

EDUCATION 2.0

CHRONICLES OF TECHNOLOGICAL
AND CULTURAL CHANGE IN EGYPT

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6. Rethinking Assessments for the Digital Age: Interview with Deena Boraie

*Linda Herrera*¹

Abstract

Deena Boraie, Senior Advisor for Assessment, Examinations, and Curriculum (2017-2022), worked with the Minister of Education Tarek Shawki to revise the system of assessments. They set out to mitigate the corrosive effects of high-stakes exams which contribute to a system of memorization in place of critical thinking and drive an unregulated market of private lessons. They introduced electronic exams, new problem-solving questions, and attempted to move towards a cumulative Grade Point Average (GPA) system for high school, but encountered roadblocks. During the COVID-19 pandemic, they introduced research projects in lieu of exams, though that experiment became compromised as people bought and sold projects in large numbers. Finally, Boraie discusses digital transformation and how teachers must adjust to new realities.

Keywords

assessments, cumulative grade, digital transformation, electronic exams, high-stakes testing, private lessons, Thanaweya Amma, TIMSS, PIRLS

1 This interview took place on 10 and 14 June 2021 in Cairo.

1. High-Stakes Exams and the Problem of Private Lessons

LH A feature of the education system in Egypt has been its unregulated system of private lessons, or the existence of a 'shadow education system'. What is your explanation of why private lessons persist despite numerous interventions over the years to curb them?

DB² First, there is the economic component of teachers who have not been paid well for many years. In fact, a former minister of education, Dr. Hussein Kamal Bahaa El-Din (1991-2004) famously said, 'We pretend to pay the teachers, and they pretend to teach'.³ I love this statement because it is exactly true until today. That is the situation. Teachers do not teach. I mean, they do not teach in schools. So, how do they teach? There is the whole parallel economy, the system of private lessons that has effectively broken the education system. Learning does not happen at the school. Teachers give private lessons to their own students outside of school. It has become a corrupt system. Teachers have become corrupt, and they do not even know that they are corrupt.

Teachers must be models of ethics and integrity. In my own code of ethics as a teacher, it is forbidden (*haram*) for me to give a private lesson to my student because I am grading my student. The whole system, the whole teaching profession, has become terribly corrupt. But I also understand poverty, which is a horrible thing. It is easy for me sit in this luxurious environment at AUC (American University in Cairo) to judge others. It is a dilemma, and it is very hard to come to terms with it.

The Thanaweya Amma is the root cause of all this. And there is also the Grade 9 exam (at the end of middle school). The fact is that we have this difficult situation because of the high-stakes exams. We cannot dismantle everything, and we could not touch the holy Thanaweya Amma (which is protected by law). Instead, we tried to come up with a

2 Deena Boraie was Senior Advisor for Assessment, Examinations, and Curriculum at the Ministry of Education and Technical Education from 2017 to 2022. For a comprehensive account of her professional life, see her LinkedIn profile (<https://eg.linkedin.com/in/deena-boraie-36b75410>).

3 The late Hussein Kamal Bahaa El-Din, former professor of paediatrics at Cairo University, was the longest serving Minister of Education in Egypt, having held the post from 1991-2004.

new system where students have a cumulative grade based on multiple opportunities.

LH What was the reasoning behind trying to implement a cumulative grade system?

DB We wanted to move away from that one-shot exam because that is what is killing students. Anyone can do badly on a test on a particular day. There should be multiple opportunities to take a high-stakes test, at least twice a year as is the system in many countries. This was the model that we came up with. We designed a cumulative system where the student would gain a percentage in Grade 10 because we want them to actually go to school, we have a problem with high student absenteeism, an additional percentage in Grade 11, and another in Grade 12. These three percentages would constitute the majority of the total cumulative score. The resistance and pushback were unbelievable.

LH Why do you think there was such fierce resistance to the idea of a cumulative grade? Did that take you and Dr. Tarek by surprise?

