledge there are many children and youth who do not see themselves as being successful in the areas of STEM, so these programmes are meant to inspire and excite, while our enrichment activities expose students to experiences greater than those offered by the regular school curriculum alone.