

# التقدم العلمي

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AL-TAQADDUM AL-ILMI



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## Knowledge Economy and Facing New Global Challenges

In this issue, we try to shed light on the economic transformations the world has witnessed since the entry of the third millennium, in the so-called knowledge-based economy, where knowledge makes a significant contribution to economic growth based on modern information technologies and applications, and on human resources equipped with, innovation, talent, and creativity.

The world is witnessing a rapid trend toward an economic future; the most important elements of which are sustainable development based on knowledge-based investment and reinforcing intellectual capital. This can only be achieved through a qualitative shift from the traditional economy based on single sources such as oil or coal, to an economy based on the Fourth Industrial Revolution; digital transformation in information and communication technology, data investment, artificial intelligence, e-commerce and smart cities.

He who has knowledge is he who has power, so most developed countries carried out radical reforms of their

education systems. There is a direct relationship between the quality of education and the role that educational curricula play in achieving the knowledge-based economy that depends on it in the process of development and advancing the development wheel.

Thus, many countries that do not have natural resources, such as South Korea, Japan, and Germany, jumped to the forefront of modern societies. E-learning technologies have become effective solutions to meet the challenges facing the educational system, as they have produced a generation capable of acquiring new basic skills, self-learning, and continuous learning. Therefore, this became an urgent matter to keep pace with future labor market variables.

It is clear that some Arab countries have not adequately caught up with the trend toward a knowledge-based economy so far, but they sense the importance of this trend, its dimensions, challenges, and opportunities. Some Arab countries, such as the Kingdom of Saudi Arabia, are making vigorous efforts to shift toward a knowledge economy through massive development projects to build smart cities that exploit clean energy, smart mobility solutions, free high-speed internet networks, and integrated digital governmental services.

The UAE also launched its strategy to enhance its position as a global center for the Fourth Industrial Revolution and to achieve a national economy based on knowledge, innovation, and future technological applications. The UAE also seeks to develop artificial intelligence tools and integrate them into the government processes in all its regions, to raise the level of quality and effectiveness of governmental services.

It has become imperative for Arab countries to focus their efforts on investing in the communication and information revolution, as well as supporting sustainable development by developing the pillars of the knowledge economy, reforming the education system, enhancing the human resources from its nationals, and building their capabilities away from the process and skills of traditional education that will not be able to keep pace with and meet the requirements of the twenty-first century.

**Editor-in-Chief**

**Dr. Salam Ahmad Al-Ablani**

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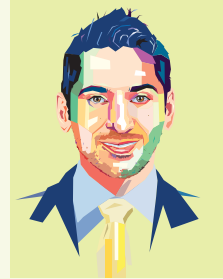
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هل تبحث عن مجلة تقدم إليك أعمق المضامين  
العلمية وأسرار الطبيعة بكلمات ميسرة وأشكال جميلة؟  
إذا كان للعلوم مسار، فالمنطلق مجلة

مسار



## Virtual Book Fair Has it Covered

As traditional book fairs are cancelled due to the COVID-19 pandemic, a digital version organized by KFAS aimed to attract half a million virtual visitors in August



As large gatherings are discouraged for the risks they pose, the Advancement of Sciences Publishing & Distribution (ASPD) held a virtual fair to allow people to feed their hunger for books.

Organized by ASPD, a non-profit subsidiary of KFAS, in collaboration with the National Council for Culture, Arts and Literature as the strategic partner, the idea emerged at a brainstorm session in March, giving the organizers less than four months to bring their ambitious plan to life.

“The fair, called E-Raf, creates a virtual venue adapting to the new normal,” said Layla Al-Musawi, CEO of ASPD and program manager of the Scientific Culture Directorate at KFAS. She noted that this would not have been possible without the heavy investment of ASPD in the previous years in digital

transformation, and the development of a robust E-commerce platform.

The event also helped publishers who traditionally rely heavily on annual book fairs, she said.

More than 30 publishers, mainly national publishers, took part, with more than 2000 fiction and non-fiction titles featured in the virtual book fair. The diverse selection catered to all tastes, ranging from literature and philosophy, to nuclear physics, self-enhancement and children’s books. There was no cost to browse, with special discounts on price and shipping. E-Raf offered a wide range of products and services targeting readers seeking books in Arabic and other languages. All books, including signed copies, were securely purchased through the platform and shipped.

A variety of cultural and educational virtual events were conducted using video conferencing; beginning with an opening ceremony, and including the opportunity to meet authors and attend seminars, book signings that were held for selected authors in filmed sessions where they presented their most recent offerings, panel discussions, poetry recitals, and concerts.

The organizers wanted E-Raf to be a forum for today’s reality. An online public lecture in conjunction with Kuwait University’s English Language and Literature department addressed the impact of the pandemic on literature. Also, a publishers’ workshop discussed challenges, opportunities, and trends in the current landscape. The audience interacted with presenters through chat functions managed by moderators.