DB Of course, we expected resistance, but not to that extent. It was almost like life or death for them. It was hurtful to hear all the anger. We were thinking academically, I mean logically. We thought we would be easing the pressure by not putting everything in one basket. We were giving students multiple opportunities. But we did not realize how private lessons had become a nightmare, how much teachers were blackmailing or enforcing them on their students, and how it had become a huge financial issue. From the parents' perspective, the concept of a cumulative grade over three years was horrifying. They said: 'Oh my God, I saved for lessons for one difficult year for my daughter or son to pass the Thanaweya Amma, and now you are going to make my life three years of hell trying to get the money for the private lessons!' That level of financial pressure did not occur to us, and it is valid. That is why we started backing down on the dream. We also wanted to change the Education Law (a prerequisite to changing the Thanaweya Amma) but we failed because the parliament was opposed to this. And yet we have continued, we have not stopped. We had to go back to rethink and redo the changes because our aim was not about getting our way but

about ensuring deep learning. That is what we have been after, getting students to acquire skills, trying to move them away from memorizing.

LH Without the political support from the parliament, and with parents pushing back against your initiatives, what means do you have in your toolkit to revise the Thanaweya Amma?

DB We started a redesign of the Thanaweya Amma exam itself. My recommendation to Dr. Tarek was not to try to do anything with the existing, '1.0' curriculum. We cannot undo everything fast or redo everything fast. We thought perhaps it would help to give students multiple attempts to sit the exam, but only if the higher education system would allow this. So, that is one of the ideas we will look at again. We also need to consider new subjects in high school because there are new subjects nowadays like Artificial Intelligence (AI), Robotics, and Information Technology (IT). There are subject-specific areas that we can introduce into the curriculum so that students are ready for the new world. That is what we are planning and how we are going to approach the Thanaweya Amma. We are also changing the questions away from memorization towards more critical thinking.

LH How can just changing the types of questions on the Thanaweya Amma foster more critical thinking?

DB I am going to give you a simple example. In the old exam there would be a question in biology to define photosynthesis. In the new approach, instead of asking for a definition, the exam will provide a scenario or a description of photosynthesis in a couple of sentences, and the question will ask them to define what it is. So, whereas we used to measure memorization, now we are measuring understanding. It is that simple. In the Arabic or English language exams, students were given a story pulled from one of their textbooks. They would memorize all the stories. The whole purpose of stories in a language curriculum is to teach students the skill of comprehension, not memorization (see Chapter 16 in this volume). So, we are trying now to focus on assessing reading and writing skills, not memorization of texts. The Arabic and English exams no longer have a story from the textbook. We give them an unseen text, and we expect them to answer questions to make sure they know how to read Arabic or English. From an applied linguistics

point of view, this is the change. We are driving the learning and the teaching in a better direction than the old Thanaweya Amma. Even though the curriculum needs to change, we are just doing that tweak in the exam questions, and for here, that is a massive change. In a few days we are going to start the practice tests, so this is where we are at now. Change is really hard.

LH Why do you think it is so difficult to change the Thanaweya Amma?

DB In general, it is hard to change the education system. Education itself is conservative. I have a theory that introducing change in our Egyptian context is always dramatic. It is a huge undertaking to change the system. And that is why we are very satisfied with that tiny little tweak in the test. This is political because to touch the university admission system (*Tansiq*) you must consider the Ministry of Higher Education and the whole society. And higher education, I think, is even more conservative than K-12. You have professors who are guardians of the system. That is the politics of it.

LH You mentioned the other high-stakes exam that takes place in Grade 9 which determines whether a student will be tracked into a general or technical secondary school. Are you planning to revise that exam too?

DB The Grade 9 exam is like another Thanaweya Amma challenge. Yes, this is the exam that tracks students into either technical education (currently 55%) or general education (45%). If you look at the exam, the way it is designed, the way it is administered, it is an assessment horror story. This exam is not valid, reliable, or fair. To add insult to injury, each governorate designs its own Grade 9 exam. The test specs include only the number of questions and the number of marks per question. There is no focus on learning outcomes, or anything related to the curriculum. It is mainly based on memorization, of course. And what is worse is that the cut-off grade for passing varies across governorates. So, it is a disaster. To me it is the most unfair large-scale test ever.

