Surgery and
Surgical Research Online Journal

LAURIN PUBLISHERS

Opinion

Artificial Intelligence and Fossil-Skilling in Surgical Education

Ken Masters*

College of Medicine and Health Sciences, Sultan Qaboos University, Oman

Submission: April 20, 2026; Published: April 23, 2026

***Corresponding author:** Ken Masters, College of Medicine and Health Sciences, Sultan Qaboos University, Oman.

ABSTRACT

With the introduction of Artificial Intelligence (AI) into surgical education, we are right to be concerned about the loss of skills (de-skilling, no-skilling, and never-skilling). Equally as important, however, is the failure to recognise that AI will make some skills obsolete, and to teach these obsolete skills, termed fossil-skilling, is equally damaging.

KEYWORDS

Surgical Education, Medical Education, Artificial Intelligence, De-Skilling, No-Skilling, Never-Skilling, Fossil-Skilling

ABBREVIATIONS

AI: Artificial Intelligence; GenAI: Generative Artificial Intelligence

INTRODUCTION

De-Skilling, No-Skilling, And Never-Skilling

Although the term *de-skilling* has been used for decades [1,2], the recent explosion of Artificial Intelligence (AI) usage has led to the term's being increasingly used and meaning "the loss of skills, capacities, and virtues essential to human flourishing and robust democratic societies" [3]. More recently, a new term has been coined: *no-skilling,* meaning "the elimination of the opportunities and environments required for acquiring such skills and virtues in the first place" [3]. In medical training, the equivalent term, *never-skilling,* "where trainees fail to acquire foundational proficiencies due to premature reliance on automation" [4] has also emerged.

I acknowledge that these problems and the associated fears are real, and I certainly have misgivings when I see young learners type a simple prompt into a Generative AI (GenAI) tool, and unquestioningly accept the output, ignoring all that we know of AI hallucinations, biases and other weaknesses. I also fear that these problems may be early indications of a broader level of overall human cognition decline [5].

While the fear of these problems is justified, there is a counter-problem we should fear, however: teaching skills that were useful in the past, but will not be needed in the future. I term this, *fossil-skilling: the continued teaching of skills that were once essential, but are no longer required for safe or effective professional practice.*

Fossil-Skilling

When I was at school, a problem like: (Sin 30.5 * Cos 68.5 / Tan 23.4) would require the use of cumbersome "log-books", be worth about 10 marks, and many students would get it wrong, hoping to pick up some marks for "showing their work". Similarly, if a student were given a data set of 100 numbers, asked to calculate the mean, median, mode, and standard deviation, and draw a bar chart depicting the numbers, that would be an hour's work, and the standard deviation would definitely be wrong.

Similarly, in medical education, long before any reader of this article was born, medical students were taught the important skill of "immediate auscultation" (holding their ears directly on the patient's chest) [6] and struggled with interpreting what they heard. These skills were crucial and required mastery for professional competence.

Today, for mathematics and statistics, we use calculators and computers; for listening to patients' lungs and hearts, we use stethoscope-enabled "mediated auscultation" [6].

Why do we no longer teach those previous skills? Because they are no longer required, and to teach them would be *fossil-skilling*.

Until recently, this problem would largely be solved by natural attrition, with previous skills' being slowly replaced by newer skills. The public release of ChatGPT, however, was unprecedented, with 1 million users in five days, and early adopters' experiencing the irritation of "ChatGPT is at capacity right now" as the company was caught off-guard by the demand that exploded. With all the GenAI tools that followed, it was quickly obvious that one important difference between the impact of AI and the impact of the stethoscope, calculator and computer was that the necessary skillset change was so rapid that identifying emerging fossil-skills is no longer a gradual, generational process; it is an urgent and ongoing challenge.

In surgery, we have seen the evolution from open surgical techniques to minimally invasive and robotic-assisted procedures. Previous generations of surgeons were required to master extensive open surgical exposures and techniques that are now rarely performed in routine practice. While these skills remain important in specific contexts, the routine, extensive teaching of such approaches for all trainees may represent fossil-skilling if they are unlikely to be required in future practice dominated by minimally invasive and AI-assisted techniques.

Medical Education in General

In medical education, there have long-been calls for teaching AI [7], and the consensus is that this teaching should not be an add-on, but should be deeply integrated into the skill set, so that learners become adept at new skills and new methods in all aspects of their professional training, including scholarship and clinical skills.

An over-riding problem, however, is that the curriculum is already over-burdened, and so trying to force AI into this situation may create an untenable situation. The solution is to identify the skills no longer required, and then to stop teaching them.

A Balanced Perspective

The central argument of this paper is not simply "Do not teach obsolete skills", as that has always been known. The central argument is to recognise that, within our context, AI-systems systems have made it increasingly difficult to identify those obsolete skills, and so we need to develop strategies aimed at applying great care in monitoring surgical teaching to be able to adapt quickly enough to avoid fossil-skilling. This will not be a trivial task.

But What If You Don't Have….?

But what if you don't have AI? I am sure this is a legitimate concern. About as legitimate as asking: "But what if you don't have a calculator," or "what if you don't have a stethoscope?" That said, however, I do not wish to be flippant, and any teaching and practice approach would have to take specific contexts into account. These contexts will include the resource availability, system failures, over-reliance, cyber-security and overall ethical responsibility which will always reside with the physician.

CONCLUSION

The challenge for medical education is no longer simply to integrate new technologies, but to actively decide what to stop teaching. In an era of rapid AI advancement, the greatest risk may not be de-skilling or even no-skilling, but fossil-skilling: the persistence of outdated competencies that consume limited curricular space and cognitive effort. Yet, the abandonment of skills must be approached with caution. Some may persist as critical fallback competencies, required only in moments of technological failure or uncertainty. The task, therefore, is to reconceptualise medical practice competence: distinguishing between routine, augmented, and contingency skills in an AI-mediated future. Surgical education may take a lead in this transition.

CONFLICT OF INTEREST

None.

REFERENCES

1. UK Parliament (1985) New Technologies - Hansard - UK Parliament.

2. Cooley M (1987) Human centred systems: An urgent problem for systems designers. AI & Society 1(1): 37-46.
3. Ess C (2025) We Fall in Love With the Technologies of Our Enslavement. … The Next Generation May Be One of No-Skilling in Regard to Essential Human Virtue Ethics', Imagining the Digital Future Center, 23 April.
4. Felix C Oettl, James Pruneski, Balint Zsidai, Yinan Yu, David Fendrich, et al. (2026) From de-skilling to up-skilling: How artificial intelligence will augment the modern physician, Journal of Experimental Orthopaedics 13(1): e70677.
5. Acemoglu D, Kong D, Ozdaglar A (2026) AI, Human Cognition and Knowledge Collapse. w34910. National Bureau of Economic Research. Cambridge, MA, USA.
6. Montinari MR, Minelli S (2019) The first 200 years of cardiac auscultation and future perspectives, Journal of Multidisciplinary Healthcare 12: 183-189.
7. Masters K (2019) Artificial Intelligence in Medical Education, Medical Teacher 41(9): 976-980.