Children got their slice of entertainment too. Storytelling and a puppet-making session were held in controlled online rooms.

“In the current lockdown conditions, the book fair will shift the media’s attention back to books and reading,” said Al-Musawi.

She hopes E-Raf can evolve to become a virtual arm of a traditional book fair. “I really hope that we can copy this knowledge and what we have developed to bigger book fairs,” she said.

## Enara E-Learning Enables Education During Lockdown

A new Kuwaiti e-learning platform intends to help students bridge the gap of disrupted formal education



Ziad Najem

When schools went into lockdown before finishing the academic year, KFAS Academy launched Enara, an online resource to provide students with a full learning experience from home.

“KFAS stepped in to find a way to keep students engaged,” said Ziad Najem, CEO of KFAS Academy. He referred to Enara as a refuge for students where they could find reliable learning resources.

Najem said this was a stopgap measure based on a belief at KFAS that interruption to learning for such a long period was detrimental. “Anybody who worked in teaching knows how hard it is to start the engines back again after a summer holiday,” he said.

Enara is part of the KFAS Emergency Resilience Program (ERP), a comprehensive plan produced to support the Kuwait community during the crisis.

Acting as a hub, Enara freely provides educational content by local vendors, in line with the curriculum of the Ministry of Education, targeting mainly public school students from first to twelfth grade.

Using a user-friendly interface, the website offers tutorials for self-learning divided according to grade and broken down by subject and chapter, mirroring a lesson in a textbook. Students choose a session that suits their needs, such as an explanation video or an exercise, giving them more independence and control.

“The journey is simple. Register. Choose your subject. Choose the lesson. Start learning,” said Najem.

To continuously improve quality and meet industry standards, the platform invites students to evaluate its content. Flagged items are removed immediately and investigated. KFAS Academy also intends to review content through a panel of teachers and instructional designers.

“The Enara educational platform is characterized by a high level of quality technical specifications,” said Khaled Alrasheed, an associate professor at Kuwait University and the former general director of UNESCO Kuwait. “It opened up traditional curricula by diversifying sources of knowledge.”

The licensing agreement requires Enara to stop operating at the start of the new academic year, so the future of the platform is now under discussion. “My main objective was to position KFAS Academy as a reliable entity that can work with both government and private sector, that can come up with a workable solution,” Najem said.

Looking ahead, Enara has different initiatives lined up to support education during the pandemic. ‘Enara Teach’ will train teachers to deal with education in a virtual environment, while ‘Enara at Home’ will help parents address the challenges of their children’s online home schooling.

For more



## Seeing Kuwait's Nature Through a New Lens

Wildlife photography program promotes awareness of local biodiversity



Common Kingfisher photographed by Majed Almunafi

It took him three days to get the photograph he wanted, but finally, after hundreds of clicks of the camera and many failed attempts, Majed Almunafi had a close-up shot of a breeding Dalmatian Pelican. The photo perfectly captured the bird's piercing, sky blue eye, framed by folds of yellow-orange skin, a crest of silvery-white plumage and a glimpse of a fire-red throat pouch poking out below the gray bill.

"When I saw the eye, I felt the beauty of the species," said 16-year-old Almunafi, an aspiring engineer at the Academy of Giftedness, a KFAS-affiliated high school.

The experience, gained during a trip to Lake Kerkini in northern Greece, was part of KFAS's inaugural Nature Ambassadors program, a training initiative to expose Kuwaiti teenagers to the natural world through wildlife photography.

Almunafi may have taken his image more than 3,000 kilometers away from his home in Kuwait City, but those majestic birds have occasionally been sighted on Kuwait's Bubiyan island, a patchwork of salt marshes at the head of the Arabian Gulf that serves as an important stop-over for migrating birds.

This helped Almunafi and his fellow students develop a newfound appreciation for the biodiversity of their

Nature Ambassador students during their trip to Greece



Nature Ambassador students on a field trip in Kuwait



home country. "I was a bit shocked when I saw the nature of Kuwait," said Almunafi's classmate, Sulaiman Alrabiah. "I really only knew the tip of the iceberg."

Over the course of the program, the group went on excursions to cormorant-covered shipwrecks, distant pelican breeding grounds, and nature reserves where flamingos roost. Through classes on Kuwait's hundreds of birds and

mammals and instruction in camera skills and drone photography, Alrabiah and Almunafi began to view the world around themselves differently.

On their return the students were inspired to create a photo exhibition to show others the beauty and breadth of nature in their own country. All the participants of the program also displayed their works to the public at The Scientific Center of Kuwait in May 2019.

"That's why we call ourselves ambassadors," Almunafi said. "After learning all about the Kuwaiti ecosystem, our goal is to pass on this information and spread the message that we should care for Kuwait's environment."

A second cohort of students started the Nature Ambassadors program last year. In March, however, all activities were put on hold due to the COVID-19 pandemic.