We have left it for now because we first need to get done with the Thanaweya Amma. I don't know if Dr. Tarek has the bandwidth to start a new battle. Since the Grade 9 exam is administered at the governorate level, all the governors would have to be involved. This means he would likely have twenty-seven governors against him, because in all likelihood

they would not want to change the system. From their perspective, it is all working fine. All the corrupt structures are in place for private lessons, etc. So, we decided to leave it for now.

LH In the absence of being able to change the high-stakes exams which drive the demand for private lessons, what can be done?

DB Nelly (El Zayat) and I would like to propose that we regulate private lessons, that we make them legal. Dr. Tarek did not say no to this, but he said, 'not now'. I do not see the concept of private lessons as inherently wrong. Students are in crowded classrooms and some of them do need additional help from teachers. The problem is the way we leave them to be unethically managed by teachers. We should set up private lesson centers in a legal way so that they pay taxes. This is the right of the country. Teachers should have the opportunity to get extra income, which they need, but they should not teach their own students. We need to legalize a system and regulate it. But this topic is political and there have been lots of counterarguments, especially from the hardliners that private lessons 'are not ethical', full stop. We need to be practical, to balance the politics. This has been going on for too long, you just cannot wipe them out.

LH The private lesson space is expanding with new for-profit digital platforms as well as small-scale online private initiatives. Do you think it is the job of the Ministry to try to regulate them?

DB Even as private lessons go online, we do not have the bandwidth to regulate that space. And for us, the more they go online the better, because this is the way of the future. So, for us, it is very positive. The control is not our problem now. There is another aspect for private education which we are not regulating at all, which is that each private school does what it likes in terms of the platforms they use. We do not have control over the private school online spaces. Private schools serve approximately 7% of the students in the system and so it is not the majority.

2. Designing National Assessments

LH The Ministry partnered with Pearson, a private company, for the national assessments. Were you involved in that decision?

DB It was Dr. Tarek's choice. What I can say is there are several top providers, but he chose Pearson because of their platform. He visited their plant and was very impressed. They have all the technology and know-how that we do not have here yet. We cannot build a platform from scratch. It is just too massive, so we decided we would go for the best. And of course, the important part of the partnership is the developmental part (see Fig. 6.1).



Fig. 6.1 Deena Boraie explaining the assessment platform models at an event for the Egyptian Knowledge Bank, 26 November 2018, Cairo, Egyptian Knowledge Bank Facebook Page, <https://www.facebook.com/photo/?fbid=774633982880344&set=pcb.774634782880264>

LH *Who is Pearson's counterpoint for assessments in Egypt?*

DB We went to the experts in NCEEE (National Center for Examinations and Educational Evaluation). With exams and tests, I am always there as an advisor behind the scenes. But who is doing the work? It is Dr. Ramadan Mohamed Ramadan and Dr. Khaled Mohamed Sayed at NCEEE. I have worked with them in many different capacities over the years. They have great psychometricians. Pearson has taken the NCEEE to the next level. They showed them how to be international, how to

create tests, test blueprints, test maps, and use a computer program that creates tests from the item bank using Pearson's platforms.

LH What is involved in producing national tests?

DB The way to produce tests begins with setting learning outcomes in each subject. Test writers are trained to write test items or questions. The item writers produce many questions for each learning outcome. To produce an exam from a test bank, programmers design a test map which identifies the number and types of questions that need to be assessed. Several test versions can be produced from the item bank. You must have a quality control system per item or question. It is like a factory to produce questions or items for a test bank. As of 2021, NCEEE learned the art and science of test development using the latest technology and methodology. And by the way, this is the first time ever that NCEEE is in charge of the Thanaweya Amma exam.

LH Who used to oversee the Thanaweya Amma before NCEEE took it over?

DB Do you know how the Thanaweya Amma was designed? It was never actually designed by the NCEEE. It was under the supervision of the Ministry of Education person in charge of general education. NCEEE's role was only to produce very brief test specs (specifications) for each subject test. These specs only described the type and number of questions, the distribution of grades for each question, and the overall time allowed for each test. There was no focus on learning outcomes. The lead of every school subject in the Ministry, such as the head of chemistry, the head of physics, the head of English, etc., created a committee (*lajna*) to design the Thanaweya Amma test. After that, they would select two or three university professors for each subject to produce the test questions. The problem was that most of these professors did not have direct contact with schools and schoolteachers on the ground. All the test questions came from the school textbooks, which of course reinforced memorization.

