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EDITORIAL

Learning radiology: Connecting with the past

Aprender radiología: un pulso con el pasado

Tell me and I forget. Teach me and I remember. Involve me and I learn.

Benjamin Franklin

A great deal has changed in medicine since Hippocrates of Kos of the Asclepiades family formulated his revolutionary *Aphorisms*. Countless brilliant physicians and scientists followed in his footsteps, contributing with their untiring efforts in discoveries of vital importance to the future of medical science; Galen, Avicenna, Paracelsus, Bernard, Pasteur, Ramón y Cajal, and many others, not to mention the forefathers of radiology such as Crookes, Röntgen, Vallebona, Coltman and Hounsfield. There is no doubt that their names and contributions have a well-earned place in posterity, but may the same be said of their teachers and the teaching methodology that utilised their talent?

Nowadays, everyone seems to accept that the university hospital is the backbone of medical education at all levels, the place where students have their first real-life contact with their future profession and where residents learn the rudiments that will define their future capabilities. At this point, we should be asking: are we radiologists doing enough to train the new generations on whom our direction as a society will depend? And we could go even further: are the trainers of new specialists conversant with the most effective educational trends in teaching? Authoritative voices in Spanish radiology have raised similar questions over the last twenty years in the pages of this same journal, reasserting the role of the radiology tutor and even calling for more training tools to hone their skills[1]. The aim of this editorial is not, given its concise nature, to engage in an in-depth discussion of the defects or virtues of our teaching system, but rather to issue a plea in favour of the classic teaching method which reaped such good results in the past, seeking parallels with the most forward-looking and effective systems of today.

Before that, however, it would seem essential that we break free from the constraints of Manichaeism, which defines teachers as either good or bad. It is reductionist to think that teaching depends wholly on the teacher or on their counterpart, the student. The act of teaching goes beyond introducing knowledge into the head of the person watching or listening, as it is a dynamic, not a stagnant, system, one in which both realities, the teacher's and the pupil's, receive a constant flow of information and two-way positive feedback. Few teachers, if any, could say that they have never learned anything from their students.

Returning to Hippocrates, it is known that his teachers were Herodicus of Selymbria, the forerunner of sports medicine, and Democritus of Abdera, co-founder of atomism and therefore one of the forefathers of physics. He was also a disciple of Gorgias of Leontini, a brilliant orator, a sophist like Herodicus, to whom we attribute the phrase, ''The man who deceives shows more justice than he who does not''. Hippocrates was a contemporary of Plato, who quoted him in some of his works, as well as his teacher Socrates, famous, among many other things, for developing the Maieutic method, a theory that revolutionised the concept of learning forever. According to this teaching method, the tutor asked the student questions so that the student would find the answers for themselves; subsequently, the teacher would discuss the answer provided with the pupil by establishing general concepts. As would seem obvious, even the founder of experimental medicine managed to see what others did not see because he did so on the shoulders of giants. From that time until today, has the science of medical teaching really advanced? Despite being inundated with information and the means to achieve our training aims, in practice we sometimes fail to leverage the numerous competitive edges we have over our past masters. Among other things, this may be due to overburdened radiology services, to clinging to false beliefs about teaching or to the fact that at some point we moved away from the concept of humanistic medicine that underpinned each and every act of classical physicians.

As the experts in the training of up-and-coming radiodiagnostic specialists would say, training needs to be eminently hands-on, providing not just adequate theoretical preparation, but also a simultaneous grounding in humanism in order to achieve both cognitive and affective objectives[2]. The old university model, defined by master classes, closed

syllabi and passive training, has already been replaced by a model focused on the skills students must proactively acquire. What matters now is not what the teacher should teach, but rather what the student should learn[3].

The ''spoon-feeding'' style of teaching has prevailed in our speciality for too long, in which the teacher obliges the student to be a passive vessel of knowledge, without giving them the opportunity to act or think for themselves[4]. The appearance of PowerPoint (Microsoft) in the meeting rooms of radiology departments and even in conference rooms has led to a progressive change in the paradigm which we still do not fully comprehend and which to a certain extent distances us from educational systems that have provided good outcomes for millennia. This does not mean that technology is our enemy, far from it. Rather, the message is that as trainers of new specialists we must leave our comfort zone and use the numerous technological resources available to us to achieve more practical and interactive teaching. Obviously, access to any prevailing cutting-edge artificial intelligence-based teaching methods will not be within reach of all budgets, although that does not prevent us from making the most of the tools we do have.

Leaving aside the support that technology can provide, even some basic teaching methods which have proven effective throughout many generations can be misused by teachers. One example: in case-based learning, the *bottom-up approach* (in which the students read the clinical case first) has demonstrated its superiority over the *top-down approach* (in which the educators solve the problem while the students look on)[5]. However, despite the fact that there is very solid evidence in this regard, it is no less true that there are limiting factors that prevent us from taking the right path: a lack of material/financial resources (buttons to select an answer, specific software, etc); the excessive number of students attending a seminar; or the low level of public participation. On a smaller scale, at workstation level, the adoption of teacher-centred teaching methods is less defensible when the web platforms of institutions of the ilk of Eurorad (https://www.eurorad.org/teaching-cases), the Radiological Society of North America (RSNA) (https://cases.rsna.org/quiz) and Auntminnie (https://www.auntminnie.com/), to cite but a few examples, provide a huge number of teaching cases with which to train our students in a way that encourages feedback.

Socrates' Maieutic method has survived for almost 2500 years and one may assume it will continue to do so for some time to come. Many innovative proposals in medical science learning theory have emerged since the day that Hippocrates founded a clinical medicine detached from religious beliefs. We are medical specialists in radiology, although at the same time we cannot avoid being children of the classics. It is they who will return to the future to provide the answers that not even the most advanced machines could ever find.

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