The group was originally hoping to take a trip to Kubbar Island in August to photograph breeding terns that migrate to Kuwait from Southeast Asia, but the pandemic put the trip on hold. Omar Alsayed Omar, the program coordinator and deputy team leader of Kuwait's Environmental Lens, a volunteer wildlife photography organization, hopes the students will still get a chance to gain that experience and to develop their camera skills.

In his opinion, the program is about much more than learning camera skills, though. "It is not only about photography. It's about art and science and care for the environment," he said. It aims to instill a sense of stewardship, responsibility and pride.



## Kuwaiti Investors Take on COVID-19 with Better PPE Staff at a KFAS-backed innovation hub are developing and making products with improved defenses against COVID-19



A KFAS-affiliated technology incubator and school for talented pupils is manufacturing improved personal protective equipment (PPE) items to help in the fight against COVID-19.

The Sabah Al-Ahmad Center for Giftedness and Creativity (SACGC), in Kuwait City, has produced and distributed tens of thousands of face shields, mask belts and touch-free door opening devices.

Since the COVID-19 outbreak, designers and engineers at SACGC who train and support inventors, have turned

their skills to making PPE that offers better protection from the virus than similar products.

“Even during the lockdown, the team continued to come up with ideas and ways to make products to help people get through the pandemic,” said Mahmoud Zaman, of the Technology and Development Department at SACGC. “We felt it was our turn to give something back to the public.”

Face shields made at the center, for example, are held in place with a thick, flexible rubber band and fit all head sizes.

Their flexible plastic screens are larger than other models improving defense against the virus. The center had produced more than 100,000 shields by the end of July.

SACGC staff have also made some 15,000 hook devices that owners can use to open doors and press buttons, such as those on bank ATMs and elevators, without touching them directly. These letter J-shaped acrylic tools are lighter and easier to handle than other available devices, and small enough to be carried on a keychain.

Instead of letting them gather dust during the lockdown, the center’s engineers used its 3D printers to produce around 10,000 mask belts. These plastic straps go around the back of the head and hold face masks in place. They are more convenient for women who wear headscarves in public and can prevent ear discomfort caused by wearing standard masks for long periods. Unlike some other mask belts, they also fit all head sizes.

The PPE items are given away for free, with priority going to those whose jobs are part of the fight against COVID-19 or involve regular contact with the public, such as healthcare workers.

Every year, SAGGC admits 50 boys and 50 girls with top science and mathematics results in fifth grade to its enhanced schooling program, starting in sixth grade. The center provides support for inventors such as patent registration, prototyping, advanced equipment, and help with getting products to the market. It also runs free training courses for school pupils in technologies such as 3D printing, coding and robotics.



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## Plotting a Bespoke Approach to Treatment

A physician and blood cancer researcher, Salem Al-Shemmari pursues the latest in cutting-edge concepts including precision medicine

For more



ILLUSTRATION: NAIF SHAQUR

Salem Al-Shemmari, an assistant professor at Kuwait University, has dedicated his career to the study of hematology, treating diseases related to blood. He divides his time between teaching medical hematology, researching biomarkers, and implementing precision medicine in Kuwait.

Precision medicine is an innovative approach that aims to offer cancer patients a personalized treatment which takes into account their genes, environments and lifestyles. With this targeted treatment, a patient does not have to endure chemotherapy and often can avoid being admitted to hospital, instead receiving care as an outpatient.

To provide patients with the right precision medicine, researchers and practitioners first look at biomarkers. “Biomarkers tell you about the disease and whether it will respond to a specific treatment,” Al-Shemmari explained. “I think that is where you become wiser in selecting a specific treatment.”

Al-Shemmari’s interest in the area began when the biomarker JAK2 was discovered in 2005 as part of the diagnostic criteria for myeloproliferative neoplasms (MPN) blood cancers. A year later, Al-Shemmari implemented the method in Kuwait, and now, the research hematology lab at Kuwait University is a reference lab to confirm MPN diagnosis.

Al-Shemmari’s current research explores the application of precision medicine in treating chronic lymphocytic leukemia. He also established the Lymphoma and Bone Marrow Transplantation clinic in 2000.

### A lifetime passion for hematology

As a young child growing up in Kuwait, Al-Shemmari liked watching medical series and was impressed by the doctors he saw on television saving patients’ lives. These series inspired him to get into medicine.

He added that he specialized in hematology to try to understand a subject he thought was mysterious. “When I was a medical student, I always hated this subject because I thought this is a black box that is hard to understand,” he said. “Then you see patients and you start to realize you can make a difference in their life, so I grew interested in understanding this black box.”

Al-Shemmari graduated from Kuwait University in 1987, and then became a resident at the University of Western Ontario in Canada where he specialized in hematology. He then completed his fellowship in bone marrow transplantation at Fred Hutchinson Cancer Research Center in the United States in 1995, before returning to Kuwait in 1996 to establish himself as a consultant hematologist specialized in treating malignant blood disorders. He joined Kuwait University in 1997 and is proud to be part of its team.