LH Can the NCEEE work independent of Pearson at this stage? Has there been a proper knowledge and technology transfer?

DB Not yet, there is always the big question of technology transfer. The platform itself does not belong to us yet, but our experts know how

to operate it. But what is key is the test, the program that we call the 'test map', that needs programming. I am sure we can get a platform in-house that would house an item bank, but it may take time to set up the other IT components in the system. For the time being we rely on Pearson's support.

LH We know that cheating in exams has been a big problem. Are there ways to design anti-cheating features into the new exam system?

DB The only way to control this uncontrolled cheating is to use this modern approach of multiple-choice questions (MCQs) which are scored by machines. There is no other way forward. That is why we need to change the current law that governs the Thanaweya Amma. The current law is very clear and specifically mandates that only one form of the test can be offered. All students in Egypt must take the same test per subject on the same day in all schools. If we could produce several forms of exams within one exam location, this would minimize cheating. Of course, the changes we propose continue to be resisted.

LH Do you mean the exams would be made up entirely of MCQs with no writing portion? Could this be an instance of solving one problem like minimizing cheating, while creating a different problem by eliminating an assessment of a student's writing?

DB We have not created a problem, we have a problem. I think we have mitigated the problem a little by actually changing the student's mindset. The problem is about the mindset, not the writing. They are going into university with a different mindset. That is what we have done. But then again, I am a language specialist. I keep telling Dr. Tarek, okay, I am very flexible, but for the record, you must know that we are taking a big risk by sending students to university without being sure whether or not they can write Arabic or English. But in a country where change is strongly resisted, we also have to be pragmatic. I see the value of what we have done, and I see the weakness of what we have done, but we cannot have it all. We have to compromise. And we have compromised. Otherwise, we go back to the old system and then we have failed. We have no intention of going back. At the end of the day, in the old system, did they really know how to write? All the writing

topics in the exams came directly from the schoolbooks. They were just memorizing everything. That was not writing either.

LH The other important national assessment occurs in Grade 4 to measure students' numeracy and literacy. Have there been any changes in this benchmark assessment?

DB In fact, another pillar of our plan is that for the first time ever, we are going to have our own national assessment for literacy and numeracy. We have never had one. We always depended on the international ones. But let me be clear, we will continue participating in PIRLS (Progress in International Reading Literacy Study) and TIMSS (Trends in International Mathematics and Science Study) no matter how expensive they are because we want the benchmark. I mean, we are not trying to hide or cover-up our rankings. But at the same time, we need to also be in control of our own strategy.

With the funding and support of the World Bank, we are designing a Grade 4 assessment. We will be running the pre-test in September (2021). We want to do a pre-and post-test to see if Education 2.0 has had an impact on literacy and numeracy. It is a curriculum-based assessment and is more fine-grained than the broad international assessments. We have analyzed the curriculum and are writing up the test items. The most refreshing news I have heard is that Al-Azhar, which is almost a parallel system, wants to participate for the first time ever in our Grade 4 assessment, and hopefully, future assessments. Maybe later Al-Azhar schools will also participate in TIMSS and PIRLS.

3. COVID-19 And the Experiment with Research Projects

LH We are talking now during the COVID-19 pandemic which has disrupted school systems around the world. When schools in Egypt closed in March 2020, you had to come up with a workaround for the end-of-year assessments. Dr. Tarek announced the research projects. What was your role in coming up with this idea and how did you envision it would work?

DB The interesting thing about this experience was that there really was no time to think. We were hit with a situation where we could not

open the schools. We had to react and solve problems. We were running to make platforms and TV channels available. We had to get teachers to record their lessons, while solving all sorts of other problems. In the midst of all this, we needed to change the assessments. We could not have exams in schools, so we tried research projects for Grades 3 to 9. Students were required to produce a research project using online learning resources provided by the Ministry. They could work either individually or in groups of up to five students. Students were given four very broad and general topics to choose from: tourism, water, energy, and health. The research project was supposed to emphasize deep learning rather than memorization and develop students' reading and writing skills. I helped the CCIMD (Center for Curriculum and Instructional Materials Development) design a very simple rubric to make it easy to score these projects consistently for each grade year. This was very well-intentioned and consistent with what we were doing overall.

LH This experiment of projects was a first for Egypt. How did it go, and what did you learn?

DB It turned out to be a total disaster. You can imagine what happened. Projects started becoming a lucrative source of business. We started hearing about projects for sale and the prices being charged for them. Parents were buying projects for their kids. Those parents who could not afford the prices started screaming that it was unfair. Some parents had the guts to just let their kids do the projects on their own, but not many would take that risk. I mean, projects were going for all kinds of prices, and of course we saw the usual divide between rich and poor. The costs ranged enormously across the country. I cannot remember the exact prices, but they were cheaper in certain governorates and astronomical, for example, in the wealthy areas like Rehab (an upscale compound in New Cairo). But the fact remains that projects were for the most part not done by the students. They were done by teachers, by clever entrepreneurs who made quite a lot of money out of this, and by parents. Of course, this was definitely not our intention. It completely missed the purpose of deep learning and developing young people's skills.

The projects became the talk of the town. And in a way, they are an example of how the society resists change. In the parents' minds, the whole purpose of the system is that their kids pass regardless of

whether they learn or not. They will do anything, even corruption and bribery, to get their kids to university. It is very Machiavellian; the ends justify the means. But it has nothing to do with education. Our purpose is always about developing the mind and they do not want that. Of course, we will never repeat it again (see Chapter 25 in this volume).

LH In retrospect, do you see any positive outcomes from the projects? Some students were taking initiatives and posting videos on their social media about how to do the projects. Could this have been a kind of silver lining in this story?

DB I would not say there were positive outcomes, but some positive feedback. Some parents, maybe the more educated parents, actually got their children to do them, but minimally. And there are always the bright and brilliant kids in any system. At the end of the day, to run a country, you need a small percentage who are smart and clever, and we have them. For sure, all over the country you have little geniuses out there who will prevail regardless of anything. They are clever, talented, and have a brain. They will always stand out, so that is normal. But we are talking about the dream of having a system where we will get 80% highly educated, or even better, 100%. As a country, trying to include everyone is a great dream, but it is impossible.

4. Digitizing Teacher Training

LH The Ministry announced that it is moving to a model of online Teacher Continuous Professional Development (CPD).⁴ What is the problem with how teacher training is currently being done?

DB It is not working, and it is corrupt. I can give you some background. Part of the vision of Dr. El-Bilawy, who served as the First Under Secretary to the Ministry of Education (2001-2005), was to create the Professional Academy for Teachers (PAT) which they did through a USAID project. NCEEE received the training and support to design the teacher tests. It was a big experiment. Teachers were given MCQ tests, and I was in the thick of it. For about a year I lived in NCEEE. I must give credit to one

4 See the document, 'Transforming Teachers' (MOETE 2020).

of the international consultants from Croatia named Zarko Vukmirovic⁵ who was helping NCEEE in the assessment component and gave all his know-how to the young people there. The tests were beautifully designed. The NCEEE involved university professors for each subject and administered assessments for a million teachers on five levels. It was brilliant. We created these tests, got scanners, and NCEEE really thrived. I was the lead in assessment. This project eventually failed, but that is another story. The interesting thing is when I returned to work with Dr. Tarek, many of those psychometricians trained at that time still worked in NCEEE. This is very important, the fact that this special cadre of people in the NCEEE and the CCIMD are stable. We knew that NCEEE has this capacity.