His most recent research looks into chronic lymphocytic leukemia (CLL), a cancer of the blood cells that affects older people. Al-Shemmari will collaborate with Kostas Stamatopoulos from the Institute of Applied Biosciences, Centre for Research and Technology Hellas (CERTH) on that research, and their findings are due to be published in 2021.

“The purpose of this research is to collect biological data about the disease in Kuwait and understand what treatment strategies we have, and implement precision medicine in management of CLL patients,” said Al-Shemmari.

Stamatopoulos explained that CLL has been characterized far better in Europe and the US than in Arab countries. “We are particularly missing information about the Arab countries and their populations,” he said.

The studies by Al-Shemmari, according to Stamatopoulos, will hopefully lead to the discovery of new information from this largely unexplored area.

“Research makes you question everything, and you try to find out if what you were taught is correct or not, or [if] sometimes you can improve on it,” Al-Shemmari said. “For me, it is really

transformative because you can bring this hyper technology or knowledge to Kuwait and to the clinic.”

### The man behind the white coat

Al-Shemmari is respected by his collaborators. “He is very well educated, motivated, enthusiastic, and has common sense,” Stamatopoulos said.

As a compassionate physician, Al-Shemmari believes in building a good relationship with his patients. “You need to make the patient feel important,” he said. “You should give them the time to speak and express their feelings.”

Al-Shemmari also believes in the value of collaboration, “It is just fact that many academic institutions in Europe and the United States are already ahead of us in the area of hematology, so we collaborate with them to benefit and build on that knowledge.”







## Getting Between the Layers

Fahad Alsenafi, a physical oceanographer who studies the dynamics below the surface of the Arabian Gulf

For more



ILLUSTRATION: NAIF SHAQUR

At Kuwait University, assistant professor of marine science and physical oceanographer, Fahad Alsenafi is trying to understand the physical processes that shape the movement of water in the Arabian Gulf. “Everything that happens in the Gulf – from fish kills and algal blooms, to the movement of pollutants or nutrients – is related to the physical dynamics of the sea,” he said. The combination of the Gulf’s shallow waters and sweltering summers also offer physical oceanographers a unique ‘natural experiment’ with which to investigate these dynamics.

Alsenafi’s career began in Ayal Anis’ lab at Texas A&M University, in the United States. During the course of his PhD, he studied how dust storms and the hot and dry Shamal winds affect circulation in the northern Arabian Gulf. By combining data from observations within the water column, such as temperature, salinity and density, with meteorological data, he worked to understand how weather systems propagate across the air-sea boundary and influence the dynamics of the water.

The data they gathered hinted at something unexpected. “We detected some signals of a specific frequency in the middle of the water column that suggested there were internal waves there,” he said. “We wanted to expand on that and see if there were indeed internal waves there or not.”

### Making waves

Internal waves form within a water column separated into different layers. If a disturbing force acts on the water column, waves form at the interface

where these layers meet, just as they do at the air-sea interface on the surface. Internal waves generally are not expected in shallow waters because the water is usually too well mixed for layers to form.

But in the Gulf, high summer temperatures can divide the water into a warm upper layer and a cooler lower layer. “Those are the preconditions you need for internal waves,” said Anis. “So after [Alsenafi] finished his PhD, we wrote a proposal to look at internal waves in the Gulf.”

Internal waves can play a crucial role in marine ecosystems. The waves release a great deal of energy when they break along the coastal slope, which can churn up nutrients or pollutants and lead to fish kills or algal blooms. “It is very important to understand the physics and mechanics of these internal waves as they have impacts on the biology, chemistry, and even the geology of the system,” said Alsenafi.

Alsenafi and Anis designed and deployed a series of moorings to measure the physical parameters of the water column at specific depths and distances from the coast. They also spent five days on a boat in 50-degree summer heat repeatedly releasing and recapturing a state-of-the-art depth profiler to get snapshots of various physical parameters throughout the entire water column. With these data, Alsenafi was able to confirm that internal waves occur in the Arabian Gulf and begin to characterize their behavior.

More work is needed to understand these internal waves and how they influence the physical dynamics of the



Gulf. “As a physical oceanographer, my main interest is to look at these processes and find the best way to model them in order to understand how they work and how they affect the region,” said Alsenafi. But he is also eager to collaborate with researchers in other fields to investigate how internal waves affect ecosystem dynamics, environmental fluctuations or other phenomena.

### Diving deeper

One such collaboration has investigated the microbial communities along the water column. Alsenafi worked with researchers in Oman to discover that the microbial community is vertically stratified, with a clear division at the interface where internal waves form. “Suspended sediment from the seabed pretty much stopped at the interface, so

the deeper layer is turbid and the top clear,” said Alsenafi. “We also had divers going down to check the instruments and they said the same thing: It was clear and then suddenly the water became turbid.”