The trouble was that early on, Dr. Tarek discovered some terrible corruption in the administration of the teacher training. Secondary school teachers were supposed to receive a training on how to use the Egyptian Knowledge Bank (EKB). The PAT received the funds to do this. By chance, Dr. Tarek was visiting a school, and he asked a teacher. 'So, how was your EKB training?' And the teacher had no idea what he was talking about. Dr. Tarek could not believe it, so he asked for an investigation. He found that on paper, the EKB training had been completed and trainers were paid. But it was not real. I mean, maybe some trainings took place, who knows? But at the end of the day, it turned out to be another corrupt structure. And just recently, a few weeks ago, the corrupt head of PAT was removed and sent back to NCEEE because of a terrible scandal in finance. He is back there because he is tenured and it is very hard to fire anyone. But they are compiling the evidence now so perhaps he will be on his way out of the Ministry in a few years. You cannot have someone at the top who is dishonest, even though we know you find this in the whole system. With the new online system, PAT is going to be the implementing body, but we want a completely new design.

LH Was the impetus for moving teacher training online largely due to corruption in the current system?

5 Between 2006-2021, Zarko Vukmirovic was a Principal Psychometrician/ Statistician and Principal Researcher at the American Institutes for Research.

DB Yes, it was that bad. These trainings involve money, tons of money. This is government money going into people's pockets and nothing is really improving on the ground. We needed to find a way to bypass the middleman. We can do this by setting up the system electronically. We need a proper system that will be driven by IT. We want to do Teacher Professional Development mainly online, with mentors who will work to develop the teachers. Assessment will also happen electronically. We are going to try to get teachers to send their videos or whatever they are doing, such as learning objects, lesson plans, students' work, onto an E-portfolio. That will be sent to evaluators who will assess it not knowing who this portfolio belongs to. That is how we want it. Is it perfect? Of course not. But we are not going to do class visits. If we go back to class visits for evaluations and promotions, then we go back to corruption and bribery again. We cannot do fake assessments again. We are setting up this new system with the help of the USAID Teach for Tomorrow project which is designing it (see Chapter 5 in this volume). Then, it is going to go back to PAT to implement it. They will need some training to manage the platforms. We are trying to minimize the corruption.⁶

5. Digital Transformation: Gains and Losses

LH *This brings us to the larger trend of digital transformation, which is happening fast and furious throughout the education system. As a senior advisor, how do you see this transformation in terms of both opportunities and risks?*

DB When we talk about technology we have to keep in mind the digital divide. There are those who have less access, which leaves them at a disadvantage. My concern is that because of the digital divide, we will not be able to include everyone. Technology is a double-edged sword,

6 In 2022, Dr. Tarek Shawki was replaced as Minister of Education during a change of cabinet. The new minister, Dr. Reda Hegazi, revived the Professional Academy of Teachers and appointed a new director, Dr. Zainab Khalife, to oversee a hybrid system of teacher training that involved on-the-ground cascade training with some online components. The USAID Teach for Tomorrow (USAID T4T) project continued to support PAT and adjusted to the changing priorities with the change of Minister. In the interest of full disclosure, Linda Herrera worked as an international consultant for USAID T4T from 2021-2023.

and hence why we plan. I do not know if we will have time to do it, but we want to provide tablets for students in the primary and prep stages because that opens minds and that gives them far more access than just studying from one book. Knowledge is not something that just comes from a book anymore. And yes, it elevates. That is the plan, but we have not done that yet, it is just too complicated. The system is so hard to manage. We started with a plan for five years, but now we see that we need about fifteen years. It just takes triple the time than what we originally anticipated.

LH The government seems to be investing heavily in the digital infrastructure. Are they narrowing the digital divide.

DB Everything will be digitized I think in five to ten years. In fact, the whole country is going in a direction of digitization in our daily life. It will take a while, but it is happening, and it is going very strong. There is a ton of cash floating around so this will be a way to regulate money and taxes. Digitization will decrease corruption, though nothing will ever eliminate it. But we want to minimize it to the extent possible. For example, you can only submit taxes through a digital system. This means that people have to learn how to use the digital systems to pay taxes, and they will get into deep trouble if they do not.

LH Are there any other downsides you see to digital transformation of the education system outside of the digital divide?

DB Um, I am a proponent, so I do not think there are any negatives. I see it as positive. I think it is an additional tool, it is my extra brain. I see it as an enhancement, and I do see enhanced humans later on. If well controlled, it enhances our skills and our ability to do things that we could not do without these machines. So, I only see positive things. But of course, things can turn wrong, as I have seen in those weird science fiction films. I do not know if you follow, but some of them have very interesting ugly outcomes.

LH There is always this question during times of largescale change, of what we should leave behind, and what we should hold onto, carry into the future? So, from your point of view, what do we need to maintain from the past?

DB Ethics. Ethics. We have lost our way in Egypt. We need academic integrity. We have a real problem of academic integrity, plagiarism, and cheating across the board. We recently found out about students in a calculus class who bribed a professor to send the answers through a WhatsApp group during the exam. It is not about machines because we have to live with and manage them. Academic integrity, and integrity in general is what we need to teach to and instill in the majority.

LH I have mixed feelings about how proponents of the new system regularly speak about memorization as if it is inherently negative. The fact that people graduate from the old system with strong powers of memorization and high degrees of mental discipline could also be viewed as impressive, an asset. It seems like in the new system those memory skills will get lost.

DB Yes, and this is as it should be. I do believe in IT and I do not believe in memorization or that it is important. People of my generation, you know, we forget. But you know what, I have my beautiful iPhone. I do not need to remember tons of facts. But I do need to have critical thinking skills. Honestly, I use Google a lot. I met Stephen Wolfram who came up with this fabulous math software called Wolfram Mathematica which students use for calculations, so they do not have to do them by hand. Working with Discovery Education who are supporting us in curriculum design and development, we are actually embedding computational math in Grades 3 and 4. And even in Thanaweya Amma calculus, students need to understand the concepts, but we do not need to teach students how to derive these formulas which can be done by machines. Critical thinking skills are a must, but our brain does not have to be preoccupied with these computing processes because we have machines now to do this for us. So, it is changing. I know diehards and the old generation will find it a bit troubling that we do not know how to do the long division, and we do not know how to do other things by memory. Maybe it is scary, but I am a proponent of change.

LH What about the value of being able to recall a poem by memory?

DB That is our generation. I am really sorry. We have to accept that the younger generation, maybe my grandkids, will not be able to recite poetry. It does not matter. I am fine with that. Honestly, I have changed my mindset completely and embraced change to that extent because it

is a different world. And the world is changing so incredibly rapidly, where machines are part of our life whether we like it or not. Machines are like an extension to humans. I think kids will soon be born with phones in their hands, or some chips embedded in our bodies. This is the new human.

LH Given the unpredictability of a minister's time in office, what are the things you are prioritizing while you still hold this role?

DB We are working to make sure we leave the legacy of the curriculum. Dr. Nawal (director of CCIMD) and her team are digitizing everything, including the curriculum frameworks, so that we leave something behind.⁷ Another thing we are trying to do is to get state approval to change the administrative setup of CCIMD and NCEEE, something you took part in.⁸ It turns out it will be really hard to change NCEEE since it was established by a presidential decree. We want to put the platforms in place for teacher CPD and other things. Later on, new people can come and build on what we have done. They can take Egypt to the next step. Once everything is set up, it will be difficult to undo. And maybe we only have a short amount of time. We do not know how long, it will take three years maybe? A president can remove a minister at any time. If we can achieve these goals, we think we can transform our people. We need research, which is not a thing that is funded even by the agencies.

But what would be really fascinating is to follow this very slow change over time and see how it evolves, because this is absolutely unique. There is nothing like this enormous reform. When you have a whole curriculum imposed, and it has been imposed, the teachers have to change, even in tiny little steps they will change to meet the curriculum. A teacher is a teacher at the end of the day. I have great faith that teachers will get used to it, and eventually master it, but it is going to take a long time. That is my two cents' worth.

7 The curriculum frameworks are available in Arabic and English on the Education 2.0 Research and Documentation website at <https://edu2-egypt.com/curriculum-frameworks>

8 Linda Herrera served as a member of a special advisory ministerial committee in 2020, appointed by Dr. Tarek Shawki and led by Dr. Deena Boraie to reimagine the administrative structures of CCIMD and NCEEE.