The composition of the microbial community influences larger communities, such as barnacles and other marine fauna involved in biofouling, which is a serious problem for oil tankers and other transport ships in the Arabian Gulf. Understanding how the dynamics of these ecosystems are rooted in the physical processes in the water column is important to understand them and mitigate the damage they cause.

Alsenafi is also working with the Kuwait Environmental Protection Agency to develop a system to predict



fish kills and algal blooms in the region. The EPA has deployed a network of 15 buoys to collect data, and Alsenafi is working with them to develop numerical models. The predictions will be useful in managing decisions such as the placement of drainage outlets that discharge brine from desalination plants or processed industrial wastewater. Positioning these correctly is crucial to minimize their impact on the ecosystems of Kuwait Bay, which serves as a nursing ground for many fish species.

Many other potential research avenues exist. Alsenafi is currently preparing a grant proposal with labs at the Massachusetts Institute of Technology, the Woods Hole Oceanographic Institute, the New York University Abu Dhabi, King Abdullah University of Science and Technology

and Texas A&M to carry out a full analysis of the oceanographic processes taking place in the Arabian Gulf, and eventually to link those dynamics with models of the Indian Ocean.

“The Arabian Gulf definitely has economic importance, but it’s also like a natural lab,” said Anis. “Because it is a bit confined, things happen quickly there, so you can see the effect of a change quickly.” This offers researchers an ideal opportunity to investigate and understand the physical processes taking place.

Alsenafi is taking the first steps towards building a model of the oceanographic dynamics of the Arabian Gulf. He is evaluating existing models against empirical data from the Gulf to figure out where they go wrong and what additional processes need to be

incorporated, such as internal waves. “To do that, you need to understand the true physics and have actual field data,” he said.

In the long run, Alsenafi’s goal is to understand the Arabian Gulf waters well enough to predict their behavior in our rapidly changing world, “To do that to the best of our ability, we need to capture every single process, including internal waves.”

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## Retraining the Eye

Cognitive neuroscientist Sharifa Alragam helps Hemianopic Alexia stroke patients regain their love of reading

For more



By Reham Alawadhi

ILLUSTRATION: NAIF SHAQUR

Imagine sitting on a train looking out the window. As the train picks up speed, your eyes land on your surroundings, tracking the movements. When your eye moves back and forth as things zoom out of sight, it induces involuntary eye movements that train the muscle: this functions as a form of therapy for people with Hemianopic Alexia.

Hemianopic Alexia is a reading disorder that occurs after a stroke or head injury. This disorder occurs after a bleed in the back of the head affects the eyesight, leading to blindness over half the field of vision. This is called a Hemianopia.

People with Hemianopia track text with extra eye movements to compensate for the vision loss experienced and this is what leads to Hemianopic Alexia.

Sharifa Alragam, an assistant professor at the College of Basic Education in the The Public Authority for Applied Education and Training in Kuwait, created a reading application, called Arabic Read-Right, which utilizes scrolling text to help retrain the eye movements; making reading easier and quicker for people with Hemianopic Alexia.

With a bachelor's in psychology, a master's in clinical speech pathology, a master's in cognitive neuroscience, and a doctoral degree in cognitive neuroscience, Alragam knew she wanted to work with people, but didn't know how and which path to take.

Early on in her undergraduate studies, she figured out she wanted to work in either physical, speech, or occupational therapy. After working with several different types of impairments

during her 13 years as a speech and language pathologist, Alragam realized she really wanted to focus on stroke patients.

The field of neuroscience, according to Alragam, is quite big in Kuwait, however, we are lacking in terms of neurorehabilitation, so there aren't many options for stroke patients. There are only a few speech pathologists in Kuwait with master's degrees and those with doctorate degrees all happen to be working in academia, she said.

"We have stroke units in different hospitals, but they just do assessments; nothing in terms of rehabilitating those patients," she said. "Then they fall between the cracks. They come for one or two therapy sessions then get bored or people are not qualified enough to help them, so they decide not to come [anymore]."

Alragam left her job to pursue neuroscience and this was when she came across the original English Read-Right app. One of her supervisors at the University College London, along with a group, created the English Read-Right app. The therapy in this app was designed for left-to-right languages like English, making it ineffective for Arabic and other right-to-left languages.

The app can be used to diagnose whether or not a patient with Hemianopia has Hemianopic Alexia. After that, they have to begin with the first set of assessments within the app, then Alragam can teach them how to start with the therapy.

Arabic Read-Right is currently only available on Apple tablets as they have the most widely used operating system



in the Gulf, according to Alragam's research. The app is not only for the tech-savvy either, as she's had people easily grasp how to use it even when they've never used any app before.

In addition to aiding with a clinical diagnosis of Hemianopic Alexia, it also provides portable therapy. This means patients can practice anytime and anywhere, giving them more practice hours beyond the clinical setting. Since there are so few speech therapists in the Middle East but many patients, online treatments are the way to go, according to Alragam.

With patients having access to therapy in their own time, it leaves the speech therapists with more time to see additional patients who need the face-to-face treatments.

And although the app is very specific to the need of patients with Hemianopic Alexia, Alragam has also found that cognitively - in terms of searching for objects - processing

becomes much faster after using the app.

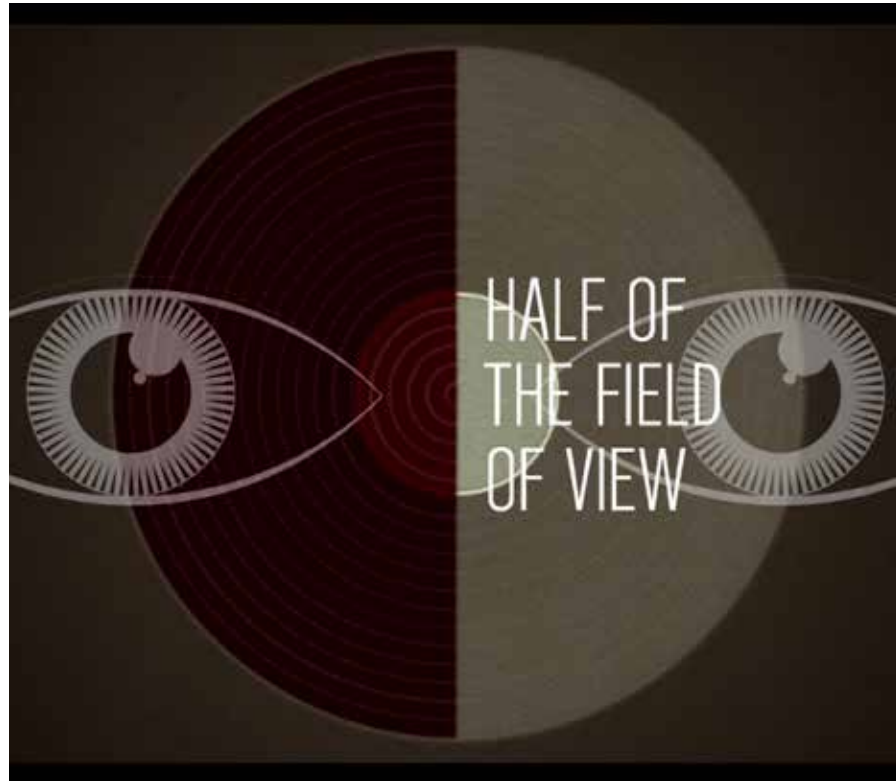
The treatment needs to be done between 30 minutes to one hour a day and they also need to accumulate 12 hours or more overall to see any kind of improvement.

The therapy consists of laterally scrolling text, which patients can control the speed, color, background, and content of. There's a library of books including the Quran, as well as an RSS news feed from the Al Jazeera website.

So far patients have developed better eye movement coordination, improved the speed of reading static [non-moving] text, and some have even been able to go back to work at the age of 45 and above. It also boosts their confidence and many of them go back to reading for pleasure once again.

"Hemianopic Alexia patients don't complain about not being able to read, their reading is effortful, so they disregard reading altogether," she said.





**We have stroke units in different hospitals, but they just do assessments; nothing in terms of rehabilitating those patients**

“If [their job] requires reading for work, it’s no longer a barrier. It doesn’t just help them in terms of improving their reading, but also helps their functioning quality.”

Making the Arabic version of the app wasn’t as simple as just switching the app technology to work with the Arabic language.

“The Arabic language is completely different and complex,” she said. “We had to completely change the way the scrolling text worked.”

The laterally scrolling text of the reading therapy had to be reversed, the Arabic words had to be chosen carefully, and they had to decide whether or not to put diacritics in the two visual reading tests done before the therapy - as they could cause more visual crowding than

necessary. Another difference is that the English version was for computers only, which meant patients had to be bound to a desk.

Regarding feedback from the app, Alragam can see exactly how the patients are doing and the patients themselves get instant feedback on task performance so they know whether they improved or stayed the same.

Her next step is to begin marketing the app, so more patients are aware of it, not only in Kuwait but across the whole Arab region.

Although Alragam grew up with an extremely supportive family who are avid education supporters, she still faced comments and many obstacles. “Nothing came easily to me. I had to fight to get those scholarships,” she said. “Because I was ambitious and a go-getter, I never let things like that stop me.”

For Kuwait, she hopes to have more training, internships, externships, and teaching-based clinics available for students in different fields because, “Reading and learning is different from applying.”

While Alragam currently teaches in the psychology department - which is just a means to an end at this point - she eventually wants to work with patients again and ultimately open her own rehabilitation center for stroke patients.