6. Addendum: Reflections on Documentation of the Education Reform from February 2023, Six Months after Tarek Shawki Was Removed as Minister of Education

DB Linda, I want to thank you for this documentation research study you are conducting. Without this documentation, all our efforts and contributions to our field may have been lost over time. You have a deep understanding of how education works in developing countries. You truly understand how difficult it is to transform an education system, particularly a large education system such as the one in Egypt, and how slow change takes place in education, in general.

I have come to realize how important it is to document and reflect on what we tried to do to transform Egypt's K-12 education system. When Dr. Tarek was removed so abruptly back in August 2022, to be honest, I was shocked and heartbroken. I was sad because we needed more time to complete what we started, and I knew that some of the strategies we introduced would be reversed. I firmly believe now that we made a great contribution to the field of education and there has been some positive lasting impact on the ground. I am very proud that we were able to introduce a modern, cutting-edge curriculum for grades K-6 in Egypt's public schools. Although the subject leads in the Ministry of Education are now removing parts of the curricula (they call this strategy 'lightening the curriculum') however, the updated and modern core of the new curricula still remain. All the well-trained tenured psychometricians and assessment experts of NCEEE remain and will always be a tremendous asset within the Ministry of Education.⁹ Regarding the Continuous Professional Development (CPD) of teachers, I was delighted to hear that the Minister of Education recently announced that the Ministry is proceeding with the licensure of teachers which was one of our key strategies.

In conclusion, I now realize that as a team of advisors, we had a very important and positive impact on the K-12 education system in Egypt, and I am extremely proud that I was part of this endeavor. Changing

9 For the NCEEE's work on the question banks and electronic exams, see Shawki and Mohamed 2021a and 2021b.

and modernizing a large education system is complex and needs time. In Egypt resistance to change, in general, is very high. What I have learned from this experience is that five years would never be enough to transform Egypt's K-12 education system and that we needed another three to five years. I know that the Ministry now has to continue the curriculum reform we started, and they will be developing the curricula for Grades 7-12 as well as the CPD system for teachers. Thank you for documenting this amazing education experience in Egypt's K-12 system.

7. Education 2.0 Resources

The Education 2.0 books and Teacher's Guides for KG-Grade 6 are available in Arabic and English on the Education 2.0 Research and Documentation Website, <https://edu2-egypt.com/kg1-2>

The Education 2.0 curriculum frameworks are available in Arabic and English on the Education 2.0 Research and Documentation website, <https://edu2-egypt.com/curriculum-frameworks>

8. Bibliography

Ministry of Education and Technical Education. 2020. 'Transforming Teachers: Education 2.0 Teachers: A New Cadre of Educators', *Education 2.0 Research and Documentation Project*, <https://drive.google.com/file/d/1VgnNBliU09U2fopMF6dbpFrzFqLYsDxv/view>

Shawki, Tarek, and Mohamed, Ramadan. 2021a. 'Journey of Thanaweya Amma Exam Forms', *Education 2.0 Research and Documentation Project*, YouTube, <https://www.youtube.com/watch?v=289fL9SNUkU>

Shawki, Tarek, and Mohamed, Ramadan. 2021b. 'The Question Banks in Egypt Explained', *Education 2.0 Research and Documentation Project*, YouTube, <https://www.youtube.com/watch?v=uIKhCpwVy3E>

9. Companion Videos

Video 6.1 Deena Boraie and Nelly El Zayat: 'Developing a New Curriculum', Interview by Linda Herrera, Education 2.0 Research and Documentation Project, 17 June 2021, YouTube, <https://www.youtube.com/watch?v=86ZiLZuEi2k>

Video 6.2 Deena Boraie and Nelly El Zayat: 'Advisors to the Minister of Education', Interview by Linda Herrera, Education 2.0 Research and Documentation Project, 17 June 2021, YouTube, <https://www.youtube.com/watch?v=3nbxwZTgZW8>

Video 6.3 Deena Boraie and Nelly El Zayat: 'Communication about the EDU 2.0 Reform,' Interview by Linda Herrera, Education 2.0 Research and Documentation Project, 17 June 2021, YouTube, <https://www.youtube.com/watch?v=zI9CVV3fte0>