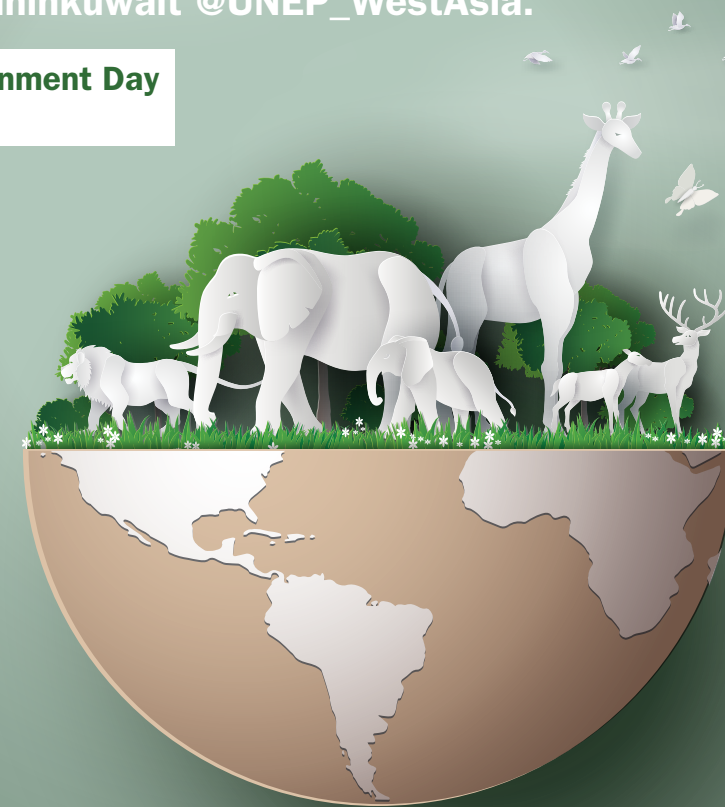
“I only see myself as a clinician. I don’t see myself anywhere else,” she said. “Working with patients is not only an obsession; it’s a pleasure. I love seeing that smile on their faces. I really love making a difference.”

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# Pioneering Genetic Engineering in Kuwait

By Reham Alawadhi

ILLUSTRATION: NAIF SHAQUR

Wearing a jumpsuit like the one usually worn by mechanics, Sabah Almomin stood over an operating table crying her eyes out. Her supervisor told her to leave the room and only come back when her tears were dry.

What Almomin was finding particularly difficult to do, was perform surgery on a sheep for the first time ever. With the smell of the animals and the amount of blood, she had to be strong hearted and build her strength. It was after this that Almomin decided to become a vegetarian.

Eventually, she and her supervisor came up with a compromise because Almomin couldn't look the animals in the eye. They would create a little opening in the fabric for her to perform surgery on, while the rest of the animal was covered during and after the surgery.

On that day 20 years ago, Almomin was learning how to do surgery on sheep in Australia as part of a three-month training program; something that became essential when she decided to delve into embryo transfer and cloning in sheep. Her supervisor had told her, "Sabah now you've learned genetics but what can you do with it? We don't want the classic anymore; go deeper."

Currently a senior research scientist in genetic engineering and molecular biology at Kuwait Institute for Scientific Research, Almomin was one of the first few in Kuwait to get a PhD in genetic engineering in the early 90s, as it was a relatively new field in the region.

Her undergraduate degree from Kuwait University had been in microbiology and botany, and after

graduating she worked at the library of the National Scientific and Technical Information Center at KISR where they gave her a scholarship in 1981 to pursue a master's in information and library sciences. After graduating and working there for a couple of years, Almomin felt like science was calling her back.

She informed them that she wanted to pursue a PhD, even if it was in information science, but they told her they didn't have the need for it. That's when she decided to submit her resignation and get the PhD on her own. People questioned her decision and asked her how she'd be able to afford to pay for her own tuition.

She told them she'd get a job, "I'll work, like everybody else. I'll support myself." Then, suddenly, the United Nations Industrial Development Organization wanted to establish an International Center for Genetic Engineering and Biotechnology (ICGEB) and introduce this to developing countries. It approached Kuwait for two candidates to train in genetic engineering.

Two people were chosen but one of them didn't continue the training and came back. That's where Almomin came in. She started by completing this training for a year, then trained in the lab of Professor Ananda Mohan Chakrabarty, who is the first person to patent a genetically modified organism. Following this training, they finally gave her a scholarship to get a PhD in genetic engineering at the University of Surrey, UK.

Since getting her PhD, Almomin has been quite active in the field of genetic engineering, having worked on

several projects, as well as become the vice president of the World Academy of Sciences for the Arab region. Most of her work has been on projects requested by various governmental entities, as well as identifying local problems and improving them to enhance the economy of Kuwait.

Her first project was working with Brucellosis Bacteria, which causes undulant fever in people and animals. There were a lot of animals dying from this fever at the time, so they designed a probe for diagnostic through the DNA of the bacteria.

She then moved on to become the first in the world to do an embryo transfer and embryo cloning by splitting, on the Naeemi sheep; effectively also making her the first person in the Middle East and North Africa region to clone the embryo of an animal. The first cloned Naeemi sheep was called Dana and this research was at the request of a client, the Kuwait Livestock Company.

Their aim was to increase the production and breeding of this local breed by twinning or tripling its embryos as it doesn't breed as well as desired. They also did interspecies breeding, putting the embryos of the Naeemi sheep into an Australian surrogate, which yielded Naeemi lambs.

Almomin also worked on the population genetics of marine species; starting with shrimp and moving on to the Zubaidi [Silver pomfret] fish. Due to its declining population, Almomin launched a research project to discover the cause behind the depleting population in order to conserve and protect it, which led them to successfully

conduct the first-ever genome sequencing of the Zubaidi.

"I just had this idea to sequence the full genome to preserve for the future," she said. "Let's pioneer in that since we're already working on it. The competition that we had worldwide was China."

The Zubaidi was the most challenging organism that Almomin ever encountered. It's always difficult working in developing countries, she said, because there is no existing information.

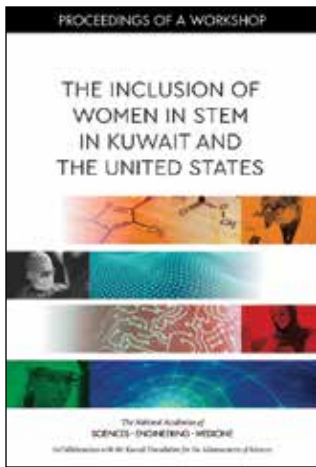
Their research also involved proving whether Kuwait had its own stock of Zubaidi, or whether the fish was migrating to other countries where it was being fished. If it were migrating, they would have had to propose an agreement with the country it's migrating to and if not, then an internal policy to control the overfishing would have to be created.

"I give the evidence and it's up to the policymakers to use it," she said. "The Zubaidi is still endangered due to overfishing. That's why in Kuwait we have a closed season where you can't fish for certain periods, to enrich the area of fishing."

Following this, Almomin's research shifted to flora, where she worked on genetically modifying the Alfalfa plant, in a recently completed project, to extract traces of crude oil and heavy metals to remediate the contaminated soil after the 1990 crude oil spill during the Gulf War.

Her current work involves trying to screen the algae species in Kuwait to find out if there are any products of value that can be produced.

These projects weren't easy to get approved because genetic engineering



was so new at the time and many of her projects were called too ambitious, “Because it’s so controversial, you’re always hitting something that hasn’t been done before,” she said.

She would get asked why she even wanted to delve into such projects and that it was too much for Kuwait to go into these areas.

“You have everything it takes to establish something like that,” she said. “You have the facilities, money, equipment, brains; you have everything. Why stay in the safe area?” She had to do a lot of talking, defending, and thinking outside of the box just to get her projects approved.

Another issue was that they always work with life forms, modifying them. When they worked with bacteria it wasn’t as bad but moving to sheep - a “higher species” - posed several issues.

During her preparation to participate in the Promising Practices for Improving the Inclusion of Women in Science, Engineering, and Medicine:

Lessons from Kuwait and the United States workshop, organized by KFAS and the National Academies of Sciences-USA, she noted that, “You have to go to the media for public awareness and talk to people. You get a lot of questioning,” she said. “You have to face cultural beliefs that you have to justify. You’re trying to find a path; a new path that nobody has walked in. So, you have to dig and do the work until you reach acceptance.”

Although times have changed, according to Almomin, this hasn’t progressed much in ingraining science in the general culture. People are more aware but there is still a lot of misinformation worldwide, not only in Kuwait.

“It’s a controversial issue. You are touching life, you are changing things,” she said. “It’s not only the public - even scientists - you find [ones] against and pro. If you develop anything, you’re going to go through a whole field of barriers because the regulations and policies are not there.”

What Almomin wants to do now is help establish policies so that they can take the results of research adhering to international regulations for releasing modified organisms, and actually put it to good use without having to jump through hoops.

It’s up to the current generation to make it easier for future generations because according to Almomin, the science fields are more challenging now.

“Science has developed so much you need to learn much more. It’s getting advanced by the minute,” she said. “We

started with genetics, then it became genetic engineering, then molecular biology. Then it branched to genomics, proteomics, bioinformatics. When we entered this field it was compact, now it has advanced so much that if someone wants to enter the field, they have to follow a certain branch otherwise they’ll get lost.”

Although there are some challenges for future generations, Almomin thinks they are equipped to handle it.

“The new generation is much more skillful, open to new ideas, and exposed to the media,” she said. “They have the information just through public knowledge, so they know what they want to do and they are up to the challenge.”

Funding science, according to Almomin, is a challenge worldwide but because Kuwait is dependent on one economic source - oil - it’s even more important to invest in science to find alternatives for our economy. It’s crucial to take our science further, especially in developing countries.

“You have to open new minds, new ideas. It’s not just talking about innovation, you have to make the environment available so people can innovate in it,” she said. “Invest in science. Invest in scientists. Invest in people.”

For more

